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BIOGAS FROM WASTE, BUEN AYRE PLANT
ARGENTINA

Figure 1: Central Buen Ayre
Sources: Central Buen Ayre team

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Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective project design or implementation.

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EXECUTIVE SUMMARY

The Central Buen Ayre S.A. project, located in Buenos Aires, Argentina, is a thermal plant that generates power through the collection, extraction, and treatment of biogas coming from a landfill. This plant is the first of its kind to operate in Argentina, and aims to displace the use of nonrenewable sources of energy in the national grid. The team of Central Buen Ayre operates under Tecsan Ingenieria Ambiental S.A., a company created in 2009 designed to generate and distribute electrical energy. The project originated through a public bidding process from Energía Argentina Sociedad Anónima (ENARSA), the government entity in charge of energy generation in Argentina. They worked in collaboration with Coordinación Ecológica Área Metropolitana Sociedad del Estado (CEAMSE), the government company in charge of managing waste and solid residues from the urban region of Buenos Aires. Central Buen Ayre designed a proposal for renewable energy generation in a module located in the already existing North Environmental Complex III, a site previously owned by the Argentine military.[1] The module, IIIc, is one of three modules already operating on site. The company that won the bidding, Tecsan Ingenieria Ambiental S.A., is a subsidiary of Benito Roggio Ambiental.[2] The lifespan of the project is 14 years, and includes the collection, extraction, treatment and valorization of Biogas through generation and injection of energy to the National Electrical Power Grid. The power plant, with a maximum power of 11.8 MW,[3] is expected to achieve a total reduction of carbon emissions of 6,043,349 t CO_2e.[4]

The power plant is deliberately located in an isolated area because it handles methane gas, a highly explosive fluid. Its location in a previously used military facility means there are few species of flora and fauna, and surrounding communities are distant. Nonetheless, the project team, in conjunction with the consulting company Ingeniería Laboral y Ambiental (ILA), performed an in-depth environmental survey of the natural landscape to ensure proper impact management. They concluded that flora, fauna, and human settlements would not be significantly impacted by the construction and operation of the plant. Studies of noise and light pollution showed in detail how the project's construction was well within desired levels according to national regulations. In addition, the project of Central Buen Ayre produced a positive economic impact by creating a total of 161 new jobs during the construction phase and 15 permanent jobs during the operation phase. Central Buen Ayre was not directly in charge of the hiring process, and instead relied on Finning Argentina S.A., the local representative of the

[1] Central Buen Ayre, "Presentación Asociaciones y Cooperativas de Cartoneros," Argentina, 2011, 13.
[2] Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Estudio de impacto ambiental, central de generación de energía a partir de biogás Central Buen Ayre," Córdoba, Argentina, 2011, 70–79.
[3] Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "4. Descripción técnica: estudio de impacto ambiental, central de generación de energía a partir de biogás Central Buen Ayre," Córdoba, Argentina, 2011, 24–25.
[4] United Nations, "Clean Development Mechanism: Project Design Document Form," 2006, 9.

Caterpillar company, for the construction phase of the plant and the process of hiring. Caterpillar was in charge of setting up the equipment and machinery for the energy generation phase, in which the project is currently operating. In addition, they have developed detailed monitoring guidelines to ensure the appropriate handling of its products.

The energy generating plant from biogas is the first of its kind in Argentina; therefore design strategies for possible unprecedented problems had to be created. The project team developed a detailed analysis of impacts in both the construction and operation phase, and concluded that possible accidents related to the handling of biogas would produce the highest negative impact during the operation phase. For this reason, they designed a new protocol for emergencies, following the guidelines of ENARSA.

There is evidence of a strong commitment to develop Central Buen Ayre within a system focused on sustainable integration. Its policies are aligned with ISO and OSHA regulations to assess quality management, management of environmental systems and security systems, and management of health in the working environment. The project also obtained approval under the Clean Development Mechanism (CDM) of the Kyoto Protocol of the United Nations. Taking them as a baseline, the project meets national and municipal Argentine regulatory requirements and laws from a sustainability and an environmental point of view.

Furthermore, the project connects with existing infrastructure to create meaningful improvements in their internal performance. Infrastructure integration is achieved in two central aspects of the power plant: in the lechate treatment facility, by using an existing plant located in one of the modules of the complex, and in the underground medium voltage line, by connecting the energy produced to an existing power station. In addition, in order to optimize the processes and increase efficient performance, the project team developed a systematic plan for the constant monitoring and maintenance of machinery operating in the power plant, linked to the person responsible for the job. This shows an adequate amount of resources allocated to plan maintenance in the long term. The project team of Central Buen Ayre developed a clear procurement policy matrix with performance specifications that applied to key companies in charge of hiring workers and other suppliers. Even though the project team outsourced the hiring process, they ensured that the companies contracted, such as Finning Argentina S.A., met sustainable practices. For this reason, the project team developed an evaluation form targeted to key companies. In addition, the project team took advantage of its location within the North Environmental Complex III to use the reclamation facility's Mechanical Biological Treatment Plant to recycle between 25% and 50% of its materials.

Central Buen Ayre did an excellent job in its energy management, showing a strong

commitment to reducing nonrenewable energy use. In the initial stages of the project, the power plant sustained internal energy needs with power produced from the six generators of the plant, of which the resulting net energy was injected into the national grid. However, in 2014 the project team bought a smaller additional GE Jenbacher 250 kW generator for the specific objective of fulfilling internal energy needs. Therefore, a higher percentage of power produced can now be injected into the national grid, displacing the use of fossil fuels. In this way, the project generates a net positive amount of renewable energy.

In terms of land and water management, the North Module IIIc is part of the North Environmental Complex, so most large-scale systems are managed by the complex as a whole. Taking advantage of the project's design as a module of a larger complex, the project team decided to use the compost produced by the composting plant located in the North Environmental Complex as fertilizer. The compost uses raw material from municipal pruning to create an organic fertilizer.

The project team of Central Buen Ayre, with input from the consulting company ILA, determined that no net negative impact would affect local communities, flora, and fauna. However, there is still room for improvement related to the potential social benefits the plant of Central Buen Ayre could have had. Because the project team was not directly involved in the hiring process for construction and operation, they were unable to enforce policies to benefit job creation for local communities, and instead most of the jobs were given to experts brought from outside the area of influence. If the hiring process for the plant had been led by the project team, they could have benefited local communities further by hiring people from the immediate surroundings. This would have increased human capital and thus produced more long-term benefits. Furthermore, even though there were benefits from the modular design of the plant as part of a larger complex, it also meant that systems were not tailored to the specifics of the energy generating plant. In order to specifically address the problems related to the project, the project team could have adapted the general guidelines designed by the complex as a whole to meet their own needs. Still, the project of Central Buen Ayre did an excellent job in the reduction of carbon emissions, by capturing the gas generated by the waste, which otherwise will be released to the atmosphere.

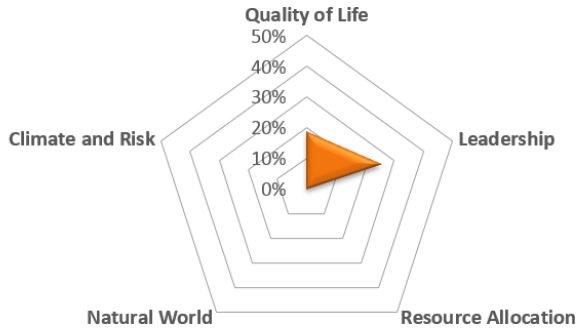


Figure 2: People & Leadership award Summary of results

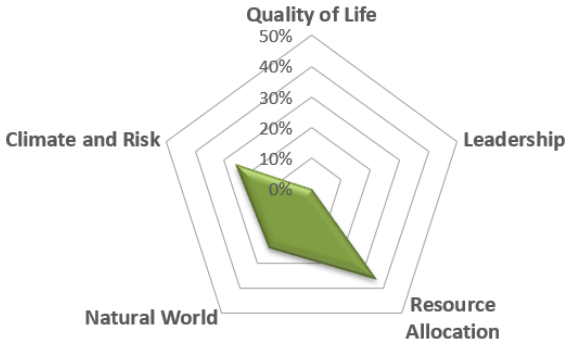


Figure 3: Climate & Environment award Summary of results

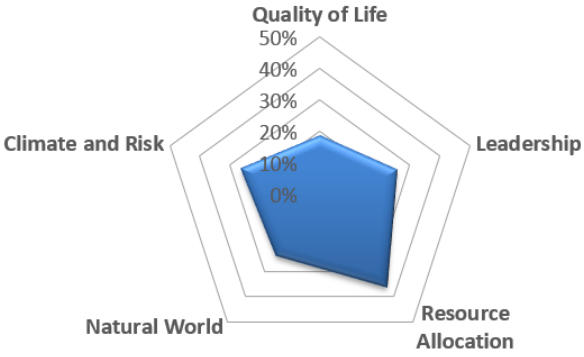


Figure 4: Infrastructure 360 award Summary of results

1. PROJECT DESCRIPTION AND LOCATION

The Central Buen Ayre S.A. project is a thermal plant located in Buenos Aires, Argentina, which generates power by using biogas from the decomposition of organic residues in waste. The company is a subsidiary of Tecsan Ingenieria Ambiental S.A., created in 2009, was designed to generate and distribute electrical energy.[5] The power plant, with a maximum power of 11.8 MW, is expected to occupy approximately 5,025 m[26] and will utilize solid urban waste from the city of Buenos Aires and its surroundings to generate power. Following the guidelines of article twelve of the Kyoto Protocol, Central Buen Ayre is the first of its kind to be developed in Argentina and expects to provide both short-term and long-term environmental benefits. The project is expected to have a lifespan of 14 years, after which the area will be restored to use for military training.[7] Central Buen Ayre has not have a role on the landfill disposal operations, of solid waste, since they have been assigned just to the collection of biogas and energy production. The project is currently in the latter phase. The project is also expected to shift ownership to a tertiary actor after its lifespan, so no significant plans for land reuse or recycling of equipment have been developed.

The project is located on military land, in Campo de Mayo within the province of Buenos Aires and 37 km northwest of the city center. The biogas module is located in the districts of Tigre (95%) and San Miguel (5%),[8] while the proposed underground medium voltage (13.2 kV) line, through which the power will be conducted, is located in the districts of San Miguel, San Martín, and Tres de Febrero. The plant was designed as a module inside the North Environmental Complex, as part of a larger system of operating plants. The site is owned by the military and has been used for the past 80 years for military training, so it is isolated and has little to no impact on surrounding communities.

Specifically, Central Buen Ayre captures biogas, which is composed of 50% carbon dioxide and 50% methane gas, the latter considered 21 times more harmful than carbon dioxide in terms of global warming.[9] Given that both have greenhouse effects, the plant will reduce their negative environmental impact and instead create electrical power for Buenos Aires. The power produced from 266 vertical wells[10] designed to extract biogas will be introduced into the regional distribution system related to the national grid.[11] For every 16 wells, a primary tube

[5] Ingeniería Laboral y Ambiental S.A., "3. Estudio de impacto ambiental."
[6] Ingeniería Laboral y Ambiental S.A., "4. Descripción técnica."
[7] Central Buen Ayre, "Presentación Asociaciones y Cooperativas de Cartoneros," 13.
[8] Departamento Evaluación Ambiental, "Declaración de Impacto Ambiental," Argentina, 2011, 5.
[9] Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "8. Conclusiones: estudio de impacto ambiental, central de generación de energía a partir de biogás Central Buen Ayre," Córdoba, Argentina, 2011.
[10] Central Buen Ayre, "Presentación Asociaciones y Cooperativas de Cartoneros," 13.
[11] Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "7. Aspectos legales: estudio de impacto ambiental, central de generación de energía a partir de biogás Central Buen Ayre," Córdoba, Argentina, 2011.

will collect and mix the gases obtained. Once the mix is ready, it will go through a process of condensation and extraction of moisture, with three capture pumps that will thrust the dried biogas to the treatment plant, used in Central Buen Ayre S.A. to generate power.[12]

In order to analyze the environmental effects of the project, it was divided into two phases: the installation phase, consisting of constructing and setting up the equipment, and the operational phase, the remaining time in which the plant works to produce power from biogas. During the installation phase, 161 jobs were created in the design and construction of the energy plant; 15 permanent jobs remained when the plant started functioning a couple of years ago.[13]

According to National Law 26.190, 8% of energy used in Argentina in 2016 should come from renewable sources. For this reason, the Ministry of Federal Planning, Public Investment and Services, through the public entity Energía Argentina Sociedad Anónima (ENARSA), called for proposals to promote renewable energy coming from solar, wind, biomass, geothermal, or biogas.[14] In response, Central Buen Ayre S.A. developed a project to reduce the amount of gases that contribute to the greenhouse effect, specifically methane and carbon dioxide, and use them instead to create carbon bonds which can then produce energy. The generators used in the plant will be placed on a sled frame to keep them mobile, as a temporary solution during critical situations. As investment increases, long-term construction sources will be built based on energy demand.[15] Secondary goals of the project include: treatment of leached liquids extracted in the process of obtaining biogas, treatment of the gas, and the design and maintenance of electric energy plants from renewable sources. On average, the plant will treat 184,287 tons of waste every month, with maximum levels of 318,151 tons.[16] Once the gases are treated, Tecsan Ingenieria Ambiental S.A. will export the energy produced to the national grid.[17]

Currently, there is no existing legislation in Argentina related to the treatment and extraction of biogas from waste, so Central Buen Ayre and the client developed a working framework in order to design the project.[18] In the same way, most equipment had to be imported, including biogas purification systems and engines, because of the current absence of this market in Argentina. Buen Ayre is expected to add 11,796 kW from biogas to the Argentinian national grid. This additional power incorporated into the national grid means less nonrenewable sources of energy will be needed in the future. For this reason, the project has a double positive

[12] Departamento Evaluación Ambiental, "Declaración de Impacto Ambiental," 5–6.
[13] Executive Board, "Clean Development Mechanism Project Design Document," Argentina, 2006, 3.
[14] Departamento Evaluación Ambiental, "Declaración de Impacto Ambiental," 4.
[15] Ibid.
[16] Ingenieria Laboral y Ambiental S.A., División Ingeniería Ambiental, "2. Datos proyecto: estudio de impacto ambiental, central de generación de energía a partir de biogás Central Buen Ayre," Córdoba, Argentina, 2011, 3.
[17] Executive Board, "Clean Development Mechanism Project Design Document," 2.
[18] Ingeniería Laboral y Ambiental S.A., "7. Aspectos Legales," 3.

effect, because it recycles waste from the city and uses it to generate energy.

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 ISI[19] and Zofnass Program[20] 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

[19] www.sustainableinfrastructure.org
[20] www.zofnass.org

into four subcategories: Purpose, Well-being, Community, and Vulnerable Groups.

Purpose

The Purpose subcategory addresses the project's impact on functional aspects of the community, such as growth, development, job creation, and the general improvement of quality of life. Positive results from infrastructure projects can include community education, outreach, knowledge creation, and worker training.

The Central Buen Ayre project is located in an isolated region, so no communities are directly affected by it. The social group most affected by the construction of the power plant is the military camp located close to the site. While the team studied the socioeconomic background of the communities they would be indirectly affecting by the plant construction, and identified some villages, no specific engagement processes were conducted in these areas.

The project team of Central Buen Ayre was not in charge of hiring workers for the construction or operation phases of the project. Instead, they contracted Finning Argentina S.A., the local representative of Caterpillar Company, for the construction of the power plant and energy generation. The contract between these two companies clearly states that the team of Central Buen Ayre should not have direct or indirect contact with workers hired by Finning Argentina S.A. In addition, the latter was free to hire tertiary companies without previous authorization from Central Buen Ayre. Having a more integrated approach would help to get feedback from different parties and therefore improve the process.

In total, the project created 161 new jobs during the construction phase and 15 permanent jobs in the operation phase. The project was deliberately located in an isolated area, so there was little local knowledge on the procedures and technologies of the plant. The project team educated the public on new technologies used in the construction and operation of the facility through media outlets. However, no specific considerations or training programs were focused on hiring disadvantaged groups or minorities. To build long-term capacity in surrounding communities, the project team could have directly addressed local residents, assuring a higher level of awareness through a direct approach. In the operation phase, a high technological skill set was necessary due to the complex, technical nature of the operations in the plant. The residents in surrounding communities did not have the technical education needed, and so skilled workers from other cities were brought onto the site. To address this problem in the long run, it is recommended that the company train local residents instead of bringing others already familiar with the processes. This will help the community acquire new skills more sustainable for the future.

Well-being

The Well-being subcategory addresses how the project has included elements of individual comfort, health, and mobility in the design. During construction and operation, it examines how the physical safety of workers and residents is ensured and nuisances minimized (including light pollution, odors, noise, and vibration). Attention is also given to encouraging alternative modes of transportation and incorporating the project into the larger community mobility network. Infrastructure owners are encouraged to enable access and mobility to enhance community livability.

The project of Central Buen Ayre is the first of its kind in Argentina, so the project team had to analyze the types of risk produced in both the implementation and operation phases, designing strategies to account for possible unprecedented problems. The team developed a detailed analysis of positive and negative impacts in each phase, concluding that the installation of the system for gas extraction would produce the most negative impact during the installation phase and the higher risks or contingencies would produce the most negative impact during the operation phase.[21] Following this analysis, the project team designed a protocol for emergencies and unexpected issues, following the guidelines of ENARSA, which would include developing a report that would be sent to the power central. In addition, a training program for the proper handling of waste was designed to prepare new workers.[22]

Studies of noise pollution during both phases of the project were developed, concluding that levels of noise produced during the operation phase would be within the regulations and below the levels that would disturb the surrounding population. Specifically, four focal points were located in the power plant: the Edenor cabinet, the corner between the right and front streets, the area containing the waste gas flaring torches, and the condensing chamber with the blowers. Under the guidelines of Norm IRAM 4062/01, it is assumed that less than 8 dBA above regulations is not considered disturbing, and the highest value obtained above regulations in the project location was 4dBA where the flaring torches were located.[23] However, due to high levels of noise production during the construction phase, it was recommended that workers use ear protection to avoid injuries. Light production was also studied and documented, showing how each space was designed with specific lighting structures adjusted to each specific function.[24] In addition, non-lighting alternatives such as signage was used to show the location

[21] Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "5. Evaluación ambiental: estudio de impacto ambiental, central de generación de energía a partir de biogás Central Buen Ayre," Córdoba, Argentina, 2011, 13.
[22] Central Buen Ayre, "Procedimiento del sistema de gestión integral: gestión de residuos" (CBAY 0504 -001), July 2012, 1–3.
[23] Ingeniería Laboral y Ambiental S.A., "5. Evaluación Ambiental," 13–25.
[24] Hernán Maierú, "Formulario del sistema de gestión integral: protocolo para la medición de iluminación planta Central Buen Ayre" (F CBAY/8080- 0/05), Argentina, 2012, 1–4.

of wells on site.[25] This aided in wayfinding and accessibility within the site.

Finally, transportation routes that would be used by the project team were located and documented, showing how construction materials and waste would be moved between city centers and the site. There was evidence of coordination between Tecsan, in charge of the plant operation and construction, and Coordinación Ecológica Área Metropolitana Sociedad del Estado (CEAMSE), the client and state-owned enterprise in charge of managing solid waste from Buenos Aires, to account for road safety when carrying the necessary materials in trucks. In addition, an evacuation plan and safety guidelines were developed for implementation in the event of accidents or contingencies.

While light, noise, site accessibility, safety, and signage issues are well handled within the site, it is recommended to take a look also at how they are integrated with the exterior. A broader approach that includes light information, accessibility and wayfinding from the outside of the module to the plant itself would give these studies a more synergistic approach and therefore a more sustainable outcome.

Community

The Community subcategory examines the extent to which the project respects, maintains, or improves its surroundings through context-sensitive design. While infrastructure is primarily driven by engineering parameters, its visual and functional impacts should be considered during design. Depending on whether the project is located in a rural or urban setting, this may include preserving views and natural features or incorporating the local character of the built environment into the design.

The power plant Central Buen Ayre is deliberately located in an isolated area because of its handling of methane gas, in an area previously used for military training. There are few species of flora and fauna in the site, and the historic and cultural resources of surrounding communities are not directly affected by the construction of the power plant. Therefore, there is no evidence of preserving historic and cultural resources. One way to address this issue, even if at a first glance there is no evident impact, would be to survey community leaders or residents prior to the construction of the project.

The project team also developed an in depth environmental description of the natural landscape, including the project's impact on flora and fauna. However, the description lacked

[25] Central Buen Ayre, "Instrucción del sistema de gestión integral: instructivo señalización de pozos" (CBAY0505-004), Buenos Aires, 2012, 1–2.

the analysis of specific impact on each species and provided no information on how these impacts would be mitigated. The high structures required for flaring torches to burn waste gas are visible from surrounding areas. While they will be visible to communities nearby, the location of the plant is far enough to prevent shadowing.

Finally, the location is isolated from the public at large due to the dangerous handling of methane, minimizing the need to take into account its effects on public space. Still, the project team developed an analysis of impact on the site in order to measure positive and negative effects. Although there is a net negative effect in the installation phase, there is a net positive impact once the plant starts operating.

Vulnerable Groups

The Vulnerable Groups subcategory addresses the extent to which the project contributes to the quality of life of women and diverse groups. Infrastructure projects can bring valuable opportunities to the surrounding communities in the form of jobs, capacity building, education, improvements in accessibility and use of existing local infrastructure, and access to services, among others.

The Central Buen Ayre project did not focus specifically on addressing the topic of vulnerable groups, mainly because of an absence of demographic studies in the area of impact. The socioeconomic data available in the area shows population growth in each of the districts affected, but it does not distinguish by gender and race. For this reason, issues concerning vulnerable groups was not available prior to the development of the project. Nevertheless, the registration sheet of community leaders and stakeholders present during project meetings documents the number of women present. This is indicative of the role of women during the project development process.

In addition, because the process of hiring was contracted to another company, the project team did not play a direct role in it. According to Argentine union labor agreements, tasks related to construction should be performed by men instead of women, so most of the construction jobs were given to men. Still, the other jobs related to road safety and health measures did not discriminate by gender, allowing women to take part in the project.

In order to address the issue of vulnerable groups, it is recommended to develop demographic studies of the surrounding communities of Tigre, Tres de Febrero, General San Martín, and San Miguel, and assess whether there is a need to implement additional social policies. In order to use these studies, the project team should get involved, in conjunction with third-party

companies, in the hiring process in both the construction and operation phases. Furthermore, if construction jobs must be given to men because of Argentine union labor agreements, the project team should develop a plan by which other jobs in the factory may be biased toward women and issues of gender inequality may be resolved.

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

In order to have a truly sustainable project, it must include input from a wide variety of stakeholders to fully capture synergies, savings, and opportunities for innovation. This type of collaboration requires all project leaders to be committed to achieving this goal together, rather than each part of the team working alone on their own piece of the project. Therefore, teams should meet and communicate, allowing stakeholders to contribute ideas and perspectives.

There is evidence of a strong commitment of Central Buen Ayre to integrating sustainable practices. This is shown by public statements made by the CEO of Benito Roggio Ambiental, Pablo Delorenzi, and later, in 2012, by Tecsan's managers. In addition, the project aligned its policies with ISO and OSHAS regulations to assess quality management, management of environmental systems, systems of security management, and health in the working environment. The project's achievement is evident in INET certificates from 2007, 2008, and 2011 showing the plant's mechanisms aligned to requirements ISO 14001:2004. The last of these certificates will be valid until 2016.

Moreover, there is a sustainable management system designed to adapt to external changes, both environmental and artificial. The project team has clearly identified the roles, amount of time, and resources associated with the implementation of this sustainable management system. Two people have been identified as environmental and quality managers.[26] Furthermore, the project obtained approval under the Clean Development Mechanism (CDM)

[26] Central Buen Ayre, "Organigrama Central Buen Ayre," Argentina, 2015, 1.

of the Kyoto Protocol of the United Nations. Taking it as a baseline, the project meets national and municipal Argentine regulatory requirements and laws from a sustainable and environmental point of view.

There is also an agreement signed between Central Buen Ayre S.A., ENARSA, and the Argentine Administrative Company for the Wholesale Market of Electricity to integrate the new power generated into the national grid. Finally, a series of presentations show how the project team targeted Argentina's chapter of the International Solid Waste Association, CEAMSE, government and public service entities, the Argentine army, and informal recycling groups of surrounding communities. One of the main goals is to integrate these institutions into the project process. However, beyond having public consultation with the stakeholders, it is recommended that the feedback obtained in these meetings should be integrated into the project.

Management

The Management subcategory addresses ways in which the project has used existing infrastructure and companies operating in the surrounding areas as opportunities for more efficient management. A broader comprehensive understanding of the project can allow the team to see and pursue synergies between systems, either within the project or among larger infrastructure systems. This requires a new way of managing and understanding the project as a whole, one that at the same time can reduce costs, increase sustainability, expand the useful life of the project, and protect against future problems.

This project connects with existing infrastructure to create meaningful improvements in its internal performance. However, there is no evidence of by-product synergy opportunities with other companies operating in nearby communities. Infrastructure integration is achieved in two central aspects of the power plant. First, part of the process of biogas treatment involves lechates treatment, which needs an additional plant, and this construction is included in Central Buen Ayre's contract. However, there is an existing plant already operating in the area managing lechates from modules North IIIb and North II, with enough operating capacity of 500m^2/day to treat lechates created in module North IIIc. For this reason, module IIIc will use this existing facility until another is needed. The existing plant was designed as a module, so it could also potentially increase its capacity according to future needs.

Furthermore, Central Buen Ayre will build an underground medium voltage line going through the precincts of San Miguel, San Martín, and Tres de Febrero in order to connect to the national grid. Instead of ending in a new station, the line will reach the Rotonda substation, owned by

Edenor, the largest Argentine distributor of electricity, which will provide more flexibility to the system. One way to connect the project further to its surroundings would be to think not only about physical infrastructure but also about social capital and community assets, such as local knowledge. By analyzing potential sources of linkages between communities and the project's needs, a more integrated design that includes human capital could be developed. For example, identifying key economic and social strengths in the community and creating linkages between those and the project's goals could produce long-term sustainable benefits.

In order to improve, the project team could connect with other companies in the area to use by-products or unwanted material that can reduce costs and minimize the use of raw materials, along with reducing waste in the area. This, in conjunction with the project's use of connecting facilities, would produce a more comprehensive management of resources and connections in the site.

Planning

The Planning subcategory analyzes how the project prepares for possible future conflicts. Taking a long-term view of the project can greatly increase its sustainability. Understanding planning issues, such as the regulatory environment in which the project is being pursued and future growth trends in the area, can lead to a project that avoids pitfalls and plans effectively for its own future, reducing costs and streamlining the entire project process.

In order to optimize the processes and increase efficient performance, the Central Buen Ayre project team developed a systematic plan for the constant monitoring and maintenance of machinery operating in the power plant, linked to the person responsible for doing the job. This shows an adequate amount of resources allocated to plant maintenance in the long term. The frequency of monitoring depends on the need and the type of machine. Special focus was placed on power generators, which will be monitored based on the Caterpillar manual to ensure high-quality operation. In addition, the mechanic in charge will measure levels of gas leakage every shift using the Testo instrument and Terberg program. Furthermore, reports on levels of lubricants and refrigerants in the CAT 3520C groups and Power House equipment were done every 100 and 250 hours of operation, respectively. Finally, procedures are in place for liquid extraction as levels rise and gas monitoring four times every shift in the gas plant and twice per shift in the filters.

To optimize sustainability at a corporate level, the project team studied in detail laws and regulations that could create barriers to the implementation of sustainable infrastructure. However, because the power plant is the first of its kind in Argentina, few existing regulations

were applicable to the project. In cases where national law was insufficient for the project, such as in air quality, the project team compared their project to the Province of Buenos Aires' law, No. 5.965, Decree 3395/96 and Amending Solution 242/97. However, in other cases such as soil protection, no alternative studies were created to account for legal gaps.

Looking at the Planning subcategory from the lifespan perspective, there was no strong evidence of efforts to extend the project's useful life to achieve a more durable and flexible project. This is partly because the life cycle of power plants like Central Buen Ayre is limited by the finite biogas resource from landfill. The project, designed to collect and generate energy from landfill biogas, after the timeline of the project the operation will not be able to continue once resources are depleted. However, one way to improve would be to produce a feasibility study of areas that would potentially have additional uses in the future, analyzing whether investing in their adaptation would offer a reasonable payback. Also, some spaces could be designed in a flexible framework, allowing other activities to take place after the project's life cycle.

5. RESOURCE ALLOCATION CATEGORY

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

Materials

Minimizing the total amount of materials used should be a primary consideration for infrastructure projects. This reduces the amount of natural resources that must be extracted and processed and the energy required to produce and transport those materials. Reducing material use must be balanced with safety, stability, and durability. There are considerations that must be taken into account regarding the life cycle of a material, including where it comes from and where it will end up after the project. Other favorable material characteristics include the percentage of recycled or reused content, and the ability to be recycled and reused at the end of its full usage. These factors help to minimize the total amount of natural resources consumed.

The project team of Central Buen Ayre developed a clear procurement policy matrix with performance specifications that applied to key companies in charge of hiring workers and other suppliers. They outsourced the plant construction and energy generation to Finning Argentina S.A., the local representative of Caterpillar. Even though the project team was not directly in charge of working with most of the tertiary manufacturing and supplier companies, they ensured that companies such as Finning Argentina S.A. met sustainable practice expectations. For this reason, the project team developed an evaluation form targeted to key companies with questions that included whether they had ISO 9001, ISO 14001, and OHSAS 18001 certificates. The team also ensured that suppliers kept up-to-date documentation and delivered their products on time. With these criteria, the project team conducted reviews of the tertiary companies based on sustainable practices and used their scores as the basis for hiring.

In addition, the project team took advantage of its location within the North Environmental Complex III to use the reclamation facility of the Mechanical Biological Treatment Plant to recycle its waste. They calculated that the amount of materials that will be recycled through this plant will range between 25% and 50%. However, further calculations of the total waste reduction by either weight or volume of each material would prove a more systematic and rigorous approach to reducing waste. Furthermore, at the end of its life cycle, after 14 years of use by Central Buen Ayre, the project is designed to shift owners to a tertiary company, mediated by ENARSA. However, in case the tertiary company or ENARSA wish to dismantle the power plant, there is machinery with enough power capacity within the facility to proceed. No specific plans addressing deconstruction have been provided.

The project team did not consider estimations of the embodied energy of key materials assessed by means of a life cycle analysis. In these studies, the project team should include information regarding the required energy for material extraction, transportation, refinement, manufacture, and the processes undertaken until the material is ready to be transported to the construction site, in order to make better choices of materials to use for the project's construction or operation.

Energy

Energy generation is the primary source of greenhouse gas emissions and numerous other pollutants harmful to the environment and human health. While use of renewable energy can contribute to the reduction of these emissions, the primary goal of all projects should be to reduce the overall energy consumed as much as possible.

The project team of Central Buen Ayre did an excellent job in the Energy subcategory, showing

a strong commitment to reducing nonrenewable energy uses. In the initial stages of the project, the power plant sustained internal energy needs with power produced from the six generators of the plant, of which the resulting net energy was injected into the national grid. However, in 2014 the project team bought a smaller additional GE Jenbacher 250 kW generator for the specific objective of fulfilling internal energy needs. Therefore, a higher percentage of power produced can now be injected into the national grid, displacing the use of fossil fuels. Extra power produced by this generator that is not needed by Central Buen Ayre is also be injected into the national grid. In this way, the project generates a net positive amount of renewable energy.

The project team identified one of the main sources of internal power usage as the network for biogas capture, so they decided to use an automatic control station from John Zink Company, a company located in the United States. This system works with three blowers of 250 HP that have velocity regulators in their system of oxygen uptake. Through these regulators, pressure capture is optimized by changing how much oxygen is taken depending on energy demands. This minimizes oxygen uptake when less energy is needed, reducing power consumption of the plant between 10% and 30%. Depending on energy demand, the project team can control this equipment by regulating how much oxygen it takes.

In order to improve, the project team should take a whole-systems design approach when considering options for machinery in every step of the design. They should not only look for obvious single energy and emissions savings, but also consider what multiple benefits might be achieved from a single investment. One way to do this is through a life cycle assessment of machines used in the power plant to provide a holistic evaluation of the environmental loads and impacts of the project over its entire life cycle.

Water

This credit addresses the increasing demands for freshwater by agricultural, municipal, and industrial users. These demands, combined with the typical variability in the hydrologic cycle, can affect water availability, quantity, and quality. Freshwater, groundwater, and surface waters are being used more rapidly than they are being naturally replenished. Future variability caused by the effects of climate change is expected.

In order to protect freshwater availability, the project team of Central Buen Ayre conducted a water availability assessment of North Module IIIc as part of the larger framework of the North Environmental Complex III. They hired the consulting company Ingeniería Laboral y Ambiental (ILA) to perform water studies that included location, type, quantity, rate of recharge, and

quality of water resources. They concluded that the underground water source on site was saline with high levels of arsenic, iron, and manganese, thus making this water nonpotable. The project, projected to consume 17.7 m^3/day, will use water from the aquifer of Puelches containing approximately 300 billion liters.

To avoid rainwater contamination, the project team designed a perimeter channel to avoid mixing with solid waste from the power plant. Black or gray water contaminated with residues will be treated in a treatment plant, which will be handled by a tertiary company. Potable water was only used by workers in the plant, and all other processes in the machinery and gas extraction were performed using nonpotable water from the aquifer of Puelches.

Monitoring of water systems was a priority for the project team. The Provincial Agency for Sustainable Development and the Secretariat of Energy were the project team in charge of this task. The Agency is an independent authority in charge of overseeing all monitoring systems performed by the project team. The area for monitoring was identified taking into account soil characteristics, underground water, type of aquifers, and their runoff directions. Twenty-three monitoring wells were set up in the aquifer of Pampeano and twenty-two in the aquifer of Puelches to test underground water using thirty-three analysis parameters. These included color, pH, chloride levels, and turbidity, among others. In addition, seventeen stations were set up to test surface water quality, encompassing forty-three analysis parameters.

The ultimate goal in this subcategory is to meet undeveloped, native ecosystem conditions. In order to do so, the project team should integrate monitoring activities into operations, allowing response management. This would enable operators to make adjustments, improving efficiency and decreasing negative impacts on water resources.

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

Infrastructure should be sited to avoid direct and indirect impacts on areas of high ecosystem value as well as areas that serve as diverse habitat, such as bodies of water, wetlands, or

temporary waters. Projects should also seek to preserve areas of geologic or hydrologic value and avoid interrupting natural cycles, such as the hydrologic cycle. When the nature or significance of the infrastructure project makes it impossible to avoid sensitive sites, mitigation measures should be taken to minimize disruption of systems. Previously developed or disturbed land is ideal for preventing further damage to that environment, improving land value, and remediating contaminated brownfields.

The project team of Central Buen Ayre, with consultation of ILA, performed studies on the soil and siting conditions that were later incorporated in the project design. Development on land that had high ecological or cultural value was avoided, as the project was designed as a module to be added to an existing complex of energy generation plants. The site, which was previously owned by the Argentine army and used for military training, did not have soil of high value, with underground saline water. Thus, development of prime farmland and disruption of surrounding forests was also avoided.

However, there is an existing lagoon adjacent to the site, connected through a 2 m stream to the Reconquista River. Even though the site is located 1.5 km from the river, the lagoon is very close to the constructed plant. In order to improve the performance of the project, areas surrounded by water bodies should be avoided, because they also contain a higher diversity of flora and fauna. On the other hand, given the site's location on an upper level of the Reconquista River valley, the steepness of the slope is low and there is no risk of flooding. Still, the project team developed an emergency plan in case of risk from either internal or external factors, including possible adverse geography of the region. Although the site is located in an area of zero seismic risk as stated by the National Institute of Seismic Prevention (INPRES), all construction was designed following the guidelines of seismic-resistant buildings.

Land and Water

Infrastructure projects should minimize impacts 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. With proper foresight, infrastructure can avoid these harmful disruptions. It is important to remember that the impact of contamination is often cumulative, especially in water bodies such as rivers and streams, and that each project and site shares responsibility for protecting the quality of the larger system.

In terms of land and water management, the North Module IIIc is part of the North

Environmental Complex, so most large-scale systems are managed by the complex as a whole.[27] Although this meant that specific plans were not always developed tailored to the project's needs, it also opened opportunities to use other resources available from neighboring activities. For example, the project team uses the compost produced by the composting plant located in the North Environmental Complex, which uses raw material from municipal pruning to create an organic fertilizer. Even though the area in the site covered by grass and other plants is only 570 m^2, the team avoids high-maintenance flora by only planting species that are positively affected by the compost. Deteriorated species are replaced.

On the other hand, the project team did not have a specific plan to manage or increase water storage capacity. In addition, they treat their surface and groundwater contamination systems as part of the larger complex, following studies designed for the North Environmental Complex as a whole. They designed a runoff water capture system that has an oil interception chamber. This will help in case oil is released from the generators. In order to improve the performance, the project team could document the initial and the final post-development water storage, infiltration, and water harvesting capacities using simulation modeling methods. These plans could be part of the larger North Environmental Complex system, or could just target the biogas and energy generation plant of Central Buen Ayre.

Biodiversity

Infrastructure can minimize 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 habitat connectivity and animal movement. Species for new planting should be carefully selected and be appropriate for the location. Infrastructure should not adversely impact wetlands, which tend to provide ecosystems that support a high degree of natural biodiversity.

Studies done by the consulting company ILA and by the entire North Environmental Complex III were used as the basis for this subcategory. The project team was able to maintain three aspects of the area's ecosystem: hydrologic connections, water quality, and habitats. Although they did not enhance these aspects, they were able to maintain previous conditions despite the large scale of the project. Specifically relating to hydrologic connections, the project team avoided mixing water and liquids produced by the activities of the plant with rainwater collection systems, existing infrastructure, or water canals used by the neighboring

[27] CEAMSE, "Complejo ambiental Norte III, Módulos IIIA, IIIB y IIIC: Plan de monitoreo ambiental."

communities.[28]

In addition, due to the team's experience working on that specific site, they were able to choose plant species that did not need high maintenance and were not invasive, preserving local flora. Although the project team specified that the region is not rich in flora and fauna because it is urbanized, ILA stated that the area of Campo de Mayo is one of the regions in the province of Buenos Aires with the most bird diversity, and that this area is extremely important for bird migration. For this reason, it would be relevant to analyze in detail how the project's construction and operation affect different bird species.

Furthermore, there were no studies to document restoration of disturbed soils after construction. Although soil excavation was limited, it is still important to consider how these soils are affected. Restored soils behave much better in nutrient retention and flood prevention, so analyzing their state and investing in their restoration is essential for sustainability.

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 understanding and reduction of dangerous emissions, including greenhouse gas emissions and other dangerous pollutants, during all stages of a project's life cycle. These emissions can increase both short- and long-term risks to the project. Minimizing risks helps to protect against future problems and may increase the project's lifespan. While reducing greenhouse gas emissions may not have a direct impact on the particular project, it can help to reduce overall global risk and may contribute far beyond the project's site borders.

The project team of Central Buen Ayre did an excellent job in this subcategory because the

[28] Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "6. Plan ambiental: estudio de impacto ambiental, central de generación de energía a partir de biogás Central Buen Ayre," Córdoba, Argentina, 2011, 23.

project consists of treating biogas, obtained from waste produced in the province of Buenos Aires, and producing power from it. By doing so, they are reducing the levels of carbon dioxide in the atmosphere and producing a renewable source of energy. The landfill disposals operations are being executed by Tecsan, while the extraction of the biogas through a network of capture wells; is being conducted by Buen Ayre. A system of biogas capture and discharge consists of three blowers, which transport the gas from the extraction wells to the treatment plant. Here, extra liquids are extracted and the biogas is then used to generate energy. The energy generated is used for the internal processes of Central Buen Ayre, and the remaining net energy produced is transmitted to the province of Buenos Aires grid.

Although the project is very successful in reducing greenhouse gas emissions, it did not directly target reducing air pollutant emissions. The team of Central Buen Ayre ensured compliance with local laws and regulations regarding the control of dust and odors during construction and operation. Specific monitoring program were conducted from April to June 2015 to measure the emission of six different moto generators. The pollutants measured were CO, NOx, SO2, NMOC's, CH4, O2 and CO2. The measurements were done according to RD 3395/96 and the results obtained where below the maximum levels established.

Resilience

Resilience includes the ability to withstand short-term risks, such as flooding or fires, and to adapt to changing long-term conditions, such as changes in weather patterns, sea level rise, or changes in climate. Understanding the types of risks and probability of risks allows the project team to deliver an informed project design that anticipates and withstands or adapts to these risks, minimizing its overall vulnerability. Increased adaptability and decreased vulnerability ensure a longer useful life and assure that the project will meet the future needs of the community.

During its 14-year lifespan, the plant of Central Buen Ayre will contribute considerably to the reduction of carbon emissions in Argentina, so the effect of its work on climate is relevant. It could affect changes in weather patterns such as precipitation or temperature, changes in natural hazards, sea level, or desertification. For this reason, the development of a plan taking into account any possible impact on climate change would improve the project's documented impact on site. This plan should incorporate input from local and regional emergency management officials in order to obtain more complete and informed action.

No potential traps and vulnerabilities that could emerge in the long term were studied because of the project's shorter lifespan of only 14 years. However, identifying these possible traps and

designing accordingly could avoid future problems for the community. In addition, preparing for long-term and short-term adaptability using these identified vulnerabilities would result in a resilient infrastructure ready to perform adequately under altered climate conditions.

Finally, documentation was provided showing consideration of surface materials used in the construction of the plant in order to manage heat island effects. Around 30% of the surfaces have a solar reflectance index higher than 29, comprising vegetated areas as well as other closed spaces. For the closed spaces, the project team hired Ternium Siderar, which operates under the norm ISO 9001.

APPENDIX:

APPENDIX A: PROJECT PICTURES AND DRAWINGS

Figure 5: General picture of the project, Biogas Capture Plant
Sources: Central Buen Ayre, "Proyecto de Recuperación de Metano y Generación de Energía, Módulo Norte IIIc - C.A. CEAMSE" Argentina 2011, 15

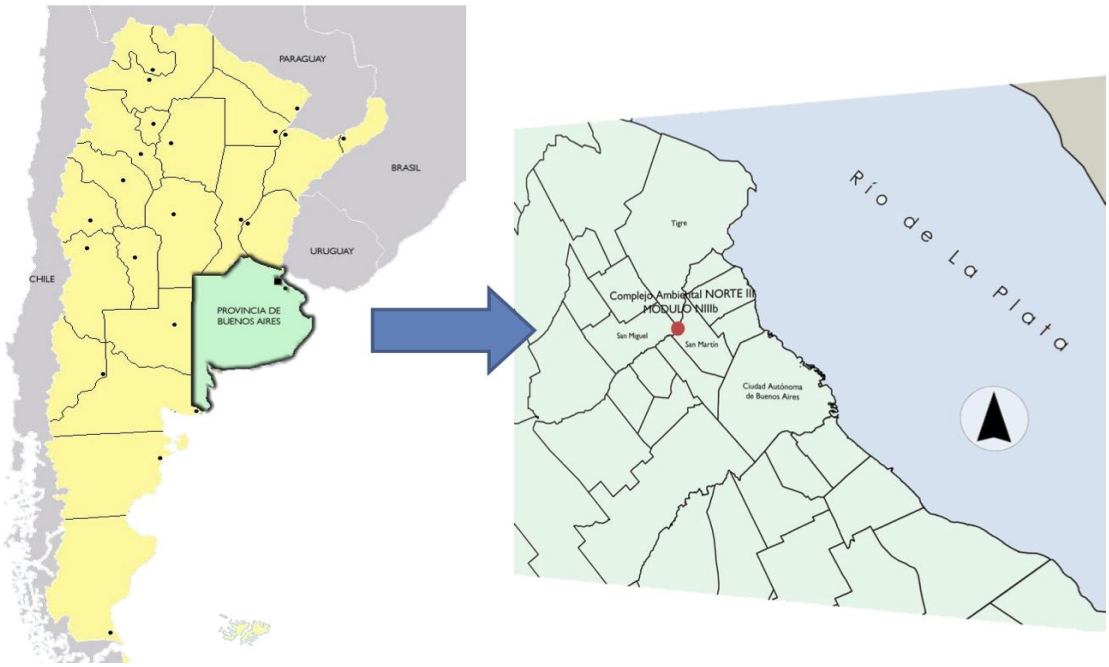


Figure 6: Location map.
Sources: Central Buen Ayre, "Presentación V Simposio Iberoamericano de Ingeniería," Argentina October 2015, 4

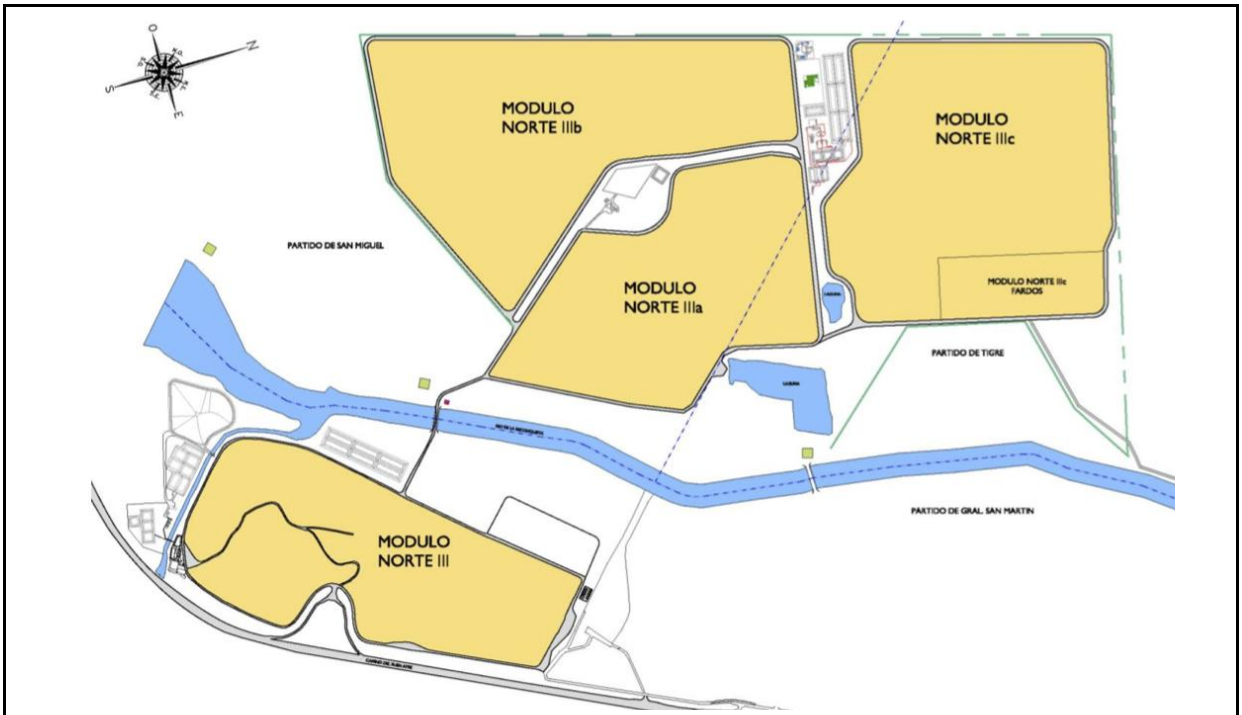


Figure 7: Location map.
Sources: Central Buen Ayre, "Proyecto de Recuperación de Metano y Generación de Energía, Módulo Norte IIIc - C.A. CEAMSE" Argentina 2011, 10

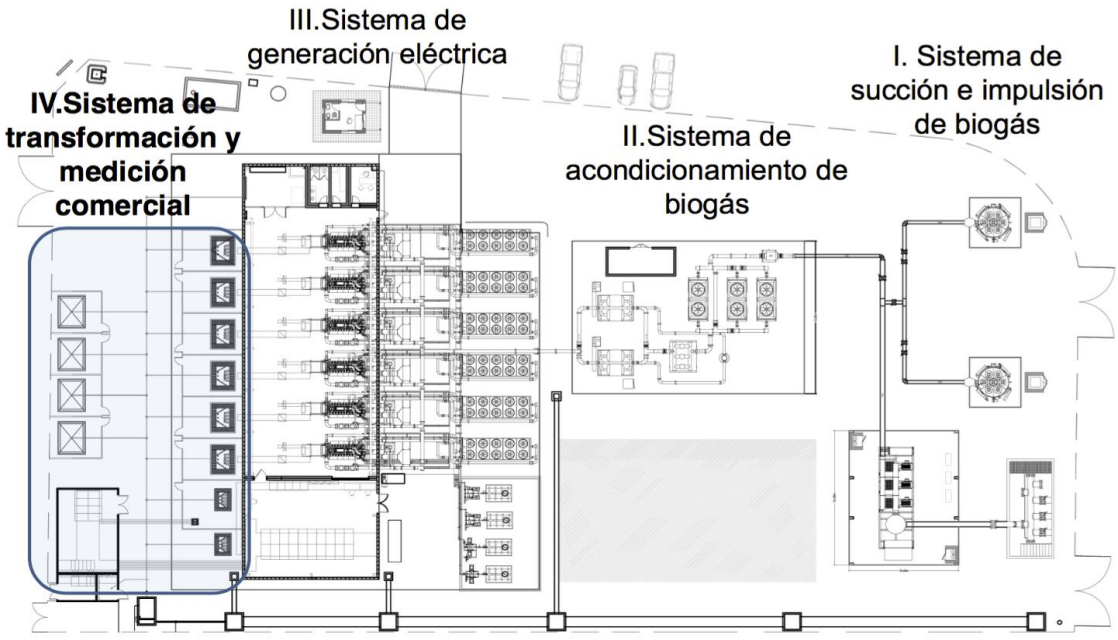


Figure 8: Plan of Central Buen Ayre
Sources: Central Buen Ayre, "Proyecto de Generacion de Energia Electrica a partir de la utilizacion de Biogas de Relleno Sanitario como Combustible" Argentina, 2013, 16

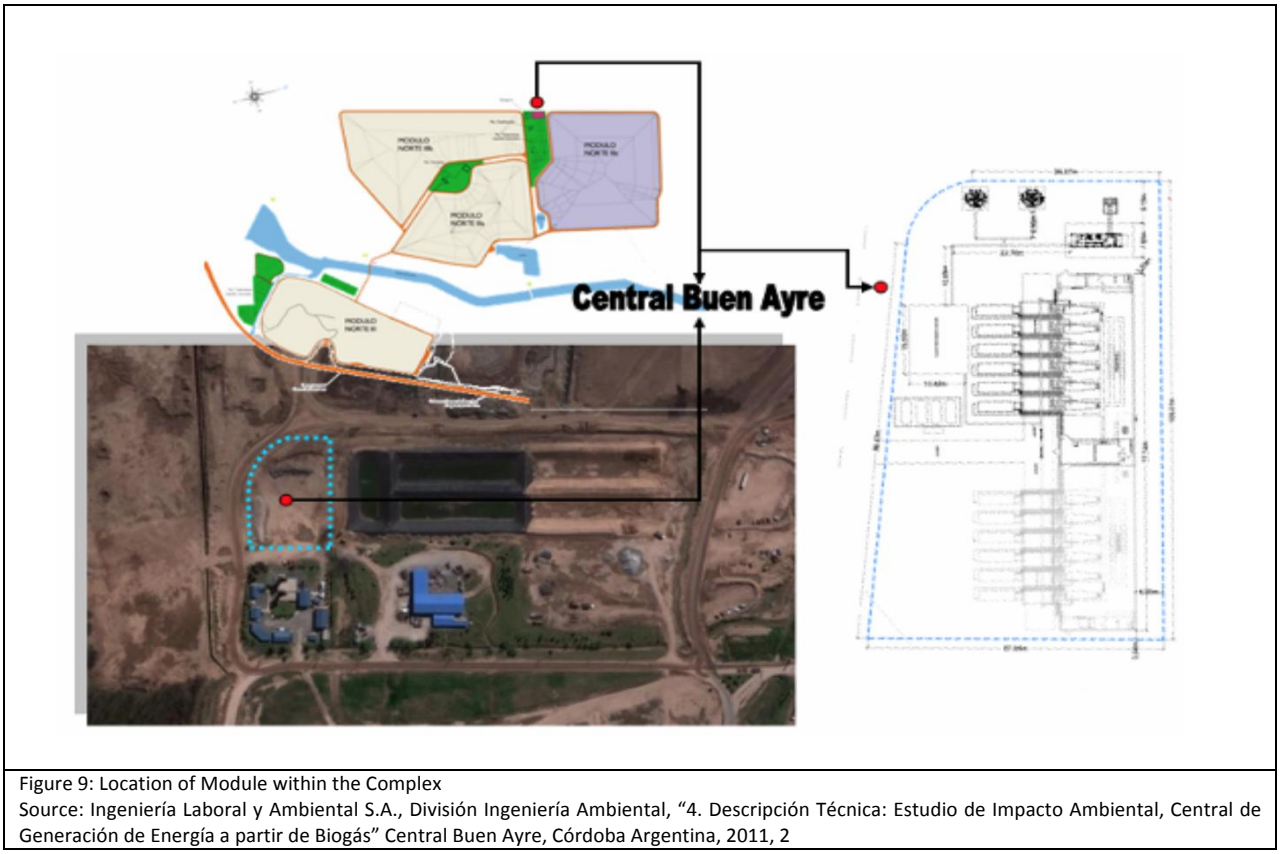


Figure 9: Location of Module within the Complex
Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "4. Descripción Técnica: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 2

Figure 10: Office of Monitoring Systems
Sources: Central Buen Ayre, "Proyecto de Generación de Energía Eléctrica a partir de la utilización de Biogás de Relleno Sanitario como Combustible" Argentina, 2013, 14

Figure 11: Siloxane Removal Plant
Sources: Central Buen Ayre, "Proyecto de Generación de Energía Eléctrica a partir de la utilización de Biogás de Relleno Sanitario como Combustible" Argentina, 2013, 11

Figure 12: Cooling System
Sources: Central Buen Ayre, "Proyecto de Generacion de Energia Electrica a partir de la utilizacion de Biogas de Relleno Sanitario como Combustible" Argentina, 2013, 11

Figure 13: Biogas Capture System
Sources: Central Buen Ayre, "Proyecto de Generacion de Energia Electrica a partir de la utilización de Biogas de Relleno Sanitario como Combustible" Argentina, 2013, 9

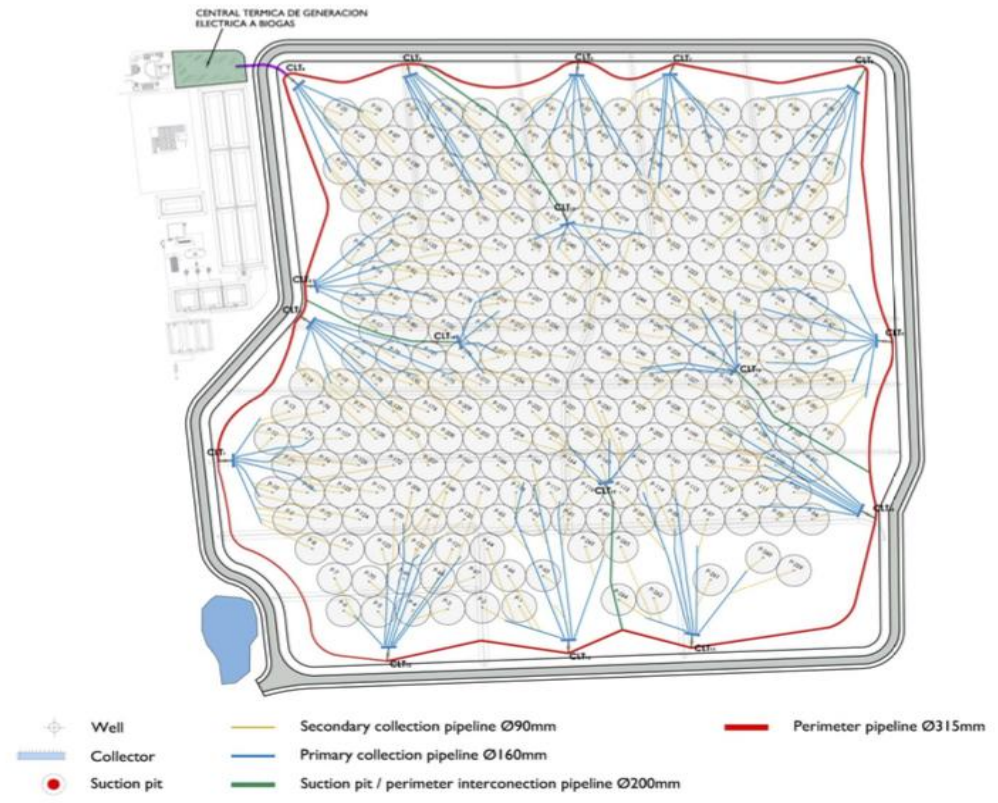


Figure 14: Location of Extraction Wells
Sources: United Nations, **"**Clean Development Mechanism: Project Design Document Form" Argentina 2006, 7

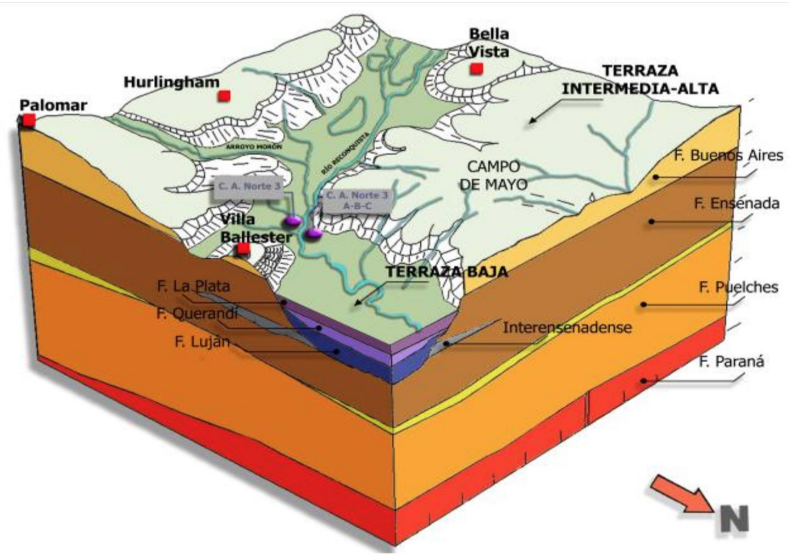


Figure 15: Layers of Soil in site
Sources: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 6

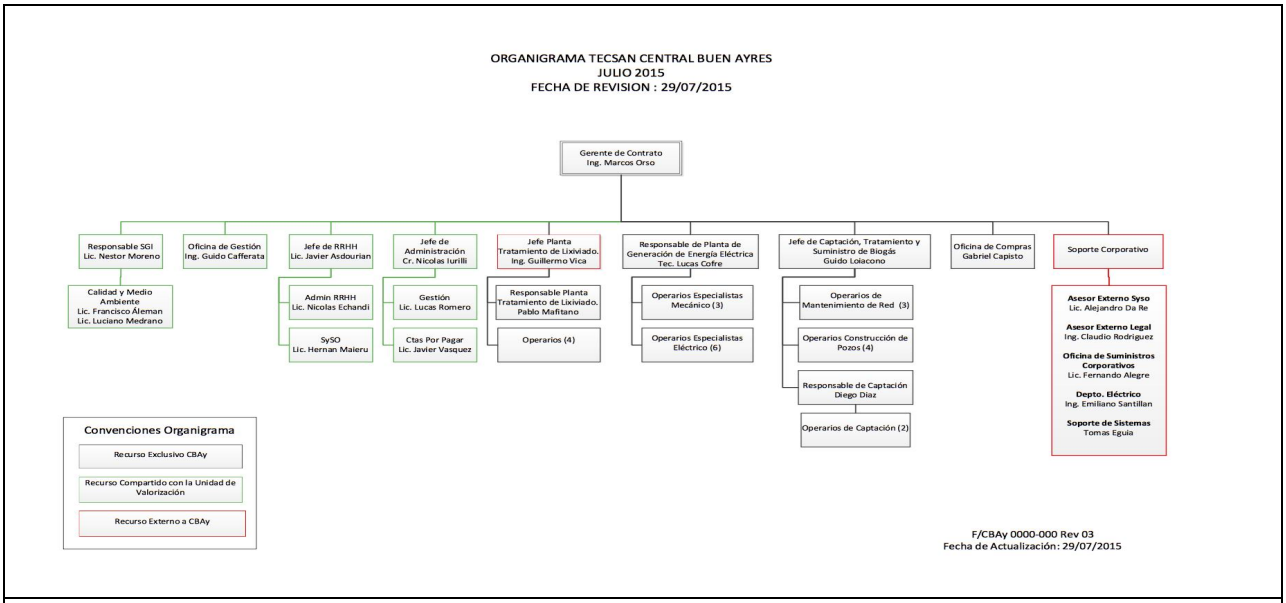


Figure 16: Organization of Personnel and their Roles
Sources: Central Buen Ayre, "Organigrama" Argentina 2015, 1

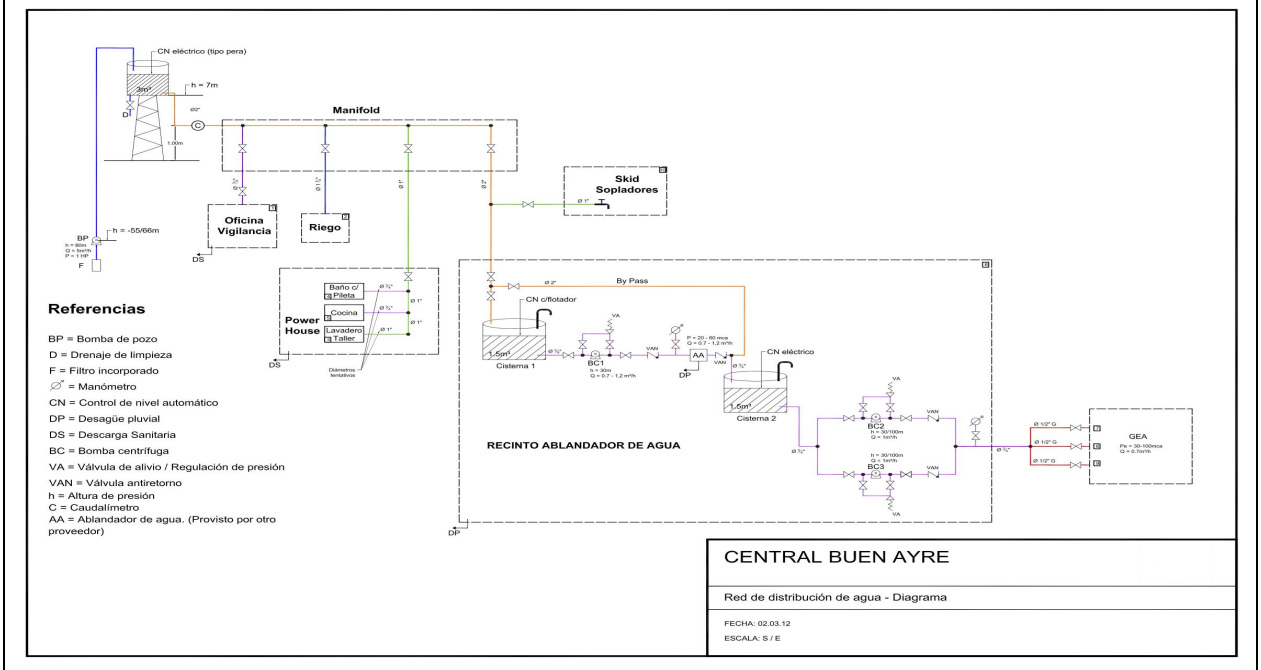


Figure 17: Water Systems
Sources: Central Buen Ayre, "Diagram of Water Distribution Systems" Argentina 2012, 1

Figure 18: Lagoon located next to Module IIIc
Sources: Central Buen Ayre, "Ref. Preguntas sobre Central Buen Ayre" Buenos Aires, 2015, 3

Figure 19: Machine Jenbacher type 2
Sources: GE Power and Water, "Jenbacher tipo 2" Argentina 2015, 1

Figure 20: Distance to Closest Body of Water
Sources: Central Buen Ayre, "Distancia de Proyecto a Cuerpo de Agua" Argentina 2015, 1

Figure 21: Caterpillar Energy Generators
Sources: Central Buen Ayre, "Proyecto de Generación de Energía Eléctrica a partir de la utilización de Biogás de Relleno Sanitario como Combustible" Argentina, 2013, 15

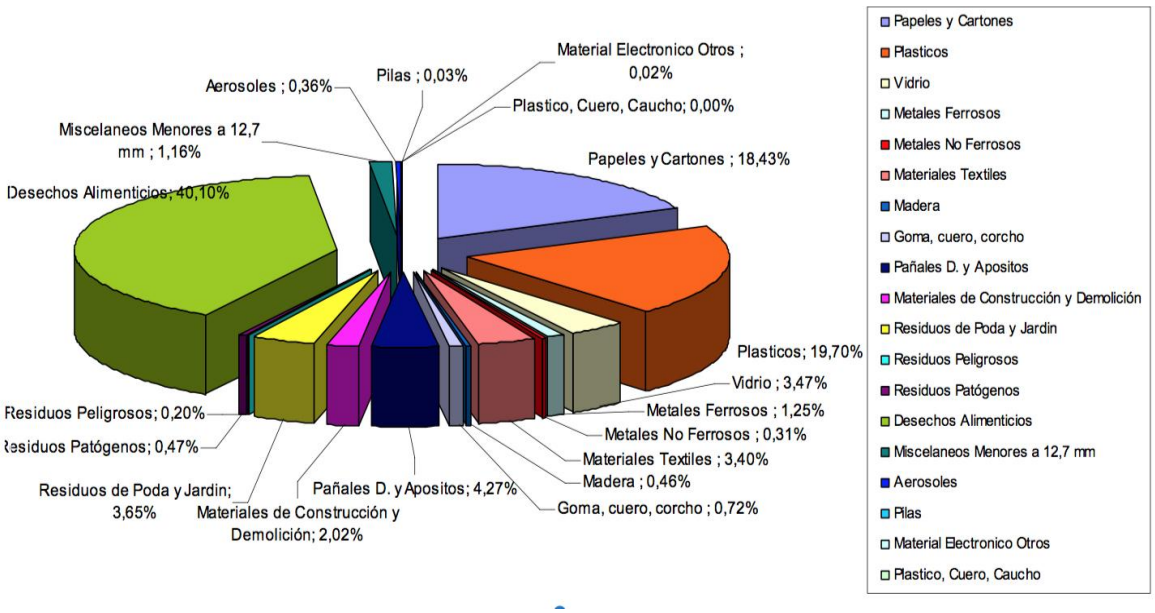


Figure 22: Waste Composition in Buenos Aires
Sources: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "4. Descripción Técnica: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 6

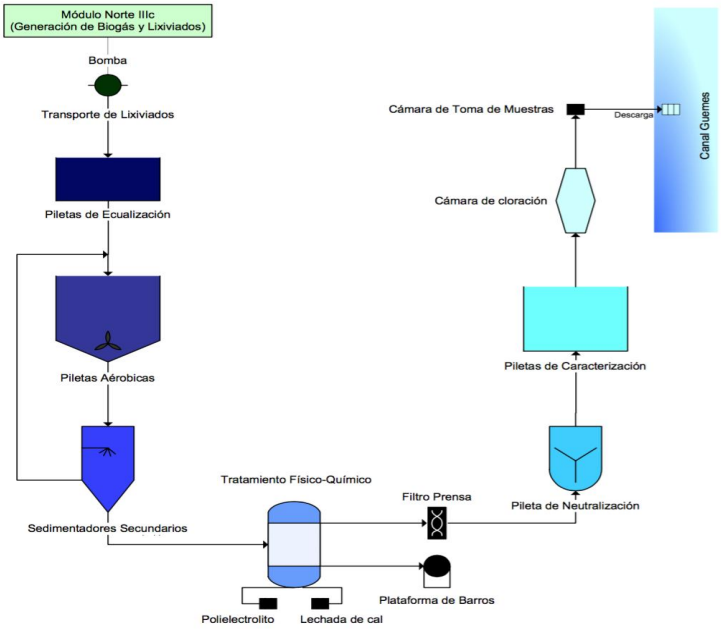
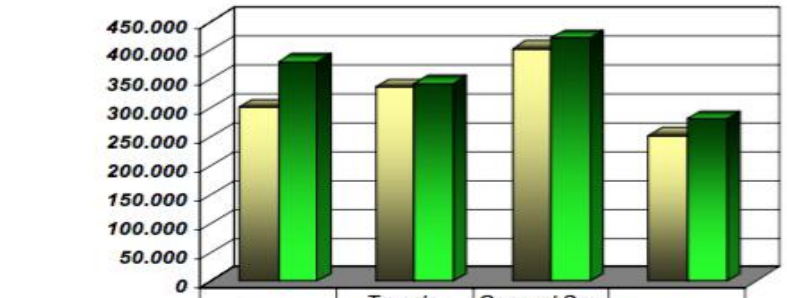


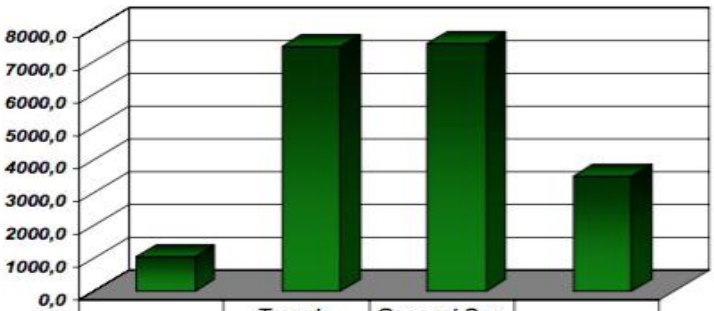
Figure 23: Lechate Treatment System
Sources: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "4. Descripción Técnica: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 26

Figure 24: Path of Line of Medium Voltage
Sources: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "4. Descripción Técnica: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 59



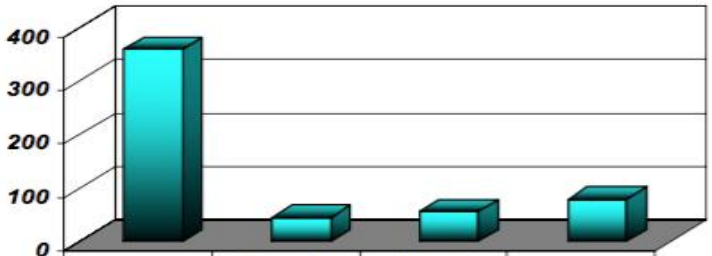
	Tigre	Tres de Febrero	General San Martín	San Miguel
Población 2001	301.223	336.467	403.107	253.086
Población 2010	380.709	343.774	422.830	281.120

Gráfico Nº 3-23: Variación Intercensal 2001-2010- Area de Influencia



	Tigre	Tres de Febrero	General San Martín	San Miguel
Densidad Poblacional (Hab/Km2)	1057,5	7473,3	7550,5	3514,0

Gráfico Nº 3-24: Densidad Poblacional Area de Influencia



	Tigre	Tres de Febrero	General San Martín	San Miguel
Extensión	360	46	56	80

Gráfico Nº 3-25: Extensión Partidos Area de Influencia

Figure 25: Information of Population in Affected Area
Sources: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 72

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
		RA2.3 Commission and monitor energy systems	—	3	—	11	
	WATER	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 26: 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

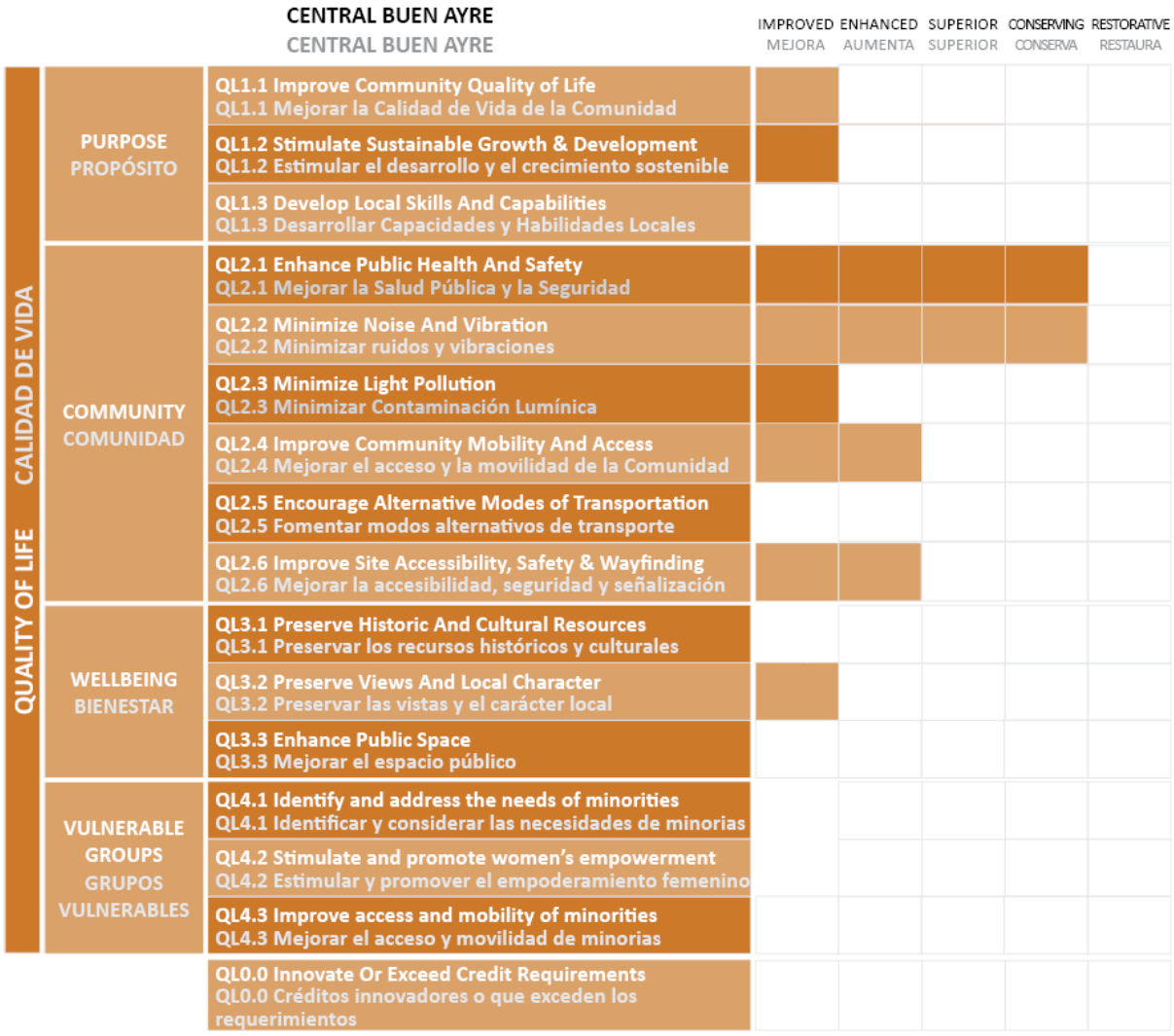


Figure 27: Quality of Life category_ Summary of results

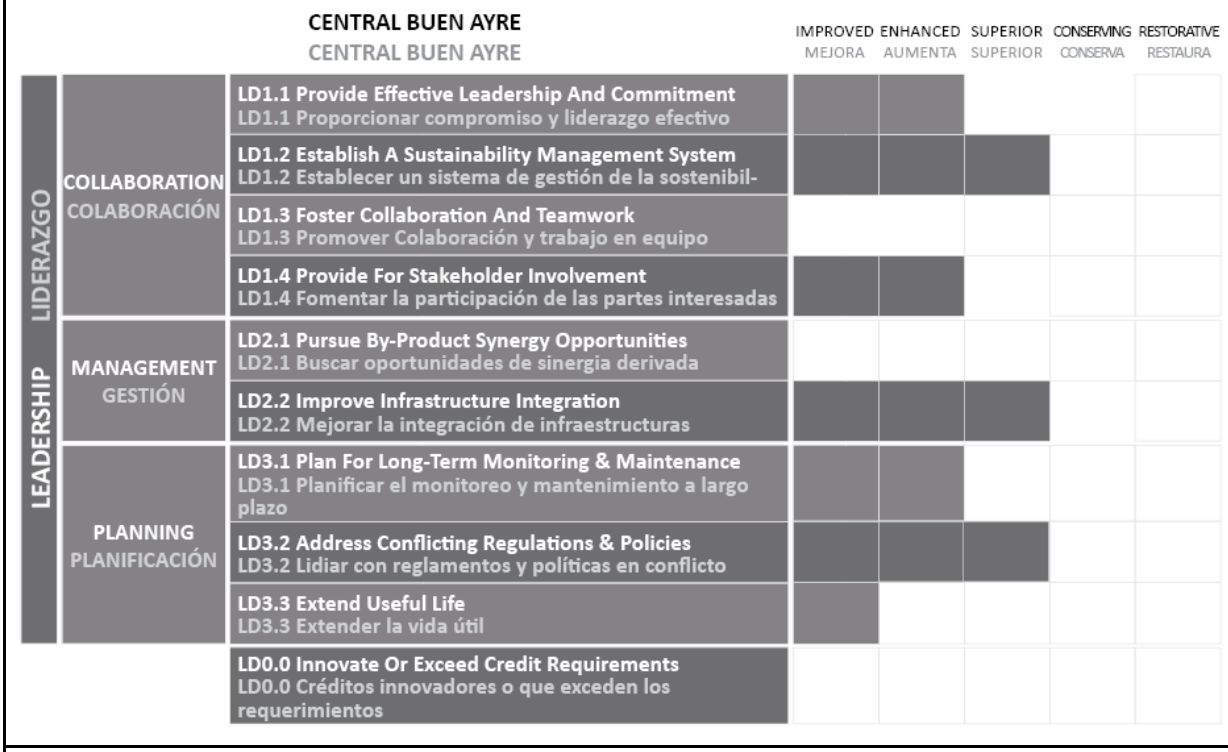


Figure 28: Leadership category_ Summary of results

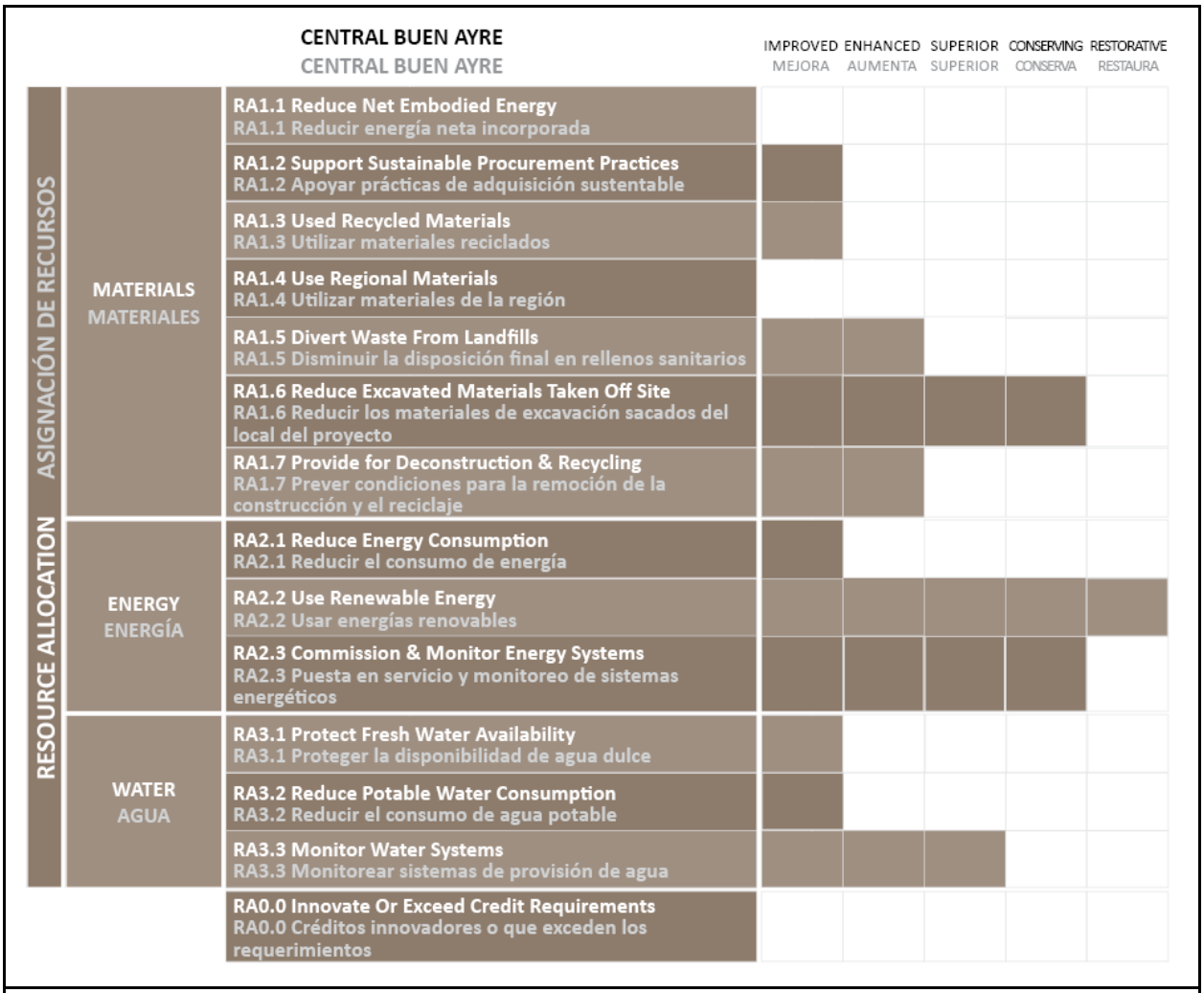


Figure 29:Resource Allocation category_ Summary of results

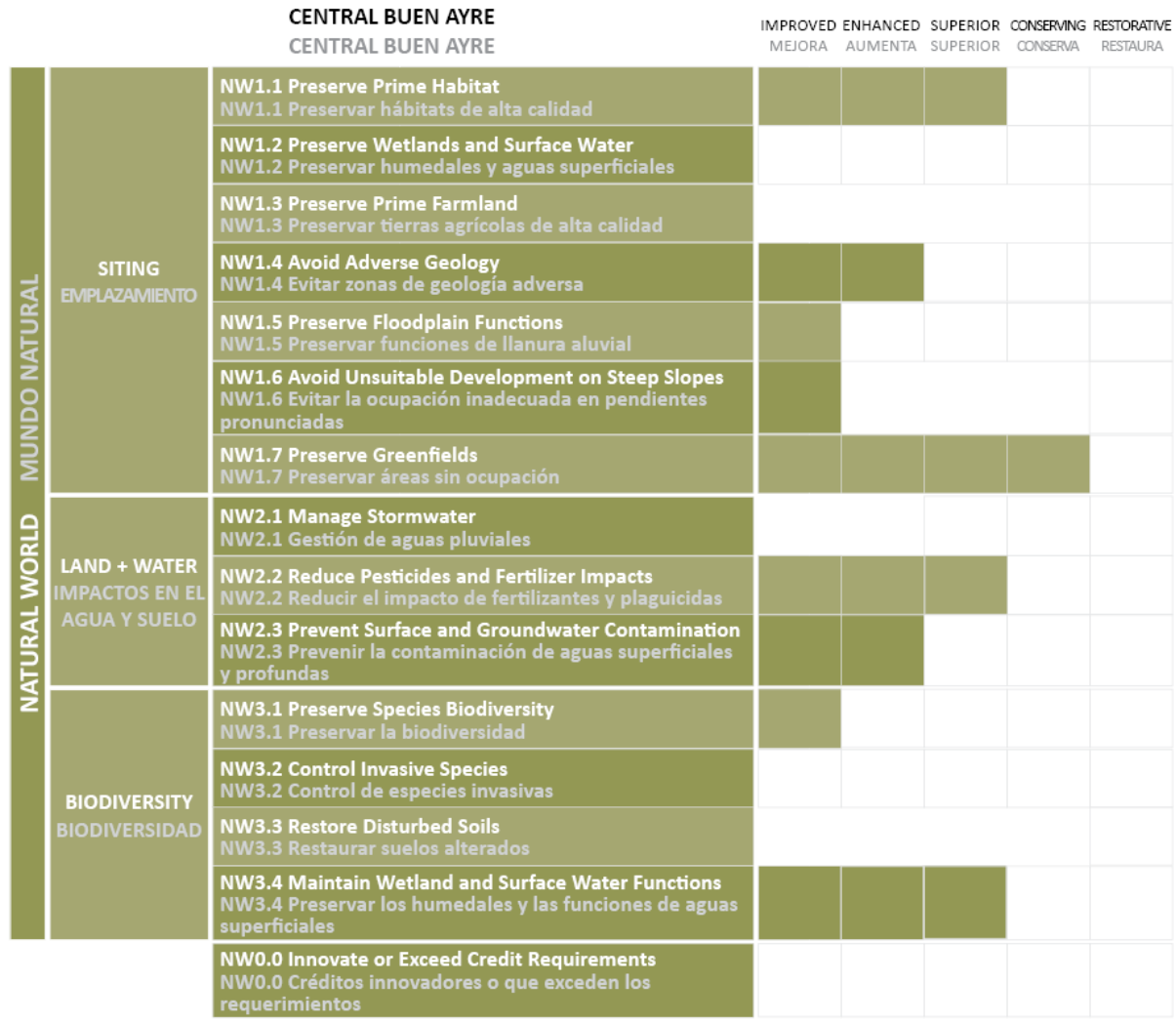


Figure 30: Natural World category_ Summary of results

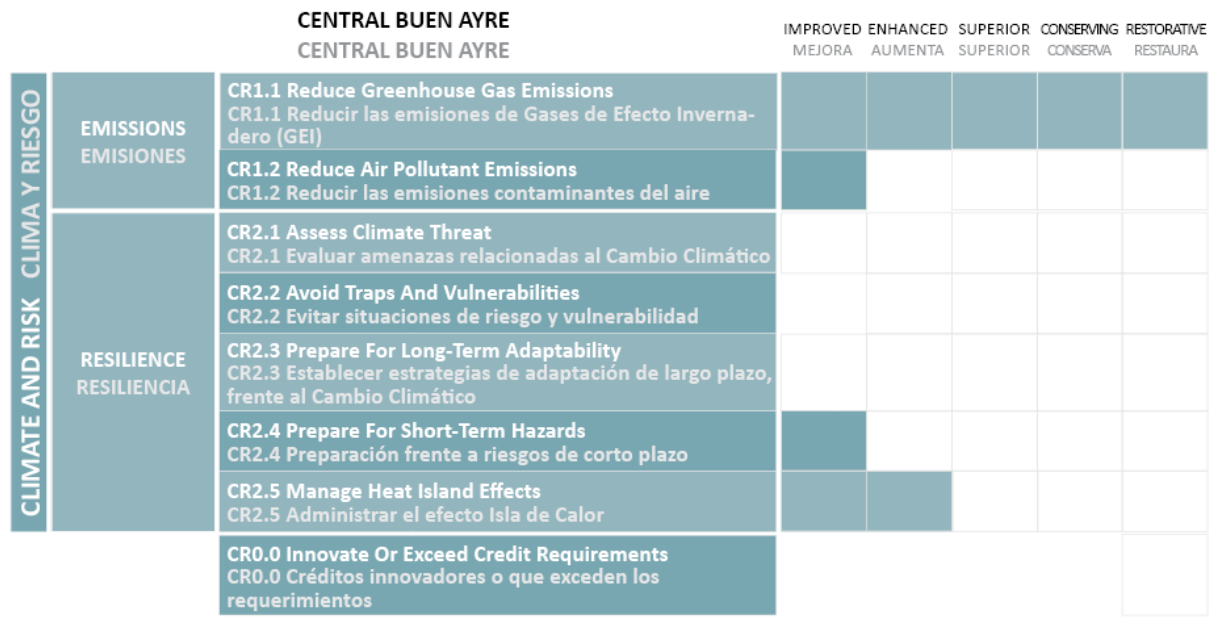


Figure 31: Climate & Risk category_ Summary of results

			CENTRAL BUEN AYRE, ARGENTINA	PT.	Performance
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life	2	Improved
2			QL1.2 Stimulate Sustainable Growth & Development	1	Improved
3			QL1.3 Develop Local Skills And Capabilities	0	No score
4		COMMUNITY	QL2.1 Enhance Public Health And Safety	16	Conserving
5			QL2.2 Minimize Noise And Vibration	8	Conserving
6			QL2.3 Minimize Light Pollution	1	Improved
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	0	No score
11			QL3.2 Preserve Views And Local Character	1	Improved
12			QL3.3 Enhance Public Space	0	No score
13		VULNERABLE GROUPS	QL 4.1 Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)	0	No score
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)	0	No score
			QL0.0 Innovate Or Exceed Credit Requirements		
			QL	36	

			CENTRAL BUEN AYRE, ARGENTINA	PT.	Performance
16	LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	4	Enhanced
17			LD1.2 Establish A Sustainability Management System	7	Superior
18			LD1.3 Foster Collaboration And Teamwork	0	No score
19			LD1.4 Provide For Stakeholder Involvement	5	Enhanced
20		MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	0	No score
21			LD2.2 Improve Infrastructure Integration	7	Superior
22		PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	3	Enhanced
23			LD3.2 Address Conflicting Regulations & Policies	4	Superior
24			LD3.3 Extend Useful Life	1	Improved
			LD0.0 Innovate Or Exceed Credit Requirements	0	N/A
			LD	31	

			CENTRAL BUEN AYRE, ARGENTINA	PT.	Performance
25	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	No score
26			RA1.2 Support Sustainable Procurement Practices	2	Improved
27			RA1.3 Used Recycled Materials	2	Improved
28			RA1.4 Use Regional Materials	0	No score
29			RA1.5 Divert Waste From Landfills	6	Enhanced
30			RA1.6 Reduce Excavated Materials Taken Off Site	6	Conserving
31			RA1.7 Provide for Deconstruction & Recycling	4	Enhanced
32		ENERGY	RA2.1 Reduce Energy Consumption	3	Improved
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	2	Improved
36			RA3.2 Reduce Potable Water Consumption	4	Improved
37			RA3.3 Monitor Water Systems	6	Superior
			RA0.0 Innovate Or Exceed Credit Requirements	0	N/A
			RA	66	

			CENTRAL BUEN AYRE, ARGENTINA	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	2	Enhanced
42			NW1.5 Preserve Floodplain Functions	1	Improved
43			NW1.6 Avoid Unsuitable Development on Steep Slopes	1	Improved
44			NW1.7 Preserve Greenfields	15	Conserving
45		L & W	NW2.1 Manage Stormwater	0	No score
46			NW2.2 Reduce Pesticides and Fertilizer Impacts	5	Superior
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	0	No score
50			NW3.3 Restore Disturbed Soils	0	No score
51			NW3.4 Maintain Wetland and Surface Water Functions	9	Superior
			NW0.0 Innovate or Exceed Credit Requirements	0	N/A
			NW	48	

			CENTRAL BUEN AYRE, ARGENTINA	PT.	Performance
52	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	25	Restorative
53			CR1.2 Reduce Air Pollutant Emissions	2	Improved
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	2	Enhanced
			CR0.0 Innovate Or Exceed Credit Requirements	0	N/A
			CR	32	

Total points	213	0

Figure 32: 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

NAME OF THE PROJECT: CREDIT SPREADSHEET WITH DETAILS		
CATEGORY I, PEOPLE AND LEADERSHIP		
SUB CATEGORY: QUALITY OF LIFE		
	Score	**CENTRAL BUEN AYRE**
QL1.1 Improve Community Quality of Life	**2**	**Improved**
		The project Central Buen Ayre is located in an isolated region, therefore no communities are directly affected by the project. Nonetheless, the social group most affected by the construction of the power plant is the military camp located close to the site. An agreement was established between the Argentine army and CEAMSE ensuring that the infrastructure capacity of the project would also contribute to improvements in army camps. However, no documentation showing explicit improvement has been provided. In addition, the team studied the socioeconomic background of the communities they would be indirectly affecting by the plant construction. In this assessment, they recognized the districts of Tigre and San Miguel, where the power center is located, and the districts of San Martin and Tres de Febrero, where the medium voltage line would go through. Specifically, the blocks affected by the line construction would be UTA in San Martin and Ciudad Jardín El Salvador and Loma Hermosa in Tres de Febrero. However, there was no identification of the community's' diverse needs, therefore no alignment between the project and existing community goals is evident. Documentation shows that because the affected districts are located in an urban region, the impact would be insignificant in terms of infrastructure, and it would only be relevant during the construction phase. Nevertheless it is estimated that the project has an indirect improvement in the quality of life due to the waste reduction
		Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "7. Aspectos Legales: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 24-25 *Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 70-79*
		In order to achieve a higher score, the project team would have to review and assess the communities' goals, plans and needs in order to integrate these needs with the own project's goals. Furthermore, community engagement could increase by including their input in the design process.
QL1.2 Stimulate	**1**	**Improved**

Sustainable Growth & Development		The project team of Central Buen Ayre was not in charge of hiring workers during the construction and implementation phase, but hired a tertiary company, Finning Argentina S.A for this task. Finining Argentina S.A, the representative company of Caterpillar in Argentina, was in charge of the power plant construction and energy generation. During the design and construction phase, 161 new jobs were created, of which only 15 remained during the operation phase. However, most people hired for the long-term jobs during the operation phase were not local residents due to the high level of technological expertise needed to operate the machines. The project team was not involved in the process, therefore this decision was made by Finning Argentina S.A. The contract between Central Buen Ayre and Finning Argentina S.A clearly states that the latter will be the only responsible entity in charge of worker contracts that correspond to the personnel hired for the jobs under their management, so no direct or indirect relation between those people and Central Buen Ayre should exist. Furthermore, Finning Argentina S.A will be able to hire tertiary companies for work under their management without previous authorization from the Central Buen Ayre team.
		Source: United Nations, "Clean Development Mechanism: Project Design Document Form" (Unknown: 2006), 3 *Finning CAT, "Oferta en firme irrevocable por el plazo de diez (10) días hábiles de la fecha del presente", Buenos Aires 2011, 11-12*
		RECOMMENDATIONS *The jobs created in the area could have included capacity building of communities rather than only economic development. Furthermore, to achieve a higher score, the completed works could have contributed to improving the capacity, capability and range of choices of workers. To ensure this, the project team of Central Buen Ayre could have assumed a larger role in the process of hiring.*
QL1.3 Develop Local Skills and Capabilities	**0**	**No score**
		During the construction phase, the third party company Finning Argentina S.A, representative of Caterpillar company, was in charge of hiring workers for the construction of the power plant and energy generation processes. As a result, there was no influence from the project team of Central Buen Ayre to integrate local firms or local workers into the process. For the operation phase, the power plant needs a higher technological skill set than what is provided by the residents of local communities, so skilled workers from outside of the local communities were hired. There is no documentation showing training programs to educate people in order to develop the set of skills and capabilities needed to perform those set of jobs.
		Source: United Nations, "Clean Development Mechanism: Project Design Document Form" (Unknown: 2006), 3 *Finning CAT, "Oferta en firme irrevocable por el plazo de diez (10) días hábiles de la fecha del presente", (Argentina: 2011), 11-12*
		RECOMMENDATIONS *The hiring process could have a stronger emphasis on hiring local residents in the construction phase. This could motivate the Finning Argentina S.A team to develop capacity building for some of the work required rather than bringing people from outside regions. This would require training the local population instead of relying on others to do the job. Despite of the fact that it may take more time, it will also give the local community leverage and the new acquired skill set would be beneficial in the long run.*
QL2.1 Enhance	**16**	**Conserving**

Public Health And Safety		The project team assessed the potential risks of the power plant on the site and developed new programs to account for the unprecedented impacts of producing energy from waste. Given that this is the first facility of this type in Argentina, the efforts made by this company in terms of reducing safety risks and applying new technologies are well above regulatory requirements. In order to assess the project risks, the team developed a matrix of positive and negative impacts in both the implementation and operation phases of the project. During the installation phase, the most negative impact was during the gas extraction system installation, the primary means of treating waste. In this case, it is important to plan the task of perforation of the ground to cover and seal the site as fast as possible, avoiding possible explosions and fires. The component that produced the most negative effect during the operation phase was the accidents-contingencies component. For this reason, a protocol for emergencies and unanticipated problems was developed. In case of an emergency, an investigation will be made in order to treat the specific case appropriately. Following the guidelines of the Anonymous Society for Argentine Energy, ENARSA, a report will be made and sent to the power central in order to develop and apply a solution to the problem. This is the first power plant to produce energy from waste, so new technologies related to waste and gas handling had to be developed for unprecedented risks, thereby reducing the risks to safe levels. For this reason, a training program for the proper handling of toxic waste by construction workers was done. In addition, a detailed matrix of possible impact and mitigation measures was documented.
		Source: Central Buen Ayre "Procedimiento del Sistema de Gestión Integral: Gestión de Residuos" (CBAY 0504 -001), (Argentina: 2012), 1-3 *Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "5. Evaluación Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, (Argentina: 2011), 13*
		RECOMMENDATIONS *There is evidence of a comprehensive study of impact and safety implications of the project and new technologies associated to it. In addition, the development of methodologies of action to mitigate these effects is well documented, so no further recommendations are made.*
		Conserving
QL2.2 Minimize Noise And Vibration	**8**	The project's noise studies are extremely relevant, especially during the operation phase since the high power machinery could potentially affect surrounding communities. Studies of both existing noise as well as the new noise from the installation and operation of the power plant have been carried out. In the installation phase, the plant Central Buen Ayre and Caterpillar is placed in charge of developing studies to test noise impacts. They recommended their workers to use ear protection in order to avoid ear injuries. During the operation phase, studies are based on the Norm IRAM 4062/01, which states that the difference between total noise and background noise should be less than 8 dBA in order avoid negative impact to the community. In this case, four focal points in the power plant were chosen: the Edenor cabinet, the corner between the right and front streets, the area containing the burning gas torches, and the condensing chamber with the blowers. The environmental noise level, 70 dBA, was taken as the baseline for the calculation. The values obtained for each point were: 71.5 dBA in the Edenor cabinet, 72.0 dBA in the corner between the right and front street, 74.0 dBA in the burning gas torches and 71.0 dBA in the condensing chamber. If the calculation is taken, where 70.0 dBA is subtracted from each of the values, it is clear that no value exceeded the 8dBA baseline shown in Norm IRAM 6062/01. Therefore, it was concluded that noise produced would not be enough to disturb surrounding communities. Still, in order to mitigate noise and vibration produced,

		there are soundproofing and periodic maintenance of generators by operating workers. For this reason, people hired will receive training prior to the start of work in the plant. Periodic test studies have proven that noise levels are within range even after the construction phase.
		Source: Maierú, Hernán "Medición de ruidos molestos al vecindario", Central Buen Ayre, (Argentina: 2015), 1-5 *Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "5. Evaluación Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 13-25* *Da Re, Alejandro, "Formulario del sistema de gestión integral: Protocolo para la medición del ruido para el medio ambiente laboral" (F/CBAY808-000/04), (Argentina: 2012), 1*
		RECOMMENDATION *S In order to achieve a higher score, the project would have to create a quieter environment directly targeted to the community. One way to begin addressing this issue would be to contact community residents and survey their auditive preferences before and after the construction of the plant.*
QL2.3 Minimize Light Pollution	**1**	**Improved**
		The project team considered and evaluated different types of lighting needed for specific areas of the project from the cost saving perspective. The documentation provided focused on interior and exterior lighting needed for the functions of each space, showing that lighting design was specific for efficient usage. In addition, they conducted luminance studies of each lighting apparatus used, demonstrating how orientation influences lighting. In a similar manner, a signage system to show the position of wells was developed. Symbols indicating the beginning of the process, extraction areas and ends of processes were marked on site with adhesive and reflective signs in order to locate these areas. No information has been provided in order to reduce light spillage for protecting the natural environment.
		Source: Maierú, Hernán, Formulario del Sistema de Gestión Integral: Protocolo para la medición de iluminación Planta Central Buen Ayre (F CBAY/8080- 0/05) (Argentina:2012) 1-4 *Central Buen Ayre, Instrucción del Sistema de Gestión Integral: Instructivo Señalización de Pozos , (Argentina:2012), 1-2*
		RECOMMENDATIONS *The project team positioned the lighting with a cost saving focus, nevertheless in order to achieve a higher score in this credit, strategies to actively pursue minimization of light usage should be conducted. Specific lighting to reduce light spillage effects or high barriers in order to reduce glare are some of these strategies. Establishment of lighting zones is also advised in order to minimize light pollution.*
QL2.4 Improve Community Mobility And Access	**4**	**Enhanced**
		The project team assessed the transportation routes on the site, in the North Landfill III a bigger complex, where the power plant was constructed. Central Buen Ayre is located next to the already existing road Buen Ayre-Progresiva 7000, between the Pan American highway and Ex highway 8 in San Martin, Buenos Aires province. The transportation in the area is considered to be satisfactory since the Buen Ayre road, built by CEAMSE in 1982, connects the north and west of Buenos Aires, in particular the municipalities of San Isidro, General San Martín, 3 de Febrero, Hurlingham, San Miguel and Ituzaingó. This road connects the site with metropolitan areas, allowing trucks to take construction materials during the initial phase and waste during the operation phase. In addition, there was coordination between the project team of Central Buen Ayre (through Tecsan, which is the subsidiary of Benito Roggio Ambiental, the company in charge of Central Buen Ayre) and CEAMSE, the client, to construct the underground busway of 13,2 KW. The underground busway crosses the parkway of Buen Ayre, so road safety measures were taken.

		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental,3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011), 7, 11 *Alem Romano, Sixto and De Zabaleta, Alberto, "Nota de Pedido Numero 08" (Contrato Central Buenos Aires) San Martín, (Argentina: 2011), 1*
		RECOMMENDATIONS Although construction routes were located and described, an analysis of traffic flows and how these would be affected during the construction and operation phase could help in anticipating changes in road traffic once the power plant starts operating. These studies could be used to analyze the impact of the plant on mobility and access between the north and west of Buenos Aires province, possibly designing methods to account for new traffic.
QL2.5 Encourage Alternative Modes of Transportation	**0**	**No score**
		Given that the project is intentionally located in an isolated area, transit access related to non-motorized transportation was not encouraged. The power plant must handle methane (a highly explosive gas), so the creation of pedestrian routes for citizens of surrounding communities was avoided. Instead, the main mode of transportation to, and from the site is via the road of "Buen Ayre," connecting the project site with metropolitan centers from which the plant would get its materials.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "2. Datos Proyecto: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás." (Internal Ingeniería Laboral y Ambiental S.A. Document). Central Buen Ayre,(Argentina: 2011), 5-7
		RECOMMENDATIONS In order to ensure safety it is clear that the project must be located on an isolated site. However, the project team did acknowledge the existence of a railroad crossing the site; programs to facilitate the use of this mode of transportation, rather than motor vehicles could be further investigated and implemented in order for this category to achieve a higher score.
QL2.6 Improve Site Accessibility, Safety & Wayfinding	**3**	**Enhanced**
		On-site use of signage to note biogas well locations, and the development of safety guidelines helped users to navigate the site. Design documents showing symbols used, and plans to locate wells were provided. The main goal of the signs was to indicate areas of danger and orient workers in charge of difficult tasks, helping to guide them through the site. The signs were designed to be adhesive, reflective and visible at the wellhead. In addition, an evacuation plan was designed in case accidents occurred or contingencies needed to be executed. This plan detailed specific tasks and procedures every person should follow in case of an emergency. The person in deemed to be in charge in such cases would be the "Emergency Coordinator" or designated "Responsible for Evacuation" individual on site. Furthermore, cuts to the supply of gas and electricity would be to follow the procedures of CBAY 0709-013, "Emergency Stop." The activation of the alarm would follow CBAY 0806-000/04 "Codes for Emergency Alarm."
		Source: Central Buen Ayre. Instrucción del Sistema de Gestión Integral: Instructivo Señalización de Pozos (CBAY0505 – 004), (Argentina: 2012), 1-2
		RECOMMENDATIONS In order to improve in this category, the project team would have to provide signage not only for the internal processes and locations of the power plant, but also in terms of its connections to the exterior of the site. These include universal access to curb cuts, pedestrian crossing signs and high visibility crosswalks. In addition, they would have to provide pedestrian over/under passes for major roads going through the site.
QL3.1 Preserve	**0**	**No score**

Historic and Cultural Resources		The power plant Central Buen Ayre is located in an isolated area without historic and cultural resources. It was acquired by the military in 1901 and previously used for military training. In addition, the land had been used for cattle raising, and was a plain landscape with few species of flora. For this reason, the project team did not work with the community and other stakeholders in regards to the preservation of the site.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, (Argentina: 2011), 11
		RECOMMENDATIONS Although the immediate area of the project presents no historic and cultural resources, the area indirectly affected by the construction of the project as explained in the Environmental Description Document does encompass the communities of Tigre, San Miguel, San Martin and Tres de Febrero. For this reason, analyses on how the construction would affect historic and cultural life in these districts could have been developed in addition to the socio economic information presented.
QL3.2 Preserve Views and Local Character	**1**	**Improved**
		An in-depth analysis of the natural landscape of the area was developed including soil, flora and fauna studies. The site was designed in order to meet and adapt to these characteristics. Specifically, the plant Buen Ayre is situated where there is no vegetation, just remnants of small bushes. Other species were located and descriptions were provided in the Environmental Description Document. However, no information regarding how these species may be affected and how it may be mitigated was provided. The same document provides information in regards to the fauna of the site, in particular, a detailed description of fish and birds living in the area. In addition to effects in the natural landscape, it is important to analyze how the construction of the site would affect views to and from the site. The project includes the construction of high structures, especially flaring torches in charge of burning gases. These structures will affect the views and local character of the area, because they will be seen from surrounding communities. Still, the location of the project is far enough from these communities to avoid direct shadowing.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011) 71-79 *Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 5. Evaluación Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011) 13-20*
		RECOMMENDATIONS There is no documentation showing reports of meetings with public officials and/or community leaders to analyze how the project would impact the built environment indirectly affected. In addition, although a description of the natural landscape is provided, no information as to how these species would be affected or how the project plans to mitigate this impact was shown.
QL3.3 Enhance Public Space	**0**	**No score**
		The project team developed an analysis of possible impacts the construction and implementation phases would have on the site, as well as the benefits that it will bring. The area in which the project was built is isolated from surrounding communities therefore no public spaces or other recreational facilities that could enhance community livability has been created.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 5. Evaluación Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011) 13

		RECOMMENDATIONS In order to enhance the public space, the project could have included in its construction larger access routes that would have connected itself with other city cores and would have positively affected surrounding communities by increasing their exposure to new activity.
QL 4.1- Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)	**0**	**No score**
		The project team addressed community leaders of the districts of adjacent communities and leaders of informal recycling cooperatives, many of which were women. Nevertheless, they did so only for the project's immediate needs, without further plans of investment in women and diverse groups. There are no records of indigenous and afro-descendant populations near the site of Central Buen Ayre. For this reason, no plans that addressed the needs of diverse communities were developed. In addition, union labor agreements in Argentina establish that tasks related to construction should be performed by men instead of women, so the company in charge of hiring followed these guidelines. Furthermore, because the hiring of construction and permanent workers was derived to tertiary companies, there was no participation from the project team in the process. Still the project team documented that during the hiring of people for security, health and safety during the construction of railroads, there was no gender preference.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011) 71-79 *Central Buen Ayre, Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE (Argentina: 2011), 1*
		RECOMMENDATIONS Studies of community growth of the districts of Tigre, Tres de Febrero, General San Martin and San Miguel could also include data on ethnographics, showing gender and race of their populations. With this data, the project team could see and determine whether there is a need to specifically address the needs of women and diverse communities.
QL4.2 - Stimulate and promote women's economic empowerment	**0**	**No score**
		The project team did not distinguish the population affected or hired during the development of the project. Because of the established labor union agreements, most of the construction jobs were actually given to men rather than women, although for the rest of the jobs there was no distinction made as to whom was hired. In addition, this task was given to a tertiary company in charge of the construction, therefore the project team was not involved in the process.
		Source: n/a
		RECOMMENDATIONS In order to obtain a score in this category, an explicit attempt to hire women must be made. Given that the hiring process was given to a tertiary company, one way to achieve a higher score would be to get involved in this process in order to ensure that a percentage of women are hired.
QL4.3 - Improve access and mobility of women and diverse communities (indigenous or afro-descendant	**0**	**No score**
		Documentation provided shows that the project team presented the project developed in Buen Ayre to a group of both men and women involved in the surrounding communities. These stakeholder meetings provided an opportunity for these groups to understand the project as well as ask relevant questions. Given that the project team took no specific approach to particular women's needs but rather focused on the general audience, this will be accounted in a different credit.
		Source: Central Buen Ayre, "Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE", (Argentina: 2011), 1

peoples)		*RECOMMENDATIONS In order to achieve a higher score, the project team would need to make an explicit distinction between diverse communities and others, showing how they would including responses of these diverse communities in their program.*
QL0.0 Innovate Or Exceed Credit Requirements		
	36	

SUB CATEGORY:LEADERSHIP		
	Score	**CENTRAL BUEN AYRE**
LD1.1 Provide Effective Leadership And Commitment	**4**	**Enhanced** There is evidence of sustainability policy statements, given by the CEO of Benito Roggio Ambiental Pablo Delorenzi, committing to develop the project within a system focused on sustainable integration. This document shows the project's effort to prioritize environmental goals by both identifying the project's impact and training workers to stimulate their involvement in these goals. This is supported by the company's certification ISO 9000:2000. Furthermore, Tecsan subscribed the corporation Central Buen Ayre's policies, certifying its Quality Management according to Norm ISO 9001, its Management of Environmental Systems to Norm ISO 14001 and its Systems of Security Management and Health in the Working Environment according to Norm OSHAS 18000. The project has also shown its achieved performance in INET certificates from the years 2007, 2008 and 2011 showing that they fulfilled the requirements of ISO 14001:2004, and the last of these certificates will be valid until 2016. Finally, some of the information provided proves that in 2012, that there was a renewed commitment by Tecsan to maintain the priorities stated by CEO Pablo Delorenzi previously. Specifically, Tecsan states that they will maintain and improve the quality of their service and evaluate environmental risks associated with the power plant. *Source: Benito Roggio Ambiental, "Política del Sistema de Gestión Integral," (Argentina: 2015), 1 Tecsan, "Política de Gestión de la Calidad, Medioambiente, Salud y Seguridad Ocupacional" (Argentina: 2012), 1* *RECOMMENDATIONS In order to achieve a higher score, the project team could publish sustainability annual reports showing specific examples of sustainable commitment and the goals that the company is aiming to achieve for the coming years.*
LD1.2 Establish	**7**	**Superior**

A Sustainability Management System		The project has a complete sustainability management system in place with specific steps to follow each manager and worker, designed to respond to changes in external variables. The project team roles are clearly defined in a matrix by separating people working exclusively for Tecsan in Central Buen Ayre, people working part-time and external consultants that have management roles. The people in charge of ensuring high quality systems and environmental systems will be Francisco Áleman and Luciano Medrano. They will act as shared resources between the power plant and the evaluation unit of the module, as part of the Central Buen Ayre team. Furthermore, the project team obtained approval under the Mechanism of Clean Development (CDM) of the Kyoto Protocol of the United Nations. In this document, the project follows the conditions of methodology ACM0001 as a landfill gas capture project. In addition, there is a step-by-step explanation on how the project responds to current Argentine national and municipal laws approached from a sustainability perspective. Specifically, each section of the process of capturing gas from landfill is documented with the responsible actor and a description of procedures attached. The procedure for monitoring each step and the measurement methods as well as the frequency of the data collection are clearly stated.
		Source: "Contrato Central Buenos Aires Número 003" (Argentina :2011), 1 *"Organigrama Central Buen Ayre" (Argentina: 2015), 1* *United Nations, "Clean Development Mechanism: Project Design Document Form" (Unknown: 2006), 10-11*
		RECOMMENDATIONS *The project team considered legal and environmental factors involved in a sustainable management system, nevertheless a prioritized list of these is recommended, especially in unexpected situations. Furthermore, the sustainability management policy document could also focus on covering project stakeholders, including the communities indirectly affected by the project. An alignment of the project's priorities with the analysis of community systems would create a more long-term sustainable management system.*
LD1.3 Foster Collaboration And Teamwork	**0**	**No score**
		There is no evidence showing collaboration between the project team and external actors operating within the area of influence. There is also no mention of integration of a holistic approach as part of the contract between different parties in which all the members involved in the process have established a meaningful risk and reward sharing.
		Source: n/a
		RECOMMENDATIONS *This category requires an effort to foster collaboration between the company and other actors operating involved in the project. The promotion of this teamwork approach can be done through procedures or methodologies agreed in an early phase of the project in which all the parties involved (designer, contractor, developer) collaborate and share the risk/ reward of the construction or any other phase of the project. It is recommended to promote the importance of early collaboration to ensure the best possible outcome.*
LD1.4 Provide	**5**	**Enhanced**

For Stakeholder Involvement		The project team presented the project to a series of local groups including major project stakeholders and community leaders such as (1) Argentina's chapter of the International Solid Waste Association (ISWA), (2) the National Ecological Coordination of the Metropolitan Society (CEAMSE), (3) Government and Public Service Entities (in a meeting with 9,000 participants), (4) the Argentine army, and (5) informal recycling groups of surrounding communities. The goals of these presentations were to explain to the different stakeholders about the extraction and treatment of biogas, as well as to address any questions or doubts that the parties involved may have. Because Buen Ayre was the first of its kind in Argentina, the project team involved the public at large through media outlets. In order to do so, Managers of Tecsan, who designed the power plant, presented the project and explained the operation process. Although, no information has yet been provided regarding how the project team integrated the feedback received from the stakeholders. Furthermore, a series of contracts between Central Buen Ayre S.A, the Anonymous Society of Argentine Energy (ENARSA) and the Argentine Administrative Company for the Wholesale Market of Electricity (CAMMESA) were provided, showing the agreement to implement the new power created to the national grid.
		Source: Central Buen Ayre, "Nota de Pedido Número 3" Documento Número 4, (Argentina: 201), 1 *Central Buen Ayre and Benito Roggio Ambiental, "Presentación de Recuperación de Metano y Generación de Energía" Módulo Norte IIIc, (Argentina: 2011), 1-24* *Central Buen Ayre and Benito Roggio Ambiental, "Proyecto de Generación de Energía Eléctrica a partir de la Utilización de Biogás de Relleno Sanitario como Combustible" Módulo Norte IIIc, (Argentina: 2012), 1* *Weihs, Juan Pablo "Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía" (Argentina: 2011), 1*
		RECOMMENDATIONS *Central Buen Ayre provided presentation documentation and some questions from the public, showing their active involvement in the process of introducing the project. However, implementing feedback from these groups could have enhanced the development of the community with the project, achieving a higher score in this category.*
LD2.1 Pursue By-Product Synergy Opportunities	**0**	**No score**
		There is no evidence of by-product synergy or search for discarded materials in nearby facilities to Central Buen Ayre that can be used in the project to minimize the use of raw materials. This credit assesses the pursuit of opportunities to use unwanted materials from other external companies, as well as providing unwanted materials by the company itself to other facilities. The connections created between two or more facilities can help reduce waste by its use in other processes.
		Source: n/a
		RECOMMENDATIONS *Looking outside the project's processes and include materials already being used in nearby facilities would result in a score in this category. For example, by identifying unwanted materials located in facilities nearby that can be used in the project instead of buying new ones. The same could be done in the operation phase. Furthermore, having active discussions with managers working in nearby facilities and regulatory agencies who oversee projects in the area could lead to productive connections between the project team and others operating in the surrounding area.*
LD2.2 Improve	**7**	**Superior**

Infrastructure Integration		The project is planned and designed with other existing infrastructure taken into consideration, positioning itself in linkages between the North Module IIIc and other facilities. First, part of the process in the plant is treating lixiviats produced from gas treatment. For this, an additional plant must be in place, and this construction is part of Central Buen Ayre's existing contract. However, the environmental complex already has a system of lechate treatment for the North Module IIa and North Module IIb, which will be used in the initial stages of North Module lllc's operation, as long as it has enough operating capacity to treat the new incoming liquid. The plant in place has a capacity of treating 500m2/day, but is still designed as a module, meaning it could increase its capacity according to future needs. Currently, it treats liquids from North IIIb and North II (Different modules). Furthermore, the line of medium voltage constructed to distribute the power from Central Buen Ayre to Buenos Aires will connect the substation Rotonda, owned by EDENOR, the largest Argentine distributor of electricity. Rather than the creation of a new station, Central Buen Ayre is merging its service of electricity production into the existing national grid. It is considered that the project takes into account other infrastructures and works in harmony with other infrastructure elements out of the own project.
		Source: Cardesa, Enrique Gustavo , Barletta Luis Miguel and de Casas, Mario, "Resolución ENRE 0144/2012" Boletín Oficial n° 32.431, (Argentina: 2012), 26, last visit 15/21/2015, http://www.enre.gov.ar/web/bibliotd.nsf/($IDWeb)/1238DE044B9C7F1803257A2B005F1F71 Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "4. Descripción Técnica: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre,(Argentina: 2011) 19-20 and 53-54
		RECOMMENDATIONS *In order to improve the project performance, it should have been designed taking into account not only physical infrastructure but also social and community assets, such as knowledge and social capital. Doing this, they could improve community efficiency*
LD3.1 Plan For Long-Term Monitoring & Maintenance	**3**	**Enhanced** The project team has developed a working plan for regular monitoring and maintenance of equipment. Reports developed in 2013 show methodology for the maintenance of machinery used in the power plant, with studies that focus on monitoring groups CAT 3520C and Powerhouse in different ways. Reports on levels and methodology used to test lubricants and refrigerants in these equipments every 100 and 250 hours of operation respectively demonstrate that resources have been applied for long-term maintenance. Furthermore, evidence shows the monitoring of liquid extraction from plant processes every time the mechanic in charge sees high levels, as well as gas monitoring every 4 times per shift in the gas plant and twice per shift in the filters. Finally, special focus on the monitoring of generators CAT 3520C shows how the project team utilized the manual "Operation and Maintenance of Generators G3500C and G3500E" as guidance for their maintenance to ensure high quality functioning. In addition, they used the measuring instrument TESTO and the program Terberg to analyze levels of gas leakage from machinery. This is done once every shift and ensures that generators are behaving correctly. In every case described, evidence shows the company and personnel in charge of implementing the plan identified for monitoring.

		Source: Central Buen Ayre, Instrucción del Sistema de Gestión Integral: Mantenimiento de Grupos Electrogenos CAT 3520C Doc CBAy 0710-031, (Argentina: 2013), 1-2 *Central Buen Ayre, Instrucción del Sistema de Gestión Integral: Verificación Horaria Sala de Control Doc CBAy 0710-058, (Argentina: 2013), 1-11* *Central Buen Ayre, Instrucción del Sistema de Gestión Integral: Muestreo APA C/100 HS Doc CBAy 0710-028, (Argentina: 2013), 1-5* *Central Buen Ayre, Instrucción del Sistema de Gestión Integral: Muestreo Refrigerante C/250 HS Doc CBAy 0710-029, (Argentina: 2013), 1* *Central Buen Ayre, Instrucción del Sistema de Gestión Integral: Inspección de Grupos CAT 3520C y Power House Doc CBAy 0710-031, (Argentina: 2013), 1-3* *Central Buen Ayre, Extracción de Fluidos de Descarte en Central Buen Ayre Doc CBAy 0710-048, (Argentina: 2013), 1-3* *Central Buen Ayre, Instrucción del Sistema de Gestión Integral: Muestreo de Gases de Escape (TESTO) Doc CBAy 0710-057, (Argentina: 2013), 1-4*
		RECOMMENDATIONS *A higher score would involve a detailed plan of how resources to implement that plant are allocated and maintained in sufficient levels to ensure long-term monitoring of equipment. In addition, there would be a direct connection between organizational frameworks of personnel to specific tasks, therefore specifying what are the specific tasks to be done, who will perform those tasks and the total cost to implement these practices should be provided.*
LD3.2 Address Conflicting Regulations & Policies	**4**	**Superior**
		The project team did detailed assessments of applicable regulations for Central Buen Ayre. They analyzed the legal framework and also evaluated how these laws could potentially create barriers in their implementation of the project. However, because the project is the first of its kind, few of the existing laws were applicable to the specific project. As of now, there are no Argentine regulations to capture and flare landfill gases. The actual legal framework states that final waste should disposal into landfills. There is no current regulation to implement or promote an active extraction system that would include biogas treatment in order to reduce greenhouse gases. As a result of this lack of regulation they developed new mechanisms aligned to government regulations. According to National Law, the responsible entities in charge of finding solutions to environmental problems are those public entities working closest to the problem. The project team found a legal gap caused by the absence of other biogas facilities in the country. They worked with the owner and CEAMSE, the entity in charge of monitoring the whole complex, to create regulations applicable to their own practices. In cases where National Law are insufficient to compare with the project, as occurred in air quality matters, the project team used law regulations from the province of Buenos Aires N0 5.965, Decree 3395/96 and Amending Solution 242/97.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "7. Aspectos Legales: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, (Argentina: 2011), 2-26 *United Nations, "Clean Development Mechanism: Project Design Document Form" (Unknown: 2006), 17-19*
		RECOMMENDATIONS

		Some Argentine laws, regulations and standards were formed in another era, before sustainability became a priority and before power plants like Central Buen Ayre were designed. In cases where there is no existing law, the project team did work with local officials to create regulations that aligned with existing practices. However, the project team could also work with decision makers to modify or change laws and regulations that restrict better practices or are not aligned with the plant procedures in order to achieve a higher score. For example, in soil protection, studies show that current law is not applicable, but no alternative regulations are suitable.
LD3.3 Extend Useful Life	**1**	**Improved**
		The life cycle of power plants like Central Buen Ayre are limited by the finite biogas resource from landfill. The project is designed to collect waste for five years, and only in the fourth year did it start creating power for the national grid. However, the plant is designed as a module within a larger environmental complex, and is expected to switch owners back to ENARSA, the state-owned company who called for proposals, once the life cycle of the plant is over. According to the project team, there is a possibility of extending the life of the project and studies are underway, but no real decision has been made.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 4. Descripción Técnica: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011) 13
		RECOMMENDATIONS *One way to achieve a higher score in this category is to design the project in a way that enables easy reconfiguration and refurbishment of constructed facilities. Credit is also given for enhancing durability and resilience to the design. To achieve this, a feasibility study that identifies key areas that could be flexible and reused versus others that are more permanent and would need more investment could be done, locating which spaces would offer a reasonable payback and which are best left as they are in the future.*
LD0.0 Innovate Or Exceed Credit Requirements		*N/A*
	31	

CATEGORY II: CLIMATE AND ENVIRONMENT		
RESOURCE ALLOCATION		
	Score	**NAME OF THE PROJECT**
RA1.1 Reduce Net Embodied Energy	**0**	**No score**
		Embodied energy is defined as the sum of energy that was used in the production of a material or product, including raw material extraction, transport, manufacture, and all the undertaken processes until the material or product is complete and ready. There was no evidence of estimations of the embodied energies of key materials used for the project or an life cycle analysis (LCA) has been conducted.
		Source: n/a
		RECOMMENDATIONS *To achieve a score in this category, it is first important to make a life cycle analysis of key materials used in the project. The materials identified as key should involve both materials used for construction and materials used for maintenance and operation during the project life.*
RA1.2 Support	**2**	**Improved**

Sustainable Procurement Practices		The project team developed a defined procurement policy matrix in their practices. They had clear performance specifications that applied to key companies in charge of hiring workers and other suppliers. It is important to clarify that the project team of Central Buen Ayre outsourced the construction of the plant and the process of energy generation to Finning Argentina S.A, the local representative of Caterpillar Company, nevertheless the project team of Central Buen ensured that Finning Argentina S.A met sustainable practices, following a collective agenda for sustainable and high quality work. The evaluation form for developed by Central Buen Ayre for key supplier and manufacturing companies before hiring followed specific guidelines, with questions that included whether they had certificates ISO 9001, ISO 14001 and OHSAS 18001. Furthermore, they ensured suppliers had up to date documentation and delivered their products with high quality and on time. The first section of the evaluation consisted on these questions, and the suppliers had to score 7 or more out of 20 in each category to pass to go through the next section. In the second section, questions related to satisfactory working conditions and logistical practices were conducted. The supplier or manufacturer had to score more than 70 out of 100 in total to be hired. Within this evaluation no specific emphasis was provided to sustainability practices, but to quality of the work.
		Source: Central Buen Ayre, Formulario del Sistema de Gestión Integral: Evaluación de Proveedores doc F/CBAy 0704-000/2, (Argentina: 2011), 1-6 *Bureau Veritas Certification, Certification Awarded to Finning Argentina S.A (Argentina: 2012) 1* *BMTRADA System Certification ISO 14001, BMTRADA To Certify Los Conoce S.A: Certificate Number 2270, (Argentina: 2013), 1* *BMTRADA System Certification ISO 9001, BMTRADA To Certify Los Conoce S.A: Certificate Number 9767, (Argentina: 2013), 1*
		RECOMMENDATIONS *Even though the project team developed a matrix for key companies in charge of the hiring of most suppliers and manufacturers, working directly with suppliers and manufacturers instead of outsourcing this service would ensure efforts for sustainability in a more direct and hands on approach. Furthermore, an increased emphasis placed on suppliers social and ethical performance could improve unresolved worker health and safety issues potentially present on site.*
RA1.3 Used Recycled Materials	**2**	**Improved**
		The project team hired the steel company Ternium Siderar to provide all the steel used for the plant structure, a company that uses recycled metal in their product. The company's objectives show a clear commitment to preserving the environment, and do so by capturing steel from waste through waste separation and magnets and recycling it to further use. However, no specification related to the percentage of recycled material used besides the information appearing on the website was provided.
		Source: Ternium Siderar Argentina, Acerca de Ternium en Argentina: Medio Ambiente, (Argentina: 2015), Accessed 11/21/2015, http://www.ternium.com.ar/acerca-de-ternium-en-argentina-medioambiente/
		RECOMMENDATIONS *In order to achieve a higher score, an inventory of materials should include the name of the product, the name of the manufacturer, the weight or volume of the material and the percentage of recycled content. All materials should meet the necessary quality and performance criteria required for the intended application.*
RA1.4 Use	**0**	**No score**

Regional Materials		Most of the equipment necessary for the plant operation was imported from abroad. This is because Central Buen Ayre is the first plant of its kind in Argentina, so technologies needed in the plant equipment are not currently being developed locally. The project team hired John Zink Company from Tulsa, Oklahoma, to provide the Enclosed Flares system and Blowes Skid assembly. Elements such as overhead conductors, reactors power transformers, the machinery building and other offices were built with local materials. However, although some materials were bought locally, the project received no score because less than 30% of these materials were locally sourced.
		Source: John Zink Company, LLC "Letter Offer Nro. ZTOF398" (United States: 2011), 1-6
		RECOMMENDATIONS *An analysis with calculations of total project materials by cost would be a starting point to determine whether some materials are best bought locally or abroad. Although the technology needed for the plant's machinery is not available locally, other more simple artifacts could be developed locally in order to increase capacity building of local companies, rather than importing them.*
RA1.5 Divert Waste From Landfills	**6**	**Enhanced**
		The project team developed a waste management plan to decrease project waste during operation. In the plan, they distinguish between urban solid waste and special solid waste. The former identifies objects or substances that are not contaminated with hydrocarbons or toxic chemicals, therefore do not represent a health risk for communities. The special solid waste category includes oils, used lubricants, batteries, wood, elements contaminated with harmful substances like paint or acid, tubes and lamps, among others. Within the North Complex III where Central Buen Ayre is located, there is also a Mechanical Biological Treatment Plant (TMB) in operation. Waste materials were separated with the same internal mechanisms as used to separate the waste in the first place (before being treated to generate energy) and were then sent to the reclamation facility to incorporate them with other recycled materials. The project team estimated a recycle rate of between 25 and 50% of their materials.
		Source: Central Buen Ayre Procedimiento del Sistema de Gestión Integral: Gestión de Residuos (CBAY 0504 -001), (Argentina: 2012), 1-3
		RECOMMENDATIONS *Calculations of the total waste reduction measures and percentage of materials diverted to recycling would increase the score. These calculations may be done by weight or volume, but should remain consistent throughout the rating process. Furthermore, hazardous waste reduction, as specified in the documentation, of materials such as oils, used lubricants, wood, and others should be included in the calculations.*
RA1.6 Reduce Excavated Materials Taken Off Site	**6**	**Conserving**
		The site was not excavated during construction, but was rather lifted facilitate stormwater runoff and to avoid the risk of flooding, for this reason is estimated that 100% of all the material has been reduced on the site. The extra soil needed was brought from a quarry used for these purposes.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 4. Descripción Técnica: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011) 14-17
		RECOMMENDATIONS
RA1.7 Provide	**4**	**Enhanced**

for Deconstruction & Recycling		The life cycle of the project in the hands of Central Buen Ayre is designed to last 14 years. Then, the project will shift from the management of Central Buen Ayre, from the company Tecsan, to ENARSA, the state-owned company who called for proposals. However, the project team of Central Buen Ayre has agreed to maintain all equipment during the term of its use until the contract ends and the project owner shifts to a third company. For this reason, all equipment should be still ready to use after this 14 years period. Instead of planning for deconstruction and recycling, the project team planned for an extended life-cycle of the project. In case the third party in charge wants to dismantle the power plant, this could also be done, since there is machinery within the facility with enough power capacity to do the deconstruction of this section.
		Source: ENARSA, Licitación Pública Nacional e Internacional Enarsa No EE 001/2010 - Provisión de Energía Eléctrica a Partir de Fuentes Renovables Biogás (Argentina: 2011), 5-23 *Central Buen Ayre, Extractor de Aire, Corte Nave de Máquinas, Diagram (Argentina: 2015), 1*
		RECOMMENDATIONS *In order to achieve a higher score, at least 50% of components should be easily separated for reuse. There should be plans and arrangements in place to identify, keep track and communicate at the appropriate time the components and prefabricated units designed for disassembly.*
RA2.1 Reduce Energy Consumption	**3**	**Improved**
		The project team identified one of the main sources of power usage as the network for biogas capture. By reviewing equipment used, they were able to successfully reduce energy consumption between 10% and 30%. For this, they used an automatic ignition and control station from John Zink Company. This system works with three blowers of 250 HP, regulating their usage by incorporating velocity regulators that optimize pressure capture to minimize oxygen uptake in the grid and therefore energy consumption. Specifically, the two gas control systems include a pressure regulator, a fail-closed shut down valve, a manual block valve and a pressure indicator. Depending on the condition of operations needed by the grid, the system will be controlled to optimize its usage.
		Source: John Zink Company, LLC Letter Offer Nro. ZTOF398 (United States: 2011) 1-6
		RECOMMENDATIONS *In order to achieve a higher score, the project team should take a "whole systems design" approach when considering options to reduce energy consumption. They should aim to reduce more that 10% of energy consumption.*
RA2.2 Use Renewable Energy	**20**	**Restorative**
		The project team changed their approach to their energy needs in 2014. Prior to 2014, the power plant's energy resources came from the energy generated within the six generators in plant, and the resulting net energy was injected into the national grid. In 2014, the project team decided to introduce an additional smaller biogas generator Jenbacher 250 kW(GE), used in nearby facilities. It has a functioning period of 60,000 hours of service before its first maintenance, and is control mechanisms have been accredited, making it a trustworthy equipment. This generator is only used to supply internal energy needs, so that all energy produced by the other generators in the biogas plant can be injected in the national grid. Extra energy produced by this generator is also injected in the national grid. The result of introducing this seventh generator means that the net value of the project is greater, and therefore it contributes to improve the national energy matrix to a greater extent. In this way, the power plant is displacing the use of fossil fuels needed for the demand in national energy, and instead introducing a larger percentage of renewable energy sources.
		Source: GE Power and Water, Distributed Power Jenbacher tipo 2:, Document GEA-13689SP, (Argentina: 2015) 1

		RECOMMENDATIONS *There are no recommendations in this credit because the project team obtained the highest score*
RA 2.3 Commission & Monitor Energy Systems	**11**	**Conserving**
		The commission for the maintenance and monitoring service for the six energy generators used in the power plant was given to Finning Argentina S.A, Caterpillar's local representative in Argentina. They were hired to provide the service for the entire lifecycle of the project, showing a commitment to long-term monitoring. Documentation provided shows Caterpillar's manual for operating the machinery in the power plant, with specific step-by-step instructions. This demonstrates a certain level of training information for workers operating the machines. Furthermore, a manual was developed by the project team in case one of the generators stopped working in an untimely manner. They specify where each monitoring meter is in the generator and how to handle them in case of problems.
		Source: Central Buen Ayre, Indicación en Contrato del Servicio (Argentina: 2013), 1-2 *Caterpillar, Manual de Operación y Mantenimiento SSBU7681-16, (United States: 2010), 7* *Central Buen Ayre, Formulario del Sistema de Gestión Integral: Operación ante parada intempestiva del motogenerador CBAy0710-043, (Argentina: 2013), 1-7*
		RECOMMENDATIONS *To improve in this category, the project team could develop a training plan for workers during maintenance and monitoring systems prior to starting the work. Rather than only providing Caterpillar's manual, it could be useful to have more in-depth training through presentations.*
RA3.1 Protect Fresh Water Availability	**2**	**Improved**
		The project team conducted a water availability assessment of North Module IIIc as part of the larger framework of the Environmental North Complex III. Furthermore, they hired, through the Argentine army, the consulting company Ingeniera Laboral y Ambiental (ILA), to perform environmental studies which encompass water availability and usage. Documentation provided shows location, type, quantity, rate of recharge and quality of water resources available to the project. On site, underground water was identified as generally saline with high levels of arsenic, iron and manganese. For this reason, ILA categorized this water as nonpotable. The project team projected their water consumption to be approximately 17.7 m3/day, most of which would be obtained from the aquifer of Puelches. Here, 300 billion of liters of water are stored. Part of this water will be used in a refrigeration chamber for the biodas, where it will condense any humidity content and thus prepare the gas for treatment at the generation station. Black or gray water with residues will be treated in a Treatment Plant. However, if too much water needs to be treated and the Treatment Plant is unable to handle that amount, a tertiary expert company will be hired to address the problem. In order to avoid contaminating rainwater, the module designed a perimeter channel as a management system for rainwater, with the objective of avoiding contact with solid waste from the power plant.
		Source: CEAMSE, Complejo Ambiental Norte III, Módulos IIIA, IIIB y IIIC: Plan de Monitoreo Ambiental, (Argentina: 2011), 1-25 *Central Buen Ayre, Red de Distribución de Agua - Diagrama (Argentina: 2012), 1* *Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 6. Plan Ambiental: Estudio de Impacto, Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011), 5-32*
		RECOMMENDATIONS

		In order to achieve a higher score, the project would have to be designed to control water usage over maximum conditions, taking into account long-term needs of the site. The ultimate performance goal would be to meet undeveloped, native ecosystem conditions.
RA3.2 Reduce Potable Water Consumption	**4**	**Improved**
		A reduce amount of potable water is required in the facility and just for drinking purposes. All the other processes in the project use non-potable water from the aquifer of Puelches. The design team did not provided specific detail of active strategies to minimize the use of potable water consumption, nevertheless the use of non-potable water for the operation of the project is considered positively towards the water consumption reduction.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "6. Plan Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 5-32
		RECOMMENDATIONS In order to improve the project score of the credit, specific procedures such as low water use fixtures could be implemented in order to actively reduce the potable water consumption. .
RA3.3 Monitor Water Systems	**6**	**Superior**
		The project team of Central Buen Ayre hired consultant Ingeniería Laboral y Ambiental (ILA) to oversee the monitoring of the entire water system in the initial stages of the project. They assessed the holistic system the project team designed in order to monitor water quality and quantity in the long term. However, the entities in charge of executing monitoring systems are the project team of Buen Ayre, the Sustainable Development Provincial Organism (OPDS) and the Secretariat of Energy. In every monitoring campaign, CEAMSE must report their results to the OPDS, ensuring periodic checking from an independent authority. An area for monitoring was established taking into account soil characteristics, underground water, type of aquifers, and their runoff directions. In total, there are 23 monitoring wells in the aquifer of Pampeano and 22 monitoring wells in the aquifer of Puelches to test underground water encompassing 33 analysis parameters. These wells are meant to monitor water quality data through parameters that include color, pH, chloride level and turbidity, among others. Furthermore, the project team identified 17 stations to test superficial water quality, having 43 analysis parameters. The frequency of monitoring will be quarterly and will follow the guidelines proposed by OPDS in the Resolution 41/14 according to the Environmental Impact Declaration.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 6. Plan Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre,(Argentina: 2011), 5-32 *CEAMSE, "Complejo Ambiental Norte III, Módulos IIIA, IIIB y IIIC: Plan de Monitoreo Ambiental," (Argentina: 2011), 3*
		RECOMMENDATIONS
RA 0.0 Innovate Or Exceed Credit Requirements		*N/A*
	66	

NATURAL WORLD		
	Score	**CENTRAL BUEN AYRE**
NW1.1 Preserve Prime Habitat	**9**	**Superior**
		The project team of Central Buen Ayre avoided development on land that had high ecological and cultural value, locating it in an isolated site previously occupied by the Argentine army for military training. The project is located in the North Module IIIc, part of a larger complex of energy generating modules, some of which have stopped functioning. Still, using an image from Google Earth, the project team demonstrated the site was located 91.44 m (300 ft) away from any human settlement. Furthermore, the consulting company Ingeniería Laboral y Ambiental (ILA) performed studies to determine all areas of prime habitat, showing that the project is not located on any high value soil. According to this study, the type of soil in the site is compatible to the activity of energy generation with biogas, so the impact on site is minimal.
		Source: Central Buen Ayre, Radius of Separation Image, Google Earth, (Argentina: 2015), 1 *Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 5. Evaluación Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina, 2011), 5-32*
		RECOMMENDATIONS *In order to achieve a higher score, the project team should incorporate plans to restore the habitat as determined by a qualified ecosystem professional. The habitat produced could be adjacent to the site, given that the North Module IIIc is part of a larger complex already consisting of other energy generating modules.*
NW1.2 Preserve Wetlands and Surface Water	**0**	**No score**
		The location of the site is 460m (1505 ft) away from Reconquista River, the closest large body of water. However, the river is connected to a lagoon adjacent to the site, formed by rainwater. This is connected to the main river through a 2m stream. According to the consulting company Ingeniería Laboral y Ambiental (ILA), no alteration to this body of water is expected from the construction of the power plant or the line of medium voltage. However, this credit requires a buffer zone for protection of the water of body of at least 15m (50 ft). No information has been provided according to the existence of a buffer zone that could avoid possible contamination.
		Source: Central Buen Ayre, "Distancia de Proyecto a Cuerpo de Agua" Image, Google Earth, August 2015, 1 *Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, (Argentina:2011), 62*
		RECOMMENDATIONS *In order to achieve a higher score, the project should identify a buffer zone of at least 15m (50 ft) from the closest body of water, in this case the lagoon. In addition, previously degraded buffer zones could be restored to a natural state. It should include a site map outlining the buffer area and areas of restoration, showing types of action taken.*
NW1.3 Preserve	**0**	**No score**

Prime Farmland		The consulting company Ingeniería Laboral y Ambiental (ILA) determined that soils in the site were not prime farmland, unique farmland or farmland of statewide importance. For this reason, the project did not interfere with any development in high value soil. The areas around the lagoon, adjacent to the Reconquista River and some areas in Campo de Mayo have forest formations, and especially those close to bodies of water have a high variety of flora. In this soil type and due to the saline nature of underground water, no food can be grown in these lands therefore this area is not suitable for farming. *Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, Córdoba Argentina, 2011, 63* *RECOMMENDATIONS* *Higher credit is earned if there is restoration of previously developed areas that are deemed prime farmland. Although restoration is very difficult, making these lands productive again is highly valued.*
NW1.4 Avoid Adverse Geology	**2**	**Enhanced** The project team of Central Buen Ayre and the consulting company Ingeniería Laboral y Ambiental (ILA) identified and delineated key geologic formations on site. They determined that the project takes place in a fluvial landscape, within the valley of the Reconquista River at the level of the tall terrace and bordering the intermediate terrace level. In addition, the districts of San Miguel, Tigre, San Martin and Tres de Febrero are located in an area of zero seismic risk as stated by the National Institute of Seismic Prevention (INPRES). Still, all construction follows the guidelines of Regulation INPRES-CIRSOC 103: Argentine Norms for Seismic-Resistant Constructions. Even though the project team assured that monitoring adverse geologic factors is not necessary because they are not significant, they designed a response plan in cases of emergencies due to external forces. In this document, there is evidence of safety plans and procedures to ensure reduced risk of damage, including climatic events. The objective of the emergency plan is to ensure a methodical response to minimize damaging effects in the environment, the workers of Central Buen Ayre and the surrounding communities. The project team defined key terms such as emergency, environmental contingency, incident, accident and environmental damage to clearly distinguish mode of action in each case. Furthermore, they designed a flow chart showing step-by-step paths to take in case of an emergency. In each case, they identified the responsible person in charge and additional documents to use as guidelines. *Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011), 63* *Tecsan, Procedimiento del Sistema de Gestión Integral: Preparación y Respuesta ante Emergencias, (Argentina: 2015), 1-8* *RECOMMENDATIONS* *To achieve a higher score, the project team should use plans to illustrate buffers and runoff controls for spill prevention. The buffers should be located around faults, coastlines and karst features. Furthermore, cleanup plans in cases of emergency should be developed.*
NW1.5 Preserve Floodplain Functions	**1**	**Improved** The project's site is located in the valley of the Reconquista River, at the level of the tall terrace 5m above sea level and bordering the intermediate/tall terrace. Following guidelines from CEAMSE, the construction is located in a zone without risk of flooding. For this reason, no emergency plans in case of flooding or other different strategies for preservation of floodplains were developed. However, there is a natural lagoon located very close to the site preserved to maintain its flora and fauna. The

		water in this lagoon has not shown environmental degradation and is constantly monitored by CEAMSE.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, 3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás Central Buen Ayre, (Argentina: 2011), 30, 62 *Gerencia de Ingenieria, Benito Roggio Ambiental, Ref: Preguntas sobre Central Buen Ayre - Sistemas de Agua, (Argentina: 2015) 1-5*
		RECOMMENDATIONS *In order to get a higher score in this category, the project team should show strategies used to maintain pre-development floodplain infiltration, such as amount of impervious surfaces, established vegetation and soil protection zones and other strategies that allow for natural floodwater infiltration and filtration of pollutants. Studies demonstrating pre-development floodplain infiltration capacity and estimates of post-development floodplain infiltration capacity using above strategies would contribute to better floodplain preservation.*
NW1.6 Avoid Unsuitable Development on Steep Slopes	**1**	**Improved**
		The site is located in the valley of the Reconquista River, at the level of the tall terrace and bordering the level of the intermediate/tall terrace. In these areas, the slopes of the land vary because it is an undulating landscape. In general, steepness values vary between 0.03 and 0.0050, so exposure and risk from erosion and landslides are avoided. The project team took into consideration the runoff generated by the plant and the appropriate drainage of the naves in the design of pluvial installations.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, (Argentina: 2011), 31
		RECOMMENDATIONS *In order to improve in this category, the project team could work with local officials and other stakeholders to ensure a well-oriented and positioned site selection. Documentation to show these procedures could include meeting minutes or other plans.*
NW1.7 Preserve Greenfields	**15**	**Conserving**
		The project is located in module IIIc as part of the Environmental Complex III, an area already developed for energy generation. Other modules North IIIa and IIIb were already in operation once the project for Central Buen Ayre began. For this reason, one hundred percent of the project is located in a greyfield, conserving undeveloped forest land surrounding the complex. This documentation is shown in the contract between the project team of Central Buen Ayre and the National Ecological Coordination of the Metropolitan Society (CEAMSE).
		Source: Central Buen Ayre, Contrato Central Buenos Aires Numero 003 (Argentina: 2011), 1-4
		RECOMMENDATIONS *To gain a higher score, the project team could locate the project in a brownfield site, a site documented as contaminated, where a remediation plan is prepared using approved methods by a controlling public authority. The brownfield status of the site would be given by a public authority, a federal agency designation, or results from an ASTM E1903-11 Phase II Environmental Assessment, or CCME National Classification System for Contaminated Sites PN 1403.*
NW2.1 Manage	**0**	**No score**

Stormwater		The project of Central Buen Ayre, as part of the larger Environmental North Complex III, manages stormwater and monitors their system through CEAMSE, the entity in charge of monitoring the whole complex. They do not have a specific plan to manage or increase water storage capacity. Documentation shows the project's runoff water capture system planned, which has an intercepting oil chamber in case oil is released from the generators. However, the other systems of rainwater sewage do not have a pre-treatment mechanism before the liquids in the power plant are released. Although the project team assures that most of the project's site consists of absorbent or semi-absorbent land which avoids runoff, it is still important to develop a plan that deals with runoff water occurring in areas where there is construction.
		Source: CEAMSE, "Complejo Ambiental Norte III, Módulos IIIA, IIIB y IIIC: Plan de Monitoreo Ambiental,"(Argentina: 2011) 3 and 16-17
		RECOMMENDATIONS *In order to obtain a score in this category, the project team should show documentation of the initial, final post-development, and target water storage, infiltration, evaporation, water harvesting and cistern storage capacities using TR-55 Curve Numbers (CNs) or other continuous simulation-modeling methods to describe site conditions.*
NW2.2 Reduce Pesticides and Fertilizer Impacts	**5**	**Superior**
		The project team uses a compost as natural fertilizer to treat plants located within the complex that is produced in one of the companies working within the complex itself. This composting plant works with prunings to create a natural compost used in the entire field of the North Environmental Complex. Furthermore, quality controls to test the pH, humidity, organic material and nitrogen, among others, are made by the complex to ensure high quality. Nevertheless, only 570 m2 of the complex is composed of fields populated with plants, and its biodiversity is low. Inside the complex, the area treated mainly consists of ryegrass. For this reason, there is no need to use pesticides or fertilizers apart from this compost. Furthermore, the project team explained that deteriorated plants whose conditions do not improve with the compost are replaced. Because the same company has been operating in the land for many years, the project team ensure that the decision to choose certain species is well informed. However, no documentation provided shows studies that pertain to this statement.
		Tecsan, "Control de Calidad: Planta de Compostaje" (Argentina: 2015), 1-3
		RECOMMENDATIONS *In order to achieve a higher score, the project team could design landscaping to incorporate plant species that will not need pesticides, herbicides and fertilizers. Given that the area has been worked in by the same company for many years, studies that document and monitor the behavior of different species could explicitly state which ones are better suited for that specific environment.*
NW2.3 Prevent	**4**	**Enhanced**

Surface and Groundwater Contamination		The project team of Central Buen Ayre operates under the systems designed for the North Environmental Complex in the category to prevent surface and groundwater contamination. In documentation provided, relevant aquifers and the type of water located in these waterbodies was clearly delineated. These studies were done both by the team of CEAMSE as a monitoring study for the entire complex and by the consulting company Ingeniería Laboral y Ambiental (ILA) prior to the construction of the power plant. In addition, the team of CEAMSE has a system of long-term monitoring to focus on surface and groundwater quality and spill prevention. On the other hand, the plant of Central Buen Ayre also has its own water capturing system that prevents oil leakage by acting as an interceptor, aiming to prevent oil leakage. This system prevents the leakage of large quantities of oil in the power generation plant. It consists on an interspersed series of baffles that separate the oil from rainwater. *Source: CEAMSE, "Complejo Ambiental Norte III, Módulos IIIA, IIIB y IIIC: Plan de Monitoreo Ambiental" (Argentina: 2011), 3* *Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, (Argentina: 2011), 63* *RECOMMENDATIONS* *To obtain a higher score in this category, the project team should seek to recycle the substances that are polluting water, keeping them within the operation or sending them off-site for use in other operations. In addition, the project could prevent future contamination by cleaning up previously contaminated land from the other companies in the complex, restoring wellhead protection and installing land use controls to prevent future contamination. Restoration may also include the removal of storage piles, rerouting of surface runoff, or restoring groundwater infiltration patterns.*
NW3.1 Preserve Species Biodiversity	**2**	**Improved** The project team demonstrated that the project of Central Buen Ayre does not impact the natural habitat surrounding it, given its location within the larger North Environmental Complex III and the urbanized nature of the surrounding areas. The consulting company Ingeniería Laboral y Ambiental (ILA) performed a detailed study of the flora and fauna in the area, determining that no significant impact would be made by the creation of the project. However, they also stated that the area of Campo de Mayo has the largest diversity of birds in the province of Buenos Aires, nevertheless there is no documentation showing plans to address possible issues related to the construction of the power plant. *Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "3. Descripción Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, (Argentina: 2011), 61-63* *RECOMMENDATIONS* *The project could not only protect existing habitats, but also upgrade them and restore them to create new ones. This would entail efforts to reinstate appropriate vegetation, improve and expand wildlife corridors and link existing habitats.*
NW 3.2 Control	**0**	**No score**

Invasive Species		Even though the project team stated that plant species were chosen based on the team's experience working on that specific site, there is no evidence showing a study of which species are more appropriate for the area and are non invasive. In addition, the trial and error method being used could be better put into practice by doing previous studies of the species and the land. In this category, we analyze how projects work with state and local agencies to identify and use only locally appropriate plants on site, avoiding any noxious plants by referring to lists provided in state noxious weeds laws or federal laws. There should be documentation that all species introduced on the site are noninvasive, including a site plan of the landscaping strategy used that includes all vegetation species. Although this category also relates to fauna and the project team has a systematic plan to control rodents, insects and birds that may transmit diseases, it is first and foremost about vegetative species introduced by the project's development.
		Source: Central Buen Ayre, "Procedimiento del Sistema de Gestión Integral: Control de Vectores" (Argentina: 2013), 1
		RECOMMENDATIONS *To improve in this category, a management plan would need to address strategies for minimizing potential for invasive species, both plants and animals, to re-appear after initial removal or enter the site from nearby areas. In addition, strategies to monitor and remove invasive species that could emerge on-site in the future should be developed.*
NW3.3 Restore Disturbed Soils	**0**	**No score**
		There is no evidence showing that soils disturbed during construction have been restored and reused properly. This category addresses soil restoration as it improves the soil's ability to support healthy plants, biological communities, water storage and water infiltration. Because disturbed soils cannot hold water, nutrients, or carbon dioxide, restoring them to its initial condition is important to sustain vegetation and prevent floods.
		Source: n/a
		RECOMMENDATIONS *To obtain a score in this category, the soils disturbed during construction in the site must be reused for functions comparable to their original function.*
NW3.4 Maintain	**9**	**Superior**

wetland and surface water functions.		The project maintained three ecosystem functions: hydrologic connections, water quality and habitats. They are all addressed by environmental studies done by the consulting company Ingeniería Laboral y Ambiental (ILA) and by studies made for the whole North Environmental Complex III, where the project of Central Buen Ayre is a module. Combining these two studies, it is clear that the three ecosystems mentioned will be maintained. First, hydrologic connections were maintained by the construction of a perimeter channel designed to capture rainwater and avoid its contact with solid residues of the plant. Water and liquids produced due to activities of the power plant will not be discharged in the same rainwater collection systems, existing infrastructure or canals pertaining to the surrounding communities. Furthermore, weekly analysis of gray and black water are done to monitor the state of water produced by the power plant. Second, monitoring systems of water quality are designed taking North Module IIIc as one component of the North Environmental Complex, and studies encompass all modules on site. The system was designed taking into account underground water bodies, type of aquifers, and the runoff directions of these waterbodies. A number of perforations have been installed to monitor water quality and according to ILA, water quality will be maintained by the project team of Buen Ayre. Finally, habitats of flora and fauna will be maintained in the site of the biogas plant. The consulting company ILA performed a series of studies and analysis, and due to the adjacencies with urbanized regions, determined that no significant alterations would be made.
		Source: Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, "6. Plan Ambiental: Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás" Central Buen Ayre, (Argentina: 2011), 11, 23, 30-31,
		RECOMMENDATIONS *To improve the performance of this credit, the project team should enhance four ecosystem functions: hydrologic connections, water quality, habitats and sediment transport. They could mix methods of improving these functions to choose the method what would be most effective for restoration. The plans should include a description of the ecosystem functions and any strategies to maintain and enhance them.*
NW 0.0 Innovate Or Exceed Credit Requirements		*N/A*
	48	

CLIMATE AND RISK		
	Score	**CENTRAL BUEN AYRE**
CR1.1 Reduce Greenhouse Gas Emissions	**25**	**Restorative**
		The completed project is carbon negative because it collects gas produced within the facility to generate energy. The biogas is collected through the landfill of North Module IIIc, which obtains waste from the province of Buenos Aires. A system of capture and discharge of biogas made up of three blowers will be in charge of transporting the biogas through the system. They will move the biogas from the extraction wells to the treatment plant, where residual liquids are extracted so that the biogas is ready to act as a fuel in the energy generation plant. This procedure will extract a source of carbon from waste and will treats it to generate energy reducing reduction of 604,225 t CO_2e every year. The project lifespan is set for 10 years. By the end of the project's life, the emission reductions estimated are 6,043,349 t CO_2e.
		Source: United Nations, "Clean Development Mechanism: Project Design Document Form" (unknown: 2006), 9 *Central Buen Ayre, "Central Térmica a Biogás - Central San Miguel Norte IIIc" (Argentina: 2013), 1-8*
		RECOMMENDATIONS *There are no recommendations in this credit because the project team obtained the highest score*
CR1.2 Reduce Air Pollutant Emissions	**2**	**Improve**
		The project follows local air pollutant emission regulations in the province of Buenos Aires, Argentina. Their monitoring systems perform biannual studies to ensure that gas emissions are within local norms Specific monitoring program were conducted from April to June 2015 to measure the emission of six different moto generators. The pollutants measured were CO, NOx, SO2, NMOC's, CH4, O2 and CO2. The measurements were done according to RD 3395/96 and the results obtained where below the maximum levels established. An addition of active controls, monitoring systems, and mitigation measures at the design stage would give the project a higher score.
		Source: Organismo Provincial de Desarrollo Sostenible (OPDS) "Obtención de Primigenia del Permiso de Descarga de Efluentes Gaseosos" Buenos Aires, (Argentina: 2013), 1 *Organismo Provincial de Desarrollo Sostenible (OPDS) "Área Efluentes Gaseosos" (Argentina: 2013), 1-4* *Organismo Provincial de Desarrollo Sostenible (OPDS), "Equipos Donde se Generan Contaminantes", Presentación No 215508, (Argentina: 2013), 1-7*
		RECOMMENDATIONS *In order to obtain a score in this category, specific monitoring should be conducted on the six criteria pollutants during the entire lifespan on the project. This should prove not just compliance with local regulation, but also not negligible air pollutant ong the long term.*
CR2.1 Assess Climate Threat	**0**	**No score**
		The lifecycle of the project is 14 years in total, of which 4 are allocated to getting enough waste in the landfill plant to obtain biogas and 10 years are planned for energy generation. The project team argue that the lifespan of the project is short to experience climate change effects. However, existing carbon dioxide concentrations are high enough to influence long-term climate change and variations in climate, and the project is contributing to a large degree in the reduction of carbon emissions. While exact effects of climate change are uncertain, we can predict that they will affect the following categories: (1) changes in weather patterns including precipitation and temperature, (2) changes in extreme weather events and natural hazards, (3) increased sea levels and (4) increased desertification. For this reason, it is important to take into account what kind of changes the project may contribute into by completing a comprehensive climate impact assessment and

		developing and adaptation plan.
		Source: n/a
		RECOMMENDATIONS *To obtain a score in this category, the project team should develop a plan with a detailed analysis accounting for the main climate threat in that area. Some of them may be locate expected changes in flood elevations and sea/river rise for the proposed project locations, inventories structures in areas of possible inundation, or plans for proposed project to addressed expected changes in inundation among others. This plan should be completed with input from local emergency management departments.*
CR2.2 Avoid Traps And Vulnerabilities	**0**	**No score**
		The project team of Central Buen Ayre did not take a long-term view of the effects of resource depletion, extreme natural or human-caused events, economic changes or limitations to the ability to adapt to a changing world because the timespan of the project is only 14 years. However, a basic evaluation during the conceptual or pre planning phase could identify possible resource constraints and vulnerabilities that the surrounding communities could face in the future. These constraints would include potential environmental changes. By doing this, they could avoid or alleviate significant infrastructure traps in the future. One example of many that the project team could develop would be to design stormwater management systems taking into account the expected changes in storm frequency and intensity due to a changing climate. Even if the project site is situated in an isolated site far away from nearby communities, they could also expect these communities to grow, therefore planning their water systems in a flexible and adaptive way that responds to environmental as well as urban change would improve score in this category.
		Source: n/a
		RECOMMENDATIONS *In order to obtain a score, the project team must assess the effect of the project on the community infrastructure as a whole in the long-term. They should take in consideration resource traps, configuration traps and standards traps. A resource trap means increasing community dependence on resources that may become very scarce and expensive, such as fuel or other commodities. A configuration traps refers to weather events, natural disasters, economic conditions or actions by others, such as placing a project in a site prone to flooding. Finally, a standard trap refers to a misalignment with changing environmental or operating conditions, such as changing storm frequencies or others. By identifying these design variables and planning accordingly, the project can have a higher long-term impact and adapt to future potential changes.*
CR2.3 Prepare For Long-Term Adaptability	**0**	**No score**
		The project of Central Buen Ayre has a set lifespan of 14 years under the operation of Tecsan, after which the project will return to the leadership of ENARSA, the government entity that made the public bidding initially. For this reason, the project team did not took into consideration a long-term adaptability strategy integrated into the project. However, we are constantly experiencing environmental change, so projects that are designed for today's conditions may not be able to function adequately under altered conditions in the near future. For this reason, it is important to design large-scale projects to withstand a range of conditions that may result from climate change.
		Source: n/a
		RECOMMENDATIONS

		To achieve a score in this category, the project team should develop strategies for managing long-term changes that include structural changes, decentralized systems, natural systems, alternative supply options, adaptive capabilities and site selection. Structural changes refers to the range of conditions in which the system can function, while decentralized systems refers to the dependence of the project on many small facilities rather than one big entity.
CR2.4 Prepare For Short-Term Hazards	**3**	**Improved**
		The project team did provided documentation showing how the design of the project responds to possible short-term hazards such as fires or leakages. They considered which types of natural and manmade hazards are possible in the region and developed plans accordingly. The project team of Central Buen Ayre indicates that because the collection of waste to extract biogas has already been finalized and the project is currently using it to generate energy the short-term risks are reduced. Furthermore, the project is located on a site that has no significant danger of flooding and has been denominated as an area of no seismic risk. However, they showed plans and emergency guidelines in case of accidents.
		Source: Tecsan, Procedimiento del Sistema de Gestión Integral: Preparación y Respuesta ante Emergencias, (Argentina: 2015), 1-8
		RECOMMENDATIONS *For this category, the project team should design the project in a way to limit the hazard itself, fortify against the hazard, or allow the project to adapt to the direct of indirect impacts of the hazard. For this, they should provide documentation to show the strategies used and how they minimize the risk of future hazards that projects for at least the next 25 years.*
CR2.5 Manage Heat Island Effects	**2**	**Enhanced**
		The project team provided documentation showing that 10-30% of their surfaces meet the solar reflectance index (SRI) requirements. Drawings showing non roof non vegetated areas of the site and surfacing materials were provided. The project team of Buen Ayre worked with company Ternium Siderar, which operates under the Norm ISO 9001 and whose galvanized products conform to the quality of TUV-AIS, in compliance to the Resolution 404 of the Ministry of Industry, Trade, and Mining. In the construction, the project team used prepainted sheets obtained from an organic coating of polyester coated over a base material. This was used for the condensing chambers, the offices, and the powerhouse. Furthermore, for the solar reflectivity material, they used a Roman Blue color with an SRI of 33. Taking into account the Envision criteria of taking an SRI value higher than 29 as adequate, the project team performed calculations to take the average amount of surfaces that were compliant with a high SRI level. The total surface area calculated was 5281 m2, of which 811m2 (15.4%) were covered with blue roofs of an SRI higher than 29. Vegetated surfaces consisted on 740m2 (14.0%), and also had an SRI higher than 29. On the other hand, paved surfaces and other surfaces added a total of 3069m2 (57.9%).
		Source: Ternium Siderar, "Revestidos y Conformados: Solución para proyectos exigentes," (Argentina: 2007), 3-4
		RECOMMENDATIONS *To obtain a higher score in this category, the project should have at least 60% of surfaces that meet solar reflectance Index requirements.*
CR0.0 Innovate Or Exceed Credit Requirements		*N/A*
	32	

OVERALL:	**213**	**CENTRAL BUEN AYRE**

APPENDIX E: SOURCES

DOCUMENTATION PROVIDED
General Information.
Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, *1. Aspectos Generales, Central de Generación de Energía a partir de Biogás* Central Buen Ayre, (Argentina: 2011)
Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, *2. Datos del Proyecto, Central de Generación de Energía a partir de Biogás* Central Buen Ayre, (Argentina: 2011)
Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, *3. Estudio de Impacto Ambiental, Central de Generación de Energía a partir de Biogás* Central Buen Ayre, (Argentina: 2011)
Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, *4. Descripción Técnica, Central de Generación de Energía a partir de Biogás* Central Buen Ayre, (Argentina: 2011)
Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, *4. Evaluación del Impacto Ambiental, Central de Generación de Energía a partir de Biogás* Central Buen Ayre, (Argentina: 2011)
Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, *6. Planificación Ambiental, Central de Generación de Energía a partir de Biogás* Central Buen Ayre, (Argentina: 2011)
Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, *7. Aspectos Legales, Central de Generación de Energía a partir de Biogás* Central Buen Ayre, (Argentina: 2011)
Ingeniería Laboral y Ambiental S.A., División Ingeniería Ambiental, *8. Conclusiones, Central de Generación de Energía a partir de Biogás* Central Buen Ayre, (Argentina: 2011)
United Nations, *Clean Development Mechanism: Project Design Document Form* (Unknown: 2006)
Central Buen Ayre, *Proyecto de Recuperacion de Metano y Generacion de Energia*, (Argentina: 2011)
Central Buen Ayre, *Proyecto de Generacion de Energia Electrica a partir de la Utilizacion de Biogas de Relleno Sanitaro como Combustible*, (Argentina: 2011)
Organismo Provincial para el Desarrollo Sostenible, *Expediente Numero 2145-13981/11,* (Argentina: 2011)
Central Buen Ayre, *Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE, FAQ* (Argentina: 2011)
Central Buen Ayre, *Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE, FAQ1* (Argentina: 2011)
Central Buen Ayre, *Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE, FAQ* 2(Argentina: 2011)

Central Buen Ayre, *Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE, FAQ3* (Argentina: 2011)
Central Buen Ayre, *Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE (Registration Data Presentacion Asociaciones y Cooperativas de Cartoneros)* (Argentina: 2011)
Central Buen Ayre, *Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE (Registration Data Presentacion ARS)* (Argentina: 2011)
Central Buen Ayre, *Exposición del Proyecto MDL - Proyecto de Recuperación de Metano y Generación de Energía. Módulo IIIc - C.A. CEAMSE (Registration Data Presentacion Ejercito Argentino)* (Argentina: 2011)
Central Buen Ayre, *Nota de Pedido Numero 2,* (Argentina: 2011), 1
Central Buen Ayre, *Nota de Pedido Numero 3,* (Argentina: 2011), 1
Central Buen Ayre, *Nota de Pedido Numero 6,* (Argentina: 2011), 1
Central Buen Ayre, *Nota de Pedido Numero 9,* (Argentina: 2011), 1
Central Buen Ayre, *Nota de Pedido Numero 10,* (Argentina: 2011), 1
Central Buen Ayre, *Nota de Pedido Numero 11,* (Argentina: 2011), 1
Central Buen Ayre, *Nota de Pedido Numero 12,* (Argentina: 2011), 1
Central Buen Ayre, *Nota de Pedido Numero 16,* (Argentina: 2011), 1
Central Buen Ayre, *Nota de Pedido Numero 17,* (Argentina: 2011), 1