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INDUSTRIAL WATER PRODUCTION AQUAPOLO – BRAZIL

Figure 01: Aquapolo site
Sources: "Fotos", Aquapolo Ambiental, accessed December 8, http://www.aquapolo.com.br/comunicacao/imagens/?nggpage=3

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1. PROJECT DESCRIPTION & LOCATION

The Aquapolo Ambiental is a water reuse project that will promote a sustainable water management in the highly populated area of ABC Paulista in São Paulo, currently suffering from serious water shortages. The current water availability of São Paulo —the third most populated city in the world[1]— is less than 10% of the rate deemed appropriate by the UN. In response to this, the project aims to produce high quality industrial water from domestic sewage generated in the ABC basin and supply the Capuava Petrochemical Center, a complex considered the biggest consumer of potable water in the region. This project will contribute in the protection of freshwater availability in the region and will increase the quality of life of the inhabitants of this area by saving around 2,58 billion liters of potable water every month, enough to supply 500,000 inhabitants. All this contributes to turning Aquapolo into the biggest waste water project in the southern hemisphere and the fifth largest in the world.

São Paulo is currently undergoing a critical stage of water scarcity, where obtaining potable water has become difficult for the community. Thus, the Aquapolo project supposes both the relief of the population while also catering the demand of one of the biggest industrial centers in Brazil. This project explores the potential of urban water recycling from previously unused waste effluents that were otherwise polluting the environment in the Tietê basin. This project is the result of a partnership between the sanitation department of São Paulo and an engineering company and it links the edge of the domestic sewage cycle with the beginning of the industrial complex cycle. This case study demonstrates the advantages and challenges of this synergy that is significantly helping to improving the quality of life of people in this area through the use of waste.

The project not only reduces the consumption of potable water in the area, it also reduces the amount of pollutants that would be released into the water by a tertiary sewage treatment system. This will eliminate 584,000 kg of ammonia and 31,390 kg of phosphorus released into the Tietê River every year. This action will improve the quality of the river's water, since the Tietê basin has been completely damaged by the high urbanization of the area and its industry.

Aquapolo Ambiental S.A. is the result of a unique business structure; a Specific Purpose Society (SPE), composed by Sabesp —the water and waste management company owned by the state of São Paulo— with 49% participation in the project and Foz do Brazil —a Brazilian waste management company owned by conglomerate Odebrecht— with 51% participation[2]. Their

[1] "Statictics", City Mayors, accessed November 27, 2014, http://www.citymayors.com/statistics/largest-cities-population-125.html

[2] "Institucional", Aquapolo Ambiental, accessed November 27, 2014, http://www.aquapolo.com.br/institucional/quem-somos/

contract has a maximum duration of 43 years, of which 2 years correspond to the construction phase of the project and the rest to its operation. The total project cost is $158 million dollars. The project's construction started in 2010 and was finished in 2012 and the contract will remain valid until October 2053.

This infrastructure project is located in the limits between São Caetano do Sul and Santo André, both municipalities of the Metropolitan Region of São Paulo, also known as Grande ABC Paulista. The Aquapolo complex is composed by three stations: the Station of Industrial Water Production (SIWP) located in the Sewage Treatment Station of São Paulo (STE ABC), a 17km pipeline route that connects the SIWP with the Petrochemical Center, and a distribution system inside of the industrial center with networks approximately 4 km long and a Distribution Tower.

Aquapolo is inserted in an urban context reason for which part of its components pass through existing communities. As a response to this during the operation and construction phase of the Aquapolo, the project team implemented several activities whith the members of the community, inside the site of the project, in schools and companies, in order to inform them about the project and to increase the awareness of the population of the rational use of water. The project will also stimulate the development of the area by generating about 800 jobs during its construction and 50 during its operation. It will also help improve the processes of production in the Petrochemical Center of Capuava —responsible for over 25,000 jobs and 27% of the ICMS (Service and Merchandise Tax) collection in the region[3]— and thus it will make the area more attractive to similar businesses. Aquapolo was designed to be able to expand its production and not only provide recycled water to the petrochemical center but also other industrial companies. Today, this waste water project produces around 650 liters of recycled water per second, but it is capable of producing 1000 liters per second.

2. APPLICATION OF THE ENVISION RATING SYSTEM

The EnvisionTM 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. In this case study, the infrastructure to be assessed is an industrial recycled water production plant in the Metropolitan Region of São Paulo, in Brazil.

Envision consists of 60 credits grouped into five categories: Quality of Life, Leadership, Resource

[3] "Polo Petroquímico", Aquapolo Ambiental, accessed November 27, 2014, http://www.aquapolo.com.br/polo-petroquimico/

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 if the qualifications for each level of achievement have been met for a particular credit. In each of the five categories there is a specific 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[4] and Zofnass Program[5] websites.

3. QUALITY OF LIFE CATEGORY

Envision's first category, Quality of Life, pertains to potential project impacts on surrounding communities and their respective wellbeing. More specifically, it distinguishes infrastructure projects that are in line with community goals, clearly established as parts of existing community networks, as well as consider the 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 further divided into three sub-categories: Purpose, Wellbeing, and Community.

Purpose

The Purpose subcategory pertains to the effort shown by the project team in promoting the improvement of the community's quality of life, growth, and development. Aquapolo will supply the region with recycled water for the operation of its industrial center, and thus will have a positive impact on the community. While the Petrochemical Center of Capuava is the biggest consumer of potable water in the Metropolitan region, the community directly around it has

[4] www.sustainableinfrastructure.org

[5] www.zofnass.org

longtime experienced shortages of water supply. Thus, by producing high quality recycled water for the industrial center's use, the project enables the redirection of fresh water from its use for industrial purposes to now supply the community. Consequently 2,58 billion liters of potable water will be saved every month, helping supply 500,000 inhabitants.

The Petrochemical Center of Capuava is composed of 10 industries that produce different petroleum based products and is responsible for over 25,000 jobs in the region[6]. By providing a new source of water for all industrial processes, Aquapolo will also make the area more attractive to similar businesses and industries, aiding in the economic development and growth of the region. Aquapolo has also worked to improve community capacities, by hiring local companies and businesses and by developing training programs[7] for the members of the community. The specifics of these programs were based on the needs of the project and were implemented in order to train people to be qualified to occupy specific positions within the company and in the construction site.

The Aquapolo team also made an effort to keep the community involved with the project by promoting different activities, such as discussions, exhibitions, seminars, and cultural celebrations with the purpose of educating people on the rational use of water. Most of the documented programs were implemented between 2012 and 2013, however, some of them are being considered to become regular programs. An example of this is the series of lectures given at different schools and meetings with professors aimed at improving teaching strategies about water use awareness. Another of these activities is the weekly guided tour of the project facilities for the community at large with the purpose of understanding the processes that take place in the plant and of reinforcing the awareness of the benefits this water treatment brings to their neighborhood. Another successful project implemented by the project team was the Planting Awareness Project, program in which children planted trees in front of the Sabesp office.[8] Communication with the community in the early stages is essential for a project to achieve good performance and their goals and objectives. On this regard, there is room for improvement, since no information could be found confirming that the different members of the nearby communities were asked to provide input during the design and planning phases of the project. Thus, no information proofing that this input had an effect on the final outcome of the project could be found either.

The Aquapolo team also identified the potential impacts the project might have on the nearby

[6] "Polo Petroquímico", Aquapolo, accessed November 6, 2014, http://www.aquapolo.com.br/polo-petroquimico

[7] Aquapolo Ambiental S.A., *Capacitação e habilidade: Treinamentos*.

[8] Aquapolo Ambiental S.A., *Relatório das Ações da Área de Responsabilidade Socioambiental 2013/2014. Hereafter cited as RAARS.*

communities. As a result of this, they decided to relocate some facilities and network public services that were previously located inside the site of the project. These actions played an important role in mitigating the project's impact, since many of its facilities are located whithin urban spaces.

Community

The Community subcategory addresses the visual and functional impacts of the project on its immediate context. The Envision rating system also allocates credits to projects whose design enhances the existing public spaces around it.

During the construction of Aquapolo, the project team found underground archeological remains in one of the areas to be constructed in São Caetano do Sul. Thus, Aquapolo hired Grupoterra1[9], a specialized agency to work with IPHAN[10] —the national institute for historic and artistic heritage of the Brazilian government— to implement a plan to safeguard the found objects in the History Museum of São Caetano do Sul.

Regarding the visual impact of the project on the surrounding areas, the Station of Industrial Water Production (SIWP) is located inside the STS ABC, and therefore did not establish a direct visual connection with the surrounding neighborhoods. The project could have had a better performance in this category if the areas where the project goes underneath the city had been developed to be more integrated with the local communities by contributing to their views and local character. In terms of enhancing previously existing public spaces, the project team implemented a plan to build and restore different facilities in both municipalities.

These programs were implemented through legal contracts developed together with the local municipal governments with the purpose of compensating the population for the disturbances caused by the pipeline construction. For instance, the Aquapolo team renovated an oncology center —the health unit of the municipality— in São Caetano do Sul[11]. In Santo André, the project team built the Centro de Referência de Assistência Social (CRAS)[12], a social assistance center.

Wellbeing

The Wellbeing subcategory adresses the health, comfort, and mobility issues the project might cause to the local population. The Envision rating system takes the safety of the local community

[9] Grupoterra1, *Relatório Final* (March 13, 2012).

[10] IPHAN, *Parecer Técnico* (April 9, 2012).

[11] Prefeitura Municipal de São Caetano do Sul, *Termo de parceria para instalação e operação de adutora de água em vías públicas do município que entre si fazem a prefeitura municipal de São Caetano do Sul e a empresa Aquapolo Ambiental S/A* (March 11, 2011).

[12] Prefeitura Municipal de Santo André, *3º Adiantamento ao termo de Compromisso* (April 2, 2014).

and its workers, as well as the wellbeing of the environment as an essential part of the planning and operation processes of any project.

As it happens with any large scale infrastructure project there are several potential risks and negative impacts the project might have on its surroundings, therefore the Aquapolo team took all necessary actions to address all of these. Three types of risks were addressed by the project team: operational systems and workers, community health and wellbeing, and environmental. In doing this, the project team not only ensures uninterrupted water supply for the community, but also promotes transparency.

Since Aquapolo is located in an urban region, it needs to attend to specific regulations regarding local noise and vibration standards, reason for which the project team did everything that was necessary to work under permissible levels. Some of these special procedures involved making adaptations to noisy machinery and changing the layout in machine rooms. Another procedure implemented by the project team was promoting a better use of natural light in some of their buildings. Even so, lighting is an area of the project its team could still improve by, for example, implementing light zones throughout the site of the project and as a result save energy.

The project also encourages the use of alternative modes of transportation to and from the site of the project by reimbursing the workers' bus and metro fares,[13] both of whose stations are located near Aquapolo's facilities. However, there is still room for improvement providing general mobility and access for the neighboring community by supplying them with more walkable areas around project facilities. Therefore, it is encouraged for the Aquapolo team to look beyond the project's boundaries and develop integrated infrastructure systems that benefit the community by improving its quality of life.

4. LEADERSHIP CATEGORY

Leadership 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 sub-categories: Collaboration, Management, and Planning.

Collaboration

This subcategory evaluates the efforts made by the project team to foster the collaboration of all

[13] Aquapolo Ambiental S.A., *Transporte Público - vale transporte*

stakeholders involved in the project. It assesses the management systems implemented inside and outside the project, its stakeholder involvement, the interaction with its surrounding community through the implementation of different programs, and its end goals. This subcategory will investigate how Aquapolo dealt with the challenges of coordinating the functions of an infrastructure project with those of the different urban conditions with which it had to deal.

Odebrecht Ambiental —the conglomerate that ownes Foz do Brazil, which has a 51% participation in the project— is an internationally renowned company whose infrastructure projects carry sustainability as a core value, guiding all decisions made from the planning to the operation of the projects. This company develops each project by looking at it through three distintict lenses: universalization, efficiency, and valorization. All of their projetcs are designed based on the idea of giving access to all members of a specific population to potable water, protecting natural resources, benefiting the local economy, and making society aware of the importance of water preservation. When constructing an infrastructure project, Odebrecht addresses all aspects of the Triple Bottom Line: economic, environmental, and social.[14]

Aquapolo's management is based on Odebrecht's management policy, allegedly committed to undertaking only sustainable and responsible practices. Its project team is composed of employees with a broad range of professional backgrounds working in collaboration.[15] The personnel has also been trained for changing conditions. Specific positions were created to address four central issues: environment, health, safety, and socio-environment.

Transparency and organization in the process of creating contracts guarantee more reliable transactions between stakeholders. The Environmental Insurance Certificate[16] and the Insurance of General Civil Responsibilities[17] are two documents created by the project team to establish all responsibilities for the case of an environmental emergency taking place in the area where Aquapolo is located.

The collaboration and coordination between the members of Aquapolo's team has been crucial to the success of the programs they have implemented throughout the communities. As a result, the project team has become a leader whithin the community since its work has been fundamental not only for the improvement of their quality of life, but also in making them aware

[14] RAARS.

[15] Odebrecht S.A., *Política de Identificação, Desenvolvimento, Avaliação e Integração de Pessoas na Organização Odebrecht* (September 11, 2012).

[16] AIG, *Certificado de Seguro Ambiental* (August 26, 2014).

[17] AIG, *Certificado de Seguro de Responsabilidade Civil Geral* (August 27, 2014).

about the importance of the rational use of water. The Aquapolo team created different programs and activities to implement them during the construction and operation phases of the project; nonetheless, these programs and activities could be designed to better serve the community and to align with their needs and goals. Aquapolo's team could improve the performance of the project in this subcategory by strengthning their communication with the community, considered to be beneficial for the integration of large scale infrastructure projects in their contexts.

Management

In the Management subcategory, The Envision rating system awards synergy opportunities taken by the project team throughout the project's lifespan. Both synergy opportunities and the integration with other existing infrastructure systems are encouraged to be pursued by the project team not only to facilitate the operation of the infrastructure project, but also to bring benefits to the community at large.

Aquapolo is itself a synergy opportunity, since it reuses wastewater from the STS ABC and generates from it a new source of water for industrial purposes. By redirecting this recycled water to the Petrochemical Center, Aquapolo creates a linkage between the community and the industry. While this synergy will provide industry with a new source of water, it will also save potable water that will in turn be redirected to the community, and thus will significantly improve its quality of life.

The cycle starts with the community's sewage discharge, which is carried to the SWIP to be treated and recycled for its industrial use. Once treated, the recycled water is piped to the Petrochemical Center of Capuava, which in turn produces petroleum-derived products.

An example of internal synergy is the return of the sludge produced during the water recycling process to the STS ABC. Other kinds of waste are also recycled during the internal processeses of the plant. According to the waste recycling indicators, the plant has a recycling rate of 20.8%.[18] Nonetheless, Aquapolo could perform better by taking advantage of other small-scale synergy opportunities.

Planning

The Planning subcategory evaluates the long-term plans and programs developed by the project team, and as a result of their implementation, the ability of the latter to be both durable and resilient. Envision also evaluates the extent of the project team's collaboration with local officials

[18] Camila Coelho, Foz do Brasil, *Indicadores de Reciclagem de Resíduos.*

with the purpose of identifying laws, regulations, and/or policies that could create barriers to would prevent the project's practices to be truly sustainable.

Monitoring plans are fundamental to the production of recycled water, and thus, they are present in almost every process of the Aquapolo plant. Some of these plans look at: water supply, energy needs, amount of effluent received, water distribution, and maintenance. The coordination team is in charge of implementing these monitoring plans and of setting goals and objectives daily, monthly, and yearly.[19] They are also in charge of implementing corrective measures for the case of unexpected or unwanted events arising in order to avoid for the production of recycled water to be compromised.

Regarding the management of the plant, the Aquapolo team implemented a long-term system that includes the goals and objectives of the company for the next five years. These goals and objectives are reviewed every year in order to keep the company on track.

In order to extend the useful life of the project, the Aquapolo team implements different maintenance plans[20] to preserve the equipment in working conditions and to ensure that it is being correctly used. An example of these plans to preserve the equipment are the scheduled shut-downs of the machinery for their cleaning and reparation.

The project was also designed to provide more water than it currently does, foreseeing the possibility that in the future more industries than just the Petrochemical Center would be interested in using recycled water for their processes. Currently, Aquapolo produces 650 liters of recycled water per second, but it was designed to be able to produce 1,000 liters per second. During the first years of operation, Aquapolo has not been operating at its full capacity and has been attending the current demand[21], while continuing to experiment with these new processes.

5. RESOURCE ALLOCATION CATEGORY

Resource allocation 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, is 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.

[19] Aquapolo S.A., *Plano de longo termo e monitoramento* (July, 2014). Hereafter cited as PLTM.
[20] Aquapolo S.A., *Indicadores de manutenção* (September, 2014).
[21] Aquapolo S.A., "Redução da demanda contratada" in *Redução de Energía: Cálculo de Alternativas*.

Materials

The Materials subcategory evaluates the specification of materials and their treatments made by the project team and how these choices respond to the sustainable practices of the infrastructure project in question. It assesses the efforts made by the project team in promoting better practices during the construction of the project and the acquisition of materials from suppliers that do the same. Taking this into consideration during the design and construction phase of a project can make a significant difference throughout its lifespan.

Aquapolo has given special interest to its relationship with their material suppliers and to the understanding of the origin of the materials and the company. In order to assess this, the project team implemented a procurement program[22] which allows them to analyze basic information about their suppliers, such as the existence of a customers' service in the company, the cleanliness and general state of their facilities, their implementation of a systems' control, their interest in the quality assurance of their materials and products, the health and safety of their personnel, their complying with human rights and the environmental laws, among others.

The Envision rating system also awards infrastructure projects that promote the use of regional materials, both helping the growth of local economy and the preservation of the environment. Since the Aquapolo team did not provide any document with a detailed inventory of their supplied materials, it was not possible judging how many of these actually came from regional sources.

The Aquapolo team has also incorporated recycling practices into all phases of the project: design, construction, operation, and demolition. The project team also reutilized four aeration tanks that were donated by Sabesp and that were not in use at the STS ABC. Some of the materials used in the construction of the project —such as pressed wood and plastic— were also recycled and will be reused in others projects as well. In addition, some of the facilities built and used during the construction of the project —such as the administration building— will be disassembled and rebuilt at another construction site.[23]

The part of Aquapolo's team responsible for social and environmental issues, developed different plans and programs to decrease waste during the project's operation, aiming at recycling more than they would send to landfills. Selective waste collection in workspaces and of sludge and

[22] Aquapolo Ambiental S.A., *Uso de materiais - formulário de avaliação dos fornecedores.*

[23] Aquapolo Ambiental S.A., *Relatório fotográfico Canteiro de obras Projeto Aquapolo.*

flushing to send back to the STS ABC are some of the recycling practices promoted by the project team. Altogether, around 40% of the waste generated by the operation of Aquapolo is recycled, meaning that 80,540 tons of waste have been diverted from landfills since 2013[24].

During the construction of Aquapolo, the project team could have improved the way it allocated the excavated materials taken off site. On top of designating the location of these materials to a protected area, the project team also had no control over the amount of waste that was diverted to be recycled, to go back to the site, or to go to a landfill. Although at that time Aquapolo worked under regulatory permissions, it could have found better solutions for the location of excavated materials and also developed a better control of them, in order to be able to benefit from them in the future.

Energy

The Energy subcategory evaluates the practices developed and implemented by the project team aimed at reducing the overall energy consumption of the infrastructure project. It also evaluates whether the project uses renewable energy and the way it monitors its energy systems.

Regarding the reduction of energy consumption, the project team considered many options[25] that can be divided into two categories: reduction through efficiency and reduction through reliability. Regarding the overall energy use of the project, different processes were considered in order to optimize its efficiency during water production. Among some of these processes were the utilization of biogas from the STE, the installation of a solar plant, and the reduction of the contracted power demand. All these possible processes were analyzed and underwent feasibility assessments.[26]

The project team is currently conducting a feasibility study with the company VIS Technology to assess the benefits of the possibility of constructing a photovoltaic plant inside the STS ABC site next to the project. This project would save Aquapolo around $193,661 USD and would produce around 1,574.6 MWh every year,[27] which would account for at least 10% of total energy needed for the operation of the plant every month.

When looking at the use of energy in an infrastructure project, a fundamental aspect to analyze are the monitoring and commissioning systems of the project. Aquapolo's operations are controlled via automatic systems from two different remote stations (RS), one in the STS ABC,

[24] Aquapolo Ambiental S.A., *Segregação de resíduos*.

[25] Aquapolo Ambiental S.A., *Redução de Energia: Cálculo das alternativas.*

[26] Aquapolo Ambiental S.A., *Redução de Energia: Confiabilidade e eficiência* (May 28, 2014).

[27] VIS Technology, *Análise para implantação de uma Usina Solar Fotovoltaica na Aquapolo Ambiental* (May 09, 2014).

and the other in the secondary elevated station (SES).[28] These stations have direct communication with other parts of the project and each has its own responsibilities. Another aspect that contributes to Aquapolo's performance is the long-term monitoring plan[29] implemented by the project team on its internal systems.

Water

The score obtained in the Water subcategory by Aquapolo is one of the highest the project was awarded in its evaluation. This is mainly due to the project's restoration of a part of the potable water supply to this region of São Paulo achieved by reducing its use by the local industries.

Aquapolo is located in a highly populated area that suffers from water scarcity. Thus, the project was designed to treat wastewater from the STS ABC and produce recycled water for industrial purpose. By doing this, Aquapolo is able to supply the Petrochemical Center of Capuava with recycled water, which in turn will no longer use potable water for production. This represents savings of 2,58 billion liters of fresh water every month[30].

Since recycling water is the main purpose of Aquapolo, the project team successfully conducted different plans and design reviews to assess the best strategies for recycling. Feasibility and costs analyses[31] were also incorporated in the preliminary phases of the project development, as Aquapolo is the largest project of its kind in the southern hemisphere and the fifth largest in the world.

The Tamanduateí river and the Meninos stream are in a critical state due to intense pollution caused by domestic and industrial effluents that are directly discharged into the river basin.[32] Aquapolo will thus help improve the river's water quality by redirecting the sewage that used to pollute the water bodies to its treatment plant to recycle it. By recycling the effluents of the STS, the project also allows for the rivers to restore themselves by avoiding further pollution.

Aquapolo keeps a strict control of all water treatment phases, from the water catchment in the STS ABC to the delivery of recycled water to the petrochemical center. In addition to Aquapolo's internal monitoring system, all recycled water produced by the plant is also monitored by an

[28] CH2MHILL - ALPHAPLAN, "Sistema de Operação e Controle" in *Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava* (February, 2012), 42. Hereafter cited as RAP.

[29] PLTM.

[30] "Sustentabilidade", Aquapolo Ambiental, accessed November 4, 2014, http://www.aquapolo.com.br/sustentabilidade/

[31] "Sistema Proposto de Abastecimento de Água" in RAP, 15.

[32] "Recursos Hídricos - Qualidade da água" in RAP, 151.

external certified laboratory[33], which promotes transparency inside the company. All management processes are controlled by the Aquapolo team, which is composed of capable personnel able to manage all equipment and systems. Through the long-term monitoring program, the project team is able to assess is own work and set goals for each month.[34]

The positive impact of Aquapolo both reducing local industry's potable water consumption and thus improving the quality of life of the adjacent communities has been rewarded with three other prizes: the Global Water Award[35] in 2011, the Prêmio Ana[36] in 2012, and the FIESP Award of Water Conservation and Reuse[37] in 2013.

6. NATURAL WORLD CATEGORY

Natural World 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 further divided into three sub-categories: Siting, Land and Water, and Biodiversity.

Siting

The Siting subcategory evaluates all site-related aspects of an infrastructure project and the way these deal with the diversity of natural resources and habitats. The Envision rating system awards those projects whose environmental measures are effective to protecting the natural environments around them.

The site of Aquapolo is located in the STS ABC, known to be the industrial region of São Paulo. Thus, since the area had been previously developed and severely modified by urbanization from its original natural conditions the land has been classified as greyfield. Locating an infrastructure project on a greyfield generally brings benefits to the immediate environment since projects of this type are asked to clean the sites of their location in order to be able to begin construction.

The Aquapolo team hired a specialized agency to study the geological features of the area and to assess both positive and negative aspects of the site. This assessment ensured a responsive project design and construction and will help the project team make future decisions regarding

[33] Aquapolo Ambiental S.A. / BiogariAmbientall Ltda., *Contrato de prestação de serviços n. 044/2014: Análise em água, efluente e resíduo* (Auguts 21, 2014).
[34] PLTM.
[35] "Global Water Awards", accessed November 26, 2014, http://globalwaterawards.com
[36] "Produção de Água Industrial - Projeto Aquapolo", Prêmio Ana, accessed November 26, 2014, http://premio.ana.gov.br/Edicao/2014/projeto-detalhe.aspx?id=11&$ListID=A2CB8C6D-6FE2-4E67-BD57-5254DBCF88DD
[37] "Prêmios e Reconhecimentos", accessed November 26, 2014, http://odebrecht.com/relatorio2013/negocios/odebrecht-ambiental/

its operation. As a result of this assessment it was also discovered that during the decade of the 1970s the site was a floodplain area, quality that has been lost today since a series of embankments were built in order to prevent the river flooding it. The project team also identified the potential impact caused to the immediate environment by its construction, creating in response a number of mitigation, compensatory, and control measures. Nevertheless, the negative impact caused by the project to its immediate context varies from moderate to very low and can be counterbalanced by the mitigation measures set by the project team.

It was also through these assessments that the project team was able to identify that the hydrological cycles and the vegetation of the site had previsouly been severely degraded. In order to counterbalance this the project team implemented a series of corrective actions. An example of this was the decision to locate the project's pipeline along the metro trails in order to avoid displacing trees. Another positive action to protect the environment was the decision to take care of an eucalyptus forest, which the project team identified in the vicinity of its pipeline. Nothing remains of the original landscape except its water bodies now in rectified canals.[38] The site where Aquapolo is located is part of the Alto Tiete basin,[39] reason for which the project team hired a specialized agency to conduct an assessment and monitoring plan of the quality of the water of the river prior to its construction. Nonetheless, the project team located some of its facilities on the banks of the river making it more prone for the project to cause a negative to the quality of its water, as opposed to deciding to locate these in an area that would not be in direct contact with the river.

Land & Water

The Land & Water subcategory evaluates the project's efforts to promote corrective and supportive practices for stormwater management, reduction of pesticide use, and protection of water resources from contamination.

The project team hired a specialized agency to generate an environmental report of the área where the project is located in order to prevent soil and water contamination. The main objectives of this report are to evaluate the existence of potential adverse geology and to identify and quantify all possible negative impacts the project might cause to the environment by making use of the soil and groundwater.[40]

The Aquapolo team hired another agency to monitor the nearby water bodies. Cetesb —the

[38] "Contexto Hidrológico" in RAP, 132.

[39] "Contexto Geológico, Geotécnico, Geomorfológico e Pedológico" in RAP, 136.

[40] Odebrecht, *Avaliação Ambiental na EPAI, no trecho inicial da Adutora do Projeto Aquapolo* (January, 2012).

Environmental Agency of the State of São Paulo– is in charge of monitoring the water quality of the streams. They did this by collecting samples from seven different points of the river once a month in order to prevent any negative impacts from accumulating over time.[41]

The Aquapolo team created a nursery outside the site of the project to grow different native tree species as part of an agreement made with Cetesb to recover the local environment by implementing the compensatory planting of trees. While implementing this program the project team made use of pesticides, chemicals, and other soil conditioning products. Therefore, the project team should aim for solutions that reduce the use of these type of products in order to improve the overall health of the environment.

Regarding Aquapolo's capacity to manage stormwater there was no mention found on how this process is conducted, leaving room for improvement in this subject. An action that could bring major improvements to the project's water storage capacity would be to develop a system that allows it to incorporate stormwater into their supply effluent. Another option would be to redirect the stormwater to the water bodies, improving thus their regeneration capacity and helping mitigate the negative impacts of the infrastructure project.

Biodiversity

The Biodiversity subcategory evaluates the project team's plans to minimize the project's negative impact on local natural species and their habitats. The Evision rating system also values actions taken to avoid the introduction of invasive species or inadvertently facilitating their spread.

Although the area of the project has been severely modified by urbanization in the past, it still presentes areas with low vegetation and some bird species. According to the documents provided by the project team[42], any environment —native or influenced by human actions— has its specific fauna and will be affected by the new development[43]. However, the extent of these impacts will be determined by the extension of the area where the project is located, the type of project, and the actions to mitigate its impacts.

With the help of specialized agencies the Aquapolo team identified the local animal and vegetation species that would potentially be negatively impacted by the project. This study also guarantees that none of the species identified will be under threat of extinction since they are

[41] "Águas Superficiais", CETESB, accessed November 4, 2014, http://www.cetesb.sp.gov.br/agua/aguas-superficiais/124-programa-de-monitoramento

[42] RAP.

[43] "Fauna" in RAP, 192.

considered common species. However, the project team identified an existing natural habitat outside the site of the project called Piscinão de Capuava, part of the Pedroso City National Park. Due to a joint agreement with Cetesb, this site underwent an extensive restoration through the planting of native species of trees.

The program, which consisted of the planting of 1,417 trees, started in March 2012 and was executed by an engineering company hired by Aquapolo. It included the planting of 50 different native species —Ipê-amarelo, Ipê-roxo, Goiaba, Jabuticaba, Pitanga, Sombreiro, among others— and it covered an area of 8,500 square meters. In order to control invasive plant and animal species, the company used pesticides. The project team has also implemented a maintenance plan to keep the newly-planted trees and the soil in good condition. The maintenance works will take place every three months and will be done by the same engineering company hired for the planting.[44]

Both the Tamanduateí river and the Meninos stream are monitored on a monthly basis by Cetesb, the Environmental Agency of the State of São Paulo.[45] By recycling wastewater from the STS ABC, Aquapolo saves both potable water for community use and avoids for this contamined water to end up in the river,[46] helping thus to improve the quality of the water in the river.

7. CLIMATE & RISK CATEGORY

Envision aims to promote infrastructure development 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 sub-categories: Emissions and Resilience.

Emissions

The Emissions subcategory was the section of the evaluation in which Aquapolo had its weakest performance. The Envision rating system also looks for infrastructure projects that avoid contributing to climate change and global warming. The main objectiv of this subcategory is the understanding and reduction of dangerous emissions —greenhouse gass emissions and other dangerous pollutants— during all stages of a project's life cycle.

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[44] Metaflora, *Relatório de implantação projeto de revegetação margem do piscinão de Capuava* (June, 2011).

[45] "Águas Superficiais", CETESB, accessed November 4, 2014, http://www.cetesb.sp.gov.br/agua/aguas-superficiais/124-programa-de-monitoramento

[46] "Trata Brasil", accessed November 9, 2014, http://www.tratabrasil.org.br/regiao-do-grande-abc-recebe-maior-empreendimento-do-hemisferio-sul-para-a-producao-de-agua-de-reuso-meio-filtrante-online-noticias

According to the Preliminary Environmental Report, in terms of air pollution and in accordance with state and national laws the project team should regularly monitor for noxious odors originating from the project. The same report concluded that at the time this assessmet was done the project did not produce any kind of odor, since the sewage from the STS comes in at a secondary stage of treatment. The report also established that the project owner and its team would aim to keep the emissions standard levels and would take all necessary measures to avoid odors emanating from the water treatment station.[47]

However, this report did not present enough information regarding the project team's preoccupation with the potential impact Aquapolo's emissions could have on larger climate issues. In terms of the reduction of Aquapolo's greenhouse gas emissions, the project team did not conduct a cabron cycle analysis. In order to score better in this category the project team should do a comprehensive assessment of the air pollutants being produced by Aquapolo.

Resilience

This subcategory evaluates the different measures and plans implemented by the project team in order to enhance the project's capacity to be resilient to weather threats and disasters. The Envision rating system also awards projects whose contingency plans address long-term measures that prevent future difficulties.

In this regard it is important for any project team to have a long view the effects resource depletion and climate change could have on the infrastructure project. In avoiding these traps and vulnerabilities, the Aquapolo team created a contingency plan in which they address all possible emergency scenarios.[48] The document also identifies decision-making positions, and measures the impact these emergencies would have on the project's operations and on its surrounding communities.

However, in regards to specific climate threats this contingency plan does not provide measures for the project's facilities to respond to climate disasters, such as floods caused by heavy rain seasons or higher ambient temperatures, among others.

In addition to long-term climate-related hazards, infrastructure projects are also subject to short-term hazards, such as earthquakes and fires. In order to prepare for these types of threats, the project team developed a Risk Evaluation Report to identify and quantify these threats. These

[47] "Emissões atmosféricas" in RAP, 61.

[48] Aquapolo Ambiental S.A., *Procedimento de atendimento à emergências* (April 14, 2013).

were identified by selecting those that would either stop or delay Aquapolo's operations. In total, 140 potential risks were identified by the project team. Each one of these risks was assessed by looking at their side effects or impact on the project together with their potential mitigation measures. These measures included specific things to keep in mind during the project design phase, the need for more detailed studies on particular topics, and the establishment of new or revised working practices and procedures, among others.

Regarding Aquapolo's contribution to the management of heat island effects, the project team should consider assessing the amount of heat being absorbed by its facilities' hard surfaces, such as rooftops and pavement. This heat absorption contributes to the heating of the surrounding air, and therefore, to the alteration of local climate. The project team did not provide any documents regarding their actions on this issue.

8. SUMMARY AND CONCLUSION

This case study evaluated both the strengths and weaknesses of Aquapolo, the largest industrial water reuse project in the southern hemisphere, and the fifth largest in the world. Overall, Aquapolo showed an outstanding performance in reconciling environmental, community, and industrial needs. It also showed the multiple benefits found in the use of recycled wastewater for non-potable purposes. The project team was also preoccupied with the restoration of some of the original assets of the surrounding communities, such as existing public areas and the natural environment, programs through which they will positively impact the quality of life of the inhabitants of the metropolitan region of São Paulo. Aquapolo also encouraged the participation of both the local population and industry in the development of different programs. This synergy is a breakthrough for this region of Brazil and will allow for the its growth.

Aquapolo had a great performance in the Quality of Life category (QL) due to the project's commitment to have a positive impact on the life of the members of the different communities around the project. Another of the project's goals is to promote a more conscious and sustainable use of potable water, which will help protect the freshwater availability in the region. Aquapolo itself will save around 2.58 billion liters of potable water per month from being used by the local industry, an amount that could supply instead 500,000 inhabitants. The project also stimulated the growth and development of the area with the creation of approximately 800 jobs during its construction and will continue doing so with the creation of 50 jobs during its operation phase. Additionally, it stimulates the production of the Petrochemical Center of Capuava —responsible for over 25,000 jobs in the area— by generating a more attractive climate for compatible businesses. In addition to the creation of Jobs both during its construction and operation phases,

the project aided in the development of the skills and capabilities of the region's workforce by implementing training programs directed to them. The project team also developed different programs in partnership with local schools, authorities, and members of the community, whose aims are to educate the population about the importance of a rational potable water consumption, to promote the community's familiarity with the project, and to protect the environment. An area in which the Aquapolo team has left room for improvement is in its dialogue with all project stakeholders. An example of this is the oportunity to incorporate the community's input during the planning and design phase of the project. However, the project team did strive to minimize the negative impact of the project in the community, conducting different assessments on the risks and negative impacts created by its construction.

The Aquapolo team has also put in place measures to monitor all the machinery and the design of machine rooms in order to comply with international noise and vibration regulations. Appropriate safety and wayfinding signage was also set in place by the project team, both during the construction and the operation phases of the project. The implementation of sustainable practices was a goal during all stages of the project, from its planning to its operation. In order to reduce energy consumption levels inside Aquapolo's facilities, the latter were designed to make the best use of natural light throughout the day. Nonetheless, in order to reduce energy consumption levels even further, the project team should conduct a lighting assessment to have a better understanding of the project's lighting needs and to establish specific light zones. The project team also encourages alternative modes of transportation among the workers by reimbursing their bus and metro fares. In terms of the preservation of the surrounding communities' historical and cultural resources, the Aquapolo team performed well; When archaeological remnants were found during the construction of the project, all works in the area were halted and specialists were called to make an assessment of the situation. Only afterwards, the remnants were sent to be safeguarded by the respective institutions. As part of the efforts to improve the quality of life of the population living around Aquapolo, the project team successfully renovated different public spaces and/or facilities in Santo André and São Caetano do Sul, both municipalities where the project passes through. The project team either renovated or created one facility in each municipality as compensation for the disturbance caused by the project's pipeline construction. Odebrecht —the engineering company in charge of the project— took full responsibility for the relocation of existing public facilities that were in the project's path. However, Aquapolo could improve its performance in this area by developing small landscaping projects along its path that would benefit the community and improve the livability of the region.

In the Leadership category (LD), the project also performed well. Mainly due to the project team's

commitment with sustainable practices that carried out in all areas of the project, from the planning to the operation phase. Odebrecht —the engineering company in charge of Aquapolo— has proofed to have an efficient and reliable internal organization. This internal leadership is reflected in the strong sustainable values of the company and in its work. Contributing to the leadership whithin the project are a broad range of employees working in collaboration in different areas and with different responsabilities. Specific positions were clearly established by the project team for the main responsibilities of the project: environment, health, safety, and socio-environmental. By doing this, the project team was able to better coordinate individual needs and concerns among themselves. Preparation and training of Aquapolo's personnel through various meetings and workshops, resulted in a better prepared team that could deal with changing conditions, such as natural disasters. By promoting the collaboration of its members with all stakeholders involved, the project team ensured transparency in the signing of contracts and in the transactions made between both parties.

Regarding the cooperation of the project's processes with other preexisting processes, Aquapolo explored different synergy opportunities around its premises that go from entire processes to smaller operations. The project itself is a synergy, since its main purpose is to recycle the wastewater comeing from the STS and redirect it to the petrochemical center. An example of a smaller-scale synergy is the return to the STS ABC of the sludge produced as part of the water treatment whithin the plant. However, the project team should consider paying closer attention to the by-products generated by itself or by others —for example, looking at the effluent of the petrochemical center— since these could increase their synergy opportunities. For instance, if Aquapolo was able to treat the wastewater generated by the industries it feeds, the cycle would become a closed loop. Regarding the monitoring and maintenance procedures of the project, Aquapolo's operations are coordinated to take place in specific schedules, with goals and objectives set for each day, month, and year. Additionally, it has set preventive, mitigation, and corrective actions for all unexpected events in order to reestablish operations, ensuring thus a more reliable water supply for the local industries. The project's coordination team has also established different long-term plans for Aquapolo, which are reviewed each year to ensure their correct operation. In terms of its water production, the Aquapolo team also planned for the long-term, since it currently produces 650 liters of recycled water per second, but was originally designed to produce 1,000 liters per second in case more companies decided to use this kind of water in their processes. An innovation in this category can be found in the project's automation of the drainage of water in the pumps, ensuring thus an efficient and accurate process.

The Resource Allocation category (RA) evaluates the contribution of infrastructure projects in the reduction of potable water consumption, as well as the opportunities created by them for the

improvement in the treatment and use of materials and energy. Aquapolo performed well in this category by treating wastewater and later supplying the Petrochemical Center of Capuava, one of the biggest consumers of potable water in the region. In consequence, by reducing its demand this process protects fresh water availability in the region. Due to the addition of a tertiary sewage system, the project also has a positive impact on the environment by reducing the amount of pollutants released into the rivers' water. Although Aquapolo monitors the nearby water bodies, it should consider developing measures to replenish the quantity of water in the rivers. The existing monitoring program for the rivers should also be better integrated into the operational systems of the project in order to improve its efficiency and reduce its negative impact. In terms of the Aquapolo's use of green energy for its operation, the project team is assessing the possibility of incorporating a photovoltaic plant to the project, which would generate at least 10% of its energy needs. However, the project team should consider increasing this percentage. Aquapolo also made some effort to support sustainable practices outside the project by establishing a supplier procurement program in order to better explain the project's goals and policies. It is recommended for the project to prioritize the purchase of materials that come from sustainable sources, that have reduced environmental impacts, and that come from regional producers.

Regarding the recycling of materials Aquapolo had a good performance. According to the documents provided by the project team, all materials used during the construction of the project can be reused in other construction sites in the future. Perhaps the best achievement of Aquapolo in this category is that approximately 40% of the waste generated by it is recycled, which means that since the beginning of its operations to this day 80,540 tons of waste have been diverted from landfills. In addition, all of Aquapolo's equipment and machineryp can be reused, enabling for the future disassembling of the project and facilitating the refurbishment of some of its parts. The project team should consider conducting an assessment of the amount of material that could be recycled at the end of the project's lifecycle in order to be able to make future decisions. The same should be done with the excavated materials taken off the site.

The Natural World category (NW) evaluates the efforts made by the project team to preserve local habitats and protect surface and groundwater. Aquapolo is located in a highly populated industrial region of São Paulo that had been severely modified by human presence even before the project's construction. Thus, by locating the project in this area the project team enables the preservation of existing greenfields in the area. Since this area is located in the Alto Tietê basin, its water bodies have also been polluted and will benefit from the project. With the addition of a tertiary sewage treatment system, the project will help improve the quality of the natural environment by reducing the amount of pollutants released into the water. The main water

bodies in the area —the Tamanduateí river and the Meninos stream— are also monitored to ensure their water quality. However, a challenge encountered by the project team was the location of their facilities. Some of these were located on the margins of the rivers and did not establish clear buffer zones. Therefore, the Aquapolo team should consider relocating these facilities far from the margins of water bodies and establishing buffer zones.

Regarding the reuse of stormwater in some of the project's operations, there is still room for improvement since the project team does not make use of it yet and does not seem to have plans to do so in the near future. In order to do this, the project team could consider increasing the project's water storage capacity by adding stormwater to their recycling process or simply redirecting it to replenish the nearby water bodies. A successful project implemented by the project team was the planting of 1,417 trees of 50 different native species outside the site of the project. This program was a result of an agreement made with Catesb, the same company that monitors the rivers' water quality. However, the use of fertilizers and pesticides needs to be revised in order to avoid polluting the environment.

The Climate and Risk category (CR) was the section of this evaluation where Aquapolo had its lowest score. Nonetheless, the project team implemented a series of successful programs in this regard. An example of this are the different programs developed in order to help prepare the project for short-term hazards. This was done by conducting an extensive assessment to identify and quantify all possible risks and to address mitigation processes. The Aquapolo team also developed a contingency plan to protect the project against traps and vulnerabilities, as well as training programs and workshops for their employees. However, regarding the plans to make Aquapolo resilient to climate changes in the long-term, the project team left room for improvement. They should consider developing plans for potential future recovery, restoration, or rehabilitation of the project in response to long-term climate changes. The same applies to the management of heat island effects and the attention given to air quality. The documentation submitted by the project team establishes that the project does not produce any kind of noxious or unpleasant odor, since the sewage coming from the STS does not present many organic componentes. However, these documents do not provide specific data of the project's emissions, including greenhouse gas emissions. Therefore, the project team should consider conducting a more exhaustive assessment of these.

This report evaluates the sustainability performance of the Aquapolo Industrial Water Production project in the Metropolitan Region of São Paulo according to the Envision™ Rating System. The report identifies areas in which the project scored highly, as well as low-scoring areas that represent opportunities for which the project team can learn and improve on in future projects,

as they strive to achieve sustainable project design and construction methodologies.

APPENDIX:
APPENDIX A: PROJECT PICTURES AND DRAWINGS

Figure 02: Aquapolo site.
Sources: "Fotos", Aquapolo Ambiental, accessed December 8, http://www.aquapolo.com.br/comunicacao/imagens/?nggpage=3

Figure 03: Aquapolo infrastructure.
Sources: "Fotos", Aquapolo Ambiental, accessed December 8, http://www.aquapolo.com.br/comunicacao/imagens/?nggpage=3

Figure 04: Aquapolo infrastructure.
Sources: “Fotos”, Aquapolo Ambiental, accessed December 8, http://www.aquapolo.com.br/comunicacao/imagens/?nggpage=3

Figure 05: Aquapolo infrastructure.
Sources: “Fotos”, Aquapolo Ambiental, accessed December 8, http://www.aquapolo.com.br/comunicacao/imagens/?nggpage=3

Figure 06: Aquapolo infrastructure.
Sources: "Fotos", Aquapolo Ambiental, accessed December 8, http://www.aquapolo.com.br/comunicacao/imagens/?nggpage=3

Figure 07: Plant visit.
Sources: "Fotos", Aquapolo Ambiental, accessed December 8, http://www.aquapolo.com.br/comunicacao/imagens/?nggpage=3

Figure 08: Plant visit.
Sources: "Fotos", Aquapolo Ambiental, accessed December 8, http://www.aquapolo.com.br/comunicacao/imagens/?nggpage=3

Figure 09: Aquapolo facilities.
Sources: Aquapolo Ambiental, Apresentação geral.

Figures 10: Aquapolo facilities.
Sources: Aquapolo Ambiental, Apresentação geral.

Figures 11: Aquapolo's site highlighted in yellow, on the Sewage Treatment Station of ABC Paulista (STS ABC).
Sources: Aquapolo Ambiental, Apresentação geral.

Figures 12: Location map
Sources: Aquapolo Ambiental, Apresentação geral.

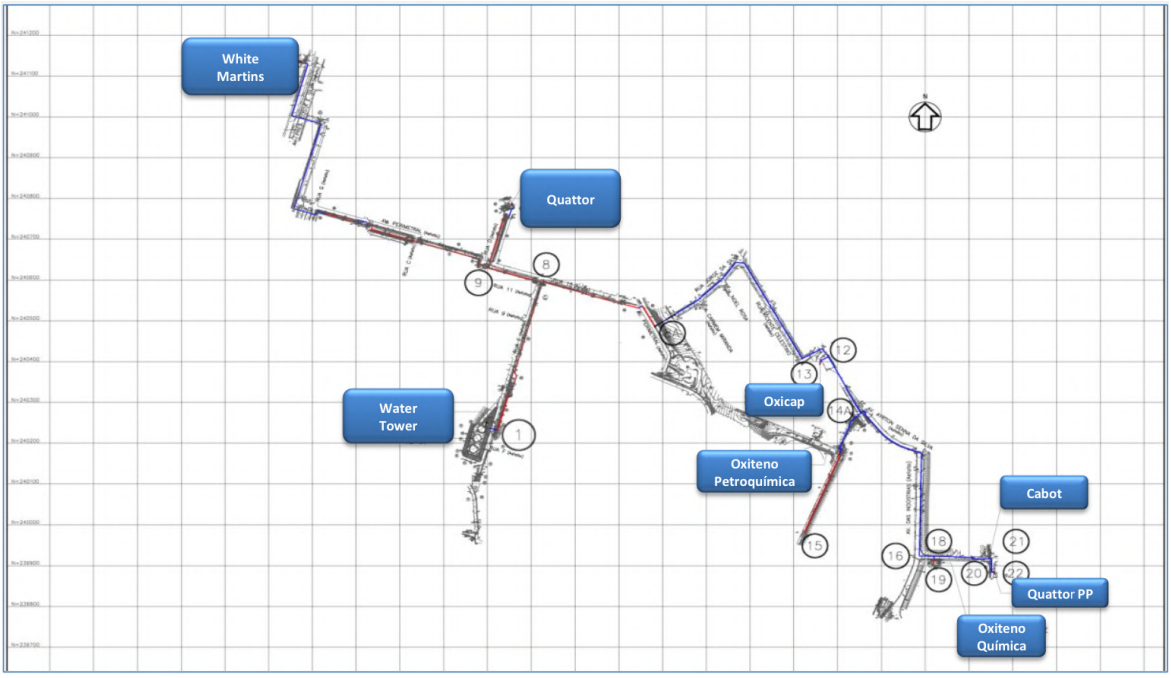

Figure 13: Distribution system.
Sources: Aquapolo Ambiental, Apresentação geral.

Figure 14: Petrochemical Center of Capuava.
Sources: Aquapolo Ambiental, Apresentação geral.

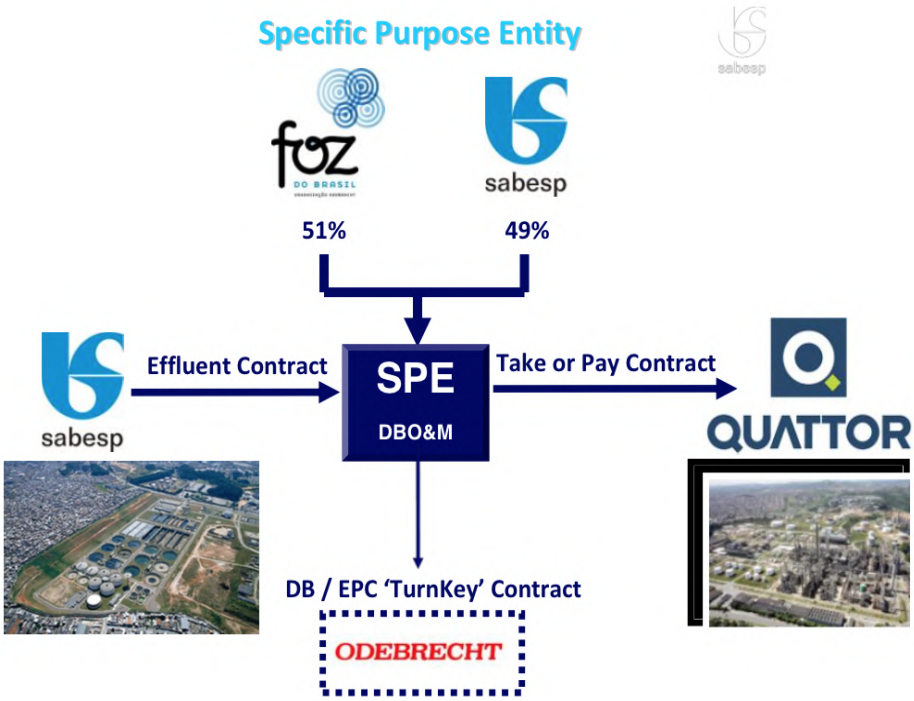

Figure 15: Institutional Structure.
Sources: Aquapolo Ambiental, Apresentação geral.

Figure 16: Construction phase, January 2012.
Sources: Aquapolo Ambiental, Apresentação geral.

Figure 17: High pressure pump station.
Sources: Aquapolo Ambiental, Apresentação geral.

Figure 18: Low charge pump station.
Sources: Aquapolo Ambiental, Apresentação geral.

Figure 19: Membrane tanks.
Sources: Aquapolo Ambiental, Apresentação geral.

Figure 20: Safety and wayfinding signage in the project facilities.
Sources: Aquapolo Ambiental S.A., Acessibilidade e segurança.

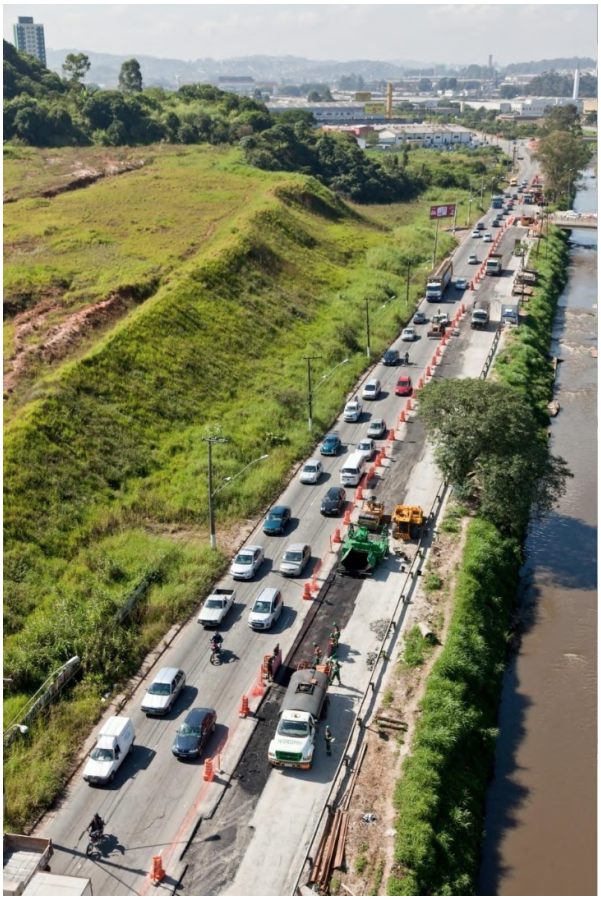

Figure 21: Integration Lectures.
Sources: Aquapolo Ambiental S.A., Melhoria na qualidade de vida da população.

Figure 22: Monitored visits to the project installation.
Sources: Aquapolo Ambiental S.A., Melhoria na qualidade de vida da população.

Figure 23: Safety and wayfinding signage in the construction site.
Sources: Odebrecht Ambiental, *Evidências Fotográficas* (September 5, 2011).

Figure 24: Safety and wayfinding signage in the construction site.
Sources: Odebrecht Ambiental, *Evidências Fotográficas* (September 5, 2011).

Figure 25: Safety and wayfinding signage in the project facilities.
Sources: Aquapolo Ambiental S.A., Acessibilidade e segurança.

Figure 26: Safety and wayfinding signage in the project facilities.
Sources: Aquapolo Ambiental S.A., Acessibilidade e segurança.

Figure 27: Integration Lectures.
Sources: Aquapolo Ambiental S.A., Melhoria na qualidade de vida da população.

Figure 28: Monitored visits to the project installation.
Sources: Aquapolo Ambiental S.A., Melhoria na qualidade de vida da população.

Figure 29: Meeting with professors in schools.
Sources: Aquapolo Ambiental S.A., Melhoria na qualidade de vida da população.

Figure 30: Planting Awareness, 2013.
Sources: Aquapolo Ambiental S.A., Melhoria na qualidade de vida da população.

Figure 31: Opening of CRAS, Santo André.
Sources: Aquapolo Ambiental S.A., Melhoria no espaço público.

Figure 32: Opening of CRAS, Santo André.
Sources: Aquapolo Ambiental S.A., Melhoria no espaço público.

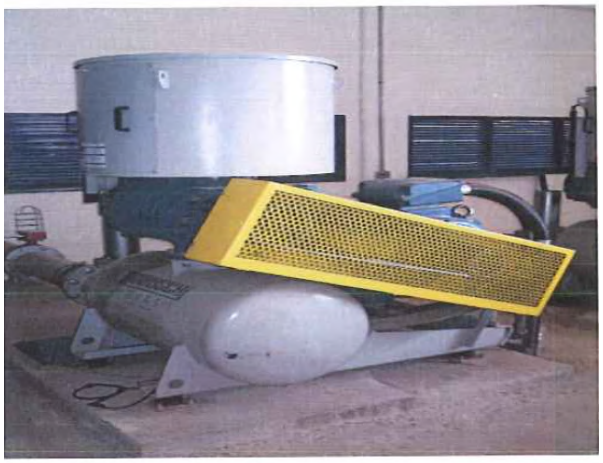

Figure 33: Noise and vibration adjustments.
Sources: Aquapolo Ambiental S.A., *Laudo técnico de Avaliação de Vibrações em Áreas habitadas* (June 22, 2012).

Figure 34: Noise and vibration adjustments.
Sources: Aquapolo Ambiental S.A., *Laudo técnico de Avaliação de Vibrações em Áreas habitadas* (June 22, 2012).

Figure 35: Area before planting, with invasive species.
Sources: KL Engenharia e Consultoria Ambiental Ltda, Relatório do Plantio Compensatório (April, 2012).

Figure 36: Area after planting.
Sources: KL Engenharia e Consultoria Ambiental Ltda, Relatório do Plantio Compensatório (April, 2012).

Figure 37: Meninos stream margins.
Sources: CH2MHILL - ALPHAPLAN, *Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava* (February, 2012).

Figure 38: Meninos stream margins, illegal occupation.
Sources: CH2MHILL - ALPHAPLAN, *Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava* (February, 2012).

Figure 39: Pipeline path in Santo André.
Sources: CH2MHILL - ALPHAPLAN, *Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava* (February, 2012).

Figure 40: Pipeline path in Santo André.
Sources: CH2MHILL - ALPHAPLAN, *Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava* (February, 2012).

Figure 41: Pipeline path in Santo André.
Sources: CH2MHILL - ALPHAPLAN, *Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava* (February, 2012).

Figure 42: Embankments in the pipeline path in Santo André.
Sources: CH2MHILL - ALPHAPLAN, *Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava* (February, 2012).

Aquapolo-Industrial water production, Brazil

APPENDIX B: ENVISION POINTS TABLE

CREDIT SCORING

				IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve community quality of life	2	5	10	**20**	**25**
2			QL1.2 Stimulate sustainable growth and development	1	2	5	13	**16**
3			QL1.3 Develop local skills and capabilities	1	2	5	12	**15**
4		COMMUNITY	QL2.1 Enhance public health and safety	2			**16**	
5			QL2.2 Minimize noise and vibration	1			8	**11**
6			QL2.3 Minimize light pollution	1	2	4	8	**11**
7			QL2.4 Improve community mobility and access	1	4	7	**14**	
8			QL2.5 Encourage alternative modes of transportation	1	3	6	12	**15**
9			QL2.6 Improve site accessibility, safety and wayfinding		3	6	12	**15**
10		WELLBEING	QL3.1 Preserve historic and cultural resources	1		7	**13**	**16**
11			QL3.2 Preserve views and local character	1	3	6	11	**14**
12			QL3.3 Enhance public space	1	3	6	11	**13**
						Maximum points possible:		**181**
13	LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	2	4	9	**17**	
14			LD1.2 Establish a sustainability management system	1	4	7	**14**	
15			LD1.3 Foster collaboration and teamwork	1	4	8	**15**	
16			LD1.4 Provide for stakeholder involvement	1	5	9	**14**	
17		MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	1	3	6	12	**15**
18			LD2.2 Improve infrastructure integration	1	3	7	13	**16**
19		PLANNING	LD3.1 Plan for long-term monitoring and maintenance	1	3		**10**	
20			LD3.2 Address conflicting regulations and policies	1	2	4	**8**	
21			LD3.3 Extend useful life	1	3	6	**12**	
						Maximum points possible:		**121**
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce net embodied energy	2	6	12	**18**	
23			RA1.2 Support sustainable procurement practices	2	3	6	**9**	
24			RA1.3 Use recycled materials	2	5	11	**14**	
25			RA1.4 Use regional materials	3	6	9	**10**	
26			RA1.5 Divert waste from landfills	3	6	8	**11**	
27			RA1.6 Reduce excavated materials taken off site	2	4	5	**6**	
28			RA1.7 Provide for deconstruction and recycling	1	4	8	**12**	
29		ENERGY	RA2.1 Reduce energy consumption	3	7	12	**18**	
30			RA2.2 Use renewable energy	4	6	13	16	**20**
31			RA2.3 Commission and monitor energy systems		3		**11**	
32		WATER	RA3.1 Protect fresh water availability	2	4	9	17	**21**
33			RA3.2 Reduce potable water consumption	4	9	13	17	**21**
34			RA3.3 Monitor water systems	1	3	6	**11**	
						Maximum points possible:		**182**
35	NATURAL WORLD	SITING	NW1.1 Preserve prime habitat			9	14	**18**
36			NW1.2 Protect wetlands and surface water	1	4	9	14	**18**
37			NW1.3 Preserve prime farmland			6	12	**15**
38			NW1.4 Avoid adverse geology	1	2	3	**5**	
39			NW1.5 Preserve floodplain functions	2	5	8	**14**	
40			NW1.6 Avoid unsuitable development on steep slopes	1		4	**6**	
41			NW1.7 Preserve greenfields	3	6	10	15	**23**
42		LAND & WATER	NW2.1 Manage stormwater		4	9	17	**21**
43			NW2.2 Reduce pesticide and fertilizer impacts	1	2	5	**9**	
44			NW2.3 Prevent surface and groundwater contamination	1	4	9	14	**18**
45		BIODIVERSITY	NW3.1 Preserve species biodiversity	2			13	**16**
46			NW3.2 Control invasive species			5	9	**11**
47			NW3.3 Restore disturbed soils				8	**10**
48			NW3.4 Maintain wetland and surface water functions	3	6	9	15	**19**
						Maximum points possible:		**203**
49	CLIMATE & RISK	EMISSIONS	CR1.1 Reduce greenhouse gas emissions	4	7	13	18	**25**
50			CR1.2 Reduce air pollutant emissions	2	6		12	**15**
51		RESILIENCE	CR2.1 Assess climate threat				**15**	
52			CR2.2 Avoid traps and vulnerabilities	2	6	12	16	**20**
53			CR2.3 Prepare for long-term adaptability				16	**20**
54			CR2.4 Prepare for short-term hazards	3		10	17	**21**
55			CR2.5 Manage heat islands effects	1	2	4	**6**	
						Maximum points possible:		**116**
								803

**The five innovation credits are bonus points and not included in total point tallies*

APPENDIX C: GRAPHS

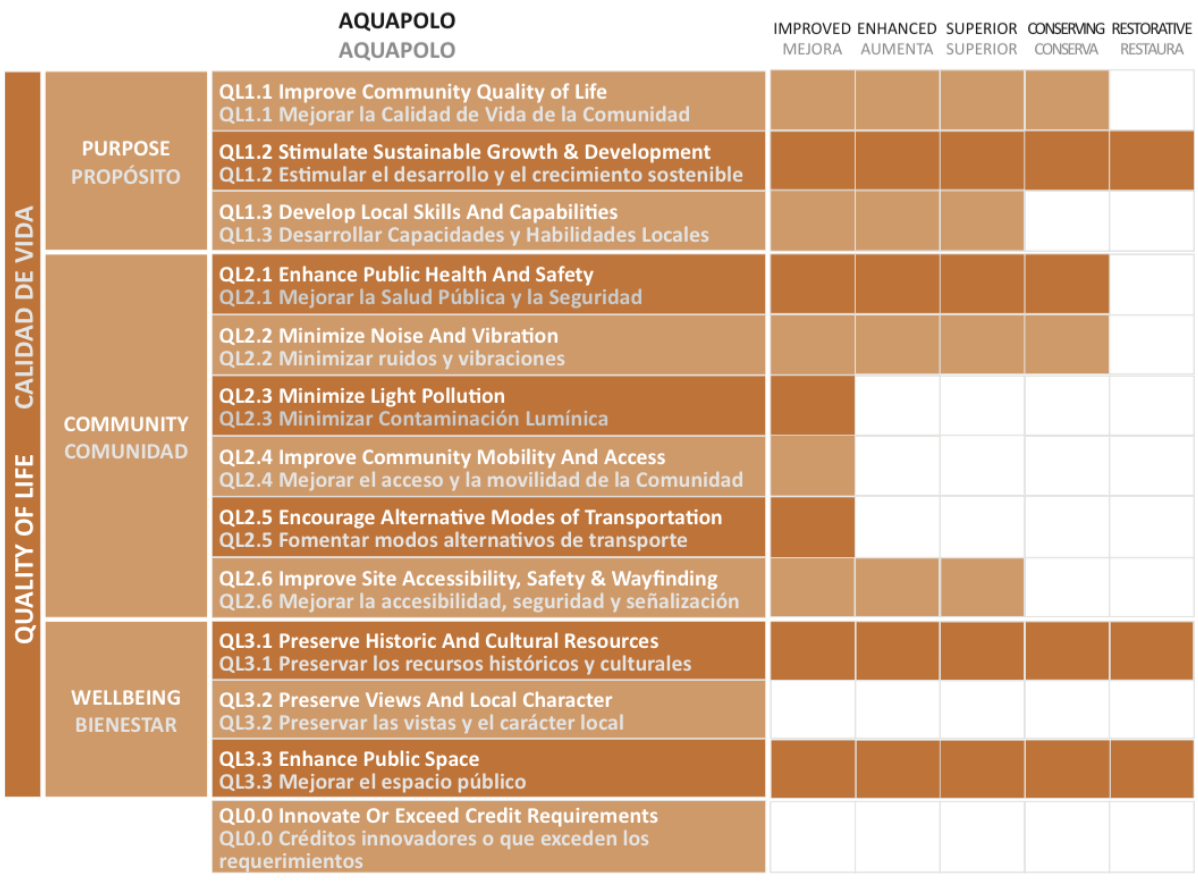

Figure 43: Quality of Life category_ Summary of results

Aquapolo-Industrial water production, Brazil

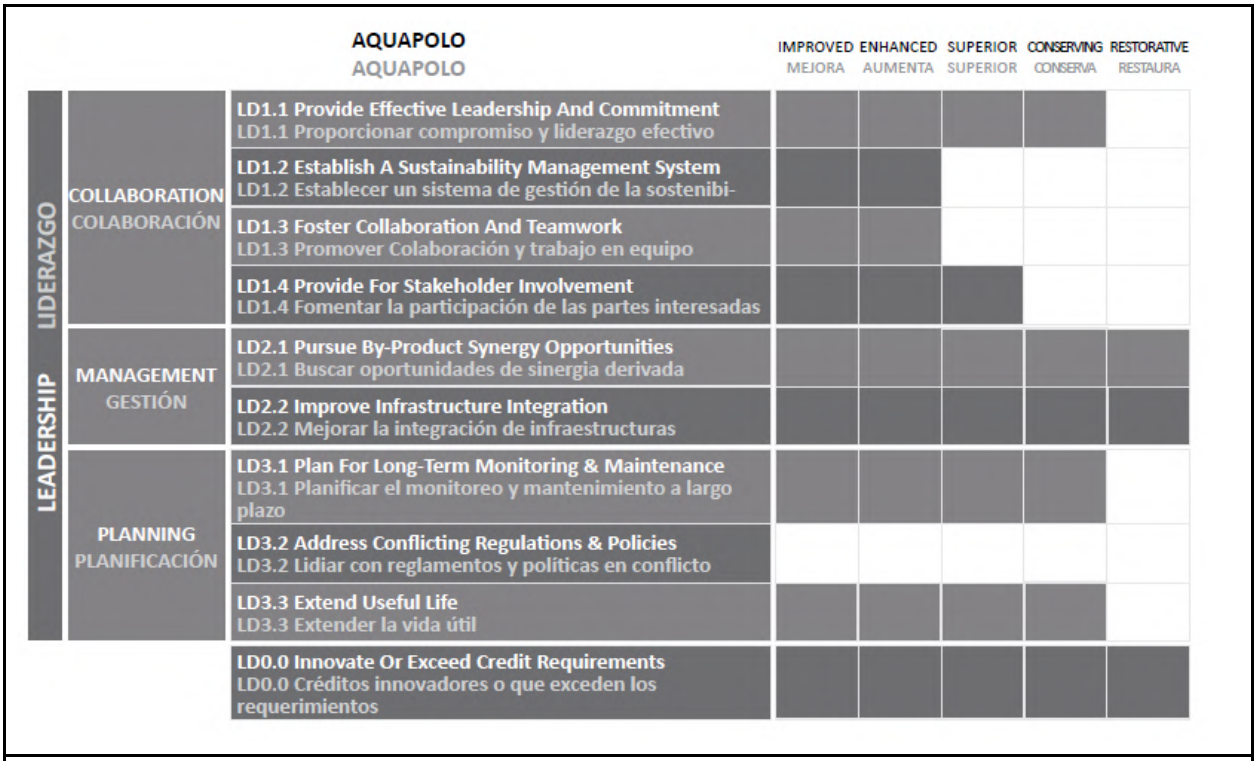

Figure 44: Leadership category_ Summary of results

Aquapolo-Industrial water production, Brazil

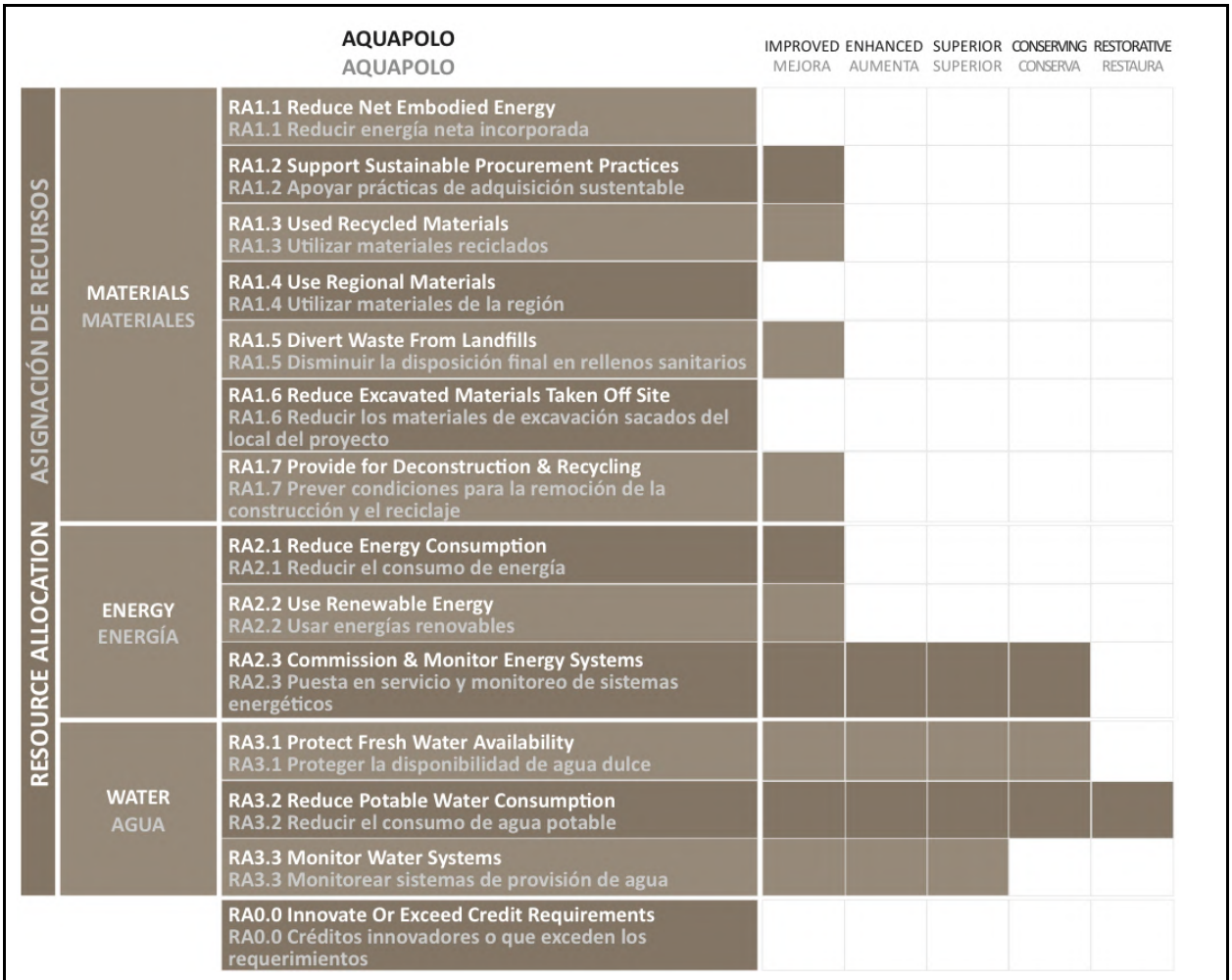

Figure 45:Resource Allocation category_ Summary of results

Aquapolo-Industrial water production, Brazil

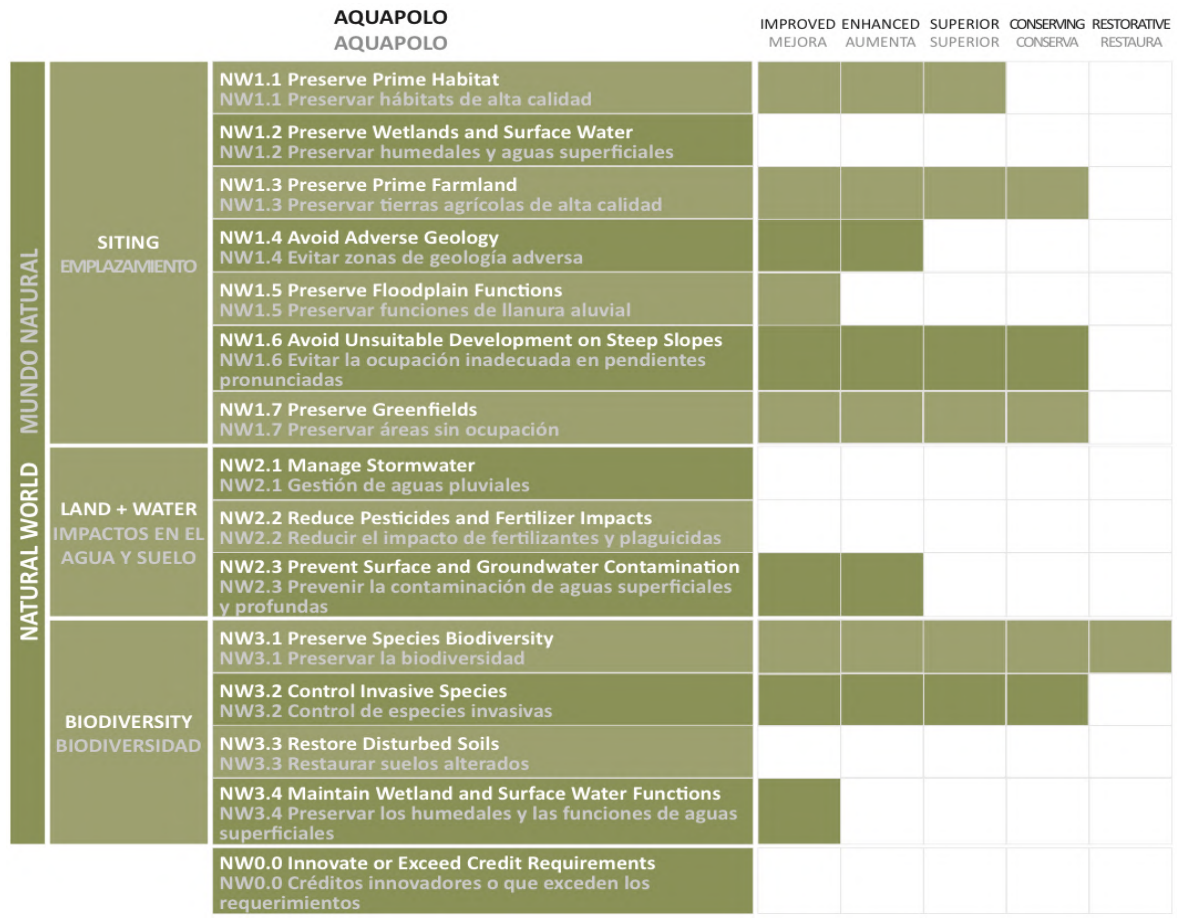

Figure 46: Natural World category_ Summary of results

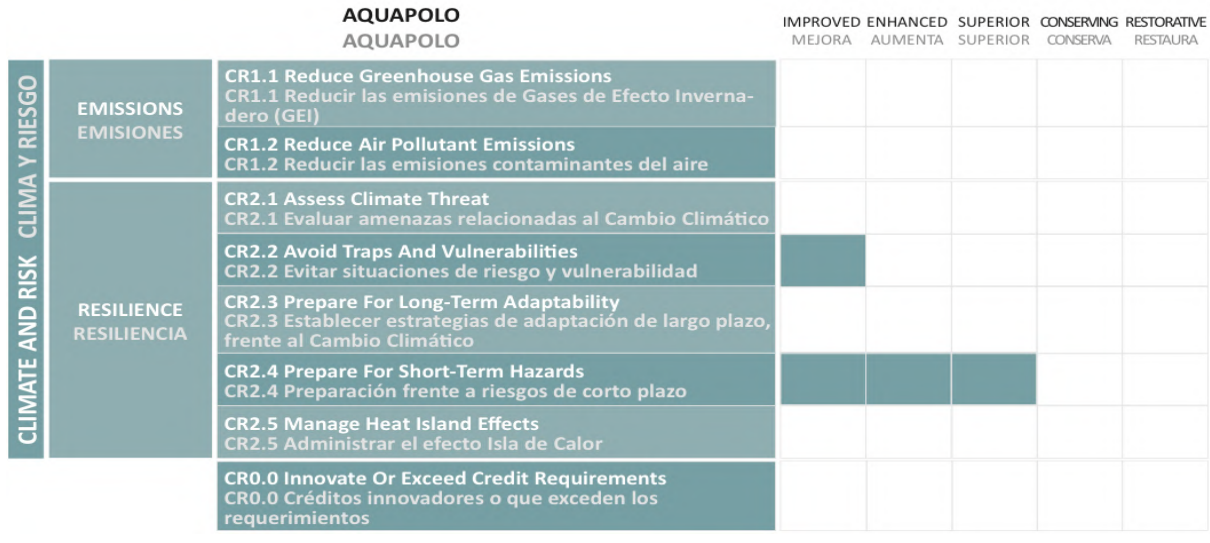

Figure 47: Climate & Risk category_ Summary of results

Figure 48: People & Leadership award Summary of results

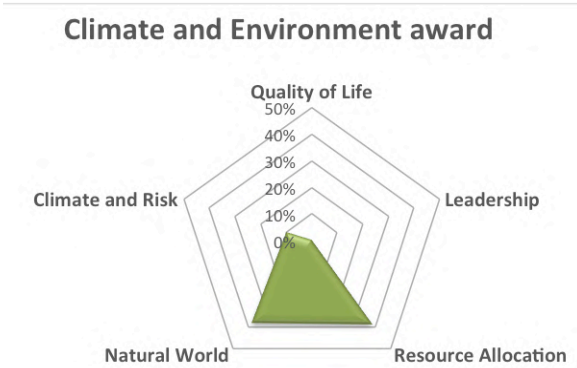

Figure 49: Climate & Environment award Summary of results

Figure 50: Infrastructure 360 award Summary of results

			INDUSTRIAL WATER PRODUCTION AQUAPOLO, BRAZIL	PT.	Performance
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life	20	Conserving
2			QL1.2 Stimulate Sustainable Growth & Development	16	Restorative
3			QL1.3 Develop Local Skills And Capabilities	5	Superior
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	Superior
7			QL2.4 Improve Community Mobility And Access	1	Superior
8			QL2.5 Encourage Alternative Modes of Transportation	1	Superior
9			QL2.6 Improve Site Accessibility, Safety & Wayfinding	6	Superior
10		WELLBEING	QL3.1 Preserve Historic And Cultural Resources	16	Superior
11			QL3.2 Preserve Views And Local Character	0	Superior
12			QL3.3 Enhance Public Space	13	Superior
			QL0.0 Innovate Or Exceed Credit Requirements	0	N/A
			QL	103	

			INDUSTRIAL WATER PRODUCTION AQUAPOLO, BRAZIL	PT.	Performance
13	LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	17	Conserving
14			LD1.2 Establish A Sustainability Management System	4	Enhanced
15			LD1.3 Foster Collaboration And Teamwork	4	Enhanced
16			LD1.4 Provide For Stakeholder Involvement	9	Superior
17		MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	15	Conserving
18			LD2.2 Improve Infrastructure Integration	16	Restorative
19		PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	10	Conserving
20			LD3.2 Address Conflicting Regulations & Policies	0	No score
21			LD3.3 Extend Useful Life	12	Conserving
			LD0.0 Innovate Or Exceed Credit Requirements	8	
			LD	95	

			INDUSTRIAL WATER PRODUCTION AQUAPOLO, BRAZIL	PT.	Performance
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	No Score
23			RA1.2 Support Sustainable Procurement Practices	2	Improved
24			RA1.3 Used Recycled Materials	2	Improved
25			RA1.4 Use Regional Materials	0	No Score
26			RA1.5 Divert Waste From Landfills	3	Improved
27			RA1.6 Reduce Excavated Materials Taken Off Site	0	No Score
28			RA1.7 Provide for Deconstruction & Recycling	1	Improved
29		ENERGY	RA2.1 Reduce Energy Consumption	3	Improved
30			RA2.2 Use renewable energy	4	Improved
31			RA2.3 Commission & Monitor Energy Systems	11	Conserving
32		WATER	RA3.1 Protect Fresh Water Availability	17	Conserving
33			RA3.2 Reduce Potable Water Consumption	21	Conserving
34			RA3.3 Monitor Water Systems	6	Superior
			RA0.0 Innovate Or Exceed Credit Requirements	0	N/A
			RA	**70**	

Aquapolo-Industrial water production, Brazil

			INDUSTRIAL WATER PRODUCTION AQUAPOLO, BRAZIL	PT.	Performance
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	9	Superior
36			NW1.2 Preserve Wetlands and Surface Water	0	No Score
37			NW1.3 Preserve Prime Farmland	12	Conserving
38			NW1.4 Avoid Adverse Geology	2	Enhanced
39			NW1.5 Preserve Floodplain Functions	2	Improved
40			NW1.6 Avoid Unsuitable Development on Steep Slopes	6	Conserving
41			NW1.7 Preserve Greenfields	15	Conserving
42		L & W	NW2.1 Manage Stormwater	0	No Score
43			NW2.2 Reduce Pesticides and Fertilizer Impacts	0	No Score
44			NW2.3 Prevent Surface and Groundwater Contamination	4	Enhanced
45		BIODIVERSITY	NW3.1 Preserve Species Biodiversity	16	Restorative
46			NW3.2 Control Invasive Species	9	Conserving
47			NW3.3 Restore Disturbed Soils	0	No Score
48			NW3.4 Maintain Wetland and Surface Water Functions	3	Improved
			NW0.0 Innovate or Exceed Credit Requirements	0	N/A
			NW	78	

			INDUSTRIAL WATER PRODUCTION AQUAPOLO, BRAZIL	PT.	Performance
49	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	0	No Score
50			CR1.2 Reduce Air Pollutant Emissions	0	No Score
51		RESILENCE	CR2.1 Assess Climate Threat	0	No Score
52			CR2.2 Avoid Traps And Vulnerabilities	2	Improved
53			CR2.3 Prepare For Long-Term Adaptability	0	No Score
54			CR2.4 Prepare For Short-Term Hazards	10	Superior
55			CR2.5 Manage Heat Island Effects	0	No Score
			CR0.0 Innovate Or Exceed Credit Requirements	0	N/A
			CR	12	

Total points	**358**	**0**

APPENDIX D: CREDIT DETAIL

INDUSTRIAL WATER PRODUCTION AQUAPOLO– BRAZIL:
CREDIT SPREADSHEET WITH DETAILS

CATEGORY I, PEOPLE AND LEADERSHIP		
SUB CATEGORY: QUALITY OF LIFE		
	Score	**AQUAPOLO**
QL1.1 Improve Community Quality of Life	**20**	**Conserving** The Aquapolo project will contribute to the quality of life of the whole Sao Paulo region by reusing wastewater for industrial purposes and reducing potable water consumption. The Aquapolo project initiative, the first of its kind, aims to produce high quality industrial water from domestic sewage generated in the ABC basin and distribute it to the Capuava Petrochemical Center, which is considered the biggest consumer of potable water in the region. This project will allow better protection of freshwater availability for the region and will increase the quality of life of the area by saving around 2,58 billions of liters of potable water per month –capable of supplying 500,000 habitants. The Aquapolo project made some efforts to engage the existing community in the process during the construction and operation phase. For instance, Aquapolo provided tours in the project construction area and promoted discussions, expositions, meetings, seminars, and cultural celebrations, which improve the awareness of the local population, and enhance the sense of community. These activities were well attended and had representatives from local schools, workers and neighborhoods. This shows the interest and satisfaction of the public. To exemplify some of those specific actions developed in 2013, the project team, in partnership with the Municipal Department of Education of Santo André and São Caetano do Sul, promoted lectures in the schools regarding the environment and water resources. Additionally, the project team promoted meetings with professors of schools in the state education network in order to come up with action plans and teaching strategies to improve environmental awareness in the schools. Another example is the Planting Awareness project, where children planted trees in front of the Sabesp office. These actions started in 2013, but a system of activities has been structured to become regular by 2014. The company Aquapolo Ambiental S.A. also makes efforts to identify potential impacts in the nearby community. There is a commitment from Aquapolo to relocate installations and networks of public services that are located in the area of the completed project, as has been specified in the Study of Neighborhood and Environmental Impact (SNEI). Measures to minimize erosive processes and interruption of drainage will be also implemented, as well as liability of building damage due to the construction of the project, which is located near surrounding water bodies. *Source:* *Aquapolo Ambiental S.A., Jornal Escolar.* *Aquapolo Ambiental S.A., fotos in Melhoria na qualidade de vida da população.* *Aquapolo Ambiental S.A., Relatório das Ações da Área de Responsabilidade Socioambiental 2013/2014.* *Prefeitura Municipal de São Caetano do Sul, Termo de parceria para instalação e operação de adutora de água em vías públicas do município que entre si fazem a prefeitura municipal de São Caetano do Sul e a empresa Aquapolo Ambiental S/A (March 11, 2011).* *Prefeitura Municipal de Santo André, 3º Adiantamento ao termo de Compromisso (April 2, 2014).* *RECOMMENDATIONS*

		It is recommended to implement monitoring systems that will ensure that the programs implemented by the owner and the project team will continue working in the long term. To score higher in this credit, it is also necessary to increasingly review and assess the communities' needs and goals. There must be an alignment between the project and the community goals. Receiving input from the community must become a meaningful and systematic process that can truly influence the design process. Since this project has already been built and no input from members of the surrounding communities influenced its design and planning, the project team should consider collecting the communities' needs and preocupations derived from their interaction with the project after its construction and address them.
QL1.2 Stimulate Sustainable Growth & Development	**16**	**Restorative**
		In the early stages of the project, the projet team worked together with members of the community to develop a plan of action that would benefit both industry and the nearby communities. In terms of stimulating sustainable growth and development, Aquapolo Ambiental will supply the region with extra 650 liters per second of recycled water, not only increasing the capacity of the Petrochemical Center of Capuava but also saving potable water previously used by this industry, which will now be destined solely to the use of the community. This procedure will directly impact the quality of life of the people living around the project as the potable water saved would benefit 500,000 people. This effort will make a huge difference in the ABC region of São Paulo, which suffers from water scarcity issues, transforming this project into a breakthrough for the region. Through the creation of a new source of usable water, the project will facilitate the supply of this base material to the industrial sector and will increase its productivity. The Petrochemical Center of Capuava is responsible for over 25,000 jobs in the region and this new scenario will generate an even more attractive climate for compatible business and industry. In this way, the project enables the region to keep growing, but most importantly the region will have a base system that is sustainable.
		Source: "Crise de Água em São Paulo: Quanto falta para o desastre?", Época, accessed November 6, 2014, http://epoca.globo.com/colunas-e-blogs/blog-do-planeta/noticia/2014/06/crise-da-agua-em-sao-paulo-quanto-falta-para-bo-desastreb.html "Polo Petroquímico", Aquapolo, accessed November 6, 2014, http://www.aquapolo.com.br/polo-petroquimico
		RECOMMENDATIONS *The next step for the Aquapolo project in terms of stimulating sustainable growth and development in the communities is to identify other community assets that could be restored, generating new opportunities for development in the region. Additionally, improvements in cultural and recreational assets that make communities more livable would benefit the population and create conditions for future development.*
QL1.3 Develop Local Skills and Capabilities	**5**	**Superior**
		In the construction phase, local hiring was a priority for the project team, but not all the personnel hired was from the surrounding community. Training programs were put in place to improve the local skills and capacity of the community, in order to train people for specific jobs in the construction and operation phases of the project. No further research was made by the project team regarding the educational needs of the community, because the training of the employees was mainly for industrial purposes. Nevertheless, the implementation of this practice will increase job opportunities for locals and will help the municipality in the development of the region, which is already an important industrial center of the country.
		Source: *Aquapolo Ambiental S.A., Capacitação e habilidade: Treinamentos.* *Aquapolo Ambiental S.A., Contratação de Funcionários 1.* *Aquapolo Ambiental S.A., Contratação de Funcionários 2.* *Aquapolo Ambiental S.A., Contratação de Funcionários 3.*

		RECOMMENDATIONS *Education programs focused on community needs could be placed in parallel to the actual training for employees, in order to encourage community development and competitiveness in the future. It could also be beneficial if the employment and education programs were to focus on sustainable methods within the field, for instance incorporating workshops with experts and engagement of the personnel regarding sustainable processes.*
QL2.1 Enhance Public Health And Safety	**16**	**Conserving**
		In terms of public health and safety issues, the project team took the required actions to address all the possible risks and negative impacts related to the technical systems, the community, and the environment. One of the assessments addresses the possible risks associated with the interruption of the water supply distribution. To prevent this possible issue a continuous management and monitoring system was put in place. Other technical issues are also addressed, such as loss of electricity and loss of communication. The protection of the environment is also taken into consideration; an example of an assessment made by the project team is basin monitoring for toxic load prevention. Mitigation proposals and avoidance procedures are included in these reports and documents. A risk evaluation was made by an outside company to address the risks and exposures of the project. It warns that there may be some social impacts on the local populace caused by the disruption of the pipeline. The report also identifies current issues in the plant and makes a number of recommendations to make the plant more efficient and reduce risks. In particular, empowerment of the operational staff and the automation of systems are key recommendations for changes to the current facility to achieve improved operations and a reduction in downtime. In addition, the Odebrecht Ambiental also promote workshops to discuss risks, consequences and measures that can be taken, setting goals and objectives that are translated into actions to keep the project and the community safe.
		Source: *Aquapolo Ambiental S.A., Procedimento de Atendimento à Emergências (May 14, 2013).* *Aquapolo Ambiental S.A., Análise de Confiabilidade do Projeto Aquapolo.* *Odebrecht Ambiental, Cenários de Emergência e Descontinuidade: Estamos Preparados?.* *Scott Willson, Risk Evaluation Report, Version 2 (November 2009).*
		RECOMMENDATIONS *The technical and environmental risks are very well understanded and discussed between the project teams, but once there is a 17 km pipeline crossing the area of two municipalities, further social considerations could be taken in this case. It is important to be aware and instruct the local communities on the procedures that would be taken by the company if any unexpected accident were to happen. It is also a way to incorporate the material of the completed project into city, avoiding the feeling of an outsider in the community. The more they make people part of the process, they will achieve more collaboration and better outcomes.*
QL2.2 Minimize Noise And Vibration	**8**	**Conserving**
		In order to comply with noise and vibration regulations, the project has completed all the required technical reports to permit the operation of the project, fulfilling the requirements of the NBR 10.151 2000/ABNT. All noise sources were identified by experts, as blowers and sets of motorized bombs, and had their levels of noise and vibration measured. All of the technical equipment operates under the standard permissible sound levels. The machinery also received special treatment to minimize noise and vibration. The project team also took in consideration the location of the machine rooms, in order to be as far as possible from the community. Nevertheless, no measures were taken to decrease the levels of noise and vibration in the city; the project simply maintains the standard requirements. The livability of the community is not improved in this case, but it is not substantially disturbed.
		Source: *Aquapolo Ambiental S.A., Images in Laudo técnico de avaliação de vibração em áreas habitadas (June 22, 2012).* *SSOMA, Laudo técnico de avaliação do ruído em áreas habitadas, visando o conforto da comunidade, conforme a NBR 10.151 2000/ABNT (May, 2012).*

		Aquapolo Ambiental S.A., Laudo técnico de avaliação de vibração em áreas habitadas (June 22, 2012). *CETESB, Licença prévia de instalação (2010).* *CETESB, Licença prévia de operação (2010).* *City of Portland, Oregon," Land Use Zones" in Noise Control Ordinance, City Code and Charter.*
		RECOMMENDATIONS *The standard requirements are taken into consideration by the project team, in a way that the project gets the required reports and documents to operate legally and efficiently. However, in addition to good performance, some effort could be made to decrease the levels of the existing neighborhood noise and vibration levels, creating a quieter community. This would improve the livability and the quality of life of the citizens. It is also important to create a monitoring program to maintain the good quality level of the measures already taken by the project team to minimize noise and vibration of the machinery.*
QL2.3 Minimize Light Pollution	**1**	**Improved**
		In the Envision methodology there are three considerations pertaining to light pollution that should be considered. The first one refers to assessments conducted by the project team regarding the overall lighting needs, the establishment of lighting zones within the project, and the requirements for digital signage. According to these aspects, the project has not provided any document that proves the existence of this type of planning by the project team. The second issue concerns the design for energy efficiency in outdoor lighting. No documentation could be found regarding these matters. The third consideration is the reduction in light spillage into sensitive environments. No documentation was found with assessments conducted to measure the light spillage into the neighborhood. The project team did consider the existing lighting fixtures in the site, both reducing costs and helping prevent light spillage and glare.
		Source: Aquapolo Ambiental S.A.*, Laudo técnico de avaliação de vibração em áreas habitadas (June, 2012).*
		RECOMMENDATIONS *According to the first and third part of this credit analysis, it is encouraged that the project conduct an overall lighting assessment, addressing the lighting needs and its impact in the surrounding areas. This documentation will be important for the project to determine the minimum need for lighting and any unnecessary fixtures. This way, the team will be able to reduce the amount of light without compromising the function of the project, improve the quality of life of the existing community, and preserve the environment.* *Strategies such as substitution of lamps for full cutoff lenses and automatic turnoff lamps will improve the energy savings of the project, consequently making the project more economically feasible and sustainable. Lastly, it is recommended to study how much the project interferes with the night sky.*
QL2.4 Improve Community Mobility And Access	**1**	**Improved**
		The Aquapolo project is located inside of the STS plant, which is isolated from the surrounding community by barriers, sloped terrain, and a river that runs near the project site. Guardhouses, situated throughout the boundary of the site, and a safety monitoring system regulates the entrances of Aquapolo. General access of the plant is mostly restricted, besides on specific visiting days or during activities promoted by the project team. Therefore, the project disposition does not improve traffic congestion or mobility and access for the region. During the construction of the pipeline that crosses through the municipalities of Santo André and São Caetano do Sul, the project team made an effort to avoid traffic congestion by taking up the smallest space possible in the avenue. Nonetheless the construction of the project still had a negative impact on local traffic and on pedestrian accessibility to those areas. To repay the communities for this inconvenience, the project owners worked to rehabilitate the streets where construction took place, providing for the resurfacing of the asphalt. Another action taken by the project team was providing reimbursements for the bus transporation of the employees to the plant, facilitating their commute given the remoteness of the plant.

		Source: *Aquapolo Ambiental S.A., Transporte Público - vale transporte* *Aquapolo Ambiental S.A., Relatório de Execução de Recapeamento na Avenida do Estado em Santo André-SP (March 29, 2012).*
		RECOMMENDATIONS *Although the project relates to city infrastructure that works mainly internally, the project will still attract more people and business to the local area, affecting the traffic and accessibility of the region. Therefore, the project team should take a broader view of the potential impacts on community mobility and access on a larger scale.* *In terms of negative impacts on traffic and mobility, the project could strive for better communication with the transportation hubs and traffic management systems during construction. Address and adjust the flows of important affected streets and avenues when interrupted by construction in order to mitigate the negative impacts on the area. Identify solutions to accommodate pedestrians during construction when the sidewalks are interrupted.*
QL2.5 Encourage Alternative Modes of Transportation	**1**	**Improved**
		One of the avenues next to the Sewage Treatment Station of the Metropolitan Region of São Paulo (STE ABC) is the Almirante Delamare Avenue, which has a bus and metro network along it. The project encourages alternative modes of transportation by facilitating worker access to the project site through reimbursements for bus and metro fare. For those who come by car, there is also internal parking at the site. In terms of specific improvements to multi-modal transportation and traffic, the project does not contribute with any actions. However, one contribution that the project made was a partnership with the Municipal Government of São Caetano do Sul in an advertisement to inform the community about the "Decade of Reductions in Traffic Accidents 2011-2020."
		Source: *Aquapolo S.A., map in Acessibilidade (September 5, 2014).* *Aquapolo S.A., map in Mapa de localização metro e ônibus (October 21, 2014).*
		RECOMMENDATIONS *The project site requires a space more isolated from the community, for safety issues. However, a positive contribution to the citizens, in terms of circulation and mobility, would be to improve the infrastructural quality of the area in the Almirante Delamare Avenue and in the vicinity, and also improve the air quality (e.g. making sure that the access roads and the avene do not experience any smell from the sewage treatment).*
QL2.6 Improve Site Accessibility, Safety & Wayfinding	**6**	**Superior**
		The Aquapolo Ambiental project is located in a very dense area, the ABC Paulista, which means that the construction of the project will be passing through roads and communities, particularly the pipeline. Accordingly, the project team took all appropriate measures of safety and wayfinding to protect this populated area. Some examples of these measures are the isolation of wells and excavated areas with special fabric or metal nets, traffic cones, fences, signage etc. In the treatment station inside the project area, appropriate signage for safety and wayfinding were also addressed at specific locations required by standards. There is signage with instructions about how to use machinery, use of proper clothes and accessories (e.g. safety glasses and ear protectors), environmental requirements (e.g. keeping the door closed or limiting circulations in determined areas), reminders to separate trash, and reminders for the workers, such as "keep your attention on your work."
		Source: *Aquapolo S.A., images in Acessibilidade e segurança - obra, (September 4, 2014).* *Aquapolo S.A., images in Acessibilidade e segurança - placas de segurança, (September 4, 2014).*
		RECOMMENDATIONS *As sewage treatment stations are places that should be, in general, isolated from the population, it requires physical barriers in some areas. Sometimes, those barriers made by a large scale project end up being quite disruptive to neighbors, increasing the unsafety of the area and limiting*

		accessibility and wayfinding. In order to avoid those impacts, the project should look for solutions that, in addition to simply isolating the area, also turns it into a pleasant place to pass through, improving the livability of the surrounding community. It could be done through the addition of tree and shrubs to provide shadow, lighting, good sidewalks, or the addition of a benefit for the community such as playgrounds or parks. This way, the project will be an isolated area but will also improve the quality of life that region.
QL3.1 Preserve Historic and Cultural Resources	**16**	**Restorative** Aquapolo Ambiental S.A. had hired Grupoterra1 S/S LTDA as the specific agency to conduct archeological monitoring at the project site. The assessment found archeological pieces in the Maria Macedo Street, where the Fábrica Adelinas archeological site was identified. Five boxes (30cm x 40cm) were collected with material that should be safeguarded. Hence, Grupoterra1, in communication and approval of IPHAN, the Instituto do Patrimônio Histórico e Artístico Nacional, was responsible for this process while the project continued its operations. Based on that, Grupoterra1 initiated the Program of Archaeological Monitoring of the Pipeline Enterprise of the Water Supply at São Caetano do Sul, under the responsibility of the Municipality of São Paulo. Through this initiative, they had temporary institutional support of the Municipality for six months, to safeguard the archeological pieces while the History Museum of São Caetano do Sul concludes its registration at IPHAN. *Source:* *IPHAN, Parecer Técnico (April 9, 2012).* *Grupoterra1, Relatório Final (March 13, 2012).* *RECOMMENDATIONS*
QL3.2 Preserve Views and Local Character	**0**	**No Score** Because the project is located inside of the STS of São Paulo, which is completely isolated from the community, no integration was made with the neighborhood, and no views were identified by the project team. Therefore, the project cannot score in this credit. *Source:* *CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012).* *RECOMMENDATIONS* *The Aquapolo site is inside of the STS site, which is in the middle of the ABC Paulista community, a region highly populated and industrialized. Although the project does not always have direct contact with the community, it can still contribute to the community views and local character, improving livability.* *Research about the local character could be developed by the project team, in order to explore methods to improve the community feeling and livability. Actions such as landscaping plans through the paths of the pipes could be a way to enhance the project and bring comfort to the people there. It is important for any project to take actions that provide benefits to the community and not only fulfill its infrastructural purpose.*
QL3.3 Enhance Public Space	**13**	**Restorative** No existing public parks, plazas, or wildlife refuges were improved to enhance the community livability. Nonetheless, two public facilities in two diferent cities were created by the Aquapolo project team to compensate for the disturbance caused by the pipeline construction. The first project was the renovation of the health unit and the oncology center of the municipality of São Caetano do Sul. Odebrecht Ambiental will also relocate the existing public facilities located in the project site and will be responsible for the implementation of measures to prevent erosion and interruptions in drainage. The second project was the creation of the Centro de Referência de Assistência Social (CRAS) for the municipality of Santo André. This facility is a social assistance resource center designated by the municipality as a public space with multipurpose rooms, which would be used for meetings with local families assisted by the CRAS and also as a space for social education activities.

		Source: *Prefeitura Municipal de São Caetano do Sul, Termo de parceria para instalação e operação de adutora de água em vías públicas do município que entre si fazem a prefeitura municipal de São Caetano do Sul e a empresa Aquapolo Ambiental S/A (March 11, 2011).* *Prefeitura Municipal de Santo André, 3º Adiantamento ao termo de Compromisso (April 2, 2014).*
		RECOMMENDATIONS
QL0.0 Innovate Or Exceed Credit Requirements		N/A
	103	

SUB CATEGORY:LEADERSHIP		
	Score	**AQUAPOLO**
LD1.1 Provide Effective Leadership And Commitment	**17**	**Conserving**
		The Odebrecht company states that sustainability is a core value, guiding its actions, planning and future decisions. For them, sustainability is taken in three different levels; universalization, efficiency and valorization. The principle of universalization is based on the idea of having a country that provides 100% of the population with potable water and treated sewage. Committing to these services has a direct relation to the population's health and quality of life. The principle of efficiency has to do with the operation of water and sewage treatment. The company states that their standards of efficiency in water transport are much better than the current ones. The statistics offered by them are based on average consumption for a house of three or four people, which is 500 liters/day. To achieve this rate, it is necessary to collect 1,000 liters in the river, representing a loss of 50% of the water. With the Odebrecht standard, it is possible to accomplish the same supply collecting just 600 liters, saving resources and supplying more people in the community. The principle of valorization represents the added value of water preservation to society and the value of the company to its stakeholders. In this way, Odebrecht Ambiental addresses all the aspects of the triple bottom line: economic, environmental and social. This is a 70 year old company that has sustainability as a guide to every action and organization. Most of their reports attesting to the sustainable practices in the organizational principles relates to general policies within the company, meaning that these steps are taken for every project. However, this project in particular has won three awards since 2011: the International Global Award in 2011, ANA Award (National Water Agency) in 2012 and FIESP Award for Water Conservation and Reuse. Those awards represent the great performance of this project and the commitment of the leadership to the success of their work.
		Source: *Odebrecht Ambiental, Política de Sustentabilidade (2014).* *AIG, Certificado de Seguro Ambiental (August 26, 2014).* *AIG, Certificado de Seguro de Responsabilidade Civil Geral (August 27, 2014).*
		RECOMMENDATIONS
LD1.2 Establish A Sustainability Management System	**4**	**Enhanced**
		The organization of the project is based on the management policy of the company, which is very committed and engaged with sustainable and responsible practices. The company has a broad range of employees from different areas working in collaboration. There is an integration of the sectors that improve the involvement of every party, helping and encouraging each other.

		In their organizational policy, there is a principle concerning the development and integration of people based in education for employment. This principle states that people in higher positions should guide the younger generation in order for all personnel to have equal levels of involvement. This principle results in the planned delegation and practice taught in the PA Cycle (Action Plan Cycle). This cycle is composed by: planning and pact making, monitoring, assessment, and judgement, representing the phases of an enterprise. This should be done with transparency, generating respect and consolidating trust between leaders and others. The hierarchy is very positive especially in large scale projects, where the complexity is bigger and there is a lot to control. Another very positive position that the company takes, facing all the challenges that come with large scale projects, is to maintain the involvement of all parties through delegations. Delegating work means a deeper specialization of a professional in a determined area, and this project employs specific positions for the core responsibilities of the project: environment, health, safety, and socio-environmental. Another important issue addressed by the project team is the preparation of personnel for any changing conditions, such as negative impacts and disasters. The team is fully prepared with workshops and training as described in the credit QL1.3 Develop Skills and Capabilities. The owner and the project team took into consideration the environmental, economic and societal aspects of the project. The environmental and economic aspects were officially addressed with documentation and reports proving their efficacy. However, the social aspects taken into consideration did not develop into activities to establish communication with the community in the design phase.
		Source: *Odebrecht S.A., Política de Identificação, Desenvolvimento, Avaliação e Integração de Pessoas na Organização Odebrecht (September 11, 2012).* *Aquapolo Ambiental S.A., Capacitação e habilidade: Treinamentos.*
		RECOMMENDATIONS The Aquapolo team is very organized hierarchically, with very clear positions and management systems established. However, an improvement that could be added in this system is in the social sector, meaning the department that handles contact with the affected communities. In the planning phase of this project, the input of the community should be taken into consideration. The team should develop a way to approach the citizens, at earlier stages of the project, in order to have a better understanding of the situation and address any issues. This way, the project will have much better performance in terms of serving the population. The project team should design the project in a way that its sustainable goals, objectives, and targets are completely aligned with community goals and needs.
LD1.3 Foster Collaboration And Teamwork	**4**	**Enhanced**
		The Aquapolo project is a good example of a collaborative work process, wherein the design of the project is based on a teamwork strategy: the Station of Industrial Water Production (SIWP) will receive water from the Sewage Treatment Station of the Metropolitan Region of São Paulo (STE ABC). The project's organizational structure is also designed to foster collaboration between its parts. The project team has created several documents —such as the Environmental Insurance Certificate and the General Civil Responsibilities Insurance Certificate— establishing the sharing of risks and rewards between the different stakeholders responsible for any actions done whithin the plant. This document analyses all actions that could have an environmental, economic, or social impact on the project's site and the surrounding communities. Regarding the collaboration of Aquapolo with the members of the nearby communities, the company leaves room for improvement. The project team made an effort to integrate the community in its processes by inviting them to learn about the water treatment process through guided visits, presentations in the surrounding schools, etc. However, no community activities

		implemented by the project team addressed people's needs, goals, and objectives. Although the project has already been completed, the project team should assess the needs of the community today and try to make changes to it based on this feedback. A collaborative process will help the project achieve their goals and better serve the community.
		Source: *AIG, Certificado de Seguro Ambiental (August 26, 2014).* *AIG, Certificado de Seguro de Responsabilidade Civil Geral (August 27, 2014).* *Aquapolo Ambiental S.A., Relatório das Ações da Área de Responsabilidade Socioambiental 2013/2014.*
		RECOMMENDATIONS One of the improvements that could be done by the project team regarding collaborative processes is teamwork and collaboration with the existing community in the direct area of influence. Communication with the existing community in the construction phase is an important step to guide the operations to improve the infrastructure and the quality of life in the community. Collaboration with the local people should exist from the beginning. It is good that the project team tries to integrate them in the operational phase, but this effort should be made starting in the design phase, in order to design a project for the existing community. In addition, feedback of the community during the operational phase is essential in order to set goals and objectives that are aligned to the community needs. It is also a good way to have a better understanding of the current situation in the area. Moreover, the project owner should be willing to share risks and rewards with the community. They should be integrated in the contract as one of the partner of the project, once they are one of the major stakeholders. The community should be a larger part of the process.
LD1.4 Provide For Stakeholder Involvement	**9**	**Superior**
		Aquapolo Ambiental S.A. establishes a good relationship with their major stakeholders: the community, shareholders, clients, collaborators, etc. In terms of the community, the company provides environmental education for the population in the nearby schools, such as visits to their treatment plants, developed in partnership with the Municipal Department Education. However, the involvement with the community is made solely in the operation phase and it's not intended to collect any feedback from the surrounding inhabitants. Therefore, no actions or plans implemented by the project team were taken based on input received.
		Source: *Odebrecht Ambiental, Política de Sustentabilidade (2014).*
		RECOMMENDATIONS The project should establish contact with the local community starting in the planning phase, since it is inserted in the middle of communities in the State of São Paulo. Another positive action from the leadership of Aquapolo Ambiental S.A. would be to create programs for soliciting feedback from the public and key stakeholders. With a more collaborative process, it would increase the interest of the stakeholders as investors and create a relationship where the need of the client could be more clear for those who are providing it. All planning and actions implemented in the community should reflect this feedback.
LD2.1 Pursue By-Product Synergy Opportunities	**15**	**Conserving**
		The Aquapolo Project functions on synergy opportunities, recycling the wastewater from the STS and redirecting it to the petrochemical center. In turn, it will use the recycled water for the production of the petrochemical products and a large amount of water will be saved. This project is generating a resource from waste water and sewage that did not exist before. The impacts of this action will benefit over 500,000 inhabitants that currently suffer from water scarcity. Synergy opportunities are also explored inside of the project. In the same way the sewage is directed to the SWIP, the sludge accumulated in the process of recycling water is sent back to the STS. So, two processes feed each other, receiving waste and transforming it into a usable material. Other kinds of waste were also recycled in the internal processes. According the indicators of

		waste recycling, the company has a rate of 20.8%. Several by-product synergy opportunities are found within the Aquapolo water reuse cycle. The cycle starts in the community, with their sewage discharge. The sewage is conducted to the SWIP to be treated and recycled for industrial water use. Once treated, the recycled water is piped to the Petrochemical Center of Capuava, which produces petroleum-derived products for Brazil. The reuse of water for industrial purposes was made possible through the Aquapolo project, utilizing waste water as a resource that was not benefiting the population. Closer attention to the by-products in this cycle can increase the synergy opportunities.
		Source: Camila Coelho, Foz do Brasil, Indicadores de Reciclagem de Resíduos.
		RECOMMENDATIONS In the same way that small synergy opportunities were found, like the return of the sludge to the STS, another small synergy opportunity could be pursued to make the process even more sustainable. Special attention could be given to the trash and effluent that is produced in the petrochemical center. Check if there is any other material that, as in the case of the sludge produced in the SWIP, can be returned to the STE ABC. Studies should be developed to enhance each part of the materials cycle to create future synergies. The cycle can possibly became a closed loop if the water from the industrial center comes back to the STE ABC. The amount of wastewater would increase meaningfully, and more people could benefit from these synergies, especially if Aquapolo starts producing reused water for the community and for neighboring projects.
LD2.2 Improve Infrastructure Integration	**16**	**Restorative**
		Considering the collaborative process that the project embodies, Aquapolo identified an opportunity in the sewage produced by the community to improve the quality of life of this population by recycling it, therefore increasing the water supply for the community. This action also improves community growth and development, because the petrochemical industry has a big impact on the country, specifically in this region (1). Aquapolo also looked to improve sustainable performances on the technical side, since one of its principles is efficiency, explained in the credit LD1.1, wherein the Odebrecht quality of technology provides better water distribution by collecting less from the source and losing less. One of the most important consequences of this project is the restoration of a valuable community asset: the water supply. Nevertheless, this impact is even better because it generates water from a resource that wasn't of use before, and now it is benefiting over 500,000 people in the community.
		Source: *'Parcerias da Aquapolo trazem benefícios sociais", Aquapolo, assessed November 16, 2014, http://www.aquapolo.com.br/2012/04/27/parcerias-da-aquapolo-trazem-beneficios-sociais-a-santo-andre-e-sao-caetano/* *Odebrecht Ambiental, Política de Sustentabilidade (2014).*
		RECOMMENDATIONS Because efficiency of distribution was a focus of the company, other individual components could also be analyzed to achieve whole project optimization. Another point is that the project may also incorporate and take advantage of other valuable assets of the community like knowledge and capital.
	10	**Conserving**

LD3.1 Plan For Long-Term Monitoring & Maintenance		Plans for monitoring and operation are an integral part of the process for Aquapolo Ambiental. They take into consideration many aspects in those systems, from the most general issue to the most specific, such as operational availability, distribution, maintenance of materials, etc. The coordination team sets goals and objectives for every day, month and year. This planning is done on a daily basis, having notes and check ups for every step of the process. Additionally, for every unexpected or unwanted event, they lay out actions in order to solve it. A preventive plan is also put in place and monitored, in order to prevent some event that could have a negative impact during the operation of the system, causing an interruption in distribution. Aquapolo Ambiental S.A. also has a long-term plan for the management system wherein it will establish goals and objectives for the company for the next five years. Experts will analyze the current situation of the firm and will come up with actions according to what they think is best for its future. Those actions include the number of employees, production, policies, etc. This management planning will dictate the next five years of the company and will be reviewed every year through direct meetings.
		Source: *Aquapolo S.A., Plano de longo termo e monitoramento (July, 2014).* *Aquapolo S.A., Indicadores de manutenção (September, 2014).* *Aquapolo S.A., Indicadores de operação (August, 2014).*
		RECOMMENDATIONS *The purpose of setting a long-term monitoring and maintenance plan is to ensure that the design performance will be maintained throughout the design life of the project. Within the scope of these assessments, there is an explanation of how funding will be allocated and maintained, as sufficient funding levels are necessary for monitoring and maintenance. The project team should provide assurance that these resources will be in place following the delivery of the project.*
LD3.2 Address Conflicting Regulations & Policies	**0**	**No score**
		This credit assesses the project in a way to identify and address laws, standards, regulations or policies that runs against the use of recycled water, creating barriers to the implementation of the sustainable practices and infrastructures. In Aquapolo case, there were no policies or regulations that present a problem or limit the installation/operation of the project, meaning that the project didn't score in this credit.
		Source: *Governo do Estado de São Paulo, Deliberação do CRH N. 156 (December 11, 2013).*
		RECOMMENDATIONS *The project team should put some efforts in identifying any conflicting laws, standards, regulations or policies that run against any sustainability goals, practices or objectives for the project. For instance, the project team can identify regulations that limit the use of recyclable water to non potable uses, if the water quality of Aquapolo's recycled water meets the potable water standards.*
LD3.3 Extend Useful Life	**12**	**Conserving**
		The Aquapolo project supplies treated water to the Petrochemical Center of Capuava, which is composed of 10 industrial companies. The project currently produces 650 liters per second of recycled water, but it was designed for a capacity of 1,000 liters per second. Looking at a possible future increase in demand, once the water produced will be cheaper, more companies from the center could join the project. Additionally, according to the document "Redução de Energía: Cálculo de Alternativas", the project has enough equipment to operate at its full capacity, which enables the project to expand its production at any moment if needed. Another element that increases the useful life of the project is the maintenance operations, such as preventive measures taken by professionals with expertise, explained in credit LD3.1. These maintenance procedures ensure that the equipment is treated and operated correctly. A good example of these procedures for equipment maintenance and repair procedures is a regularly scheduled stop in the machinery for a cleaning at one of the substations.

		Source: *Aquapolo S.A., Indicadores de manutenção (September, 2014)* *Aquapolo S.A., "Redução da demanda contratada" in Redução de Energía: Cálculo de Alternativas. "Sustentabilidade", Aquapolo Ambiental, accessed October 30, 2014, http://www.aquapolo.com.br/sustentabilidade/*
		RECOMMENDATIONS *Aquapolo could start thinking about the community needs as a future demand for expansion. The total capacity could be utilized at the station but for purposes beyond their current ones. The population that lives in this region suffers from water scarcity, therefore, a system that could offer them treated water for non-drinkable purposes would improve the community's quality of life and livability.*
LD0.0 Innovate Or Exceed Credit Requirements	**8**	There is an innovation in the performance of the water treatment plant drainage process in maintaining operations without interruption and without unexpected risks that improve the work environment for the workers. This optimization in the system contributes in ensuring the supply of reuse water for the Petrochemical Center without interruption, which excludes the need of potable water in the center production. This optimization in the technical processes of Aquapolo also helps in other technical issues. This has turned the systems more accurate and efficient, which helps the team to plan and base their statistics with safety. This automation innovation already received an award in 2013, the "Prêmio Odebrecht Ambiental, Automação e Eficiência". The importance of this automatization in the drainage process is that it was done manually before, draining the resultant water from machinery. Without the innovation, the pumps reached a daily level of water in the machines that needed manual draining that required to stop the machine making the process slower and inefficient. This efficient automated drainage system works with the addition of another machine and sensors detectors that are connected to the pumps. Through sensors detectors, the draining machine will start working when the water reaches certain level, without having to stop the pump. This process avoids leaks, protects the entire system ensuring its durability, efficiency and accuracy, in addition it avoids the daily manual maintenance procedure that was being required in the machinery. The automation of the drainage system is an innovation pertaining to credit LD2.2 Improve Infrastructure Integration in the Leadership category that calls to the design of projects that take into account the operational relationships with other surrounding elements and thus leads to the overall improvement in the efficiency and efectiveness af any infrastructure project. This measure could be scalable and transferable to not only other parts of the water recycling process but can be integrated into other projects. By automatizing the drainage system, the project will be saving energy for not stopping the machinery to drain water, and saving resources by not requiring additional maintenance procedures nor extra personnel to operate it. It is considered an innovation because it is a change made in the operational system. The team identified the weakness in the operation and planned optimization measures to facilitate and better operate the water reuse facility. *Source:* *Odebrecht Ambiental, Prêmio Odebrecht Ambiental, Automação e Eficiência (2013), 4.*
	95	

CATEGORY II: CLIMATE AND ENVIRONMENT		
RESOURCE ALLOCATION		
	Score	**AQUAPOLO**
RA1.1 Reduce Net Embodied Energy	**0**	**No Score** This credit analyzes the project according to its reduction in the net embodied energy. This information can be obtained through a specific assessment of net embodied energy. Aquapolo did

		not score in this credit because did not make this type of assessment. The energy consumption during manufacture can estimate the environmental impact of the materials used in the project. It will represent around 20% of the energy used in the project, so reducing the net embodied energy of the project will significantly reduce the overall environmental impact of the project.
		Source: *"What is Embodied Energy?", Level, accessed November 4, 2014, http://www.level.org.nz/material-use/embodied-energy/.* *"What is Embodied Energy?", Level, accessed November 4, 2014, http://www.level.org.nz/material-use/embodied-energy/.*
		RECOMMENDATIONS It is highly recommended to invest in assessments that can address energy life cycle analyses. These certificates are helpful in the planning phase of the project, as the team will be able to have accurate numbers in terms of energy produced by the project. Not only its internal processes are taken into consideration, but also the activities that are consequently related to the project, for example the production of its raw materials. Every large scale project will have numerous impacts regarding energy, and those impacts will depend entirely on the project's decisions, such as choosing its partners, its producers, technology to be applied, etc. Little changes in these decisions can make significant differences in the project performance.
RA1.2 Support Sustainable Procurement Practices	**2**	**Improved**
		Aquapolo established a basic procurement program wherein they analyze their distributors according to their procedures and their policies for a better quality of material, service and compatibility of ideals. A two-page questionnaire is required for all distributors, with basic information about the company, customer service, installations, personnel, cleanliness of the company, control systems, quality assurance, health and safety, human rights, environment, qualification of suppliers, etc. In the contracts, there is a human rights clause that certifies the fulfilling of the standards by the distributors and suppliers.
		Source: *Aquapolo Ambiental S.A., Uso de materiais - formulário de avaliação dos fornecedores.*
		RECOMMENDATIONS A stronger program for sustainable procurement that documents the total weight or volume of materials should be implemented in addition to the pre-qualification criteria for the suppliers for Aquapolo. Further research should be conducted by the project team to better evaluate their partners. Also, consider the triple bottom line as a base for their requirements as it is a complete way to assess future partnerships. It is also considered a sustainable practice to search for materials that come from sustainable sources. The team should seek to specify materials from manufacturers who utilize materials with reduced environmental impacts and who take into account the environmental, economic and social impacts of their products. In the contracts of the project, it is specified the need to fulfill this requirement, however, it is important to implement systems that can ensure this has been done by the partners, especially before the hiring process.
	2	**Improved**

RA1.3 Used Recycled Materials		In terms of recycled materials and equipment, one practice undertaken by the Aquapolo project is the reutilization of four aeration tanks that were not being used by the STS of ABC Paulista (Sabesp), which represents 30% of the project's tank equipment coming from recycled material. During the construction phase of the project some of the materials used were recycled, such as the pressed wood use for construction aid and the metal joins, which are made of recycled material instead of iron. As established by Odebrecht, the wood used on site will also be reused on the construction of other projects. The same will happen with some facilities —like the finance and administrative buildings— that were built onsite only for the construction period. After construction ended, the facilities were disassembled and used in other projects. Overall, the project recycles 20.8% of the materials it uses.
		Source: *Aquapolo Ambiental S.A., Relatório fotográfico Canteiro de obras Projeto Aquapolo.* *Aquapolo Ambiental S.A., Tanques de aeração.* *12_Reciclagem de Resíduos - indicadores.xlsx*
		RECOMMENDATIONS *Some good practices are incorporated into the project in the construction phase, which is a standard for Odebrecht. But another practice that could add value to the project and to the company, related to this issue, is to work with recycled materials for the main infrastructure materials, such as pipes and ducts.* *The amount of recycled material used on the project is also a good way to measure the commitment of the company to social, economic and environmental goals. Therefore it is recommend that the project take an inventory of existing materials and structures that have reuse potential. This type of assessment will help Aquapolo to find synergy opportunities for these recycled materials, in addition to being able to quantify and compare with statistics developed by the project team to reach their goals and objectives.*
RA1.4 Use Regional Materials	**0**	**No Score**
		Although the Aquapolo team asked their material suppliers to have certain characteristics in order to work with them —such as location and size of their company, customer services policies, cleaning procedures, and quality control systems, among others— they did not specify the materials being provided to them needed to be locally sourced. Thus, the project cannot score any points in this credit.
		Source: *Aquapolo Ambiental S.A., Formulário de Pré-Qualificação de Fornecedores.*
		RECOMMENDATIONS *It is highly encouraged for the project team to assess the available materials on site and from nearby regions that could benefit the environment and also make the process more feasible. The use of regional materials also benefits the local economy, promoting more demand for local firms and encouraging growth and development.*
RA1.5 Divert Waste From Landfills	**3**	**Improved**
		The sustainability sector of Aquapolo, responsible for social and environmental issues, has developed plans to decrease the waste during the project, aiming to recycle more than they send to landfills. The planning goes from the small practices up to bigger operational processes. An interesting fact is that avoiding to send waste to landfills is also a manner to send them to the STS of ABC, where comes from their main product, the sewage, increasing the process synergy. At the small scale, the waste diversion process is the selective waste collection, inside of the work space, where trash is separated and part of it is recycled. After trash is separated, the recyclable material is sent to special agencies to be recycled. At the large scale, waste diversion consists of the collection of the sludge and flushing that is sent back to the STS ABC. In total, around 40% of the waste generated in Aquapolo is recycled, which means that 80,540 tons of waste have been diverted from landfills since 2013.

		Source: *Aquapolo Ambiental S.A., Segregação de resíduos.* *Aquapolo Ambiental S.A., Planta da rede de drenagem.*
		RECOMMENDATIONS *Diverting 40% of your waste is an achievement for a project; higher scores would require diverting at least 50% of the waste stream. The project team is doing a good job in creating synergies, redirecting some of the waste to the STS ABC, and recycling part of it. If Aquapolo cannot reduce more of their waste generation with the current plan, an alternative option could be analyse operational methods that produce less waste.*
RA1.6 Reduce Excavated Materials Taken Off Site	**0**	**No Score**
		According to the standard NBR 10.004/04, the excavated material taken off site should be designated to a separated area where it can be better analyzed, collected and have its final destination defined. This area is called the 'Bota-Espera' area. This location, for the Aquapolo project, was chosen in a Permanent Protection Area (PPA), because there was no other available area closer than 20 Km from the site. Because of that, the project team took all necessary measures to be able to work in this area, such as environment protection, replanting and constructing barriers, because it is also next to a river, from which the project also respects the required setbacks. The function of this area is simply to host the excavated soil taken from the project site and the length of stay is no more than 24 hours. This soils will be classified and designated to its proper destinations. However, what counts for assessing this project is the percentage of excavated material that is taken off site here, and the project did not provide enough material for this discussion.
		Source: *Aquapolo Ambiental S.A., Autorização de Intervenção Temporária de Bota-Espera (2011).*
		RECOMMENDATIONS The project team should provide estimations of the amount of excavated material to be taken off site and excavated material beneficially reused on site in order to have a better assessment of this credit and to be able to monitor and plan this process. Calculating these numbers can help the project achieve much better results regarding environment and economic issues.
RA1.7 Provide for Deconstruction & Recycling	**1**	**Improved**
		The Aquapolo team did not provide any documentation addressing the potential future deconstructibility or recyclability of the different parts that compose the project. Nonetheless it is likely that most of the pieces that compose it —such as metal pipes and machinery— can both be disassembled and reused.
		Source: *Aquapolo S.A., Reciclagem membranas.*
		RECOMMENDATIONS This type of project usually uses a lot of recyclable materials, especially pipes and machinery that, with some refurbishment, can be reused in the future. The owner and the project team did not conduct any assessment to address this, but it could be a great opportunity for this type of infrastructure. Conducting an assessment that can address the amount of the material that can be reused or recycled could represent a meaningful economic gain for the project, and the environment will benefit as well.

RA2.1 Reduce Energy Consumption	**3**	**Improved**
		The project team has conducted planning and design assessments to analyze options for reducing energy consumption. Among the studies they made were those that considered the efficiency of the project through which five processes were identified: energy generation through reverse osmosis, utilization of biogas from the STE, installation of energy saving reverters, installation of a solar plant, and reduction of contracted power demand. For now, all the studies have been analyzed and are undergoing feasibility assessments. The only option that was put in place was the reduction of the power demand, with an initial contracted power demand of 3,600 KW and a later reduced contract for just 2,600 KW, representing a 22.2% in energy savings. While this is a good action, no documents could be found proofing that this plan implemented by the project team truly means a reduction in the energy consumption of the plant.
		Source: *Aquapolo Ambiental S.A., Redução de Energia: Confiabilidade e eficiência (May 28, 2014).* *Aquapolo Ambiental S.A., Redução de Energia: Bomba de alta pressão da osmose (May 21, 2014).* *Aquapolo Ambiental S.A., Redução de Energia: Cálculo das alternativas.* *Aquapolo Ambiental S.A., Redução de Energia: EEBC (July 7, 2014).* *Aquapolo Ambiental S.A., Redução de Energia: Soprador de ar 2p mebranas (May 21, 2014).*
		RECOMMENDATIONS This credit is assessing the energy savings that the project reached through planning and design. Although there are many plans to achieve more energy reductions in the future, there is only one put in place right now, upon which this assessment has been based. It will be good for the project if some or all of the other methods will be able to be implemented in the future. Work on synergies, reduce energy consumption, and optimize process efficiency.
RA2.2 Use Renewable Energy	**4**	**Improved**
		All energy needs of the project are met through the National Agency of Electric Energy (ANEEL, its acronym in Portuguese), also known as Eletropaulo. From this source, more than 62.97% of the energy used is hydropower, 2.99% windpower, 1.42% nuclear, 0.01% solar and 8.72% biomass, which results in 76.11% of the energy used in the plant coming from renewable energy sources. The other 23.89% comes from fossil fuels and energy imported from other countries in South America, such as Paraguay, Argentina, Uruguay, and Venezuela. When it comes to the production of renewable energy inside the plant, the project team hired an specialized consultant to conduct a study about the possibility of having a photovoltaic plant next to the Aquapolo project. The study analyzes all benefits of the installation of this renewable energy project. According to the document "Análise para implantação de uma Usina Solar Fotovoltaica na Aquapolo Ambiental", the project will save $193,661 USD per year and will produce 1,574.6 MWh per year, which would account for at least 10% of the total energy need per month.
		Source: *VIS Technology, Análise para implantação de uma Usina Solar Fotovoltaica na Aquapolo Ambiental (May 09, 2014).* *"Matriz Energética", ANEEL, accessed November 4, 2014, http://www.aneel.gov.br/aplicacoes/capacidadedebrasil/OperacaoCapacidadedeBrasil.cfm.*
		RECOMMENDATIONS *It would be good for Aquapolo to integrate renewable energy generation into their processes. In the photovoltaic case already analyzed, it would be a clean and reliable source of energy, with quick installation, bestowing a positive image on the company and benefiting the environment. The project team should provide benchmarks of the project's annual energy needs broken down by source type. It should also make efforts to find synergies between wastewater filtration and energy generation. Aquapolo should aim to use a bigger percentage of renewable energy, providing more benefits for the environment.*

RA 2.3 Commission & Monitor Energy Systems	**11**	**Conserving**
		The operations of Aquapolo are automatic and controlled by efficient systems, which makes the team able to develop a long-term monitoring plan. Personnel training is also emphasized in order to make workers able to execute the maintenance of those systems and monitoring processes. The operational system will be controlled in two different Remote Stations (RS) to be installed, one of them in the STS ABC, and the other in the Secondary Elevated Station (SES). These stations communicate with other parts of the project, and each has its own responsibilities established. Another aspect that contributes to the project performance is the long-term monitoring that is developed by the project in its internal systems.
		Source: *CH2MHILL - ALPHAPLAN, "Sistema de Operação e Controle" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 42.* *Aquapolo S.A., Plano de longo termo e monitoramento (July, 2014).* *Aquapolo S.A., Indicadores de manutenção (September, 2014).*
		RECOMMENDATIONS -
RA3.1 Protect Fresh Water Availability	**17**	**Conserving**
		The objective of this credit is to address how the negative net impact of the project on the fresh water availability of its region can be reduced. In this regard —and since this is the main feature of this project— Aquapolo scored "Conserving," since it does reduce the total impact of the project on the local fresh water availability, but still does not restore it to an undeveloped native ecosystem condition. Aquapolo is located in a highly populated area that suffers from water scarcity, and its contribution to the region is to redirect 2.58 billion liters of fresh water per month to the population by recycling the wastewater from the STS of ABC Paulista. The water being recycled by the plant today originally ended in the nearby river. The project team also addresses the project's water requirements, which include estimations of average peak demand and plans for long-term monitoring. Cetesb, a specialized agency of the State of São Paulo, is also working to manage the quality and quantity of water resources, including temperature and salinity. But above all, the project is most beneficial for the environment and society because it recycles the STS ABC affluent, which was previously discharged into the rivers. According to the Preliminary Environmental Report, the team conducted a water availability assessment, where the existing water bodies of the Tamanduateí river and Meninos stream (an affluent from Tamanduateí river) are located. According to this document, both the Tamanduateí river and the Meninos stream are currently in a critical situation due to intense pollution from residential and industrial discharges that are released into the river basin. The project provides an opportunity for the rivers to repair themselves by avoiding further pollution. Another quality of Aquapolo's design is that it will create a new source of water for industrial purposes, and thus the demand for fresh water will be reduced, protecting the superficial and groundwater resources.

		Source: *"Sustentabilidade", Aquapolo Ambiental, accessed November 4, 2014, http://www.aquapolo.com.br/sustentabilidade/* *CH2MHILL - ALPHAPLAN,"Controle da Qualidade das Águas" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 56.* *CH2MHILL - ALPHAPLAN, "Recursos Hídricos - Qualidade da água" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 151.* *Aquapolo Ambiental S.A. / BiogariAmbientall Ltda., Contrato de prestação de serviços n. 044/2014: Análise em água, efluente e resíduo (Auguts 21, 2014).* *Aquapolo S.A., Plano de longo termo e monitoramento (July, 2014).* *"Águas Superficiais", CETESB, accessed November 4, 2014, http://www.cetesb.sp.gov.br/agua/aguas-superficiais/124-programa-de-monitoramento*
		RECOMMENDATIONS *The Aquapolo project is already eliminating one of the main sources of pollution in the basin: residential and industrial effluent discharge into the river. However, for the project to go beyond its achievements, it could develop strategies to complement the restoration of the rivers. Measures should be taken to replenish the quantity of water in the rivers and to clean the water thoroughly.*
RA3.2 Reduce Potable Water Consumption	**21**	**Conserving**
		The project's total savings of potable water will be 2.58 billion liters per month, which can supply 500,000 inhabitants. Aquapolo is located in a highly populated area, which suffers of water scarcity, while the Petrochemical Center of Capuava uses potable water in the production of its petroleum-based products. The project was designed to treat wastewater from the STS ABC and produce reused water for industrial purpose. By doing that, Aquapolo is able to supply the Petrochemical Center of Capuava with this industrial water, which will no longer use potable water in its production. The potable water previously used by the Petrochemical Center will be redirected to the community. As recycling water is the major purpose of the project, the team conducted planning and design reviews to assess the best strategies. The success of this project in reducing potable water consumption has garnered three prizes: Global Water Awards in 2011, Prêmio Ana in 2012 and FIESP Award for Water Conservation and Reuse in 2013.
		Source: *"Sustentabilidade", Aquapolo Ambiental, accessed November 4, 2014, http://www.aquapolo.com.br/sustentabilidade/* *CH2MHILL - ALPHAPLAN, "Sistema Proposto de Abastecimento de Água" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 15.* *"Global Water Awards", accessed November 26, 2014, http://globalwaterawards.com* *"Produção de Água Industrial - Projeto Aquapolo", Prêmio Ana, accessed November 26, 2014, http://premio.ana.gov.br/Edicao/2014/projeto-detalhe.aspx?id=11&$ListID=A2CB8C6D-6FE2-4E67-BD57-5254DBCF88DD* *"Prêmios e Reconhecimentos", accessed November 26, 2014, http://odebrecht.com/relatorio2013/negocios/odebrecht-ambiental/*
		RECOMMENDATIONS *In order to generate a net positive direct impact in the generation of water for the community, the project should also provide an available source of reused water for neighboring projects or communities to offset their own water needs. Aquapolo should also verify whether all the internal operations of the project use recycled water. If there is any activity that uses potable water, this should be addressed.*
	6	**Superior**

RA3.3 Monitor Water Systems		Aquapolo maintains a strict control of all water treatment phases, from the water catchment in the STS ABC, through the delivery of the reused water to the petrochemical center. Aquapolo monitors the flow and quality of water through pH, turbidity, conductivity, ironing, and other quality tests. Most of these tests are done automatically by a software and are available online, which enables the eprson in charge to be able to check this data in real time. Besides the internal monitoring systems, external monitoring and analysis is done by Biogary, a certified laboratory, which enables transparency in the results. Long-term monitoring is also considered; in order to achieve this, the Aquapolo team set monthly goals and objectives to be maintained by all the processes that take place inside the plant.
		Source: *CH2MHILL - ALPHAPLAN, "Controle de qualidade de Água" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 55.* *Aquapolo Ambiental S.A. / BiogariAmbientall Ltda., Contrato de prestação de serviços n. 044/2014: Análise em água, efluente e resíduo (Auguts 21, 2014).* *Aquapolo S.A., Plano de longo termo e monitoramento (July, 2014).* *Aquapolo S.A., Indicadores de manutenção (September, 2014).*
		RECOMMENDATIONS *The environmental protection from the monitoring program put in place needs to go beyond the monitoring of the Meninos stream. The existing monitoring program should be integrated into operational systems, to improve efficiency and reduce negative impacts. Moreover, other water monitoring actions, such as groundwater quality, should also be conducted by specific agencies. Increasing the extent and comprehensiveness of the commissioning effort will help the long-term monitoring systems, which are a good opportunity to develop a responsive pace to the project.*
RA 0.0 Innovate Or Exceed Credit Requirements		*N/A*
	70	

NATURAL WORLD		
	Score	**AQUAPOLO**
NW1.1 Preserve Prime Habitat	**9**	**Superior**
		The Aquapolo project was developed inside of the STS of ABC Paulista site, which is located in a highly populated area. According to the Preliminary Environmental Report, the site is already severely modified by urbanization in this industrial area of São Paulo. Therefore Aquapolo is not located in a prime habitat area. The hydrology, podology, and vegetation of the site and its context are also at the same level of degradation for the same reasons. There is a small eucalyptus forest with original vegetation in the RECAP area, —east of the pipeline path— but it will not be affected by the project. The document also states that since the site of Aquapolo follows the metro rails, it will not be necessary to relocate any trees, only grassy areas next to the nitrification station.
		Source: *CH2MHILL - ALPHAPLAN, "Área de Influência Direta e Área Diretamente Afetada" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 193.*
		RECOMMENDATIONS

		Although the Aquapolo project is not located in a prime habitat area, it is encouraged that the project documents all green areas of São Paulo in the project's vicinity in order to preserve them. There is a difference between avoiding prime habitats and creating buffer zones around them to restore them.
NW1.2 Preserve Wetlands and Surface Water	**0**	**No Score**
		The Aquapolo project is part of the Alto Tietê basin, which includes many rivers. In addition to that, the project is also an extensive undertaking, because it is composed of stations and pipelines. More than once, the project runs on the margins of these waterbodies or crosses them. Aquapolo has direct contact with the Tamanduateí river, Meninos stream and Cassecara stream, and no buffer zones were set by the project team to protect them.
		Source: *CH2MHILL - ALPHAPLAN, "Contexto Hidrológico" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 132.* *CH2MHILL - ALPHAPLAN, "Contexto Geológico, Geotécnico, Geomorfológico e Pedológico" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 136.*
		RECOMMENDATIONS *Establishing buffer zones means setting specific distances from the water bodies in order to isolate them from any intervention or influence from the project construction and operation. It is important to make these limits clear in areas where crucial natural resources exist, to be able to preserve them for future generations. Locate the installations of the project in an area that does not have direct contact with the rivers, is a good improvement for the project, as well as establish buffer zones to determine approachable areas, where the project can develop activities.*
NW1.3 Preserve Prime Farmland	**12**	**Conserving**
		According to the Preliminary Environmental Report, the project site and its surroundings are not designated as prime farmland. The documentation states that the site is located in an urban area.
		Source: *CH2MHILL - ALPHAPLAN, "Contexto Geológico, Geotécnico, Geomorfológico e Pedológico" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 136.*
		RECOMMENDATIONS *The project should conduct an assessment to confirm whether there is any site in the surrounding areas that can be considered prime farmland.*
NW1.4 Avoid Adverse Geology	**2**	**Enhanced**
		The project team hired specific agencies to conduct an extensive assessment regarding the physical aspect of the soils and geology of the site. This broad evaluation was made through the Preliminary Environmental Report, which assesses the area in different tiers: directly affected, directly influenced and indirectly influenced. The main features of the soil geology were identified, and both positive and negative aspects were assessed, in order to guide future decisions and to ensure responsive construction and operation of the project. The referred document also identified the major potential impacts that may occur with the implementation of the project in the referred area, as its mitigation, compensatory and control measures. The study also points out monitoring systems to keep the environment stable and prevent negative impacts from the construction and operation of the project. Nevertheless, the report concludes that the impacts generated by the project vary from moderate to insignificant levels, which can be easily controlled by the monitoring and mitigation actions that have been already set out by the project.
		Source: *CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 125, 235.*
		RECOMMENDATIONS

		With all the geological aspects identified within its mitigation and monitoring procedures, the project team should look to developing safety plans in order to ensure reduced risk of damage in the adverse impacted geological areas.
NW1.5 Preserve Floodplain Functions	**2**	**Improved**
		The region of ABC Paulista is a floodplain area of the Tamanduateí river and Meninos stream. However, this area was previously deeply modified by the urbanization and development of the city and the industry. As a result, water bodies were tubed and conducted to rectified canals. Nonetheless, the presence of the rivers led Aquapolo to hire specialized consultants to conduct assessments and monitor the quality of those water bodies, keeping them safe from any impacts the project could cause on them.
		Source: *CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 235.*
		RECOMMENDATIONS *The floodplain function here is understood as the presence of the Tamanduateí river and Meninos stream. The monitoring system conducted by Aquapolo is a responsible way to keep the environment stable in this case. A future action around this issue would be to develop a way to restore the floodplain habitat and environment, at least in areas where this process is feasible, and also make sure that erosion does not diminish the water bodies.*
NW1.6 Avoid Unsuitable Development on Steep Slopes	**6**	**Conserving**
		Aquapolo is not located on a steep slope or hillside. As described in the documentation, the area was first developed in the 1970s, therefore, the site where the project is located is a flat surface.
		Source: *CH2MHILL - ALPHAPLAN, "Contexto Geológico, Geotécnico, Geomorfológico e Pedológico" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 136.*
		RECOMMENDATIONS -
NW1.7 Preserve Greenfields	**15**	**Conserving**
		According to the project's environmental impact assessment, Aquapolo's site is entirely located in a previously developed area, classified as greyfield. The landscape where the project is located was altered in the past due to the siting of industry in the area, reason for which it underwent an intense process of urbanization and urban development.
		Source: *CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012).*
		RECOMMENDATIONS -
NW2.1 Manage Stormwater	**0**	**No Score**
		This credit assesses whether or not the project minimizes the impacts on stormwater runoff, both in terms of quantity and quality. Aquapolo did not explore the possibilities of increasing water storage capacity. According to the information submitted, the Preliminary Environmental Report and the Environmental Evaluation, there is no mention on how they manage stormwater or increase the stormwater storage capacity. The drainage of stormwater is done through the common system that sends it to the streets, so there is no reuse or storage of stormwater.
		Source: *Aquapolo Ambiental S.A., Avaliação Ambiental na EPAI, no trecho inicial da Adutora do Projeto*

		Aquapolo (January 23, 2012). *CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 192.*
		<u>*RECOMMENDATIONS*</u> *The best level of achievement in this credit would be to maintain on site all runoff and/or restore the the hydrologic conditions of the undeveloped regional ecosystem. Being able to naturally supply the nearby streams, improving their regeneration capacity, is a good way to mitigate the infrastructure impacts. The project team should look for synergies between stormwater management and a water reuse facilities as it can be integrated and increase the volume of recycled water for industrial purposes.*
NW2.2 Reduce Pesticides and Fertilizer Impacts	**0**	**No Score**
		In this credit is evaluated the project efforts in reducing the source pollution caused by pesticides and fertilizers, as well as reduce their quantity, toxicity and bioavailability. Aquapolo did not provide documentation regarding the use of these products on its site. However, according to an agreement between Aquapolo Ambiental S.A. and Cetesb - Environmental Company of the State of São Paulo., some planting work was done in an external area. This area, called Piscinão de Capuava, is part of the Pedroso City National Park, and it was treated to receive the new natives species. In the treatment of this area, invasive species were identified and fertilizers and pesticides were used for that. Also, the soil received treatment, with the addition of limestone, chemical fertilizer and soil conditioning. Although some of this substances has low toxicity, no policies or programs were addressed to reduce the toxicity, quantity or need of them. No efforts were presented to analyse other options instead of fertilizers and pesticides.
		<u>*Source:*</u> *Aquapolo Ambiental S.A., Avaliação Ambiental na EPAI, no trecho inicial da Adutora do Projeto Aquapolo (January 23, 2012).* *Metaflora, Relatório de implantação projeto de revegetação margem do piscinão de Capuava (June, 2011).* *KL Engenharia e Consultoria Ambiental Ltda, Relatório do plantio compensatório TCRA n. 24.186/2010 (April, 2012).*
		<u>*RECOMMENDATIONS*</u> *To score in this credit, it is necessary to implement policies and programs that control the application of pesticides and fertilizers in the soil, in order to have a healthier and natural environment. For highest scores, incorporate plant species that requires less use of chemical products, will guarantee less pollution in the nature. Ideally, is to design landscaping where it is not required any pesticides, fertilizers or herbicides. For Aquapolo, as a water treatment project, this credit could also be understood as the importance to maintain the quality of the landscaping. Because the process uses chemicals to treat water, is important to maintain the health of the nearby soil.*
NW2.3 Prevent Surface and Groundwater Contamination	**4**	**Enhanced**
		The project team hired an agency to conduct an environmental report of the state of the area of the project to prevent soil and water contamination. The objectives of this report were to assess the existence of possible ground and/or surface water and to identify and quantify possible impacts the project could cause to these fresh water sources. Cetesb, the Environmental Company of the State of São Paulo, is the specialized agency the project team hired to conduct the water quality monitoring of the streams. This monitoring takes place once a month and is done to ensure the quality of the water and to prevent any potential negative impact to these sources.
		<u>*Source:*</u> *Odebrecht, Avaliação Ambiental na EPAI, no trecho inicial da Adutora do Projeto Aquapolo (January, 2012).*

		"Águas Superficiais", CETESB, accessed November 4, 2014, http://www.cetesb.sp.gov.br/agua/aguas-superficiais/124-programa-de-monitoramento
		RECOMMENDATIONS *The existing monitoring program should be integrated into operational systems in order to improve efficiency and reduce negative impacts. Moreover, other water monitoring systems, such as groundwater quality, should also be conducted by specific agencies. Increase the extent and comprehensiveness of the commissioning effort.*
NW3.1 Preserve Species Biodiversity	**16**	**Restorative**
		Although the area around the project and its site had already been severely modified due to urbanization in the past, it is still the habitat for low vegetation and some bird species. According to the Preliminary Environmental Report, any environment —untouched or affected by human actions— has a specific fauna and will be disturbed by human development. However, the extent of these impacts will be determined by the extension of the area, the type of project being developed, and the actions taken by the latter to mitigate impacts. By hiring a special agency, the Aquapolo team identified the local species and vegetation to be impacted by the project, which guaranteed that none of those species were under threat of extinction and were instead considered 'common' species to the area. In accordance to the agreement made between Aquapolo Ambiental S/A and Cetesb —the Environmental Company of the State of São Paulo— and in compliance with the Terms of Commitment of Environmental Recovery (TCER) n. 24.186/2010, the project team identified the Piscinão de Capuava, a habitat outside of the site of the project that is part of the Pedroso City National Park. This habitat was selected to be restored via a compensatory planting program executed and engineered by a company hired by Aquapolo. This program initiated in March, 2012, consists in the planting of 1,417 trees of 50 different native species —such as, Ipê-amarelo, Ipê-roxo, Goiaba, Jabuticaba, Pitanga, Sombreiro, among others— in an area of 8,500 square meters.
		Source: *CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 192.* *CH2MHILL - ALPHAPLAN, "Fauna" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 192.* *Metaflora, Relatório de implantação projeto de revegetação margem do piscinão de Capuava (June, 2011).* *KL Engenharia e Consultoria Ambiental Ltda, Relatório do plantio compensatório TCRA n. 24.186/2010 (April, 2012).*
		RECOMMENDATIONS *The identification phase was concluded successfully, but no work was done to mitigate the impact of the new infrastructure. Some actions to improve in this category are, for example, preserving some natural portions of the site, creating connections between them or paths from those areas to bigger natural areas; sometimes these measures will entail the removal of existing barriers.*
	9	**Conserving**

NW 3.2 Control Invasive Species		This credit assesses the measures taken by the project to protect some habitats, by controlling or eliminating invasive species. Aquapolo conducted a planting of over 1,417 trees in an external site, called Piscinão de Capuava, which is part of the Pedroso City National Park, an area of 8,500 square meters. In this planting, made by an especific engineering company, was found some invasive species that needed to be controlled, in order to restore that habitat. The company, Metaflora, founded gramineas species - capim gordura, capim braquiara and napier - and invasive shrubs - vassourinha and fumo-bravo - spread all over the site. They also founded a specie of ant - formiga cortadeira, also known as saúva - that needed to be controlled. Therefore, the invasive species was controlled by the companny and also a maintenance plan was put in place to keep the trees free of invasive species and keep the soil in good conditions. This procedure will be done in every three months by the engineering company.
		Source: *Metaflora, Relatório de implantação projeto de revegetação margem do piscinão de Capuava (June, 2011).* *KL Engenharia e Consultoria Ambiental Ltda, Relatório do plantio compensatório TCRA n. 24.186/2010 (April, 2012).*
		RECOMMENDATIONS *In order to score higher in this credit, the invasive species needs to be totally eliminated. Comprehensive management plans for removal of invasive species are also an option for the team. Further than that, the project team should also develop programs to rehabilitate and restore the site to a pre-invasive state.*
NW3.3 Restore Disturbed Soils	**0**	**No Score**
		Aquapolo does not present any documentation that shows this kind of improvement on the site, so it cannot achieve a score. The opportunity that Aquapolo would have to restore disturbed soils is in its "Bota-espera site". This site is located in an external area of the project and it receives all excavated material taken off the site. Bota-espera site is located in a Permanent Protection Area (PPA) and hosts the soils until decide its destination; if it goes for recycling, back to the project site or landfills. This area is not working as its main purpose, restore the disturbed soils, and it is also prejudicing the protected area.
		Source: *CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012).*
		RECOMMENDATIONS *The project team should redefine its options and review "Bota-espera" system. They should take other options for locate the excavated materials and well as put in place some programs that promotes the restoration of the soils. In order to restore disturbed soils, measures should be taken to ensure the soils are able to perform their original functions (e.g. topsoil is used as topsoil, subsoil as subsoil).*
NW3.4 Maintain wetland and surface water functions.	**3**	**Improved**
		The Aquapolo project scored in this credit because it maintains and enhances one of the ecosystem functions described in the criteria: water quality. This project maintains the waterway's flow, the quality of its source, and its maintenance process. The existing river, Tamanduateí, and its stream, Meninos, are monitored by the Environmental Company of the State of São Paulo, Cetesb. This agency is responsible for monitoring the water bodies monthly. Related to the maintenance of the water sources, the project reuses wastewater from the STS ABC and saves potable water for community consumption, diminishing the demand for fresh water from its sources. Also, in treating the sewage from the STS ABC, it avoids this effluent ending up in the river.
		Source: *"Águas Superficiais", CETESB, accessed November 4, 2014, http://www.cetesb.sp.gov.br/agua/aguas-superficiais/124-programa-de-monitoramento* *"Trata Brasil", accessed November 9, 2014, http://www.tratabrasil.org.br/regiao-do-grande-abc-*

		recebe-maior-empreendimento-do-hemisferio-sul-para-a-producao-de-agua-de-reuso-meio-filtrante-online-noticias
		RECOMMENDATIONS *In this credit, the project should approach other four ecosystems functions (besides the water quality function): hydrologic connection, habitat and sediment transport. For the first one, the project should establish connection with its riparian floodplain with frequency. For the second, they need to provide an habitat survey of the waterbody and referenced areas, by recognized professional, and a plan to maintain or enhance the habitat for aquatic and riparian species by plantings and appropriate physical modifications. The third one, sediment transport, is through maintaining the sediments flow, do not interrupting it or removing any barriers, if appropriate. Reports from qualified professionals are also required for this last one.*
NW 0.0 Innovate Or Exceed Credit Requirements		*N/A*
	78	

CLIMATE AND RISK		
	Score	**AQUAPOLO**
CR1.1 Reduce Greenhouse Gas Emissions	**0**	**No Score**
		Documentation regarding the project's efforts to reduce greenhouse gas emissions was not found, therefore no score is given.
		Source: *CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012).*
		RECOMMENDATIONS *It is possible to measure and monitor the greenhouse gas emissions a project produces and create a program to mitigate their impacts. Carbon emissions released during the operation of the project should also be relevant. A restorative achievement in this credit means that the project results in carbon neutral or net negative carbon emissions.*
CR1.2 Reduce Air Pollutant Emissions	**0**	**No Score**
		According to the Preliminary Environmental Report regarding air pollution, Aquapolo must check for noxious odor to be in accordance with state law and the constitution. In this report, it is confirmed that the project does not produce odor due to the fact that the sewage from the STS comes in a secondary stage of treatment, not presenting a lot of organic components, therefore not producing odor. The report also states that the owner and the project team will aim to attend to standard levels of emissions and will be responsible to take necessary measures to avoid possible odors coming from the treatment station. The report does not present enough information to assess this credit. It would be necessary to have more complete information from a comprehensive assessment of air pollutants.
		Source: *CH2MHILL - ALPHAPLAN, "Emissões atmosféricas" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 61.*
		RECOMMENDATIONS

		As an industrial water production station, it is essential for Aquapolo to develop air pollutant studies to better serve the community in which it is inserted. The importance of these studies goes beyond the environmental impacts; it affects health issues and quality of life. If the project does not emit any air pollution, it will be good for the company image, and will provide a scientific database where Aquapolo can control and assess its impacts and be guided in future decisions. It is indispensable to this kind of project, inserted in urban space, surrounded by communities, with roads, bus and metro lines circulating it all around to conduct a specific air quality assessment.
CR2.1 Assess Climate Threat	**0**	**No Score**
		In the case of Aquapolo, this credit should be seen as an opportunity to show the project's effort in the procedures of the company safer in the case of disasters such as floods, higher ambient temperatures, rain seasons, and others. Aquapolo does have a contingency plan, but it is an overall view of possible events, in which flooding is addressed. It does not specify the adaptation of the project to that weather condition nor the conscious design of the project to recover from these situations.
		Source: *Aquapolo Ambiental S.A., Procedimento de atendimento à emergências (April 14, 2013).* *Odebrecht Ambiental, 'Cenários de emergência e descontinuidade: Estamos preparados?'*
		RECOMMENDATIONS *It is recommended that the project develop a comprehensive Climate Impact Assessment and Adaptation Plan. This plan would address climate threats and natural hazards. It should also present contingency plans to prepare the project for those disasters. Plans should include measures to prevent the events, alter operation conditions, and increase its ability to operate over a wider range of conditions. Moreover, the plan should assess the risk of changing operating conditions. Large scale projects have many impacts in the area where it is located. It is expected from this type of project a specific plan to protect the surrounding community and its own operations.*
CR2.2 Avoid Traps And Vulnerabilities	**2**	**Improved**
		In avoiding traps and vulnerabilities, Aquapolo has created a contingency plan to address potential emergencies that could occur whithin the project in the long term. The document identifies different scenarios, sets roles for leadership positions on decision-making, measures the level of the impact within the project operations and its surrounding communities, and the level of exposure in the media. This is a general plan that establishes roles and gives the Aquapolo team guidelines to deal with potential emergency scenarios. Nontheless, this plan does proof the project was designed taking into account the future and does not take a long view of the potential effects that resource depletion and/or climate change could have on the project.
		Source: *Aquapolo Ambiental S.A., Procedimento de atendimento à emergências (April 14, 2013), 9.*
		RECOMMENDATIONS *To score higher in this credit, it is necessary to work with the community and translate their needs into design criteria for the project. The current assessment is very well developed for the clients, but needs to improve on the community engagement side.*
CR2.3 Prepare For Long-Term Adaptability	**0**	**No Score**
		Aquapolo did not provide any report or assessment made based on these considerations.
		Source: *Aquapolo Ambiental S.A., Procedimento de atendimento à emergências (April 14, 2013).*
		RECOMMENDATIONS *To score in this credit, it would be necessary to develop plans and designs that address futures recoveries, restoration or rehabilitation from long-term change including desertification, beach erosion and loss of wetlands. Some of the strategies for adapting to long-term change may include: structural changes, decentralized systems, natural systems, alternative supply options, adaptive capabilities and site selection.*
	10	**Superior**

CR2.4 Prepare For Short-Term Hazards		In preparing the Aquapolo project for short-term hazards, the project team developed a Risk Evaluation Report to identify and quantify known risks. In the report 140 potential risks were compiled for all events that might result in a penalty or delay in commissioning of the Station of Industrial Water Production (SIWP). The risks have been grouped under the following categories: design, construction, operational, environmental, and social issues. For each risk the consequences were assessed together with any relevant mitigation measures that may exist. Potential mitigation measures included specific provisions in the project design, detailed studies on particular topics, and the establishment of new or revised working practices and procedures. Additional measures were considered and introduced to address selected key risks identified in the risk register.
		Source: *Scott Wilson, Risk Evaluation Report (November, 2009), 25, 28.*
		RECOMMENDATIONS *The project should think not only of planning after disasters but also of minimizing risks. To that end, the use of environmental restoration can be a strategy, because many hazards may be worsened by degraded environments. Restore and rehabilitate natural systems, such as wetlands to accommodate flooding.*
CR2.5 Manage Heat Island Effects	**0**	**No Score**
		In term of managing heat Aquapolo did not provide documentation in this area.
		Source: *Aquapolo Ambiental S.A., Procedimento de atendimento à emergências (April 14, 2013).* *CH2MHILL - ALPHAPLAN, "Emissões atmosféricas" in Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012), 61.*
		RECOMMENDATIONS *Many hard surfaces, such as rooftops and pavement, absorb a large percentage of the incident solar radiation, heating the surfaces and the surrounding air. This alters the microclimate around them, creating so-called heat islands. Providing reflective surfaces can decrease the amount of heat that is absorbed, alleviating the impacts of this received heat.*
CR0.0 Innovate Or Exceed Credit Requirements		*N/A*
	12	

OVERALL:	**358**	**AQUAPOLO**

Aquapolo-Industrial water production, Brazil

APPENDIX E: SOURCES

DOCUMENTATION PROVIDED
General Information.
Aquapolo Ambiental S.A., Capacitação e habilidade: Treinamentos.
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Grupoterra1, Relatório Final (March 13, 2012).
IPHAN, Parecer Técnico (April 9, 2012).
Prefeitura Municipal de São Caetano do Sul, Termo de parceria para instalação e operação de adutora de água em vías públicas do município que entre si fazem a prefeitura municipal de São Caetano do Sul e a empresa Aquapolo Ambiental S/A (March 11, 2011).
Prefeitura Municipal de Santo André, 3º Adiantamento ao termo de Compromisso (April 2, 2014).
Aquapolo Ambiental S.A., Transporte Público - vale transporte
Odebrecht S.A., Política de Identificação, Desenvolvimento, Avaliação e Integração de Pessoas na Organização Odebrecht (September 11, 2012).
AIG, Certificado de Seguro Ambiental (August 26, 2014).
AIG, Certificado de Seguro de Responsabilidade Civil Geral (August 27, 2014).
Camila Coelho, Foz do Brasil, Indicadores de Reciclagem de Resíduos.
Aquapolo S.A., Plano de longo termo e monitoramento (July, 2014).
Aquapolo S.A., Indicadores de manutenção (September, 2014).
Aquapolo S.A., "Redução da demanda contratada" in Redução de Energía: Cálculo de Alternativas.
Aquapolo Ambiental S.A., Uso de materiais - formulário de avaliação dos fornecedores.
Aquapolo Ambiental S.A., Relatório fotográfico Canteiro de obras Projeto Aquapolo.
Aquapolo Ambiental S.A., Segregação de resíduos.
Aquapolo Ambiental S.A., Redução de Energia: Cálculo das alternativas.
Aquapolo Ambiental S.A., Redução de Energia: Confiabilidade e eficiência (May 28, 2014).
VIS Technology, Análise para implantação de uma Usina Solar Fotovoltaica na Aquapolo Ambiental (May 09, 2014).
CH2MHILL - ALPHAPLAN, Relatório Ambiental Preliminar do Sistema de Adução de Efluentes Tratados para o Pólo Petroquímico de Capuava (February, 2012).
Aquapolo Ambiental S.A. / BiogariAmbientall Ltda., Contrato de prestação de serviços n. 044/2014: Análise em água, efluente e resíduo (Auguts 21, 2014).
Odebrecht, Avaliação Ambiental na EPAI, no trecho inicial da Adutora do Projeto Aquapolo (January, 2012).
Metaflora, Relatório de implantação projeto de revegetação margem do piscinão de Capuava (June, 2011).
Aquapolo Ambiental S.A., Procedimento de atendimento à emergências (April 14, 2013).