

## CENTER FOR SOLID WASTE TREATMENT, SEROPÉDICA (CTR RIO) - BRAZIL



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## EXECUTIVE SUMMARY

The Santa Rosa Center for Solid Waste Treatment, known as CTR Rio, is waste management center mainly consisting of a sanitary landfill located in Seropédica municipality, close to the city of Rio de Janeiro in Brazil. CTR Rio operates one of the largest landfills in Brazil, covering 2.2 square kilometers, and has operated since April 2011. About 10,000 tons of waste from Seropédica, Itaguaí, and Rio de Janeiro city are received per day to be treated in CTR Rio. When dump trucks arrive they are weighed and the waste is identified by categories, then the waste is deposited into the landfill to be covered with clay, avoiding the spread of odors. The leachate generated from the decay of organic matter is treated and transformed into recycled water. Also, the biogas produced by the breakdown of organic matter is led off to be flared. At present, CTR Rio is considered the most secure, modern, and efficient solution for treating solid waste in Brazil. The project has showed deep concern for the environment that surrounds the site as well as for the community. The project cooperates with society by implementing social projects and generating jobs, and benefits the environment by launching plans to monitor surface and groundwater, soil, and degraded areas. The project conforms to the National Solid Waste Policy in Brazil, which determines an appropriate allocation and treatment to waste without harming the environment. CTR Rio enabled the closure of the open-air dump areas of Gramacho, Seropédica, Itaguaí, which have polluted heavily the environment and natural habitat.

Ciclus, the enterprise that operates CTR Rio, has emphasized sustainability as a core value in its work. The project team established a sustainability management system through the Environmental Social Management Plan that adopts principles of sustainable development with stakeholder and community participation, environmental control, and programs for improving social problems. This plan is part of sustainable guidelines imposed by the Brazilian bank Caixa Econômica Federal, which lent US \$160 million to fund the project. Ciclus was founded in 2010 and is a partnership between Júlio Simões Transport Services Ltd and Haztec Technology and Environmental Planning. Ciclus has worked with a wide variety of stakeholders and specialized companies to carry out specific analytical procedures and to train professionals involved in the project. In order to build a relationship with the community and improve management, CTR Rio counts on a social communication plan, responsible for engaging the community and stakeholders of the project. The project has a department called CTR Rio Open Doors where communities and stakeholders can present their opinions, complaints, and desires. The project improved infrastructure integration by integrating the existing urban infrastructure into the project design and improving roads and streets of nearby communities. Nevertheless, in spite of working with several stakeholders to broaden the involvement and the understanding of the project, CTR Rio still needs to engage better in teamwork. Several companies (private and

municipal) have worked on the project from its implementation until it coming into operation. CTR Rio did not present reports or documents that monitor whether its teamwork has been working efficiently. An environmental and social management plan was imposed by the Brazilian bank Caixa Economica Federal in partnership with the World Bank, to create the Center for Environmental Education in July 2010.<sup>1</sup> This center, located in CTR Rio, serves for interacting with, informing, and educating local communities about environmental issues and recycling procedures. It also provides workshops to CTR Rio employees to develop skills and capacities. Besides the Center for Environmental Education, the project has undertaken several initiatives to engage and benefit the community. Among them are: a Social Inclusion Plan; a Plan for Environmental Education; and a Social Inclusion Plan for Waste Pickers.

CTR Rio has demonstrated a great interest in improving the quality of life of communities that have might be affected by the project. Several social programs have been implemented to engage society in the project, ensuring a positive impact on the functional aspects of the community. The project cared about the waste pickers who were affected by the closure of former open-dump areas (Seropédica and Itaguaí). Waste pickers are people whose income depended on picking recyclable waste from the open-air dump to sell to recycling companies. When these dumps were closed, many waste pickers did not have any support to restructure their lives. CTR Rio implemented the Social Inclusion Plan for Waste Pickers to compensate them for their loss of income, offering alternatives to reinsert them into the formal labor market or through the revitalization of the recycled waste cooperative and other inclusive businesses. In this center, area residents can learn more about the CTR Rio project, suitable practices, environmental concerns, and recycling procedures. All guidelines were developed through the environmental education plan. The center also provided annual workshops to update employees on waste management technologies and improve their skills. Beyond concern for social improvement, CTR Rio has helped to improve the urban landscape of Seropédica. The project has invested in and recovered public spaces through the reform and adaptation of 20 public squares in the municipality of Seropédica, and has performed drainage and pavement work in several parts of the districts of Jardim Maracanã, Santa Sofia, and Piranema in Seropédica. Therefore, the project has had positive effects on sustainable growth and development. To avoid disturbing the closest community – Vila do Chaperó, located 2 km from the site – CTR Rio has implemented a green belt around the site that works as a natural barrier to hold dust, odor, and noise. Still, there are some issues CTR Rio needs to perform better, such as encouraging alternatives modes of transportation to get to the site, improve community mobility and access, and minimize light pollution. Also, no concerns were showed to implement programs aimed at women, improving their skills and helping them move into the

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<sup>1</sup> Caixa Econômica Federal, “Marco socioambiental: aplicável a projetos de gestão integrada de resíduos sólidos e mecanismo de desenvolvimento limpo no Brasil” (Brasília, 2012).

job market.

In order to protect freshwater availability, CTR Rio characterized all basins and analyzed the quality of water before implementing the project. Also CTR Rio includes a comprehensive drainage system and incorporates design features to minimize negative impacts on surface and groundwater. The drainage system leads stormwater to two swales channelized on site, from which the rainwater is properly led to its natural watershed. In this manner, the project has created essential measures to address the runoff and successfully maintains wetland and surface water functions. Also, the waterproofing system ensures that the leachate generated by the accumulation of rubbish deposited does not reach and pollute any groundwater or surface water. Network sensors were spread in the area where the rubbish is dumped and covered with clay, in order to detect any trace of pollution in the soil. Thus the project has taken many measures to mitigate any pollutants generated by the leachate. Furthermore, the leachate produced by the decomposing organic matter is treated and transformed into renewable water to be used in the site. CTR Rio counts on some plans and programs to mitigate any negative impact on the hydrologic environment: the Program for Monitoring the Quality of Surface and Groundwater executed by National Institute for the Environment (INEA), which is responsible for collecting and analyzing the quality of water from the aquifer every three months; the Geotechnical Program, responsible for monitoring erosion, landslides, and any issues related to soil; and the Plan for Degraded Areas that has helped to restore any degraded area inside CTR Rio. Although CTR Rio has showed concern for its water functions, there are measures that still need to be taken to improve the system. Some of these include storage and reuse of rainwater, checking and management of potable water, and monitoring of the water system inside the project.

The project has not directly affected fauna and flora in the surrounding area. CTR Rio was implemented in area that had already suffered from human action and heavy grazing. The sanitary landfill is located in a rural area away from any environmental protected area. Nevertheless, in the environmental study assessment, the project team evaluated all animals and plants in the surrounding area as well as the features of the land. The project was implemented in agricultural/pasture flat land with clay soil. Both characteristics are good for installing a sanitary landfill. A good approach has been taken toward reducing excavated materials taken off site. All soil excavated is used to cover the rubbish. The clay used is also found in the site, reducing transport costs. There is a plan to periodically control pests. In terms of the material used to build the project, the project team should have given more attention to the resources (physical material, energy, and water use). The project did not present documentation that the construction materials were recycled or reused, or that they could be recycled/reused at the end of the project's life. At present, CTR Rio has not demonstrated that

it reduces overall energy use of the plant or any use of renewable energy sources.

To contribute to climate adaptation, CTR has launched the Plan for Mitigating Greenhouse Gas Emissions, based on the Kyoto Protocol. It aims to reduce greenhouse gas emissions by 40% between 2015 and 2018 and methane emissions by 50%. It is certified under the Clean Development Mechanism (CDM), offering carbon credits to other countries. CTR Rio has installed a pipe system to capture the biogas produced by the decay of organic matter. The biogas is led to the flares where the methane is transformed into CO<sub>2</sub>, which is less polluting. CTR Rio plans to use the biogas as a renewable energy source in the future. In terms of becoming a resilient project, CTR Rio has some gaps to improve on. The project has a plan to address short-term risk which mentions the measures that need to be taken in case of any damage to the system, though it does not explain how in detail. No plans were provided to reduce air pollution, monitor air quality, prepare for long-term climate change, or assess climate threat. If CTR Rio aims to be a resilient project, these issues should be addressed more carefully, since the infrastructure project is a landfill. If any natural or human disaster should happen to the project, CTR Rio needs to be prepared with resilience solutions to meet natural and social environmental needs.

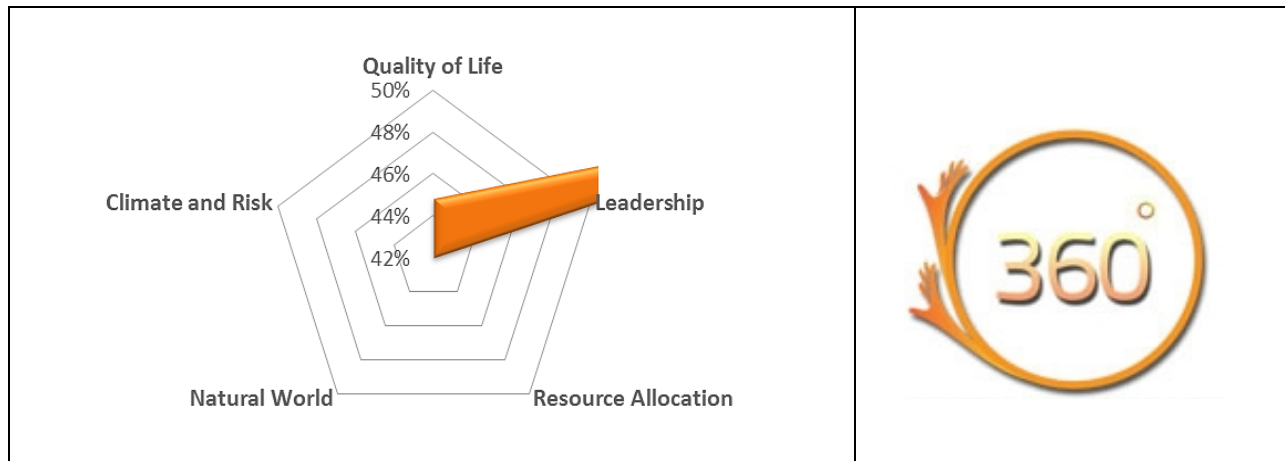


Figure 02: People & Leadership Award Summary of results

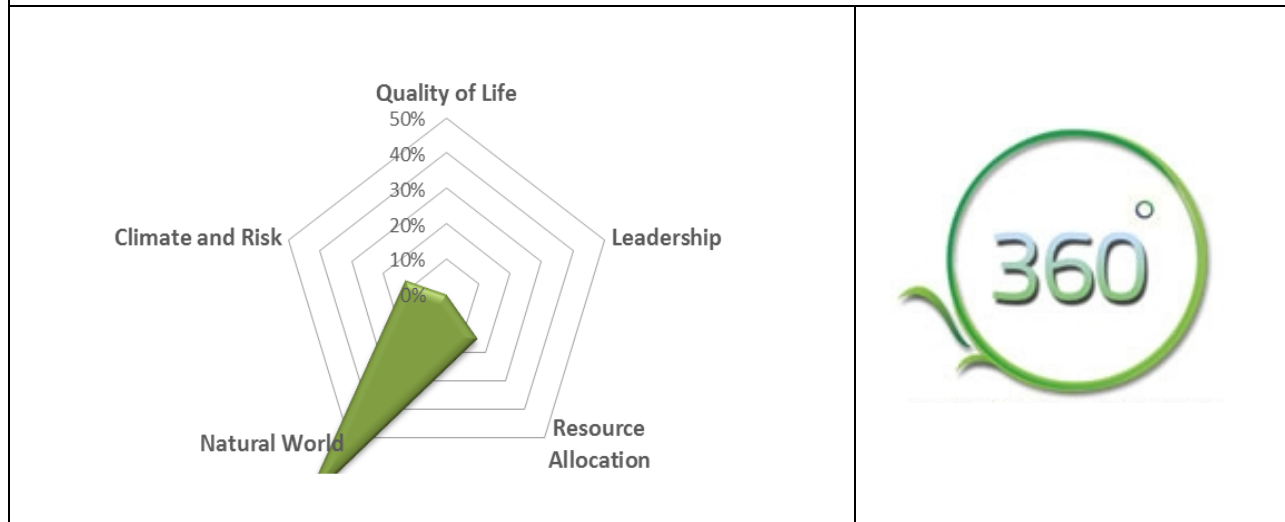


Figure 03: Climate & Environment Award Summary of results

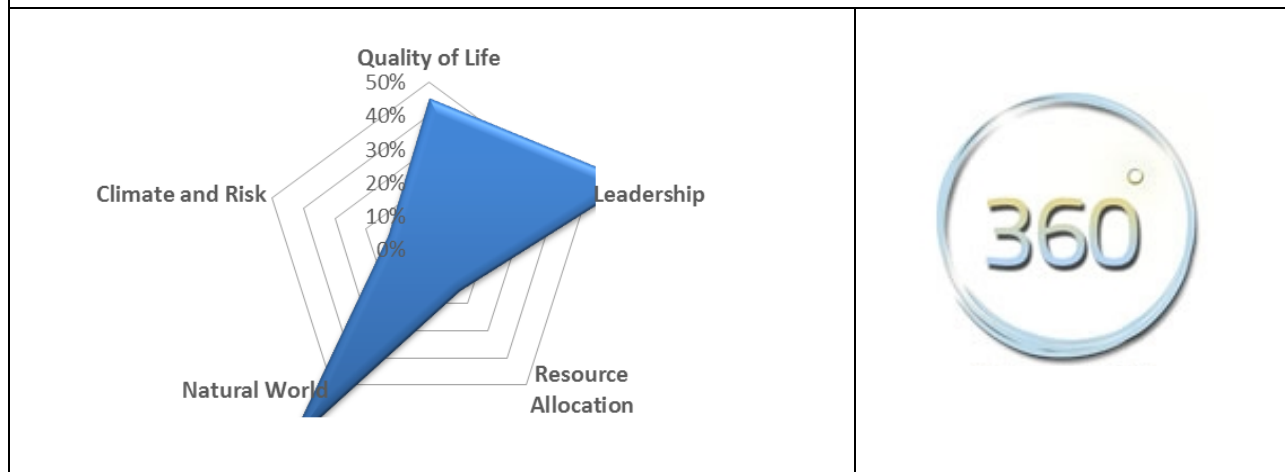


Figure 04: Infrastructure 360 Award Summary of results



## 1. PROJECT DESCRIPTION AND LOCATION

The Center for Solid Waste Treatment in Seropédica is a waste management project consisting of a sanitary landfill to dispose and isolate waste to reduce the risk of environmental pollution. The project is also known as CTR Rio (Centro de Tratamento de Resíduos do Rio de Janeiro), and it is located in Seropédica, about 79 km (49 miles) from the city of Rio de Janeiro. The center receives on average 10,000 metric tons of solid waste per day from the cities of Rio de Janeiro, Itaguaí, and Seropédica. The large amount of waste received corresponds to the waste generated in this metropolitan area that has a population of more than 15 million people. Currently, CTR Rio is one of the largest landfills for solid waste treatment in Brazil and complies with international standards for protecting the environment. CTR Rio infrastructure project contains a bioenergetic sanitary landfill, a center for leachate treatment, units to receive construction debris, a flare system to burn off methane, and a Center for Environmental Education.

To implement CTR Rio, the municipality of Rio de Janeiro opened a bidding process through which Júlio Simões Transport Services Ltda received the concession to provide solid waste management services for Seropédica, Itaguaí, and Rio de Janeiro. Júlio Simões Transport Services Ltda in partnership with Haztec Technology and Environmental Planning founded a special-purpose entity called Ciclus (formally, Sanitation and Renewable Energy of Brazil Inc., or SERB) to manage the solid waste treatment. Ciclus manages CTR Rio and seven waste transfer stations. Among the seven waste transfer stations, three were existing (Caju, Jacarepaguá, and Bangu) and four (Penha, Marechal Hermes, Tanque, and Campo Grande) were implemented to interconnect the system of solid waste management and provide services to Rio de Janeiro neighborhoods. COMLURB, the Municipal Company for Urban Cleaning of Rio de Janeiro, conceded to Ciclus the right to operate the Rio de Janeiro solid waste management. COMLURB is responsible of collecting the waste from streets and bringing it to the waste transfer station. From there, it is Ciclus's responsibility to transfer the waste to CTR Rio and carry out waste treatment there. According to the contract established between COMLURB and Ciclus, COMLURB will provide its services to Ciclus for about 180 months, as well as give a monthly pay to Ciclus estimated US \$2 million for the CTR services.<sup>2</sup> The estimated cost to implement the Center for Solid Waste Treatment was about US \$106 million.<sup>3</sup>

The system of solid waste management operates as follows: First, dump trucks collect the solid waste of each area and bring it to the closest waste transfer station where the waste is

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<sup>2</sup> COMLURB, Contract Number 318/2013 (Rio de Janeiro, 2013).

<sup>3</sup> The amount of the cost was presented as BRL 400 million by the project sponsor. Estimated exchange rate: BRL 3.75 = US \$1 for the period of November 2015 to December 2015. This period was based on the construction timeline provided by the sponsor.



transferred to large trucks. Then, large trucks transport the waste to CTR Rio, where the trucks are weighed on arrival and the waste is identified by category. The second step is the proper treatment of the solid waste. The waste is deposited in landfill cells, which are areas prepared to receive the waste. There the waste is compacted and covered by clay to avoid pests, diseases, and bad odors. The rubbish remains in the cell to undergo the decomposition process. Once decomposed, the leachate (liquid generated by the decay of organic matter) is collected through drains and led to a covered reservoir. In this reservoir, which is covered to avoid bad odors, starts the process to turn leachate into reusable water. Currently, the biogas (composed of methane, carbon dioxide, hydrogen sulfide, and moisture) generated by the decomposition of organic matter is collected and flared to transform methane into CO<sub>2</sub> before being released to the atmosphere. By doing so CTR Rio received Certified Emission Reductions credits from the United Nations (CERs), called carbon credits. CTR Rio has followed the Clean Development Mechanism (CDM) framework of the Kyoto Protocol, and also intends to transform the biogas into renewable energy for the facility's own use. Also, CTR Rio plans to convert the biogas into natural gas to distribute via a natural gas grid connected to the Brazilian National Electricity Grid. According to the Component Project Activities Design Document of the CDM, this will also contribute to increase renewable energy in Brazil, helping the country to attain the goals outlined in the National Climate Change Plan.<sup>4</sup>

The CTR-Rio implementation is comprised of various phases that include the deployment of the landfill cells and the biogas capture system, the construction of access roads, the remediation of the open dumps in Seropédica and Itaguaí, among other requirements and expansions. The majority of construction works of the implementation phases spans between 2011 and 2014. CTR Rio began operations after meeting all the required permits, environmental licenses, and conforming to the National Solid Waste Policy in Brazil. The National Solid Waste Policy is a law that aims to contribute to the elimination of open-air dump areas and establish planning instruments at national, state, micro-regional, metropolitan, and municipal levels to increase the sustainability of solid waste management. It requires that all municipalities develop solid waste management plans. Based on this policy, CTR Rio closed the many open-air dump areas in Seropédica, Itaguaí, and Jardim Gramacho (in Rio de Janeiro). Jardim Gramacho was the largest open-air dump area in Brazil operating without an environmental license, thus contaminating the natural environment. Jardim Gramacho as well as other open-air dumps provided an informal income to people who scoured landfills for any recyclable waste that could be sold to recycling companies. When these open-air dumps were closed, many waste pickers lost their income. CTR Rio counts with a specific project to assist the waste pickers community of Seropédica and Itaguaí. The waste pickers from Gramacho became responsibility

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<sup>4</sup> Clean Development Mechanism, Executive Board (2014), 2.

of Rio de Janeiro city community plans. CTR Rio infrastructure project received an investment of about US \$160 million from the Brazilian bank Caixa Econômica Federal and has followed the guidance of the environmental and social management plan as imposed by this bank.<sup>5</sup> Through this plan and in partnership with the World Bank, the Center for Environmental Education was created in July 2010.

To implement the project, all topographical, morphological, and hydrological features of the site were studied and documented in the Environmental Impact Assessment (EIA). The project has an area of approximately 2.2 square kilometers, and its excavations follow a pyramidal geometry. It avoids using the whole area at once and might extend its lifespan, currently estimated to be about 26.8 years.<sup>6</sup> The landfill is composed of two independent areas, which allows the rubbish to be grouped by similar characteristics in specific areas. The area called AS1 has 16 cells, and final volumetric capacity will be about 35,586,000 m<sup>3</sup> of waste. Area AS2 has 16 cells and its final capacity will be about 21,284,139 m<sup>3</sup> of waste.<sup>7</sup> CTR Rio is able to map the areas to monitor and control effectively the impact on the environment. The project has taken precautions not to contaminate the natural environment. Since CTR Rio has a certain proximity to an aquifer, the National Institute for the Environment (INEA) set several requirements to protect and preserve the groundwater and any other water source adjacent to the project. CTR Rio has adhered to all requirements and paid close attention to monitoring water. Soil protection is guaranteed by a complete waterproofing system. Among the soil and the rubbish, there are several protective layers: clay, one blanket of high-density polyethylene (HDPE), sand, geotextile fabric, a second layer of clay, sensors with 300 electrodes, a second HDPE blanket, and finally the third layer of clay. In each of the cells a network of sensors is deployed every 20 meters (65 feet).<sup>8</sup> In case of any break in the web, the electric current flows, and the circuit between the poles is closed, generating information that goes to the control boxes. The data is analyzed by a specific computer software that generates graphs and reports based on the results of monitoring. Because of its high sensitivity, the electrodes can detect any leakage.

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<sup>5</sup> Caixa Econômica Federal, "Marco socioambiental: aplicável a projetos de gestão integrada de resíduos sólidos e mecanismo de desenvolvimento limpo no Brasil" (Brasília, 2012).

<sup>6</sup> Cepollina Engenharia e Construções Ltda, "Centro de tratamento e disposição final de resíduos sólidos – CTR Seropédica, avaliação da vida útil total" (São Paulo, 2014).

<sup>7</sup> Cepollina Engenharia e Construções Ltda, "Memorial descritivo do projeto do centro de tratamento de resíduos sólidos de Seropédica" (Seropédica, 2010).

<sup>8</sup> Ibid.

## 2. APPLICATION OF THE ENVISION RATING SYSTEM

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

The criteria for the levels of achievement vary from credit to credit, but generally an “improved” level of achievement is awarded for performance that slightly exceeds regulatory requirements. “Enhanced” and “superior” levels indicate additional gradual improvement, while “conserving” often indicates performance that achieves a net zero or neutral impact. “Restorative” is the highest level and is typically reserved for projects that produce an overall net positive impact. The Envision system weighs the relative value of each credit and level of achievement by assigning points. Credit criteria are documented in the Envision Guidance Manual, which is available to the public on the ISI<sup>9</sup> and Zofnass Program<sup>10</sup> websites.

## 3. QUALITY OF LIFE CATEGORY

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

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<sup>9</sup> [www.sustainableinfrastructure.org](http://www.sustainableinfrastructure.org)

<sup>10</sup> [www.zofnass.org](http://www.zofnass.org)

## **Purpose**

The Purpose subcategory addresses the functional assets of communities, such as growth, development, job creation, and the general improvement of quality of life. Amongst the positive outcomes from infrastructure projects are community education, outreach, knowledge creation, and worker training.

In improving quality of life, the project identified and addressed the needs of the community. CTR Rio has engaged the community and other project stakeholders through the Social Inclusion Plan. Based on this plan, CTR Rio is able to improve upon existing community conditions, and address potential adverse impacts to the affected community. Through the closure of the open-air dumps in Itaguaí and Seropédica, and Jardim Gramacho, CTR Rio ultimately was able provide a better quality of life for the people who depended on informally picking waste as a source of income. The project created a program to assist these groups and has provided support for COOTRASER (the local waste pickers' cooperative) and encouraged their initiatives. However, to better achieve in this section, CTR Rio must present reports demonstrating efforts to monitor and ensure community improvement and satisfaction.

To stimulate sustainable growth and development, CTR Rio has directly and indirectly generated new jobs. CTR Rio has promoted jobs in Seropédica and Itaguaí by restoring public squares, and paving roads, among other activities. CTR Rio employs about 185 people from different areas, including the neighboring towns of Seropédica and Itaguaí. By implementing biogas flaring, CTR Rio has mobilized new job capacities as skilled labor is needed to operate the flares and other technical devices used in the landfill. CTR Rio has motivated the establishment of cooperatives for waste pickers and thus has enhanced capacity, which increases the productivity of the community. Moreover, CTR Rio has incorporated a new Center for Environmental Education to stimulate public participation in the preservation of natural resources and the search for solutions to identified environmental problems, as well as in promoting local sustainable growth.

In terms of developing local skills and capacities, the project team considered community needs and has established specific projects to attend to the needs of disadvantaged groups, such as the waste pickers. The Social Inclusion Plan for Waste Pickers has assisted former waste pickers with reintegration into the formal labor market and fostered education for children and adults. By incorporating new technologies into the project, CTR Rio has been attracting skilled labor at different levels of expertise to operate technological devices.

## Well-being

The Well-being subcategory addresses issues related to the comfort, health, and mobility of local communities and project workers. Safety should be positioned as an integral part of the planning process, and the project should promote the expansion of alternative modes of transportation.

To enhance public health and safety, CTR Rio assessed the risk of implementing a landfill within the context of the environment and nearby communities. Significant risks were identified and characterized, such as bad odors, disease, and leachate leaks which could contaminate waters. Security control measures were adopted during the operation of CTR in order to guarantee the safety of employees and the quality of its services. In order to minimize noise and vibration, CTR Rio has a green belt that serves as a natural barrier and blocks dust, odor, and noise, thus protecting the neighboring community of Vila do Chaperó, located 2 km from the project site. Biannually, CTR implements precautions for environmental noise, based on the guidance of the Brazilian National Council of the Environment, which defines the criteria and patterns of acceptable noise emission levels. However, there is no evidence of noise level reductions during or after the construction. No documents were provided showing the monitoring of noise levels in accordance with Brazilian regulations. In terms of minimizing light pollution, the project has been using lamps that produce less light pollution than other technologies commonly used for public lighting. However, CTR Rio still needs to improve on its lighting strategies, as the project has not shown evidence of increasing emphasis on the prevention of light spillage or preserving or restoring the night sky.

With regard to improving community mobility and access, the project has facilitated the flow of trucks and vehicles to the CTR Rio site. The main access road to the site has been paved, as well as the access roads from the municipalities Seropédica and Itaguaí. The waste transfer stations were strategically placed near CTR Rio to shorten transfer distances, and ultimately minimize vehicle traffic in both municipalities and Rio de Janeiro. CTR Rio performs periodic inspections of the access roads and other areas affected by the landfill, in order to reduce traffic congestion during the construction and operations of the project. Still, the project needs to address the community's long-term access and efficiency of mobility. CTR Rio still needs to encourage the use of alternatives mode of transportations to reach the site. There are two shuttle buses provided to transport CTR employees to the project. One is linked to the public municipal transportation and the other is a private shuttle managed by Cooperative of Transport. Although CTR Rio is a walkable distance from nearby communities, no bikeways, pathways, or other modes of transportation have been incorporated into the design of the project. To improve site accessibility, safety, and wayfinding, CTR Rio has to present plans that

demonstrate how the project has restored safety and access in the adjacent neighborhoods. Plans for access to and egress from the project during an emergency were implemented and approved by the fire department. Signposts and strip paintings on the ground have been expanded to access CTR Rio along Chaperó road and Da Conquista street through a specific project presented to the Department of Roads.

## **Community**

The Community subcategory addresses issues that can improve the site's surroundings. An infrastructure project needs to preserve views and natural features, as well as incorporate the local character of the built environment into the design.

CTR Rio has room for improvement in this subcategory. The project attempts to preserve the historical and cultural resources of the community by implementing a social inclusion plan, as well as a social inclusion plan for waste pickers. This plan aims to engage the community to better understand community desires. However, these plans did not show any results for preservation, or net benefits to historical and cultural sources. The project has not conducted a feasibility analysis to determine whether or not preservation or the improvement of resources should be incorporated into the project.

The project tried to preserve views and local character by minimizing most of the impacts of a landfill in a rural area. The project implemented a greenbelt, which helps to block views of the landfill from the outside. This greenbelt contains only local plants as a way to better integrate with the natural landscape, thus enhancing the project's aesthetic quality. To restore areas inside the project, CTR has implemented a plan for degraded areas. However, the project has to improve the local character of the communities by demonstrating the views of the project from nearby communities, and/or whether the project has helped to restore views for the closest communities.

In order to enhance public space, the project restored 20 public squares in Seropédica, as well as performing drainage and paving work in several parts of the districts of Jardim Maracanã, Santa Sofia, and Piranema, in Seropédica. Additionally, the project helped to restore the banks of the Guandu River, which is especially important to the state of Rio de Janeiro; it also helped to prepare and monitor the recovery project of the former open-air dumps of Seropédica. Nonetheless, the project has not provided any feedback from the community or other stakeholders regarding their satisfaction with the restored public spaces.

## **Vulnerable Groups**

The Vulnerable Groups subcategory addresses how the project contributes to quality of life of women and diverse groups. It is important to identify and assess the needs and constraints of different groups for them to provide benefit to the project and/or to benefit from the project's initiatives. CTR Rio has not shown any performance in this subcategory, having received no score for each credit.

CTR Rio has to better approach the needs of women and diverse communities. The project did not score in this subcategory due a lack of documentation, information, and plans. For this subcategory CTR Rio should promote the participation of women and diverse groups in consultation processes; thus, the project can address social and gender-based disparities, and ensure that benefits are equitably distributed throughout the community.

For stimulating and promoting women's economic empowerment, the project has to provide job training and skills enhancement for women. The project may also enhance human capital, and create plans to target women-owned businesses for opportunities associated with the infrastructure project.

CTR Rio needs to evaluate whether the project has been located, designed, and constructed in a way that understands the mobility needs of women and diverse communities. The project has not adopted strategies to improve upon the safety of public transportation, and/or nonmotorized transportation for women and children.

## **4. LEADERSHIP CATEGORY**

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

### **Collaboration**

The Collaboration subcategory addresses the importance of including input from a wide variety of stakeholders in order to fully understand synergies, savings, and opportunities for innovation. This type of collaboration necessitates a new kind of leadership and commitment

from the project team as well as new ways of managing processes.

CTR Rio has established sustainability as a core value, and has provided effective leadership and commitment in order to achieve its goals. Through the environmental and social management plan of Caixa Econômica Federal, CTR Rio has been committed to facilitating sustainable development by improving on the treatment of solid waste, providing jobs, attracting the private sector to participate in the project, improving the quality of life of the local community, increasing governmental participation, protecting the natural environment, and reducing greenhouse gas emissions.

The project has provided for stakeholders to become involved in the project. CTR Rio created a social communication plan that aimed to communicate strategies to the community. The aim is to develop plans that can attend to the needs of the community affected by the project. This plan has also worked to build relationships between stakeholders. Through this plan, the CTR Open Doors department was created, which is located in the Center for Environmental Education and serves as a communications channel between the project and the community as well as other stakeholders. In this department, CTR employees are available to hear the opinions and desires of the public with regard to the infrastructure project, or plans for the communities.

In establishing a sustainability management system, members of the CTR Rio team have written reports to quantitatively monitor and manage the processes, which helps to facilitate improvements in decision making. In addition, an environmental audit is conducted annually to verify if the project's activities have attended to the goals and vision that have been proclaimed by the team project. However, CTR Rio still needs to develop a list of all of the environmental, economic, and social aspects of the project that are related to sustainability.

Additionally, the project team has to better approach collaboration and teamwork. The team members' primary objective is in meeting the project requirements, whereby the project is delivered through the different tasks of various groups that primarily work independently. CTR Rio should better recognize the importance of working together.

## **Management**

The Management subcategory covers how a broader and more comprehensive understanding of a project can allow a team to see and pursue synergies between systems, either within the project itself or with larger infrastructure systems, thus leading to new ways of managing the project while increasing sustainability and useful life.



In pursuing by-product synergy opportunities, CTR Rio has shown a strong performance. The project has used reusable water for humidifying on-site roads and cleaning trucks. This water comes from the treated leachate, which is generated from the decomposition of organic matter. Additionally, CTR Rio was designed to minimize project costs by using a pyramid-shaped site geometry. This shape reduces the use of geomembranes and soil waste by utilizing excavated soil to cover the solid waste. When the biogas begins to be used for energy generation, the performance in pursuing by-product synergy opportunities will be higher.

In terms of improving infrastructure integration, CTR Rio has performed well. The project linked the existing nearby infrastructure with the project design. By implementing CTR Rio in an area that is adequately surrounded by existing roads and near the waste transfer locations, the project has optimized the system as whole. Additionally, the project has restored municipal squares, paved streets, and created more roads, which have helped help improve the infrastructure of the local communities. Through these restorative actions CTR Rio has helped to enhance community efficiencies and effectiveness.

## **Planning**

The Planning subcategory considers taking a long-term view of the project in order to greatly increase its sustainability. This approach necessitates the understanding of planning regulations in order to avoid pitfalls and effectively plan for the future.

The project has incorporated plans and programs to assess long-term monitoring and maintenance. Among these are the program for monitoring the quality of surface water and groundwater and the plan for recovering degraded areas. These plans help to monitor whether the project is functioning as designed and environmental impacts have been prevented or mitigated. At the time of this evaluation, CTR Rio was developing a plan for emergency hazards. This plan will outline steps to be taken in case of accidents or emergencies, and measures that must be taken to control the damages caused by human actions or natural catastrophes. In order to monitor the consistency of the work, the project has created reports to ensure that each person within the project has been working properly to monitor and maintain the constructed works.

The project team worked with the municipalities as well as environmental, state, and federal agencies to minimize conflicts with public policies. Several plans and public meetings were requested to address the requirements imposed by federal and municipal laws and policies. CTR Rio did not need to address conflicting regulations and policies. Nonetheless, the project

could have demonstrated practices to address new problems arising from sustainability issues.

CTR Rio has an estimated 26.8 years as its initial lifespan; in order to achieve this, all programs within the project must achieve expected results. For example, CTR Rio has implemented programs to make the community aware of the process to properly recycle waste, and has invested in environmental education and supported local cooperatives to avoid recyclable materials ending up in the landfill. These measures may help to extend the lifespan of the landfill. Additionally, the design of the project itself may help to extend its lifespan as well.

## 5. RESOURCE ALLOCATION CATEGORY

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

### Materials

The Materials subcategory seeks to minimize the total amount of materials used as a primary consideration for infrastructure projects. Minimizing materials reduces the amount of natural resources that must be extracted and processed, as well as the energy involved in the production and transportation of such materials. CTR Rio still has room for improvement in this subcategory, as a lack of information has been presented for most of the subcategories.

ICTR Rio has not shown any documentation regarding the percentage reduction in net embodied energy as outlined in a life cycle energy assessment. The project should consider the materials to be used in the project's construction, as well as the materials to be used for maintenance and operations during the life of the project.

The same attention must be given to supporting sustainable procurement practices. The project did not present evidence that materials were acquired from sustainable sources, as certified by reputable third-party accreditation and standard-setting organizations. The project team has stated that construction waste was used to build internal roads and paved sidewalks. However, the team did not evidence the percentage of recycled materials used in the project. CTR Rio must provide an inventory of materials used in order to assess materials that may have reuse

potential, accompanied by design documents showing the location and weight or volume of reused structures or materials.

CTR Rio has not received any score for diverting waste from landfills and providing for deconstruction and recycling, due to the lack of information presented. For diverting waste from landfills, the project team has only identified potential destinations for waste generated on site, sending the waste to a recycling cooperative in the municipality of Seropédica. No percentage of the total waste diverted from disposal was evidenced. However, the Environmental Impact Assessment (EIA) does state that after its closure, Class II landfills and household waste landfills can be reused as parks; however, no plan to upcycle the project into a park has been presented.

CTR Rio did receive a score for reducing excavated materials taken off site, with the clay used to cover the waste in the landfill as an example. The clay is found in a reservoir on the site, thus significantly reducing the transportation needs for this raw material and ultimately minimizing transportation costs and impacts. Additionally, the trees that have been planted in the greenbelt are local, and diminish the likelihood of plants being degraded during transportation. All soils that were excavated on site have been used to cover the waste, pave inner roads, or construct embankments and correct gradients. These measures count toward the use of regional materials, and reduce the amount of excavated materials taken off site.

## **Energy**

The Energy subcategory addresses the importance of reducing overall energy use, particularly from nonrenewable sources.

CTR Rio performed lowest in this subcategory of any of the subcategories within the Envision framework. More attention is needed to better address this topic. Although there are estimates for CTR Rio's energy consumption in the EIA, the analysis does not show any reductions of overall operations and maintenance energy consumption throughout the project's life cycle.

In terms of using renewable energy, the project performed at the lowest level possible. In the future, the project intends to generate renewable energy through the use of biogas; however, CTR Rio needs an effective energy plan to support a better score.

The commissioning and monitoring of the performance of energy systems must be developed and implemented in order to quantify and qualify sustainable, long-term energy use. Additionally, in order to enhance the project's performance in this area, the project team needs

to document the annual percentage of renewable energy used to meet energy needs.

## **Water**

The Water subcategory emphasizes the importance of reducing overall water use, particularly that of potable water, amid the changing climate and increasing population which pose risks to future water security. Monitoring and studying water availability as well as looking for alternative water resources are possible ways to improve performance here.

With regard to protecting freshwater availability, CTR Rio still needs to replenish the quantity and quality of surface water and groundwater supplies to levels that meet undeveloped, native-ecosystem conditions. All basins were characterized, and the quality of water was analyzed before implementing the project. Additionally, CTR Rio has included a comprehensive drainage system, and incorporated design features to minimize negative impacts on groundwater and surface water. It has also studied the water flows of the Valão do Neves and Brejo Micro basins, which could potentially be affected by implementing the landfill. The project has carefully taken measures not to alter the natural fluctuations of flows for the receiving water ecosystem.

Although CTR Rio has attempted to reduce potable water consumption, there are still further measures which should be taken. The recycled water that comes from the treated leachate effluents has been used just to humidify inner roads and wash trucks. This recycled water could be used for other internal purposes as well, such as flushing toilets. The water used to clean machinery and patios is well water, not recycled water. There is no documentation indicating the level of reductions in overall potable water consumption, or promotion of the use of recycled stormwater.

CTR Rio also has to provide more documentation that proves the monitoring of water performance during operations. The project team has stated that it uses recycled water for internal purposes, but no documents were provided that show the monitoring of this water. It is important to integrate the water system in order to enhance the efficiency of the project in terms of reducing costs and furthering sustainability.

## 6. NATURAL WORLD CATEGORY

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

### **Siting**

The Siting subcategory addresses the fact that infrastructure should be sited so as to avoid direct and indirect impacts on important ecological areas. Projects should avoid areas of high ecosystem value, or those that serve as diverse habitats. Using previously developed or disturbed land is ideal to prevent further damage to the environment, improve land value, and remediate contaminated brownfields.

In terms of preserving prime habitat, CTR Rio performed well, as the site was previously a farm that had been modified by human activity and did not contain natural vegetation or prime habitat onsite. However, in order to ensure the protection of the nearby environment, environmental protection areas were identified as were aquifers, basins, and water bodies. It was concluded that the environmental protection areas have not suffered any direct or indirect impacts as a result of the project, and habitats remain as undisturbed as possible.

Although the project was developed on a hydrological system that presents basins, aquifers, and vernal pools, CTR Rio has shown concern for protecting wetlands and surface water. The leachate produced by the decay of organic waste can contaminate the soil and waters; to avoid this, CTR Rio has taken all measures to avoid contamination by leachate, such as incorporating a drainage system to improve runoff on site. To preserve floodplain functions, the project has not significantly changed the topography and runoff of the site. It was ascertained that the area has never suffered from flooding; additionally the drainage system was implemented to help drain the area and avoid flooding. CTR Rio needs to improve its flood emergency contingency plans. The project team has not shown concern for a flood emergency evacuation plan for the entire site. However, overall, in order to protect surface waters and groundwater, CTR Rio has taken all measures to mitigate any contamination by leachate.

As presented in the EIA, the land was previously used for pasture and presented some areas of degraded vegetation, but CTR Rio has not shown evidence of considering whether the land was prime farmland or had potential for other agricultural activities. Nonetheless, the site had great advantages for implementing a landfill project. All morphological, topographical, and geological

features were evidenced in the EIA, which characterized the area as flat and not susceptible to erosion, thus avoiding adverse geologic formations and reducing the risk of natural hazards. The project has also avoided unsuitable development on steep slopes, and has taken measures to avert landslides provoked by trucks or leachate movements. Two programs were implemented regarding soil issues. The geotechnical program is responsible for monitoring erosion, landslides, and adverse geology; and the plan for degraded areas is responsible for controlling and recovering degraded areas, thus preventing the spread of degradation. These plans help sustain local environmental quality during the operations phase of CTR Rio.

The project could not avoid being implemented on a greenfield, as it needed to be far away from the city. The Envision assessment considered the site a greenfield because it is in a rural area. However, the project enabled the closure of open-air dump areas in Seropédica, Itaguaí, Gramacho, and Gericinó. Cliclus has been responsible for monitoring the former open-air dump of Seropédica, in terms of its geotechnical and environmental conditions. No plan has been presented to turn the former open-air dump of Seropédica into a green area.

Additionally, in order to get its operating license, CTR Rio needed to attend to constraints imposed by National Institute of the Environment in accordance with Brazilian forestry code. As the project is an infrastructure project located in a rural area, the forestry code determines that an area equivalent in size to 20% of the project's land area needs to be destined for environmental use or revegetation. CTR Rio acquired this percentage from another site and donated it to the municipality, thus meeting the requirement of the law. The project also attended to another constraint that determined that CTR Rio should cooperate with the Guandu River project by planting native trees on its banks. CTR Rio met all requirements related to the natural environment.

## **Land and Water**

The Land and Water subcategory calls for minimal impacts on existing hydrologic and nutrient cycles, by assessing whether or not projects are taking particular care to avoid the introduction of contaminants through stormwater runoff or the use of pesticides and fertilizers.

CTR Rio has shown great efficiency in managing the existing hydrology of the site. In order to manage stormwater, it installed a drainage system throughout the site to collect rainwater and ensure that it does not carry leachates to watersheds. To install these drains, first the topography of the land was evaluated. Although the land presented efficient natural runoff, after implementing the project it was necessary to make some minimal corrections to gradients in order to facilitate water flow to natural watersheds. Additionally, two narrow swales that

crossed the site were identified. These swales (Valão do Brejo and Neves) have been channelized to reduce the negative impacts associated with increased runoff. Collected rainwater is led to these channels, which then lead to cisterns to be released to the Piranema River in a manner that does not affect its natural flow. Furthermore, trees have been planted along the CTR Rio perimeter through the greenbelt project, creating a buffer area that helps to absorb rainwater. However, as a way to improve in this subcategory, CTR Rio should present evidence of rainwater or stormwater harvesting that could be used for things like irrigation and flushing toilets, among other uses; and also demonstrate the percentage of increased soil permeability or storage capacity.

In order to prevent surface water and groundwater contamination, the project contains a waterproofing system that was installed on the site to keep leachate from reaching groundwater. This system is made with a double layer of high-density polyethylene thermoplastic, as well as compacted clay, geotextile, concrete blanket, and high-sensitivity sensors to detect possible leaks, thus avoiding any contamination from leachates. To monitor water quality, the project launched a Program for Monitoring the Quality of Surface and Groundwater. This program periodically examines the water quality from water bodies and aquifers in the site.

The project planted native plants in order to minimize the use of pesticides and fertilizers; this is outlined in the Plan for Degraded Areas. However, it is important to identify which fertilizers and pesticides have been used, in order to avoid harm to the environment and not contaminate waters.

## **Biodiversity**

The Biodiversity subcategory focuses on how infrastructure projects should minimize negative impacts to natural species and their habitats, both on and near the site. Special attention must be paid to avoiding the introduction and proliferation of invasive species, as well as the fragmentation of habitats and hindering of animal movement.

CTR Rio has identified all possible fauna and flora of the area, and has found that the project has not negatively impacted it. No rare or endangered animals are found in the area, and the site is mostly used by birds for landing and foraging. The vegetation located in the area, or in surrounding areas, consists of pastures or remnant secondary vegetation; only about 0.5 ha of this secondary vegetation was removed by the project. To minimize any impacts caused by the project, a greenbelt has been implemented around its perimeter. This buffer zone may link existing habitat, and serves as a new habitat for local species.

CTR Rio has demonstrated a robust approach to solving the problem of controlling invasive species. As the infrastructure project is a landfill, even if all waste were to be covered and treated, the project could attract undesirable pests such as rats and fleas, among others. In order to control pests, CTR Rio relies on periodical evaluation through certification (Pest Control Certificate), which ensures that pests are being eliminated.

CTR Rio has properly implemented reuse practices to restore disturbed soil. The process of clearing the area and preparing for project implementation was essentially to remove any inappropriate materials from the site and dig out the area where the waste was to be deposited and made ready for treatment. According to the program for degraded areas, some areas of the site needed restored soil to grow native plants. Therefore all of the soil that was removed was reused on site, especially in the greenbelt perimeter.

As for maintaining wetland and surface water functions, the project has helped to restore ecosystem functions by maintaining hydrological connections and sediment transportation. The project has implemented a plan for monitoring groundwater and surface waters. Before implementing the project, the waters were analyzed for comparison with later analyses, which has helped to guarantee water quality.

CTR Rio has a greenbelt around its perimeter and has helped in revegetating the banks of the Guandu River. In this manner, CTR Rio has fully restored disturbed functions, ensuring water quality and enhancing natural habitat.

## 7. CLIMATE AND RISK CATEGORY

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

### **Emissions**

The Emissions subcategory aims to understand and reduce dangerous emissions, both greenhouse gas emissions as well as other pollutants, during all stages of a project's life cycle. Reducing these emissions minimizes short- and long-term risk to the life cycle of the project.



CTR Rio has demonstrated a great concern for reducing greenhouse gas emissions. The project just released a Plan for Mitigating Greenhouse Gases based on Kyoto Protocol requirements, and also approved by the National Environmental Institute of Brazil, CDM assessment, and Caixa Econômica Federal Waste Management and Carbon Finance Project. The plan aims to reduce by 40% the emission of carbon gas until the end of 2018, and about 50% of methane emissions. Since the plan has just been approved, the inventory was based on data produced in 2014, when 98.4% of greenhouse gas emissions came from waste decomposition. Nowadays, CTR Rio has a system to capture the biogas produced by decomposing organic matter. The biogas is captured by special tubes and led to flares, where the methane is burnt and transformed into CO<sub>2</sub>, which is less polluting than methane. The project also intends to transform the biogas into renewable energy, which can be used for electricity generation. CTR Rio was the first Brazilian institution to receive Certified Emission Reductions (CERs), or carbon credits, from the United Nations. The Caixa Econômica Federal (the Brazilian bank that provides financial help to the project) participates in the carbon market and has guaranteed assistance in selling carbon credits generated by CTR Rio.

The Plan for Mitigating Greenhouse Gas Emissions is a great measure since there are no laws or regulatory incentives to enforce the capture and flaring of methane in landfills. This plan is a step improvement in carbon emissions reductions performed by the CTR project, but since it has been just approved, there are shortages of data. Once the plan begins to work effectively and reach its goal, CTR Rio might have a better approach to life cycle carbon assessment, quality of air, and climate impact.

CTR Rio has also created measures to reduce air pollution emission, but the project still needs to provide calculations for reductions of the emission of six criteria pollutants and how strategies implemented have reduced air pollutants to predevelopment levels. One of the greatest measures taken by CTR Rio is the decrease in number of dump trucks running on routes toward CTR Rio. Since CTR Rio was placed strategically close to the waste transfer stations, small trucks collect the garbage of nearby cities and bring it to local transfer stations. Then bigger dump trucks take the garbage from the transfer stations to CTR Rio. Consequently there are fewer trucks running on roads, which help to reduce the amount of pollutant gases emitted by vehicles and the traffic, especially in Rio de Janeiro city. The greenbelt project is also a great measure to retain dust particles and absorb CO<sub>2</sub>. These are measures counting toward reducing air pollutant emissions.

## **Resilience**

The Resilience subcategory addresses the ability to withstand short-term risks, such as flooding or fires, and to adapt to changing long-term conditions, such as changes in weather patterns, sea level rise, or changes in climate. Increased adaptability and decreased vulnerability ensure a longer useful life and ensure that the project will be able to meet the future needs of the community.

CTR Rio has planned on having a contingency plan for mitigating short-term hazards. At present, it has showed a scope that explains general aspects and the intentions of the contingency plan, but it needs to provide more detailed plans. Also, it needs to show better performance in moving from assessment to action. So this is a great opportunity for CTR Rio to improve and demonstrate a concern to be a more resilient project.

The CTR Rio Environmental Impact Assessment has shown some measures taken to protect the natural environment, the community, and strategies to adequately enable the project. However, the project has not demonstrated a concern about long-term risks and more elaborate short-term hazard plans, for instance. This is crucially relevant when the infrastructure project is a landfill and has a risk of contaminating the environment, with consequent ecological and social impacts. Infrastructure projects need to be designed to adapt to any change, whether natural or human in origin, so as to minimize effects on the environment.

**APPENDIX:**

**APPENDIX A: PROJECT PICTURES AND DRAWINGS**

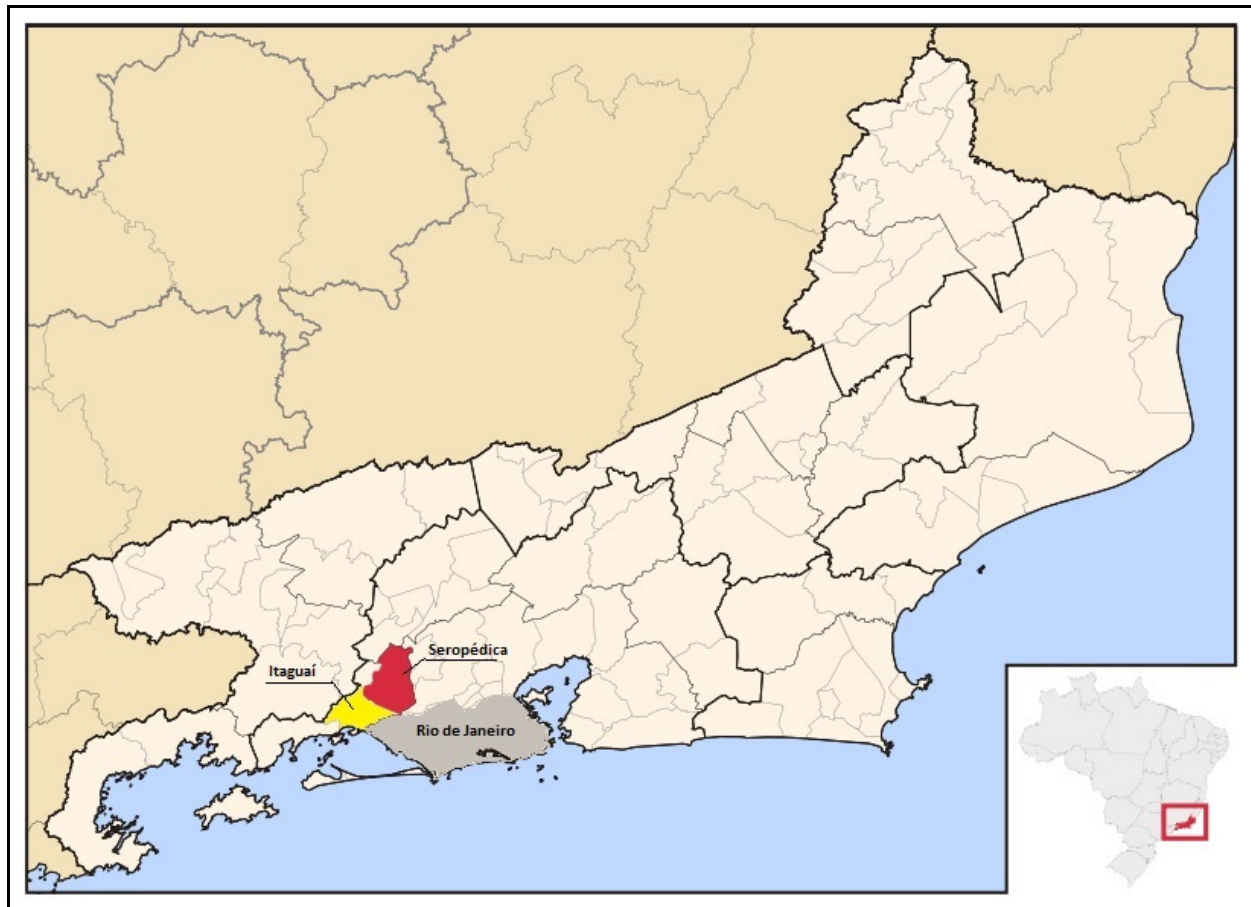


Figure 5: Location map of Seropédica, Itaguaí and Rio de Janeiro city  
Sources: Wikipedia map. Accessed in 2015. [https://pt.wikipedia.org/wiki/Seropédica#/media/File:RiodeJaneiro\\_Municip\\_Seropedica.svg](https://pt.wikipedia.org/wiki/Seropédica#/media/File:RiodeJaneiro_Municip_Seropedica.svg)



Figure 6: Location map of CTR Rio and waste transfer stations.  
Sources: Cidade Olímpica. *CTR Seropédica*. Accessed in 2015. <http://www.cidadeolimpica.com.br/academia-da-terceira-idade-2/>.  
Ciclus. Accessed in 2015. [http://www.ciclusambiental.com.br/ciclus\\_waste\\_transfer\\_station.php](http://www.ciclusambiental.com.br/ciclus_waste_transfer_station.php)



Figure 7: View of CTR Rio.

Sources: Cidade Olímpica. *CTR Seropédica*. Accessed in 2015. <http://www.cidadeolimpica.com.br/academia-da-terceira-idade-2/>

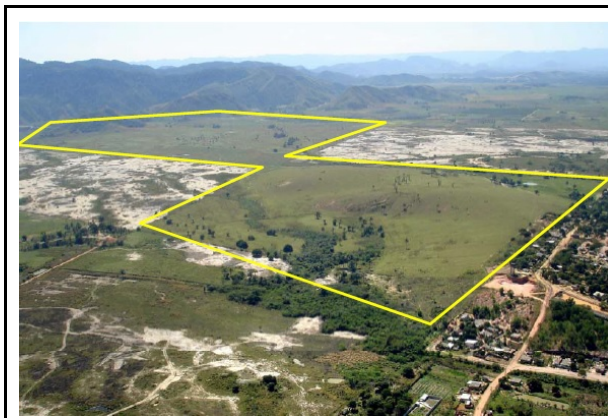


Figure 8: Area of the project before implementing CTR Rio.

Sources: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, "Alternativas Tecnológicas e Locacionais". Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007), 4.

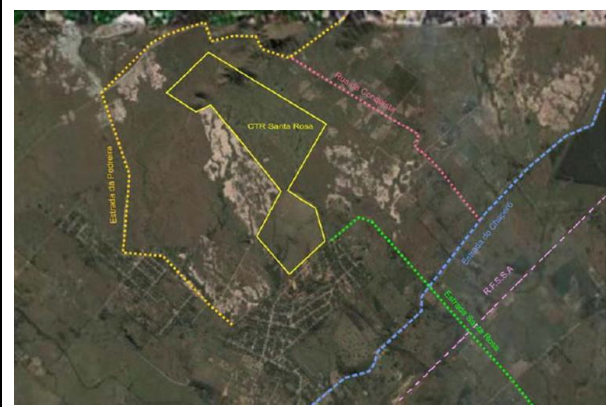


Figure 9: Near routes and access

Sources: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, "Alternativas Tecnológicas e Locacionais". Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007), 4.



Figure 10: Dump truck arriving in CTR Rio.  
Sources: Cidade Olímpica. *CTR Seropédica*. Accessed in 2015.  
<http://www.cidadeolimpica.com.br/academia-da-terceira-idade-2/>



Figure 11: Dumping the waste on site.  
Sources: Cidade Olímpica. *CTR Seropédica*. Accessed in 2015.  
<http://www.cidadeolimpica.com.br/academia-da-terceira-idade-2/>



Figure 12: Reservoir where the leachate is led before treatment.  
Sources: Cidade Olímpica. *CTR Seropédica*. Accessed in 2015.  
<http://www.cidadeolimpica.com.br/academia-da-terceira-idade-2/>



Figure 13: Leachate covered..  
Sources: Cidade Olímpica. *CTR Seropédica*. Accessed in 2015.  
<http://www.cidadeolimpica.com.br/academia-da-terceira-idade-2/>



Figure 14: Treatment of the leachate.  
Sources: Cidade Olímpica. *CTR Seropédica*. Accessed in 2015.  
<http://www.cidadeolimpica.com.br/academia-da-terceira-idade-2/>



Figure 15: Transforming the leachate into reusable water.  
Sources: Cidade Olímpica. *CTR Seropédica*. Accessed in 2015.  
<http://www.cidadeolimpica.com.br/academia-da-terceira-idade-2/>

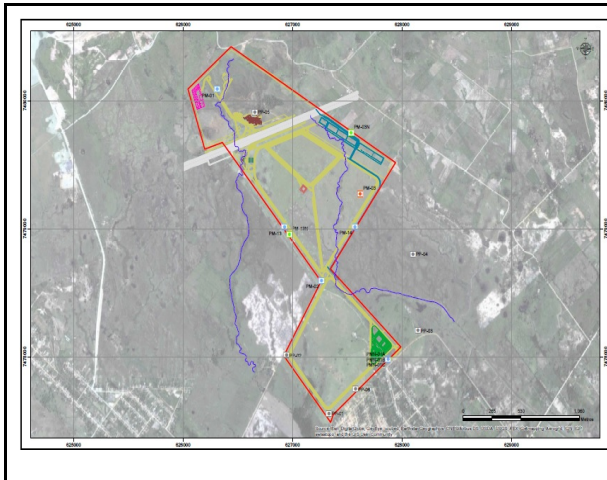


Figure 16: Map of location of the water monitoring network. (in the map set as PM and PP).  
Sources: AECOM, *Atualização do Plano de Monitoramento da Qualidade das Águas Superficiais e Subterrâneas da Área de Influência da CTR Rio* (2015), 10.



Figure 17: Groundwater collection.  
Sources: "Meio Físico" in *Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa* (Seropédica, RJ: 2007),75.



Figure 18: Piranema and Piloto River location.  
Sources: Image sent from CTR Rio project team on October 21th, 2015



Figure 19: Valão do Brejo channeled.  
Sources: Image sent from CTR Rio project team on November 15th, 2015



Figure 20: Waterproofing system implemented in CTR Rio.  
Sources: Ciclus. Accessed in 2015  
[http://www.ciclusambiental.com.br/ciclus\\_ctr.php](http://www.ciclusambiental.com.br/ciclus_ctr.php)

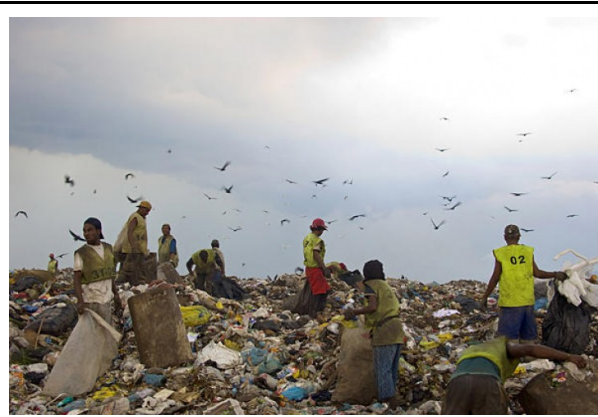


Figure 21: Waste Pickers in Jardim Gramacho open air dump before its disclosure  
Sources: Inhabitat. Accessed in 2015 <http://inhabitat.com/rio-de-janeiro-set-to-replace-the-worlds-largest-open-air-landfill-with-a-recycling-plant/jardim-gramacho-workers/>



Figure 22: Seropédica open air dump in 2011  
Sources: COOTRASER, *Relatório Fotográfico da Cooperativa*.





Figure 23: COOTRASER Seropédica.  
Sources: COOTRASER, *Relatório Fotográfico da Cooperativa*.



Figure 24: COOTRASER new equipment.  
Sources: COOTRASER, *Relatório Fotográfico da Cooperativa*.



Figure 25: Children in the center for environmental education at CTR Rio  
Sources: Ciclus. Accessed in 2015.  
[http://www.ciclusambiental.com.br/ciclus\\_ctr.php](http://www.ciclusambiental.com.br/ciclus_ctr.php)



Figure 26: LFG collecting system.  
Sources: Image sent from CTR Rio project team



Figure 27: Landfill cells at CTR Rio.  
Sources: Image sent from CTR Rio project team



Figure 28: Biogas flare at CTR Rio.  
Sources: Image sent from CTR Rio project team



Figure 29: CTR Rio in September 2011.  
Sources: Image sent from CTR Rio project team



Figure 30: CTR Rio in February 2012.  
Sources: Image sent from CTR Rio project team



Figure 31: CTR Rio in December 2012.  
Sources: Image sent from CTR Rio project team



Figure 32: CTR Rio in December 2013.  
Sources: Image sent from CTR Rio project team



Figure 33: CTR Rio in April 2014.  
Sources: Image sent from CTR Rio project team



Figure 34: CTR Rio in August 2015.  
Sources: Image sent from CTR Rio project team

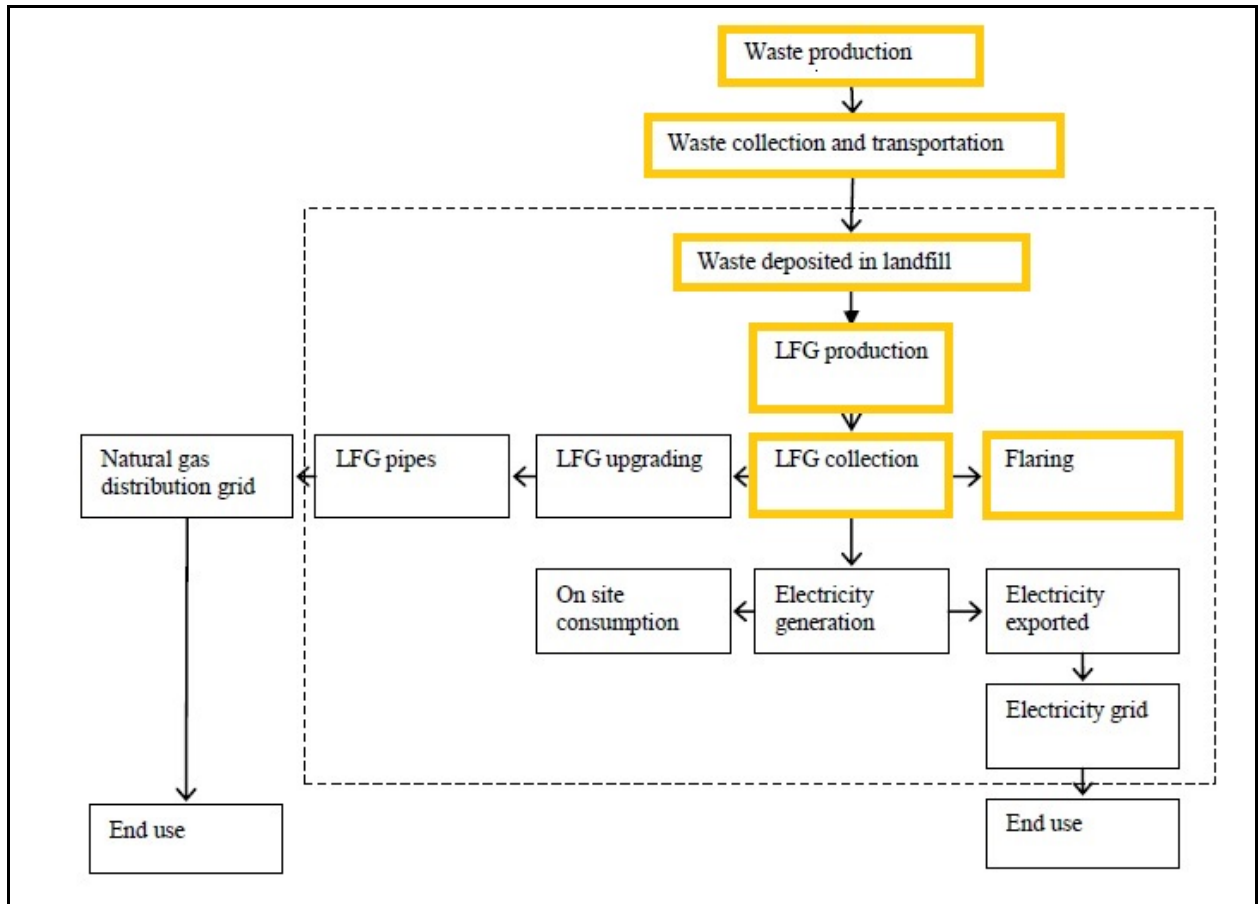


Figure 35: Simplified schematic representation of CTR Rio project for using the biogas. The yellow underlined represents what the project carries out at the present.  
 Sources: CDM- Executive Board, *Component Project Activity Design Document Form Version 02.0.* (2013), 13.



## APPENDIX B: ENVISION POINTS TABLE

## ENVISION POINTS TABLE

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

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

\* Indigenous or afro-descendant peoples

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

Figure 36: Envision credits with scores by achievement level. This table includes experimental "Vulnerable Groups" credits developed in collaboration with the Inter-American Development Bank.  
Sources: Envision™ and the Zofnass Program for Sustainable Infrastructure.

APPENDIX C: GRAPHS

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

Figure 37: Quality of Life category\_ Summary of results

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

Figure 38: Leadership category\_ Summary of results



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

Figure 39:Resource Allocation category\_ Summary of results

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

Figure 40: Natural World category\_ Summary of results

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

Figure 41: Climate & Risk category\_ Summary of results

## APPENDIX B: ENVISION POINTS TABLE

CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA - CTR RIO - BRAZIL			PT.	Performance
1	PURPOSE	QL1.1 Improve Community Quality of Life	20	Conserving
2		QL1.2 Stimulate Sustainable Growth & Development	13	Conserving
3		QL1.3 Develop Local Skills And Capabilities	12	Conserving
4	COMMUNITY	QL2.1 Enhance Public Health And Safety	16	Conserving
5		QL2.2 Minimize Noise And Vibration	1	Improved
6		QL2.3 Minimize Light Pollution	2	Enhanced
7		QL2.4 Improve Community Mobility And Access	7	Superior
8		QL2.5 Encourage Alternative Modes of Transportation	1	Improved
9		QL2.6 Improve Site Accessibility, Safety & Wayfinding	3	Enhanced
10	WELLBEING	QL3.1 Preserve Historic And Cultural Resources	0	No score
11		QL3.2 Preserve Views And Local Character	6	Superior
12		QL3.3 Enhance Public Space	6	Superior
13	VULNERABLE GROUPS	QL 4.1 Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)	0	No score
14		QL4.2 Stimulate and promote women's economic empowerment	0	No score
15		QL4.3 Improve access and mobility of women and diverse communities (indigenous or afro-descendant peoples)	0	No score
		QL0.0 Innovate Or Exceed Credit Requirements	0	0
		<b>QL</b>	<b>87</b>	
CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO - BRAZIL			PT.	Performance
16	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	17	Conserving
17		LD1.2 Establish A Sustainability Management System	4	Enhanced
18		LD1.3 Foster Collaboration And Teamwork	1	Improved
19		LD1.4 Provide For Stakeholder Involvement	9	Superior
20	MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	12	Conserving
21		LD2.2 Improve Infrastructure Integration	16	Restorative
22	PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	3	Enhanced
23		LD3.2 Address Conflicting Regulations & Policies	4	Improved
24		LD3.3 Extend Useful Life	12	Conserving
		LD0.0 Innovate Or Exceed Credit Requirements	0	N/A
		<b>LD</b>	<b>78</b>	
CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO - BRAZIL			PT.	Performance
25	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	No score
26		RA1.2 Support Sustainable Procurement Practices	0	No score
27		RA1.3 Used Recycled Materials	0	No score
28		RA1.4 Use Regional Materials	0	No score
29		RA1.5 Divert Waste From Landfills	0	No score
30		RA1.6 Reduce Excavated Materials Taken Off Site	6	Conserving
31		RA1.7 Provide for Deconstruction & Recycling	0	No score
32	ENERGY	RA2.1 Reduce Energy Consumption	0	No score
33		RA2.2 Reduce Pesticide and Fertilizer Impacts	0	No score
34		RA2.3 Commission & Monitor Energy Systems	0	No score
35	WATER	RA3.1 Protect Fresh Water Availability	17	Conserving
36		RA3.2 Reduce Potable Water Consumption	4	Improved
37		RA3.3 Monitor Water Systems	1	Improved
		RA0.0 Innovate Or Exceed Credit Requirements	0	N/A
		<b>RA</b>	<b>28</b>	

CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO - BRAZIL			PT.	Performance	
38	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	16	Restorative
39			NW1.2 Preserve Wetlands and Surface Water	4	Enhanced
40			NW1.3 Preserve Prime Farmland	12	Conserving
41			NW1.4 Avoid Adverse Geology	5	Conserving
42			NW1.5 Preserve Floodplain Functions	8	Superior
43			NW1.6 Avoid Unsuitable Development on Steep Slopes	6	Conserving
44			NW1.7 Preserve Greenfields	0	No score
45	L & W	NW2.1 Manage Stormwater	9	Superior	
46		NW2.2 Reduce Pesticides and Fertilizer Impacts	5	Superior	
47		NW2.3 Prevent Surface and Groundwater Contamination	18	Restorative	
48	BIODIVERSITY	NW3.1 Preserve Species Biodiversity	16	Restorative	
49		NW3.2 Control Invasive Species	11	Restorative	
50		NW3.3 Restore Disturbed Soils	10	Restorative	
51		NW3.4 Maintain Wetland and Surface Water Functions	19	Restorative	
NW0.0 Innovate or Exceed Credit Requirements			9	Innovate	
<b>NW</b>			<b>148</b>		
CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO - BRAZIL			PT.	Performance	
52	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	13	Superior
53			CR1.2 Reduce Air Pollutant Emissions	0	No score
54	RESILIENCE	CR2.1 Assess Climate Threat	0	No score	
55		CR2.2 Avoid Traps And Vulnerabilities	0	No score	
56		CR2.3 Prepare For Long-Term Adaptability	0	No score	
57		CR2.4 Prepare For Short-Term Hazards	3	Improved	
58		CR2.5 Manage Heat Island Effects	0	No score	
CR0.0 Innovate Or Exceed Credit Requirements			0	N/A	
<b>CR</b>			<b>16</b>		
<b>Total points</b>			<b>357</b>	<b>0</b>	

Figure 42: Envision credits with scores by achievement level. This table includes experimental "Vulnerable Groups" credits developed in collaboration with the Inter-American Development Bank.  
 Sources: Envision™ and the Zofnass Program for Sustainable Infrastructure.

**APPENDIX D: CREDIT DETAIL**

CATEGORY I, PEOPLE AND LEADERSHIP		
SUB CATEGORY: QUALITY OF LIFE		
	Score	CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO
<b>QL1.1 Improve Community Quality of Life</b>	<b>20</b>	<p><b>Conserving</b></p> <p>The intent of this credit is to improve the net quality of life for all communities affected by the project, and mitigate any negative impacts to them from project activities. Efforts for this credit are based on the measures taken to assess community needs and improve quality of life, while minimizing negative impacts. The purpose of the project is to treat the solid waste of more than 8 million people from various urban areas in Rio de Janeiro. By properly treating and disposing of waste, CTR Rio has eliminated the open-air dumps that were propitious to the proliferation of disease vectors, such as rats, cockroaches, and mosquitoes; and therefore the project has helped in enhancing overall public health.</p> <p>CTR Rio has taken into account community needs through public hearings, as well as through several plans and programs which have been incorporated into the project to minimize any negative impacts to the local communities. In the environmental impact assessment (EIA), social and economic features of nearby communities were examined in order to understand which projects and plans should be implemented to effectively attend to the needs of the communities. The first plan which was implemented was the social communication plan (PIS) known in Portuguese as PCS. This plan works as a tool to understand the local community factors, such as complaints and suggestions regarding the implementation of the project. In order to make the community aware of this plan, pamphlets and posters were distributed throughout local communities, in addition to other measures, such as face to face contact; public meetings were set up to meaningfully engage the community with the project design. The social communication plan engages the community and other stakeholders with the project as a way to improve upon the project itself and existing community conditions. Due to the ongoing necessity for periodic contact with the community, “CTR Open Doors” has been incorporated into the PIS; this consists of a department where CTR employees are available for the community to voice opinions, complaints, and claims involving social and environmental issues of the project and its impacts on the communities.</p> <p>With the closures of the former open-air dump areas in Seropédica, Itaguaí, and Jardim Gramacho (in the city of Rio de Janeiro), many informal waste pickers who depended on collecting and selling recyclable waste as a source of income have been adversely impacted. Based on the PIS, and a report from 2011 about the socio-economic life of the waste pickers from Seropédica and Itaguaí, CTR Rio incorporated other programs to better life in the communities of Seropédica and Itaguaí. According to the report which was presented, 91% of the waste pickers from Seropédica and 41% from Itaguaí were not aware of any social program or organization which could provide them with support. As a result, CTR Rio created a social inclusion plan for waste pickers (PISCA). This plan has aimed to provide for the inclusion of waste pickers from Seropédica and Itaguaí, into formal labor markets, or help to revitalize cooperatives, and/or others businesses. Some of the goals of the plan are to: provide monitoring and social support for the families; collaborate with the revitalization of the cooperative for waste pickers of Seropédica (COOTRASER), and the construction of its business plan; foster education by reinforcing the formal education of children and adults; provide technical support and equipment for COOTRASER; and assist with incorporation into the labor market. The Rio de Janeiro city hall is responsible for implementing social programs to help out the waste pickers from Gramacho.</p>

	<p><u>Source:</u>  <i>Cepollina Engenharia e Construções Ltda, Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica (Seropédica, RJ: 2010), 22.</i>  <i>Ciclus, Plano de Gestão Socioambiental, Anexo II- Plano de Comunicação Social (2014).</i>  <i>Ciclus. Plano de Gestão Socioambiental, Anexo I- Plano de Inclusão Social dos Catadores-PISCA (2014).</i>  <i>Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Análise dos Impactos Ambientais.” Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007), 16, (hereafter cited as EIA).</i>  <i>Ibid., 35-36.</i>  <i>Ibid., 2-4.</i>  <i>Analítica Empresa Júnior de Pesquisa e Consultoria, Relatório Final-Cadastramento e perfil socioeconômico dos catadores de materiais recicláveis dos lixões de Itaguaí e Seropédica (2011).</i></p> <p><b>RECOMMENDATIONS</b></p> <p>The project needs to ensure community improvement and satisfaction. No report was provided showing evidence of community acceptance, and restoration, or of the improvement of community social and economic conditions. Although all of the plans incorporated into CTR Rio should have a positive social and economic impact to the community, the project still needs to show evidence of the results of the plans</p>
<p><b>QL1.2 Stimulate Sustainable Growth &amp; Development</b></p>	<p><b>13</b></p> <p><b>Conserving</b></p> <p>Infrastructure projects should support and stimulate sustainable growth and development, including providing improvements to job growth, capacity building, productivity, business attractiveness, and local livability. This is measured with an assessment of the project’s impact on the community’s sustainable economic growth and development.</p> <p>CTR Rio has been designed to substantially contribute to community attractiveness for compatible businesses and industries by improving the overall business environment. The project created a significant number of new jobs during its design, construction, and operations. CTR Rio employs about 185 people from different parts of the region, including the neighboring towns of Seropédica and Itaguaí. CTR Rio supported and facilitated the concession to COOTRASER to act as an official body in regard to the selective collection of recyclables in Seropédica through the Plan of Selective Collection of Seropédica (Plano de Coleta Seletiva in Portuguese). COOTRASER is the cooperative of recycled waste of Seropédica, which through this licensing is now legalized to perform the selection of recyclable waste activities, while the Seropédica Municipality is just responsible for monitoring these actions. This concession was very important, because from now COOTRASER, will receive support from state and federal municipal agencies, which will expand the scope of the work and will affect positively the municipality of sustainability with regard to matters environmental, creating jobs and increasing the income of 'recyclers', also referred to as waste pickers.</p> <p>By implementing the flaring of biogas initiatives, CTR Rio has mobilized new jobs capacity by providing skilled labor to run the flaring operations. In this manner, the project has enhanced capacity and increased productivity. Additionally, CTR Rio contributed to improving the socio-economic conditions of the community. Through the social inclusion plan for waste pickers(PISCA), CTR Rio enabled the renovation of the COOTRASER building, which belongs to the cooperative of waste pickers, by providing new machinery and creating a business plan, thus enhancing community values. Moreover, CTR Rio has implemented a center for environmental education (CEA) that serves as a new space for communal interaction, knowledge sharing, information, and education. This center was created as part of the “Plan of Environmental Education” to stimulate both public participation in the preservation</p>

	<p>of natural resources, as well as the search for solutions to identify environmental threats; and to promote debate regarding the type of development expected in the region, the respective vision, and possible ways for meeting the needs of sustainability. Amongst the activities envisioned in the CEA is a workshop for the continued training of employees. The workshop's objective is to hold meetings once a year from 2014 to 2016 to improve and update employees skills on the following topics: waste management, selective garbage collection, analysis and accident investigation, and environmental impact assessment (EIA). This also aids in achieving Ciclus' mission focus on sustainable growth and development.</p> <p>The project also improves the infrastructure of nearby communities by providing for 20 new public squares, paving roads and providing electric power poles on some streets in Seropédica and Itaguaí.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, "Análise dos Impactos Ambientais" in EIA, 33. Ciclus. Plano de Gestão Socioambiental, Anexo III- Plano de Educação Ambiental-PEA(2014). COOTRASER, <i>Ata da Assembleia Geral Extraordinária da Cooperativa de Catadores de Matérias Recicláveis do Município de Seropédica LTDA</i> (Rio de Janeiro, RJ: 2014). Omnes Consultoria em Sustentabilidade, <i>Plano Executivo de Coleta Seletiva de Itaguaí</i> (Rio de Janeiro, RJ: 2012). Prefeitura Municipal de Itaguaí, <i>Convênio entre Prefeitura de Itaguaí e a SERB sobre a Urbanização do Logradouro Público</i> (Itaguaí, RJ: 2011). Prefeitura Municipal de Seropédica, <i>Convênio entre Prefeitura de Seropédica e a SERB sobre as praças públicas de Seropédica</i> (Seropédica, RJ:2012). Prefeitura Municipal de Seropédica, <i>Convênio entre Prefeitura de Seropédica e a SERB sobre o Termo de Encerramento do Vazadouro de Seropédica</i> (Seropédica, RJ:2012).</p> <p><u>RECOMMENDATIONS</u> CTR Rio needs to provide an analysis of the effects of the delivered works on local productivity. This should include performance metrics and reporting to evaluate the impact of the implemented initiatives.</p>
<p><b>QL1.3 Develop Local Skills and Capabilities</b></p>	<p><b>12</b> <b>Conserving</b></p> <p>CTR Rio has collaborated on local employment, training and education, with an emphasis on the most needy or disadvantaged groups. By incorporating new technology into the project, CTR Rio has attracted skilled labor from many different technical levels to operate technological devices, such as those for flaring biogas. CTR Rio hired local workers from Seropédica and Itaguaí to work on the project, and has provided local jobs by things like paving roads, and restoring public squares, among others. Therefore, CTR Rio has both directly and indirectly contributed to job creation. The center for environmental education" has also helped to develop local skills and capabilities through workshops and educational activities.</p> <p>The project team considered the needs of the community, and has emphasized specific program to attend to disadvantaged groups such as waste pickers. The social inclusion plan for waste pickers (PISCA) has provided activities to increase the community's capacity for development, and assisted the former waste pickers with their reintegration into the formal labor market by fostering education for both children and adults. Among the activities that PISCA provides are: educational workshops for health, environmental education, jobs skills; engagement of the waste pickers with the cooperatives; providing technical support for structuring inclusive business with waste picker participation; support COOTRASER initiatives, and providing it with a remodeled building and equipment; incorporating the community into the plan for environmental education (PEA) in order to enable the community's commitment to preserving the natural and cultural environment, with an emphasis on the application of the "4Rs" of "respect, reduce, recycle, and reuse," through the implementation a selective collection plan within PEA.</p> <p><u>Source:</u></p>



	<p>Ciclus, “Anexo III- Plano de Educação Ambiental.” Plano de Gestão Socioambiental (2014). Ciclus. <i>Plano de Gestão Socioambiental, Anexo I- Plano de Inclusão Social dos Catadores-PISCA</i> (2014).</p> <p><b>RECOMMENDATIONS</b> CTR Rio needs to provide documentation that indicates plans and commitments to hire local workers. Additionally, the project has to show evidence of the outcomes of workshops, as well as educational and social programs implemented to develop local skills and capacities. The project needs to ensure a meaningful contribution to the long-term competitiveness of the community.</p>
<p><b>QL2.1 Enhance Public Health And Safety</b></p>	<p><b>16</b> <b>Conserving</b></p> <p>Infrastructure projects should take into account the health and safety implications of using new materials, technologies, or methodologies, to a level above and beyond meeting regulatory requirements. This credit is measured by the efforts to exceed normal health and safety requirements, taking into account additional risks in the application of new technologies, materials, and methodologies.</p> <p>Various exposure types and risks can be related to the construction and operation of the CTR landfill. By treating and disposing of waste properly, CTR Rio eliminated the open-air dumps that were conducive to the proliferation of disease vectors such as rats, cockroaches, and mosquitoes, thus enhancing overall public health.</p> <p>Security control measures have been adopted during the operations of CTR to guarantee the safety and quality of the executed services, thus enabling indications of low environmental risk. The system of the stabilization and solidification of solid waste has been monitored for better detection of contamination, as well as the efficiency of waste treatment. The area solid waste preparation is also monitored to identify leakage or accidental contamination. Drainage systems to capture and transfer upwelling, percolated liquids, biogas, and rainwater are implemented for environmental control.</p> <p>In order to eliminate accidental risks from the contamination of the water table and the surface water, a waterproofing system with technical materials, consisting of a double layer of HDPE, compacted clay, geotextile, of the and bentonite blanket, as well as highly sensitive sensors to detect possible leaks was developed. The design waterproofing system is associated with the monitoring of the underground aquifers in the areas of solid waste reception, preparation and storage. The reservoir where the leachate is collected before being properly treated and transformed into reused water is covered to avoid spreading the unpleasant odor to the nearby community.</p> <p>The project owner and the project team instituted the appropriate health and safety methodologies and protocols during construction. The emissions of atmospheric particles and dust generated by the project is addressed by limiting the activities that require vehicle and machine operations to an area located far from the community. This protocol is also supported by the construction of a greenbelt around the project. The greenbelt will also minimize spreading dust to the community. CTR does the control the emission of particles in strategic spots, monitoring the emanation of particulates through PM10 monitoring equipment, HI-VOL (high volume samplers). CTR Rio also adheres to guidelines for auto-control and the emissions of black smoke from vehicles, respecting Brazilian requirements.</p> <p>Measures for the control of environmental and health risks are monitored annually through programs for prevention, environmental risk assessment, and medical health control. Evaluations are done to reduce risks to public health and workers’ safety, which have received approvals and signatures from the appropriate officials. Each year, employees from CTR Rio must pass the annual medical evaluation; this can be done more frequently if prescribed by the doctor.</p> <p><u>Source:</u></p>

	<p>Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010), 8.          Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007), 21-28.          Dor Saude e Segurança do Trabalho, <i>Programa de Controle Médico de Saúde Ocupacional</i> (2014).          Corpo de Bombeiros, <i>Certificado de Aprovação do Corpo de Bombeiros</i> (Rio de Janeiro, RJ: 2012).</p> <p><u>RECOMMENDATIONS</u></p> <p>The greenbelt and the maintenance of machines is helpful in reducing health impacts, but it is also necessary to do an air quality assessment, and monitor health indicators of the workers, such as respiratory system functioning, vision, and hearing, and subsequently adopt restrictive measures in cases of impairment. Special attention must be given to children of the neighboring communities to avoid play and exercise activities within areas that the project poses risk. It would be desirable to provide new public spaces that attend to the needs of these children, especially if there are nearby schools.</p>
<p><b>QL2.2 Minimize Noise And Vibration</b></p>	<p><b>1</b>      <b>Improved</b></p> <p>To maintain and improve community livability, infrastructure projects should minimize the noise and vibration generated during the construction and operations of the project. The metric used is the extent to which noise and vibration have been reduced during construction and operations.</p> <p>In terms of minimizing noise and vibration, a green belt was incorporated into the design of the project. The green belt implemented around the site serves as a natural barrier that blocks dust, odor, and noise, thus protecting the neighboring community of Vila do Chaperó, which is located 2 km from the project.</p> <p>CTR Rio has not provided studies specifically appropriated for predicting the level of airborne, ground-borne, and structure-borne noise and vibration from construction and operations. A robust maintenance system for machines and vehicles has been implemented, which helps to regulate engine emissions. Activities are reduced during night shifts to minimize noise and vibration. Biannually, CTR takes measurements of environmental noise, according to the CONAMA (Brazilian National Council of the Environment) resolution #001, which defines the criteria for and patterns of noise emissions, to control noise pollution. However, there is no evidence of noise level reductions during, or after construction, and there is no evidence provided about reducing ambient noise to level that substantially improves community livability.</p> <p>In cases where noise affects workers, they are advised to utilize personal protective equipment (PPE), which according to project team, is an efficient measure that has proven to work well. The workers are trained to follow health and safety procedures, getting certificates of approval issued by the Ministry of Labour.</p> <p><u>Source:</u></p> <p>Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Análise dos Impactos Ambientais” in EIA, 16.          Ibid, 23.</p> <p><u>RECOMMENDATIONS</u></p> <p>The team should verify that the noise of machines and vehicles is not creating nuisances for the neighboring communities by performing monitoring, and consulting with community members on a weekly basis to understand their routines and get their feedbacks; this can also aid in building a trustful relationship with them. Additionally, measures of environmental noise must be done inside the office to adhere to NBR 1052, according to the recommendations of the Prevention Program of Environmental Risks in Brazil (Programa de Prevenção dos Riscos</p>

		Ambientais in Portuguese). The team should present the results of noise measurements and resolve issues in cases where they are higher than the criteria defined in resolution #001 of CONAMA. Programs for monitoring noise and vibration must be established.
QL2.3 Minimize Light Pollution	2	<b>Enhanced</b> The team should verify that the noise of machines and vehicles is not creating nuisances for the neighboring communities by performing monitoring, and consulting with community members on a weekly basis to understand their routines and get their feedbacks; this can also aid in building a trustful relationship with them. Additionally, measures of environmental noise must be done inside the office to adhere to NBR 1052, according to the recommendations of the Prevention Program of Environmental Risks in Brazil (Programa de Prevenção dos Riscos Ambientais in Portuguese). The team should present the results of noise measurements and resolve issues in cases where they are higher than the criteria defined in resolution #001 of CONAMA. Programs for monitoring noise and vibration must be established.
		<u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “ <i>Descrição do Projeto</i> ” in EIA, 28-30.
		<b>RECOMMENDATIONS</b> CTR Rio needs to switch the lighting inside offices from incandescent to fluorescent bulbs. The team should make sure that the use of light at night is not disturbing the lighting of the adjacent streets, roads, and the nearby communities. Measures should be incorporated to reduce the use of electrical energy from biogas, and to reduce or remove excessive lighting.
QL2.4 Improve Community Mobility And Access	7	<b>Superior</b> This credit assesses efforts to locate, design, and construct the project in order ease traffic congestion, improve mobility and access, prevent urban sprawl, and otherwise improve the livability of the community. This is measured in terms of how the project improves access and walkability, and reduces commuting and traversing times to existing facilities and transportation hubs. The credit also assesses how a project improves user safety, considering all modes of transportation (e.g., personal vehicles, commercial vehicles, public transit, bicycles, and pedestrian access).  Different activities throughout the phases of implementation and operations of the project have been consolidated to minimize the impact of traffic to a single phase. The project has also planned for the use of railways to transport waste, which will enable transport across long distances. The proximity to Itaguaí Harbor, a growing area with new ventures, and the MRS railway enable the transport of waste across long distances, by being able to transport waste from these areas as well. The project team has also requested that the Rio Department of Roads (DER) allow for the future beltway to facilitate a connection between CTR Rio and Itaguaí Harbor through the provision of service roads.  The main access road to CTR (Santa Rosa) has been paved, in addition to the access roads from the Seropédica and Itaguaí municipalities. Waste transfer stations have been created in strategic locations where the waste of Rio de Janeiro is transferred from compactor trucks to trailers of four times the capacity, thus minimizing vehicle traffic in both municipalities.  According to the CTR Rio team, periodic maintenance is done on the Santa Rosa road, including cleaning, signaling, and repairs, when needed, and the socio-environmental communications team of CTR Rio makes periodic inspections on the access roads (areas of direct influence of the landfill), in order to reduce the inconvenience of the traffic generated from the construction and operations of the project.
		<u>Source:</u>

		<p>Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Análise dos Impactos Ambientais</i>” in EIA, 15-17. Ibid,29. Ibid,43.</p>
		<p><b>RECOMMENDATIONS</b></p> <p>The project must address the recommendations of the environmental impact study, such as those of improving the pavement system, extending the local roads, implementing a system of rainwater drainage, and a program for road maintenance, to improve the flow of traffic, quality of rides, and road safety, thus reflecting on the quality of life for the community. Hazardous waste must be carefully transported in ways and timeframes that do not cause risk to the community.</p> <p>The expectations embedded in the project have not addressed the access and mobility of the immediate community directly, and alternative transportation has not been proposed for these individuals. The traffic of Chaperó road will affect and conflict with the traffic of the nearby communities of Arrozal São Sebastião and Parque Primavera. All of the implemented strategies have been focused on the flow and volume of vehicle traffic; however new alternative modes of transportation must be brought to the site so that workers can have easy access from different parts of the city, and also to prevent the flow of the trucks and other vehicles from conflicting with pedestrians, local drivers, and the community in general. Passages must be created to avoid overflow and conflicts.</p>
<p><b>QL2.5 Encourage Alternative Modes of Transportation</b></p>	<p><b>1</b></p>	<p><b>Improved</b></p> <p>Infrastructure projects should improve accessibility to non-motorized transportation and public transit. Furthermore, projects should promote the use of alternative transportation and reduce congestion. The metric used for this credit is the degree to which the project has increased walkability, as well as the use of public transit, and non- motorized modes of transportation.</p> <p>The project is located within walking distance of near communities (Gleba A and B, Parque Primavera and Santa Rosa) is pedestrian accessible to multi-modal transportation. Many CTR employees live close to the project and access it by walking to the site. To access CTR Rio by public transportation, there are two bus lines that attend the area of Vila Chaperó (the Chaperó / Itaguaí line and the Chaperó / Santa Cruz line). Additionally, there are private vans that offer transportation service. There is no evidence that CTR-Rio encourages users and workers to use non-motorized transportation. No action was found of engagement between the project and the community for developing programs to motivate the use of alternative modes of transportation, or to improve the quality of roads or bike paths. There is no evidence of the project having facilitated transportation for workers who live far from the site, or any multimodal system connecting the project to Rio (e.i. on-site parking facilities for cars, bikes, motorbikes). However, there is an effort to use railways to transport a portion of the solid waste, and also to connect the access roads to the Metropolitan Ring Road of Rio de Janeiro (also known only as Metropolitan Arch) which is a freeway that was built in around the metropolitan area of Rio de Janeiro with a mission to divert the heavy traffic vehicles only passing through the city of Rio de Janeiro.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Meio Antrópico</i>” in EIA, 123.</p> <p><b>RECOMMENDATIONS</b></p> <p>As many of the workers live near the site, it would be efficient and sustainable to provide alternative modes of transportation to access CTR Rio. The project needs to provide for better multimodal connection to the neighboring cities, and to Rio de Janeiro. The project should provide parking facilities for all kinds of transportation, and also provide pathways and bicycle paths.</p>
<p><b>QL2.6 Improve Site</b></p>	<p><b>3</b></p>	<p><b>Enhanced</b></p>

<p><b>Accessibility, Safety &amp; Wayfinding</b></p>	<p>Projects should improve user accessibility, safety, and wayfinding of the site and surrounding areas. This credit is measured through the clarity, simplicity, readability, and broad-population reliability in wayfinding, user benefit, and safety.</p> <p>The project team has developed the appropriate signage for safety and wayfinding through its visual communication program. CTR Rio paved roads, as well as provided electricity and signage for the streets that are near the project.</p> <p>The project has a security cabin which controls the entry and exit of trucks, and guides them away from critical points of hazard inside the work field. The signs have been adapted and applied routinely throughout the evolution of the project, and the main access road to CTR Rio. Plans for access and egress of the project during an emergency were implemented and approved by the fire department. There is no evidence that the project has extended the accessibility and signage to protect nearby sensitive sites. Signposts and strip paintings on the ground have been expanded to access CTR Rio along Chaperó road and Da Conquista street through a specific project presented to the Department of Roads (DER). The signs were determined according to prescriptive requirements, with the following categories being used; hazard, informative, precaution, safety, directional, regulatory, warning, indication, identification, and education signage.</p> <p><u>Source:</u>  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Descrição do Projeto</i>” in EIA, 118  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Programas de Gestão Ambiental</i>” in EIA,12-14  Ciclus, Projeto de Engenharia- Estrada Santa Rosa, <i>Projeto de Sinalização</i> (2011), 15-29.  Corpo de Bombeiros, <i>Certificado de Aprovação do Corpo de Bombeiros</i> (Rio de Janeiro, RJ: 2012).</p> <p><u>RECOMMENDATIONS</u>  The project should integrate with the local community, as well as its environmental and cultural resources to improve public safety (which is different to public health). The team must also give a special attention to the adjacent neighborhoods, making sure that safety and access are restored beyond the limits of the project itself.</p>
<p><b>QL3.1 Preserve Historic and Cultural Resources</b></p>	<p><b>0</b> <b>No score</b></p> <p>Infrastructure projects should preserve or restore significant historical and cultural sites, as well as related resources, in order to enhance community cultural resources. This is measured through a summary of steps taken to identify, preserve, or restore cultural resources.</p> <p>The project team has worked with the community and government agencies to create a committee for participatory and transparent decision-making, in order to discuss the management and financing of community projects. In the center for environmental education (CEA), groups have been formed by representatives of community, institutions, dwellers associations, regional administrative offices, and all stakeholders to discuss the interests of the local community. The project attempts to preserve the historic and cultural resources of the community by implementing the social inclusion plan and the social inclusion plan for waste pickers. However, the project team has not conducted a feasibility analysis to determine whether or not the preservation or improvement of resources should be incorporated into to the project.</p> <p><u>Source:</u>  No evidences were found in the following source:  Ciclus, “Anexo II- Plano de Comunicação Social.” Plano de Gestão Socioambiental. (2014).</p> <p><u>RECOMMENDATIONS</u>  CTR Rio needs to increase efforts to enhance or restore existing historical and</p>

		cultural resources by identifying the resources which define the character of the community. The project needs to have close coordination with all stakeholders, the community, leaders of communities, and the appropriate regulatory and resource agencies.
<b>QL3.2 Preserve Views and Local Character</b>	<b>6</b>	<b>Superior</b>
		This credit assesses efforts to design the project in a way that maintains the local character of the community, and does not negatively impact community views. The metrics which are measured are through thorough efforts to identify important community views and aspects of the local landscape, including communities themselves, and incorporate them into the project design.
		CTR Rio has tried to preserve most of the natural landscape and morphology of the area by minimizing the impact on natural or community features. A green belt has been incorporated into the design of the project, and helps to block views of the landfill from the outside. This green belt only contains local plants, which allows it to smoothly integrate with the natural landscape. The green belt also enhances the aesthetic quality of the project, having gone beyond the municipality requirements. The plan for degraded areas has helped to restore lost or damaged natural landscape features. The project showed concern for community values, with regards to preserving community views and local character, through restorative actions for urban infrastructures in Seropédica and Itaguaí.
		<u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Análise dos Impactos Ambientais.” Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007, 16). Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Revisão do Projeto de Implantação do Cinturão Verde de Proteção Arbórea, transplântio e produção de mudas da espécie Eugenia villa novae da Central de Tratamento de Resíduos de Santa Rosa - CTR Rio.</i>
		<b>RECOMMENDATIONS</b> The project needs to make efforts to aid local communities in developing more comprehensive policies and regulations with regards to views, and to fit in with the local character of the nearby communities. Through maps and photos, the project has to show views from the nearby communities to the project. The project must also clearly demonstrate the restored views of the near communities.
<b>QL3.3 Enhance Public Space</b>	<b>6</b>	<b>Superior</b>
		Infrastructure should improve public spaces, including parks, plazas, recreational facilities, or wildlife refuges, in order to enhance the livability of the community. Efforts are measured through plans and commitments to preserve, conserve, enhance, and/or restore the defining elements of the public spaces.
		The project has invested in, and recovered public spaces through the restoration and adaptation of 20 public squares in the municipality of Seropédica, and has also performed drainage and paving work in several parts of the districts of Jardim Maracanã, Santa Sofia, and Piranema, all within Seropédica. Therefore, CTR Rio has positively helped to enhance public space by integrating the community within the direct area of influence of CTR Rio with the project. However, there is no evidence which has been provided that identifies and describes restoration efforts, as well as community and stakeholder satisfaction.
		<u>Source:</u> Ciclus, Prefeitura Municipal de Seropédica, SMO 117/2014: <i>Termo de Aceitação das praças de Seropédica</i> (Seropédica, RJ: 2014). Prefeitura Municipal de Seropédica, <i>Termo de encerramento do Vazadouro de Seropédica</i> . Seropédica (RJ: 2012). Valle Sul Serviços e Mineiração Ltda, <i>Urbanização das vias públicas, Termo de Aceitação.</i> (Seropédica RJ: 2014).
		<b>RECOMMENDATIONS</b>

		The project needs to show documentation regarding community and stakeholder satisfaction for the public spaces which have been created. The team should provide for measures and additional changes in order to meet the needs of the community.
<b>QL 4.1- Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)</b>	<b>0</b>	<b>No score</b>
		This credit assesses the degree to which the project has identified the needs of women and diverse communities. It is important that CTR- Rio considers the creation of a policy which gives priority to hiring women and diverse groups, based on the limitations imposed upon these groups.
		The needs and interests of women and diverse groups have not been identified or addressed by the project. The project team has not worked with architects and decision-makers to address concerns about diverse communities and gender equality. The project team has not presented alternatives or intentions to develop, implement, and/or monitor appropriate methodologies which are sensitive to gender health and safety, as well as other types of protocols during the construction and operations of the project.
		<u>Source:</u> No evidences were found in the following documents: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007). Ciclus, <i>Plano de Gestão Socioambiental, Anexo I- Plano de Inclusão Social dos Catadores-PISCA</i> (2014). Ciclus, “Anexo III- Plano de Educação Ambiental.” <i>Plano de Gestão Socioambiental</i> (2014). Ciclus, “Anexo I- Plano de Inclusão Social dos Catadores.” <i>Plano de Gestão Socioambiental</i> ” (2014).
		<u>RECOMMENDATIONS</u> Women and diverse groups must be motivated and invited to engage in decision making for their opinions to be heard, considered, and incorporated into the project and operations management. Special programs should be made to support the women that used to pick the waste on the formers open-air dumps. Local agencies, nonprofit organizations, environmental and urban agencies, as well as design and planning professionals must be consulted, and brought into the participatory process of decision-making, and play a role in identifying key changes and design actions in collaboration with women, children, and diverse groups, in order to develop the best strategies for inclusion and attendance to the needs of all; thus promoting social inclusion and justice
<b>QL4.2 - Stimulate and promote women’s economic empowerment</b>	<b>0</b>	<b>No score</b>
		This credit addresses the extent to which a project hires local women and strengthens their skills-base. CTR Rio has not addressed or contributed to increasing economic opportunities for women, and there are no goals or planning efforts to develop strategies for increasing the proportion of women on the workplace, or for skills training.
		<u>Source:</u> No evidences were found in the following documents: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007). Ciclus. <i>Plano de Gestão Socioambiental, Anexo I- Plano de Inclusão Social dos Catadores-PISCA</i> (2014). Ciclus, “Anexo III- Plano de Educação Ambiental.” <i>Plano de Gestão Socioambiental</i> (2014). Ciclus, “Anexo I- Plano de Inclusão Social dos Catadores.” <i>Plano de Gestão Socioambiental</i> ” (2014)
		<u>RECOMMENDATIONS</u>

		<p>The project should ensure the inclusion women into construction processes, both in terms of workers and local supporters of the operations system, such as by creating opportunities for local businesses to grow. Such measures can be related to food, alternative transportation, and childcare for the children of workers, cleaning, educational actions to promote communal environmental awareness and responsiveness. The project still needs to provide documentation showing the number of women employed and their skill level; explanation of how the project team identified women’s employment and training needs. Also, the project has to show documentation of proposed education and training programs to be developed and implemented for female employees.</p>
<p><b>QL4.3 - Improve access and mobility of women and diverse communities (indigenous or afro-descendant peoples)</b></p>	<p><b>0</b></p>	<p><b>No score</b></p> <p>Improvements in access and mobility for women and diverse communities is evaluated by how the project has been placed, designed, and constructed in relation to understanding the limits to access and mobility that women and diverse communities may face. There is no evidence of plans that aim to improve the access, mobility and safety for women and diverse communities within the project framework. The project does not adopt strategies to improve the safety of public transportation, and/or non-motorized transportation for women and children.</p> <p><u>Source:</u> No evidences were found in the following document: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007).</p> <p><u>RECOMMENDATIONS</u> The project needs to develop assessment studies and reports addressing the effects of the constructed works on the access and mobility of women and diverse communities. It also needs to show efforts taken to identify and address the different patterns of mobility and barriers to access for women and diverse communities.</p>
<p><b>QL0.0 Innovate Or Exceed Credit Requirements</b></p>		
	<p><b>87</b></p>	



SUB CATEGORY:LEADERSHIP		
	Score	CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO
LD1.1 Provide Effective Leadership And Commitment	17	<b>Conserving</b>
		<p>This credit assesses whether the project provides effective leadership and commitment to achieve sustainable goals. The metric used in this credit is expressed through the demonstration of a meaningful commitment by the project team to adhere to the principles of sustainability, and improvements to sustainable performance.</p> <p>Sustainability is a core value stated in the mission, vision, and values of Ciclus, the CTR Rio sponsor. Amongst the visions and values are socio-environmental responsibility, simplicity, objectivity, outcomes, operational efficiency, continuous improvement, entrepreneurship, and leadership by acting as a model of example. CTR Rio made public commitments, and statements were made by the organization's leadership about the commitment to sustainability. The project has been approved to get funding from Caixa Econômica Federal (a Brazilian bank), and to be guided by the environmental social management plan (ESMP) from Caixa Econômica Federal bank (in Portuguese Plano Marco Socio Ambiental da Caixa Econômica Federal) Through this plan and in partnership with the World Bank, the center for environmental education (CEA) was created in July 2010 as a center for interaction, knowledge sharing, information, and education for local communities. In this regard, CTR Rio is committed to meeting the expected outcomes indicated in the ESMP. Such expected outcomes go beyond general statements to more specific statements about sustainability. ESMP states that as a main result, CTR Rio has to demonstrate an improvement for the treatment of solid waste. Other important outcomes are to provide jobs, attract the private sector in participating in the project, improve the quality local community, increase governmental participation, protect the natural environment, and reduce greenhouse emissions. CTR Rio has demonstrated a meaningful commitment to the principles of sustainability and sustainable performance improvement.</p>
		<p><i>Source:</i> Caixa Econômica Federal, <i>Marco Socioambiental- Aplicável a Projetos de Gestão Integrada de Resíduos Sólidos e Mecanismo de Desenvolvimento Limpo no Brasil</i> (Brasília, DF: 2012), 38-40. Ciclus, <i>Missao, Vissao e Valores</i>. Accessed in 2015. <a href="http://www.ciclusambiental.com.br/">http://www.ciclusambiental.com.br/</a></p>
		<p><b>RECOMMENDATIONS</b> As the project achieved the maximum score for this category, no additional recommendations can be provided at this time</p>
LD1.2 Establish A Sustainability Management System	4	<p><b>Enhanced</b></p> <p>The intent of this credit is to create a project management system that can manage the scope, scale, and complexity of a project. In order to achieve these goals, organizational policies, authorities, mechanisms and business processes that have been put in place are evaluated. Additionally the credit considers the judgment that such measures are sufficient for the scope, scale, and complexity of the project.</p> <p>Although, Ciclus states that CTR Rio has attempted to establish a sustainability management system, there is little evidence to support this claim. CTR Rio works with private companies to address project construction and monitor environmental quality, in addition to other activities. There is no evidence of the team having gathered the companies to verify if their goals are in line with sustainable principles. Therefore, project roles, responsibilities, and authorities related to sustainability have been assigned through basic assignments to technical engineers who have mostly conducted general assignments to monitor the management system.</p>

		<p>Additionally, every year an environmental audit is conducted to verify if the project's activities have attended to the goals and vision intended by the project team. This audit is conducted by an independent, multidisciplinary team, as well as an independent auditor who is technically qualified. However, CTR Rio has not provided any report which presents the results, and with suggestions about where the management system should be improved. Furthermore, CTR Rio has not shown any evidence of managing for extraordinary changes in environmental operating conditions.</p> <p><u>Source:</u> Ciclus, <i>Indicadores de desempenho</i> (Seropedica, RJ: 2011). Ciclus, <i>Atendimento a Condicionante LOINO16380 e da LI INO23959</i> (Rio de Janeiro, RJ: 2015). CREA RJ, <i>Anotação de Responsabilidade Técnica</i> (Rio de Janeiro, RJ: 2013).</p> <p><b>RECOMMENDATIONS</b></p> <p>CTR Rio must present plans and documents that address extraordinary changes in expected averages, variances, and plausible extremes in key design variables. Aside the audits, CTR Rio should present a more comprehensive document where the project team develops a list of all environmental, economic, and social aspects of the project. Once established, this list should be prioritized by the project team, based on the importance in meeting both project, and sustainability objectives.</p>
<b>LD1.3 Foster Collaboration And Teamwork</b>	<b>1</b>	<p><b>Improved</b></p> <p>This credit evaluates efforts to eliminate conflicting design elements and optimize the system by using integrated design and delivery methodologies, as well as collaborative processes. For assessing the performance of this project, the extent of collaboration within the project team and the degree to which the project delivery processes has incorporated whole-systems design and delivery approaches has been evaluated.</p> <p>The project team has understood that the project is a set of systems that are interconnected with other systems, especially as the proper treatment of waste begins with the collection from the streets. In this regard, CTR Rio has to worked through municipal and government partnerships to ensure that the all of the process have been interconnected to entire CTR Rio system. The project team has also recognized the project's importance in the context of the city and the community. In order to foster more collaboration between the community and the project, plans to engage with local society were created in order to optimize the overall performance of CTR Rio. There is no documentation provided which demonstrates that the project has shown a willingness to share risk and rewards with the community or other stakeholders.</p> <p><u>Source:</u> Caixa Econômica Federal, <i>Marco Socioambiental, Aplicável a Projetos de Gestão Integrada de Resíduos Sólidos e Mecanismo de Desenvolvimento Limpo no Brasil</i> (Brasília, DF: 2012), 53-55.</p> <p><b>RECOMMENDATIONS</b></p> <p>CTR Rio must periodically ensure that the project is managed as an interconnected system of systems, and that the team works together to achieve high levels of sustainable performance. Additionally, the project needs to promote and employ multidisciplinary teams where management processes are collaborative. Whole-system design processes, procedures, and methodologies must be applied by involving new and relatively untried technologies and methodologies. Risk and reward sharing must be part of the contracts between the project owner and the project team as an important step in advancing sustainable performance.</p>
<b>LD1.4 Provide For</b>	<b>9</b>	<b>Superior</b>

<p><b>Stakeholder Involvement</b></p>		<p>The intent of this credit is to establish sound and meaningful programs for stakeholder identification, engagement, and involvement in project decision-making. To assess performance for this credit, the extent to which the project stakeholders are identified and engaged in project decision-making is evaluated. Additionally, the satisfaction of stakeholders and decision-makers with regards to their involvement in the process is considered.</p> <p>CTR Rio coordinated several meetings to involve stakeholders within the project. These meeting included participation of the community, as well as private and nonprofit organizations. CTR Rio conducted an initial survey in the community to obtain public opinion of the actions proposed for the project. The opinion polls, which were conducted with all stakeholders (institutional, internal, external), facilitated to create other plans for the community, such as the social communication plan (PIS), and the social inclusion plan for waste pickers.</p> <p>The PIS aims to communicate with, and bring strategies to the community, in order to develop plans that can positively attend to the needs of community affected by the project. The plan is also a tool for building positive relationships and dialogue with stakeholders to enhance positive impacts, and minimize adverse impacts. Based on this understanding, the plan works proactively in promoting the participation of communities, by providing them with necessary information in order to ensure transparency and better participation. The program seeks to reconcile misleading or distorted analyses that can undermine the process. Through this plan the “CTR Open Doors” was created, which is a department located in the “Center for Environmental Education,” and serves as a communications channel with the community and other stakeholders. Through this department, CTR employees are available for community members to voice opinions and desires with regards to the implementation of the project, or project programs which are to be implemented within the community. The PIS presents a list of stakeholders which included; Ciclus, Caixa Economica Federal (a Brazilian bank), the World Bank, Ciclus Officials, former waste pickers from Seropédica and Itaguaí as well as their families, neighboring communities of the project, third sector organizations, private companies, non-governmental organizations, and government agencies.</p> <p><i>Source:</i> COMLURB, <i>Contrato numero 318/2013. Rio de Janeiro (RJ: 2003).</i> COOTRASER, <i>Ata de Assembleia Extraordinária da Cooperativa de Catadores de Materiais Recicláveis do Município de Seropédica – COOTRASER (Seropédica, RJ: 2014).</i> Ciclus, <i>“Anexo II- Plano de Comunicação Social.” Plano de Gestão Socioambiental (2014).</i></p> <p><b>RECOMMENDATIONS</b> CTR Rio needs to provide for more feedback programs, and show how opinions have been incorporated into the project, thus ensuring that project decisions are fair and equitable.</p>
<p><b>LD2.1 Pursue By-Product Synergy Opportunities</b></p>	<p>12</p>	<p><b>Conserving</b></p> <p>The goal of this credit is to reduce waste, improve, project performance, and reduce project costs by identifying and pursuing opportunities to use unwanted by-products or discarded materials from nearby operations. For this credit, the metric which is evaluated is the extent to which the project team identified project materials needs, sought out nearby facilities with by-product resources which may meet such needs, and identify opportunities for synergies.</p> <p>In terms of the by-products of the waste managed on-site, the project team has been quite successful. The main by-products in the landfill are leachate and methane gas. The project has been successful in by-product synergy application through the use of water generated from the CTR leachate treatment station for the humidification of internal roads, thus avoiding potable water usage. In addition, the methane gas which is generated is captured and directed to the burners (flares) with</p>

	<p>the expectation of generation of energy, and the purification of gas in the future.</p> <p>CTR Rio was designed to minimize project costs and reduce waste by taking advantage of synergy opportunities. The soil which was removed from within the project area has been utilized to fix the gradients and declivity of the site; the project design is pyramid-shaped in its geometry. This pyramid-shaped geometry is most appropriate in flat areas to minimize the impact on the area, and reduce the use of geomembranes, thus minimizing costs in implementing the project.</p> <p>The project team has identified and characterized unwanted by-products or discarded materials on a limited basis and with little assessment. However, the by-products generated during the implementation phase of the operational cells were donated to the “Cooperative of Collectors of Recycled Materials” of the Seropédica municipality, which generates sources of income for the families of former waste pickers.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Análise dos Impactos Ambientais,” in Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa - Seropédica - RJ (Seropédica, RJ:2007), 22. Ciclus, <i>Atendimento a Condicionante LO INO16380 e da LI INO23959</i> (Rio de Janeiro, RJ: 2015). Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).</p> <p><u>RECOMMENDATIONS</u></p> <p>The project team should facilitate discussions with managers of nearby facilities in order to pursue by-product synergy opportunities which involve collectors, local recycling businesses, and the city councils. CTR Rio must implement industrial ecological practices that diminish the production of waste and transform it into renewable energies, not just through biogas, but also during all phases of waste treatment. The team should ensure that the generation of energy, or the purification of gas is measured, quantified, and documented.</p>
<p><b>LD2.2 Improve Infrastructure Integration</b></p>	<p><b>16 Restorative</b></p> <p>The intent of this credit is to assess whether the project team has taken the operational relationships, among other elements of community infrastructure into account when designing the project, thus resulting in an overall improvement in infrastructure efficiency and effectiveness. The metric which is used is based on evaluating the extent to which the design of the delivered works integrates with existing and planned community infrastructure, and results in a net improvement in efficiency and effectiveness.</p> <p>The project team has sought to improve project sustainability performance through a project-wide system. According to the operational memorandum, CTR Rio was strategically placed in an area that could bring benefits to both the project itself, as well as nearby communities and urban infrastructure. The selected area enables various methods for receiving waste, by being interconnected with the main state access roads, such as BR-101-RJ, BR-465 (formerly Rio-São Paulo), and the Rio de Janeiro Metropolitan Beltway (also known only as the Metropolitan Arc). the Metropolitan Arc is a freeway which was built around the metropolitan area of Rio de Janeiro with the purpose of diverting heavy traffic from vehicles that are only passing through the city of Rio de Janeiro by directly connecting BR-101-RJ, BR-040 and BR-116 to the Port of Itaguaí. All waste transfer location can be easily accessed from CTR Rio, thus minimizing traffic that could be generated by waste vehicles. Additionally, CTR Rio has restored existing community infrastructure assets. The project restored 20 public squares, and paved roads in the municipalities of Itaguaí and Seropédica, in addition to installing electrical poles in these areas. The streets to access the CTR Rio were paved to dump trucks passed. This measure has helped</p>

	<p>to achieve a better performance on waste collection transportation. The project team sought to improve sustainable performance of the existing community infrastructure. CTR Rio enabled the closure of the open-air dumps of Gramacho, Seropédica, and Itaguaí, which did not conduct activities in an environmentally friendly manner, and thus had adverse impacts to the natural and social habitat. Ciclus was in charge of preparing and monitoring the recovery project of the open air-dump in Seropédica.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Descrição do Projeto.</i>” Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007), 27-32. Ciclus, <i>Manual de Operação CTR Seropédica</i> (2011), 7-13.</p> <p><b>RECOMMENDATIONS</b> As the maximum level of achievement has been awarded for this credit, no further recommendations are provided at this stage.</p>
<p><b>LD3.1 Plan For Long-Term Monitoring &amp; Maintenance</b></p>	<p><b>3 Enhanced</b></p> <p>This credit evaluates whether the project put in place plans and sufficient resources to ensure (as far as practical) that ecological protection, mitigation, and enhancement measures are incorporated into the project, and will be carried out. Evaluation for this credit is considered through the comprehensiveness and detail of long-term monitoring and maintenance plans, as well as a commitment of resources to fund the activities.</p> <p>At the time of this evaluation, CTR Rio had used less than 50% of its area, as each cell of the landfill had been set to be used in accordance with the amount of solid waste which had already been deposited. Other plans or programs such as the program for monitoring the quality of surface water and groundwater, and the plan for recovering degraded areas have been incorporated into the project in order to assess if the project is functioning as designed, and environmental impacts have been preserved or mitigated.</p> <p>At the time of evaluation, CTR Rio was developing a plan for emergency hazards. This plan has been set to outline steps to be taken in cases of accidents and emergencies; measures that must be taken to control the damage caused by human activities or natural catastrophes; responsibilities and obligations of the project team; and will include a plan for communicating to the community in cases of any changes to groundwater levels or quality, or if there is evidence of community exposures that could pose risks to human health.</p> <p>The project has created a report to ensure environmental controls, and clearly delineates designations of the persons of organizations assigned to monitor and maintain the constructed works. In this manner, CTR Rio has developed a working plan for the long-term maintenance and monitoring of the project. The project team needs to ensure that all plans and programs which are implemented in regards to long-term monitoring and maintenance must work in accordance with each other and not be contradictory.</p> <p><u>Source:</u> Cepollina Engenharia e Construções Ltda, <i>Central de Tratamento e Disposição Final de Resíduos Sólidos- CTR- Seropédica</i> (São Paulo, SP: 2014). Arcadis Hidro Ambiente S.A, <i>Aspectos Gerais do Plano de Contingência Ciclus, Medidas de Controle de Riscos Ambientais</i>(Seropédica, RJ: 2013). Ciclus, <i>Colaboradores Ativos</i> (Seropédica, RJ: 2013). Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Programas de Gestao Ambiental.</i>” Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007), 2-24.</p> <p><b>RECOMMENDATIONS</b></p>

		The project needs to provide sufficient resources and personnel to implement a plan or document for how funding will be allocated and maintained at sufficient levels to fund necessary monitoring and maintenance activities.
<b>LD3.2 Address Conflicting Regulations &amp; Policies</b>	<b>4</b>	<b>Improved</b>
		The purpose of “addressing conflicting regulations and policies” is to work with officials to identify and address laws, standards, regulations, or policies that may unintentionally create barriers to the implementation of sustainable infrastructure. This is measured through the efforts taken to identify and change laws, standards, regulations, and/or policies that may unintentionally contradict goals, objectives, and practices of sustainability. The project has identified and assessed laws, standards, regulations, and policies associated with its development in regards to safety, and the environment. The project team worked with the municipalities, as well as environmental, state, and federal agencies to attend to all of the requirements presented in the CONAMA ( National Environmental Council), INEA( National Institute for the Environment), and municipal legislation. CTR Rio did not need to address laws or policies that could unintentionally create barriers to implementing the project.
		<u>Source:</u> COMLURB, <i>Contrato numero 318/2013, COMLURB e Ciclus</i> (Rio de Janeiro, RJ: 2003). COOTRASER, <i>Ata de Assembleia Extraordinária da Cooperativa de Catadores de Materiais Recicláveis do Município de Seropédica – COOTRASER</i> (Seropédica, RJ: 2014). Ciclus, <i>“Anexo II- Plano de Comunicação Social.” Plano de Gestão Socioambiental</i> (2014) INEA, <i>Licença de Instalação IN023959</i> ( Rio de Janeiro, RJ: 2013).
		<u>RECOMMENDATIONS</u> The project needs to demonstrate how overall design and construction standards and practices need to be changed in order to address new problems arising from sustainability issues.
<b>LD3.3 Extend Useful Life</b>	<b>12</b>	<b>Conserving</b>
		It is important that a sustainable project extend useful life by designing the project in a way that results in a constructed works that is more durable, flexible, and resilient. This credit assesses the degree to which the project team incorporates full life-cycle thinking to improve the durability, flexibility, and resilience of the project. The owner and project team have considered a few ways to extend the durability and resilience of the project. The design of the project is projected to serve a 26.8 year lifespan. However, in order to reduce the need for future maintenance of the landfill, a robust management system for recycling waste has been incorporated into the project. CTR Rio has implemented programs to make the community aware of proper processes to recycle waste. Additionally, the project has invested in environmental education and supported local cooperatives, thus ultimately preventing recyclable materials from ending up in the landfill. These measures may help to extend the lifespan of the landfill. The design of the project may also help to extend its lifespan. The pyramid shaped site geometry permits that each cell is excavated in accordance with the amount of waste that has been deposited; therefore, each cell is released over periods of time.
		<u>Source:</u> Cepollina Engenharia e Construções Ltda, <i>Central de Tratamento e Disposição Final de Resíduos Sólidos- CTR- Seropédica, Avaliação da Vida Útil Total</i> (São Paulo, SP: 2014).
		<u>RECOMMENDATIONS</u> As the project achieved the maximum score for this category, no additional recommendations can be provided at this time.
<b>LD0.0 Innovate Or Exceed Credit Requirements</b>		N/A
	<b>78</b>	

CATEGORY II: CLIMATE AND ENVIRONMENT		
RESOURCE ALLOCATION		
	Score	CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO
RA1.1 Reduce Net Embodied Energy	0	<p><b>No score</b></p> <p>A goal in an infrastructure project should be to conserve energy by reducing the net embodied energy of project materials over the project life. This credit is measured strictly by the percent reduction in net embodied energy from a baseline established in a life-cycle energy assessment.</p> <p>The project team has not considered estimations of materials' embodied energies assessed by means of a life-cycle assessment (LCA). The documentation provided by the owner and project team lacked evidence to show that the net embodied energy of the project was reduced. Neither the descriptive memorandum of the project, nor the environmental impact assessment (EIA) mentioned anything with regards to reducing net embodied energy.</p> <p><u>Source:</u> No evidences were found in the following documents: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007). Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).</p> <p><u>RECOMMENDATIONS</u> CTR Rio needs to provide or perform a life-cycle assessment for the project. As a first step for measuring the percentage in reduction of net embodied energy, the project owner and project team must calculate and estimate the net embodied energy of project materials through the LCA. This would include the required energy for materials extraction, transportation, refinement, manufacture, and the undertaken processes prior to the material is ready to be transported to the construction site. Such estimation must consider all of the materials to be used for maintenance and operations over the project life.</p>
		<p><b>No score</b></p> <p>The intent in supporting sustainable procurement practices is to obtain materials and equipment from manufacturers and suppliers that implement sustainable practices. This is measured through the percentage of project materials which are sourced from manufacturers that meet requirements for sustainable practices.</p> <p>CTR Rio has not shown any evidence that materials were acquired from sustainable sources or certified by reputable third-party accreditation and standard-setting organizations. Further documentation is needed to prove any efforts or intentions to verify supplier integrity. No evidence was found in the descriptive memorandum of the project, or the environmental impact assessment (EIA) with regards to supporting sustainable procurement practices.</p> <p><u>Source:</u> No evidences were found in the following documents: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007). Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).</p> <p><u>RECOMMENDATIONS</u> CTR Rio should present evidence, which confirms that manufacturers and suppliers were chosen by considering their sustainable policies and practices, and that the same applies for materials and equipment which have been obtained by only procuring certified materials. The project team must make greater efforts towards ensuring supplier integrity by taking workers' health and safety into account, as well as any environmental violations of suppliers.</p>
RA1.2 Support Sustainable Procurement Practices	0	<p><b>No score</b></p> <p>The intent in supporting sustainable procurement practices is to obtain materials and equipment from manufacturers and suppliers that implement sustainable practices. This is measured through the percentage of project materials which are sourced from manufacturers that meet requirements for sustainable practices.</p> <p>CTR Rio has not shown any evidence that materials were acquired from sustainable sources or certified by reputable third-party accreditation and standard-setting organizations. Further documentation is needed to prove any efforts or intentions to verify supplier integrity. No evidence was found in the descriptive memorandum of the project, or the environmental impact assessment (EIA) with regards to supporting sustainable procurement practices.</p> <p><u>Source:</u> No evidences were found in the following documents: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007). Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).</p> <p><u>RECOMMENDATIONS</u> CTR Rio should present evidence, which confirms that manufacturers and suppliers were chosen by considering their sustainable policies and practices, and that the same applies for materials and equipment which have been obtained by only procuring certified materials. The project team must make greater efforts towards ensuring supplier integrity by taking workers' health and safety into account, as well as any environmental violations of suppliers.</p>

<p><b>RA1.3 Used Recycled Materials</b></p>	<p><b>0</b></p>	<p><b>No score</b></p> <p>The use of recycled materials in an infrastructure project must be documented in order to evaluate the impact of sourcing. This can be done by reducing the use of virgin materials and avoiding sending useful materials to landfills by procuring reused materials (including structures), and materials with recycled content. The basic metric to assess the use of recyclables is through the comparison of the percentage of project materials that are reused or recycled, against the total volume or weight of all primary project materials which have been used.</p> <p>The project team has not identified appropriate reuse for existing structures and materials on-site, nor have they incorporated them into the project. There is no evidence regarding the weight or volume of materials used from reclaimed or recycled materials. According to the CTR Rio descriptive memorandum, concrete and masonry materials were used for the drainage system. However, the document does not state if these materials were recycled.</p> <p>According to descriptive memorandum, construction waste was used to build internal roads and paved sidewalks. This measure minimized the extraction of natural materials and reduced the costs of construction. However, CTR Rio has not presented numbers (in percentage) of recycled materials which have been used in the project.</p> <p><u>Source:</u> No evidences were found in the following document: Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010), 29-30.</p> <p><b>RECOMMENDATIONS</b></p> <p>The project still needs to report on an inventory of materials (by product name, manufacturer name, weight or volume of the material, and the percentage of recycled content) to assess the materials that may have reuse potential; this should be accompanied by design documents showing the location and weight (or volume) of reused structures or materials. CTR Rio should try to use recycled materials in installations (units, offices, or any architectural projects) in concentrations of up to 80%. Any recycled material which is used must not pose significant risks to human health, safety, and the environment. Also, the project team has to specify the percentage of recycled materials and materials with recycled content which have been used, if any.</p>
<p><b>RA1.4 Use Regional Materials</b></p>	<p><b>0</b></p>	<p><b>No score</b></p> <p>Through the use of regionally-sourced materials, projects should try to minimize transportation costs and impacts, as well as retain regional benefits by procuring from local sources. The metric used to assess this credit is the percentage of project materials by type and weight, or volume which are sourced from within the required distances. Envision recommends the following distances for materials: soils (80 km), aggregates (80 km), concrete (160 km), plants (400 km), and all other materials (800 km).</p> <p>The project has not shown any evidence to prove that regionally-sourced materials were used in the construction of the landfill, or if materials were coming from within the recommended distances.</p> <p><u>Source:</u> No evidences were found in the following sources: Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010) 11-17. Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Revisão do Projeto de Implantação do Cinturão Verde de Proteção Arbórea, transplântio e produção de</i></p>



		<p><i>mudas da espécie Eugenia villa novae da Central de Tratamento de Resíduos de Santa Rosa - CTR Rio.</i></p> <p><b>RECOMMENDATIONS</b></p> <p>The project team needs to identify locally sourced materials used in the architectural project, and calculate the percentage of materials which are locally sourced. Although CTR Rio has not stated the percentage of clay and plants that are locally sourced. CTR Rio needs to procure at least 95% of materials for project from local sources in order to earn a maximum score for this credit.</p>
<b>RA1.5 Divert Waste From Landfills</b>	<b>0</b>	<p><b>No score</b></p> <p>This credit to divert waste from landfills concentrates on reducing waste, and diverting waste streams from disposal to recycling and reuse. This is measured through the percentage of total waste that is diverted from disposal. Identification and evaluation of options for recycling and reuse are the first steps in developing effective plans for the handling, segregation, and storage of materials. It is important to determine which materials must be separated, and which materials can be commingled.</p> <p>According to the documentation which was submitted, the project team has not developed a waste management plan to decrease project waste, and divert waste from landfills and incinerators during operations. No evidences were found in the documents provided in regard to divert waste from landfills</p> <p><b>Source:</b></p> <p>No evidences were found in the following sources:  Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010) 11-17.  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Revisão do Projeto de Implantação do Cinturão Verde de Proteção Arbórea, transplântio e produção de mudas da espécie Eugenia villa novae da Central de Tratamento de Resíduos de Santa Rosa - CTR Rio.</i>  COOTRASER, <i>Ata da Assembleia Geral Extraordinária da Cooperativa de Catadores de Matérias Recicláveis do Município de Seropédica LTDA</i> (2014).</p> <p><b>RECOMMENDATIONS</b></p> <p>CTR Rio needs to develop a waste management plan that not only decreases project waste, but also recycles from the waste stream and reduces on-site toxicity, thus reducing waste streams and diverting them from disposal to recycling and reuse. Additionally, the project should reduce hazardous waste and calculate waste reductions, and the percentage of materials diverted to recycling or reuse, if any; and this should be introduced into to the project plan.</p>
<b>RA1.6 Reduce Excavated Materials Taken Off Site</b>	<b>6</b>	<p><b>Conserving</b></p> <p>Through the reduction of excavated materials taken off-site, projects can minimize the movement of soils and other excavated materials on-site to reduce transportation and environmental impacts. This credit is strictly measured by the percentage of excavated material retained on-site.</p> <p>Sand and clay are components of the layer used within the project to cover the waste. According to the environmental impact assessment (EIA), part of the soil that forms the area of the project is clay, which is good for sealing the waste which has been deposited. Therefore, the excavated soil has been used to cover the rubbish, pave inner roads, and for the formation of embankments and correct gradients. According to descriptive memorandum, all on-site excavated soil has been re-utilized within the project area. Therefore, at least 95% of the excavated materials are reused.</p> <p><b>Source:</b></p> <p>Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).</p> <p><b>RECOMMENDATIONS</b></p> <p>As the maximum score available for this credit has been awarded, no further</p>

		recommendations are provided at this stage.
<b>RA1.7 Provide for Deconstruction &amp; Recycling</b>	<b>0</b>	<b>No score</b>
		The main goal in providing for deconstruction and recycling is to encourage future recycling, upcycling, and reuse by designing for ease and efficiency in disassembly or deconstruction at the end of a project's useful life. The metric for this credit is the percentage of components that can be easily separated for disassembly or deconstruction.
		The owner and the project team have not specified materials that can be easily recycled or reused after the useful life of the project has ended. According to environmental impact assessment (EIA), some areas of the landfill may be reused after the project is disabled. Areas of industrial landfill (Class I) may not have any kind of future use, and must be isolated and monitored, even after completion of their useful life. The area where the waste Class II be transformed into revegetated areas and be used as a public park. However, any plan to upcycle the project into a park has not been provided.
		<u>Source:</u> No evidences were found in the following document: Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).
		<b>RECOMMENDATIONS</b> The project needs to ensure that the project design encourages future recycling, upcycling, and reuse by designing for ease and efficiency in project disassembly or deconstruction at the end of its useful life. The team should plan and predict the use of the infrastructure's operational facilities, such as offices and machinery, and present a strategy for reuse. Management should identify, track, and at the right time communicate the components and prefabricated units which have been designed for disassembly and deconstruction. Additionally, the likely effects of time and facilities operations on materials should be considered before determining their recyclability and reuse value, after which the team should adhere to materials that can be recycled, but which will not contaminate the waste stream.
<b>RA2.1 Reduce Energy Consumption</b>	<b>0</b>	<b>No score</b>
		To reduce energy consumption, infrastructure projects can conserve energy by reducing overall operations and maintenance energy consumption throughout the life of the project; this is strictly measured through the percentage of reductions achieved.
		The owner and project team have not conducted planning or design reviews to identify and analyze options for reducing energy consumption in the operation and maintenance of the constructed works, nor have they conducted any feasibility or cost analysis to determine the most effective methods for energy reductions and incorporated them into the design. The project has not reduced energy consumption above industry norms.
		<u>Source:</u> No evidences were found in the following documents: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007). Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).
		<b>RECOMMENDATIONS</b> CTR Rio has to introduce a plan within the project to reduce the overall consumed energy by as much as possible. The team should adopt a whole-systems design approach that conserves energy by reducing overall operations and maintenance energy consumption throughout the project life-cycle, and considers the multiple benefits to be achieved from reducing energy consumption and emissions.

RA2.2 Use Renewable Energy	0	<p><b>No score</b></p>
		<p>Sustainable infrastructure must try to meet energy needs through renewable energy sources. This effort is measured by the extent to which renewable energy sources are incorporated into the project.</p> <p>CTR Rio intends to produce renewable energy by transforming the biogas generated from the decay of organic matter into waste. At the time of assessment, the CTR was flaring the produced biogas to reduce harmful emissions. However, the project is not able to score in this category because there was no renewable energy being produced at the time of assessment. No evidence was found in the descriptive memorandum of the project, or in the environmental impact assessment (EIA) with regards to renewable energy use.</p>
		<p><u>Source:</u> No evidences were found in the following documents: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> ( Seropédica, RJ: 2007) . Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).</p>
RA 2.3 Commission & Monitor Energy Systems	0	<p><b>No score</b></p>
		<p>Energy systems performance can ensure efficient functioning and extensions of useful life by specifying commissioning and monitoring of the performance of energy systems. This credit seeks the third-party commissioning of electrical/mechanical systems, and appropriate documentation of system monitoring equipment having been incorporated into the design.</p> <p>The owner and project team have not engaged an independent commissioning of the project. The project team has not assembled the necessary information to train operations and maintenance personnel sufficiently for operations and maintenance activities. The design does not incorporate any advanced monitoring systems that can enable more efficient operations.</p>
		<p><u>Source:</u> No evidences were found in the following documents: Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> ( Seropédica, RJ: 2007) . Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i> (Seropédica, RJ: 2010).</p>
		<p><u>RECOMMENDATIONS</u> The project must ensure energy functioning and extended useful life by specifying the commissioning and monitoring of the performance of energy systems. The project must present documentation to provide necessary information to train operations and maintenance workers on the requirements for monitoring energy systems. The monitoring equipment must be capable of monitoring all primary project functions needed for efficient operations.</p>

<p><b>RA3.1 Protect Fresh Water Availability</b></p>	<p>17</p>	<p><b>Conserving</b></p>
		<p>“Protect Fresh Water Availability” is to reduce the negative net impact on the availability, quantity, and quality of fresh water. This is measured by the extent to which the project considers availability and replenishment of freshwater resources.</p> <p>CTR Rio has conducted a robust water availability assessment, having located all nearby basins, aquifers, and rivers. The following topics can be found in the environmental impact assessment (EIA) with regards to water assessment of the natural habitat: quality of water bodies, considering bacteriological, physical, and chemical issues; quality of water bodies during drought and rainy seasons; quality of groundwater; and water flow direction and drainage.</p> <p>In 2006, samples of water from the Valão do Brejo and Neves streams were collected from different areas to be analyzed before implementing CTR Rio. Since then these have been periodically collected and analyzed by institute of the state of Rio de Janeiro (INEA), and guided by the program for monitoring the quality of surface and groundwater, in order to ensure water quality. The same precautions have been taken for groundwater.</p> <p>The EIA presented a study which estimated the demand for daily water consumption; this was estimated to be 77.3 m3 of water per day. The water supply for the CTR Rio operation is obtained from wells which have been specifically implemented for this purpose, and approved by the environmental institute of the state of Rio de Janeiro (INEA). All waters which are collected are constantly monitored through water quality tests in specialized laboratory units located within CTR Rio. After going through treatment the water is channeled to tanks to later be distributed for industrial purposes and humidify inner road as well. The waster for human consumption is fueled by supply network CEDAE (state company for water and sewage)</p> <p>The project incorporated design features to minimize the negative net impact on groundwater and surface water. A drainage system was implemented in the area of CTR Rio to drain rainwater to be released into rivers. CTR Rio has also studied the water flow of the Valão do Neves and Brejo streams, which could potentially be affected by implementing the landfill. Therefore, the project has taken careful mitigation measures to not alter the natural fluctuation in flows of the receiving waters’ ecosystems.</p>
		<p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Meio Físico.” <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> ( Seropédica RJ: 2007), 24-79 (hereafter cited as EIA). Ibid, 30. Ibid,41 AECOM, <i>Atualização do Plano de Monitoramento da Qualidade das Águas Superficiais e Subterrâneas da Área de Influência da CTR Rio</i> ( 2015).</p>
		<p><u>RECOMMENDATIONS</u> The project should to provide calculations showing that the project has a long-term net positive impact on freshwater systems. Additionally, the project has to ensure that it replenishes the quantity and quality of fresh surface water and groundwater supplies, to an agreed upon undeveloped natural ecosystem condition.</p>
<p><b>RA3.2 Reduce Potable Water Consumption</b></p>	<p>4</p>	<p><b>Improved</b></p> <p>Reduce overall potable water consumption and encourage the use of greywater, recycled water, and stormwater to meet water needs. This credit is measured through the percentage of reduction in water use.</p> <p>The project team has considered strategies to reduce the use of potable water during operations and maintenance of the project. The water used for cleaning in the offices is collected from the wells, with authorization from the environmental</p>

		<p>agency of Rio de Janeiro (INEA). The humidification of internal roads and the watering of plants is carried out by using the recycled water that comes from the treated leachate effluents. However, the project team did not provided the percentage of reductions in potable water consumption, to levels above industry norms. The project team has not conducted feasibility or cost analysis to determine the most effective methods for potable water reductions, or incorporated them into the design.</p> <p><u>Source:</u> INEA, <i>Outorga de Direito de Uso de Recurso Hídricos</i>( 2013). Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Descrição do Projeto.</i>” <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica RJ: 2007), 30.</p> <p><u>RECOMMENDATIONS</u> The project needs to develop feasibility and cost analyses in order to be able to measure the water consumption, and aim for a 100% reduction in potable water usage. CTR Rio should provide a deeper analysis of the amount of recycled water (generated by the treated leachate) that has been used in the project. Additionally, CTR Rio can incorporate other strategies to reuse water, such as recycling water that has been used for internal purposes, or reusing treated water and rainwater. The project can also aim to recycle water for community usage.</p>
<b>RA3.3 Monitor Water Systems</b>	<b>1</b>	<p><b>Improved</b></p> <p>This credit aims to assess the implementation of programs to monitor water systems during operations, and their impacts on receiving waters. This is evaluated by provided documentation of systems design.</p> <p>CTR Rio engaged an independent entity (AECOM) to develop the Program for Monitoring the Quality of Surface and Groundwater. This program is executed by INEA, which periodically checks the quality of groundwater and surface waters. However, the project team has not provided information about the entity that is responsible for monitor water systems of the project. The water that have been recycled for inner purposes must be monitored to ensure quantity and quality . There are no documents that show the project has monitor water to mitigate negative impact or improve efficiency.</p> <p><u>Source:</u> AECOM, <i>Atualização do Plano de Monitoramento da Qualidade das Águas Superficiais e Subterrâneas da Área de Influência da CTR Rio</i> (2015).</p> <p><u>RECOMMENDATIONS</u> It is understood that the project had one time monitoring when the treatment to transform the leachate into reusable water was implemented. Nevertheless, the project needs to present constantly monitoring of water system to enhance the score in this category. Thus, project needs to integrate monitoring activities into operations. Also, the project needs to make adjustments in operation, when necessary, to reduce negative impacts and improve efficiency.</p>
<b>RA 0.0 Innovate Or Exceed Credit Requirements</b>		N/A
	<b>28</b>	

NATURAL WORLD		
	Score	CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO
NW1.1 Preserve Prime Habitat	16	<b>Restorative</b>
		<p>This credit looks to avoid placing the project and the site compound, or temporary works, on land that has been identified as being of high ecological value, or as having species of high value. This credit is measured by the avoidance of high ecological value sites and the establishment of protective buffer zones.</p> <p>In terms of selecting the site for implementing CTR Rio, four areas were studied and compared, taking into account surrounding urban infrastructure and potential impacts of natural systems. The selected site was a pasture farm (Santo Antonio), also known as Morro dos Cochós, which possessed favorable features for implementing a center for waste treatment and disposal. The site has been characterized as a flat-land, dominated by pasture areas, and with a low incidence of individual trees; the site had previously been modified by human activity. Therefore, the project did not significantly modify the morphology of the site, and therefore did not impose great impacts on the natural environment. Additionally, no environmental protected areas were identified on the site, however, preservation and protected areas in the municipality of Seropédica and Itaguaí were identified, which were not affected by the implementation of the project.</p> <p>A green belt has already been implemented around the perimeter of CTR Rio, with native species of trees that cover about 22.4 ha. This green belt brings benefits to the area because it acts as protection against odor and noises, as well as helps to absorb stormwater and protect prime habitat. Due the fact that CTR Rio is a massive infrastructure project, according to the regulation of the National Institute for the Environment (INEA), in order to get its operation licence the project needed to contribute to other environmental programs approved by CONAMA ( Ministry of the Environment) and INEA as well. As a result, CTR Rio has contributed to revegetating the riverbank of the Guandu River. The Guandu River is one of the main rivers that make up the water supply system in the metropolitan area of Rio de Janeiro. Additionally, the project acquired an area located in the same region that corresponds to 20% of the area of CTR Rio, and has been donated to government for restoration and preservation. These actions have helped to increase the area of prime habitat for animals and plants. This measure is in accordance with the Brazilian forestry code. The Brazilian forestry code requires that owners of rural property restore and preserve between 20% and 80% of areas containing native forests, depending on the region where the property is located. The code establishes alternative methods for restoring legally established forest reserve areas, which may be adopted successively or cumulatively. These alternative methods constitute compensatory measures, such as the provision of a condominium system consisting of more than one property; the use of another area situated within the same micro-basin or hydrographic basin in the state; the leasing of an area under the public forest system with right-of-way; or the acquisition of stakes in forest reserve areas which have created specifically for this purpose.</p> <p><u>Souces:</u>  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Alternativas Tecnológicas e Locacionais.</i>” <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos</i> (Santa Rosa, Seropédica, RJ: 2007), 30. ( hereafter cited as EIA)  Ciclus, <i>Atendimento a condicionante LO INO16380 e daLI INO23959. Rio de Janeiro</i> ( RJ: 2015).  Vereda Estudos e Execução de Projetos Ltda and Ciclus, <i>Revisão do Projeto de Implantação do Cinturão Verde de Proteção Arbórea, transplântio e produção de mudas da espécie Eugenia villa novae da Central de Tratamento de Resíduos de Santa Rosa</i> (2010), 4.</p>

		<p>INEA, <i>Licença de Operação Centro de Tratamento de Resíduos Sólidos Santa Rosa</i> (Rio de Janeiro, RJ: 2013).</p>
		<p><u>RECOMMENDATIONS</u></p> <p>As the project has been awarded the maximum score for this credit, not further recommendations are provided at this stage.</p>
<p><b>NW1.2 Preserve Wetlands and Surface Water</b></p>	<p><b>4</b></p>	<p><b>Enhanced</b></p> <p>In order to preserve wetlands and surface water, it is necessary to protect, buffer, enhance, and restore areas designated as wetlands, shorelines, and water bodies, by providing natural buffer zones, vegetation, and soil-protection zones. The effort to preserve these areas is measured by the size of natural buffer zones which have been established through the project around all wetlands, shorelines, and water bodies.</p> <p>CTR Rio was implemented in a hydrological-sensitive area, composed of the main Seropedica basin and sub-basins, as well as aquifers. There are two micro basins that have been directly affected by the CTR Rio project; Valão do Brejo and Valão dos Neves. About 58.9% of the site is located in the Valão do Brejo micro-basin, and the remaining 41.1% is in the Valão dos Neves basin. The water bodies of both Valão dos Neves and Brejo’s micro-basins do not pass through the project area; however, the natural bioswales do. These water bodies are narrow (less than two meters in width), however, vernal pools and shorelines that have suffered from human activities and do not contain vegetation to protect them have been found in many parts of the routes. Where the swales (Valão dos Neves and Brejo) did cross the CTR Rio site, they were channeled in accordance with approval of the National Institute for the Environment (INEA). This measure permits for better runoff in the area, and has major significance for the project, as it is responsible for leading stormwater to the Piranema River. The closest rivers to CTR Rio are the Piranema and Piloto, with distances of about 3.5 km. and 4 km., respectively. The Piranema River receives water from the Valão dos Neves and Brejo streams, and discharges it into the Piloto River. Based on Brazilian forestry code, an area for environmental protection to protect shorelines must exist along rivers or any water courses: this area differs in width in width, according to the width of the river. According to environmental impact assessment (EIA), all environmentally protected areas next to rivers and water bodies were conserved, as they have not been affected directly by CTR Rio In addition, mitigation measures were carefully taken in order to avoid the pollution of aquifers and water bodies.</p> <p><u>Source:</u>  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Meio Físico.</i>” in EIA, 24.  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Análise dos Impactos Ambientais.</i>” in EIA, 28.  Ciclus, <i>Atendimento a condicionante 17 da lei número IN001633</i> (Rio de Janeiro, RJ: 2013).  Ciclus, <i>Atendimento a condicionante LO INO16380 e daLI INO23959</i> (Rio de Janeiro, RJ: 2015)</p> <p><u>RECOMMENDATIONS</u></p> <p>The project did not earn a better score because the team project did not avoid development on area that contains vernal pools or natural bioswales. Natural swales are composed of the natural runoff and might be affected by sediment accumulation, or any other impact that can create barriers to runoff. Although CTR Rio has channeled the Valão do Brejo and Neves streams, a measure that has helped to avoid the contaminating of swales, a buffer zone should be created around them in order to protect soils and the natural runoff of the site.</p>

<p><b>NW1.3 Preserve Prime Farmland</b></p>	<p>12</p>	<p><b>Conserving</b></p>
		<p>This credit has the purpose of identifying and protecting soils which have been designated as prime farmland, unique farmland, or farmland of statewide importance. It is measured by the percentage of prime farmland which has been avoided during development.</p>
		<p>According to Seropédica zoning requirements, the site is located in a rural area, and is limited by the Serra da Calçada to the north, agro-pastoral properties to the south (with the Agrovila Chapero locality), agro-pastoral properties to the east, and lands used for mineral extraction to the west.</p>
		<p>In order to implement the project, the viability of the soil was studied, features of the site's soil and surroundings municipalities having been analyzed. Although the site was located on a degraded private farm which could be used for pasture, the selection of the site was justified for reasons of favorable topographic and geographic conditions for a waste treatment and disposal center. The "Information Center Soil Foundation," in conjunction with the use of state data from Rio de Janeiro (CIDE), compared the use of soils in the cities of Itaguaí and Seropédica, which surrounded the site. The results characterized Itaguaí as having significant a presence of fields and pastures, while containing smaller percentages of urban areas and agricultural uses. The municipality of Seropédica was classified primarily by pastures, with a small percentage of natural vegetation. There are no studies evidencing the value of farms, and whether or not those areas should be considered as prime farmland of significant economic value. Additionally, there is no evidence to show if the project would have indirectly affected the surrounding farms and agro-pastoral activities.</p>
<p><b>NW1.4 Avoid Adverse Geology</b></p>	<p>5</p>	<p><b>Conserving</b></p>
		<p>Projects should avoid development on adverse geologic formations and safeguard aquifers in order to reduce risks of natural hazards and preserve high-quality groundwater resources. The metric for this credit is the degree to which natural hazards and sensitive aquifers are avoided, and geologic functions are maintained.</p>
		<p>The geology of the site was properly studied and characterized, therefore low-lying coastal areas, karst formations, and aquifers were identified for the purpose of maintaining records. In the area of indirect influence of the project, three main litho-stratigraphic compartments, represented by Precambrian rocks (granitic, gneisses, migmatites) were identified. Additionally, sediments deposited from currents in the floodplain and along the coastline were also identified. Considering the possibility of a landslide (even on a small scale), the project team developed plans to reduce the risk of damages caused by landslides. All prevention methods which were studied and applied in order to mitigate erosion can be found in the plan for degraded areas. This plan has analyzed the on-site gradients and proposed measures that can be incorporated in order to reduce the risk of landslides, either by lessening their magnitude, or avoiding them altogether. Some measures were simple, such as planting vegetation on the slopes, while others were more complex, such as the</p>



		<p>implementation of a drainage system to create runoff control.</p> <p>Additionally, the green belt that has been created around the area helps to prevent geological disasters. The geotechnical program was created to periodically monitor the stability of the soil, thus avoiding the risk of possible landslides. As the aquifer in the area of the project was of concern, the team project created a program for monitoring the quality of surface waters and groundwaters. The team has been collecting surface and underground water every three months in order to ensure water quality. Furthermore, in order to maintain the integrity of the aquifer, sensors were installed throughout the operating area, and a protection system, with a double layer of HDPE matting, was installed in order to avoid any leachate leakage.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>“Meio Físico.”</i> in EIA, 1-6. Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>“Programas de Gestão Ambiental.”</i> in EIA Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica (Seropédica, RJ: 2010)</i>, 46.</p> <p><u>RECOMMENDATIONS</u> As the maximum score was achieved for this credit, no further recommendations are provided at this stage.</p>
<p><b>NW1.5 Preserve Floodplain Functions</b></p>	<p><b>8</b></p>	<p><b>Superior</b></p> <p>This credit assesses efforts to preserve floodplain functions by limiting development, and the impacts of development, in order to maintain water management capacities and capabilities. This is measured through the efforts taken to avoid floodplains, or maintain predevelopment floodplain functions.</p> <p>Due its topography, the area of the project, has never suffered from flooding. The site is located within two micro- basins that have been a great advantage for on-site runoff, as all rainwater is led to the closest river. Nonetheless, as CTR Rio it is a massive infrastructure project, it has affected the natural morphology and runoff of the area. In this regard, measures to mitigate any possible flooding or soil erosion have been developed. The project corrected gradients in order to help runoff, and also implemented a drainage system to drain the rainwater and discharge it into the Piranema River (the closest river from the area). All measures which have been taken have not been demonstrated to affect the aquatic habitats of the nearby streams and rivers. In order to ensure the water quality of groundwater and surface water, the project implemented the program for monitoring the quality of surface waters and groundwaters. Additionally, the project has included a meteorological system to monitor temperatures, as well as forecast weather conditions and water precipitation. CTR Rio is developing a contingency plan which may present a flood emergency plan.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>“Meio Físico.”</i> in EIA, 20-39</p> <p><u>RECOMMENDATIONS</u> As the project is a landfill, there is the risk of soil and water contamination; therefore it is relevant to demonstrate a plan for emergency flooding situations by showing how to address such situations, and in providing an evacuation plan for the site. Additionally, the fact that the project is not a water dependent structure does not mean that does not have an impact on aquatic habits. Since CTR Rio has modified land (even if an insignificant proportion), and channelized two natural swales, it would be important to monitor aquatic habits, especially where the rainwater and stormwater are being led.</p>

<p><b>NW1.6 Avoid Unsuitable Development on Steep Slopes</b></p>	<p><b>6</b></p> <p><b>Conserving</b></p> <p>This credit assesses efforts to protect steep slopes and hillsides from inappropriate and unsuitable development, in order to avoid exposures and risks from erosion, landslides, and other natural hazards. This is measured by the degree to which development on steep slopes has been avoided, or to which erosion controls and other measures are used in order to protect the completed project and other downslope structures.</p> <p>Steep slopes were avoided as the area chosen for the project to be implemented is flat with low susceptibility to erosion. Proper measures were applied in order to avert any erosion, especially during the first phase of the project where soil needed to be removed. All of the procedures were evidenced in “Plan for Recovering Degraded Areas,” which presents a chart with all gradient conditions, and mitigation actions that should be taken to control erosion. A landscape project was designed to improve stability on slopes; this consisted of covering portions of the site with grass in order to protect the exposed areas which were susceptible to erosion (such as cuts, embankments, and slopes), thus providing them with surface strength, and preserving, when possible, the nearby natural landscape features. Additionally, the plan aims to revitalize any area that has been exposed to erosion and is affected by the movement of trucks, piling of waste, or any other condition which may cause landslides or erosion.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Meio Físico” in EIA, 10. Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Análise dos Impactos Ambientais” in EIA, 24 Signus Vitae, <i>Programa de Recuperação de Áreas Degradadas</i> (2015), 12.</p> <p><b>RECOMMENDATIONS</b></p> <p>As the maximum score was achieved for this credit, no further recommendations are provided at this stage.</p>
<p><b>NW1.7 Preserve Greenfields</b></p>	<p><b>0</b></p> <p><b>No score</b></p> <p>The intent of the credit is to conserve undeveloped land by locating projects on previously developed greyfields and/or sites which have been classified as brownfields. Metrics for the credit consist of the percentage of an area that is considered to be a greyfield, or the use and cleanup of a site which has been classified as a brownfield.</p> <p>According to the glossary of the Envision manual, greenfields are undeveloped land within a city or rural area that is being considered for development. Greenfields may contain natural landscape, natural amenities, or agricultural land. CTR Rio was implemented in a rural area, and therefore, could be considered as greenfield land for development. The land had some degraded area; however, as the project did not provide evidence of the greyfield area that has been improved, the project is not able to receive points for this subcategory.</p> <p>The plan for recovering degraded areas has been responsible for restoring degraded areas by increasing vegetation. There is no evidence of the percentage which was degraded, could be considered as a greyfield, or the percentage that has been restored. As a result of implementing CTR Rio, the closest open-air dump areas in the surrounding cities of Seropédica and Itaguaí were closed. Additionally, CTR Rio enabled to closure the Gramacho and Gericinó open-air dumps in the city of Rio de Janeiro. The former open-air dump area of Seropédica has been monitored by Ciclus, CTR Rio’s sponsor, which was a requirement for obtaining the operating license. Ciclus created the “Plan to Control the Seropédica Landfill,” which monitors the geotechnical conditions of the landfill by assessing the overall integrity of landfill, as well as the environmental conditions through measures such as the assessment of changes in fauna and flora, as well as surface and underground waters.</p> <p><u>Source:</u></p>

		<p>No evidences were found in the following documents:  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>“Alternativas Tecnológicas e Locacionais.”</i> Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos. Santa Rosa Seropédica, RJ: 2007, 3-7.  FRAL Consultoria LTda, <i>Vazadouro de Seropédica- Plano de Monitoramento (2012).</i></p> <p><b>RECOMMENDATIONS</b></p> <p>The project needs to provide the percentage of the site that could be considered a greyfield, as well as the percentage of the area that has been restored through the “Plan for Degraded Areas.”</p>
<p><b>NW2.1 Manage Stormwater</b></p>	<p><b>9</b></p>	<p><b>Superior</b></p> <p>This credit aims to minimize the impact of infrastructure on the quantity and quality of stormwater runoff. This is measured by the infiltration and evapotranspiration capacity of the site, and a return to pre-development capacities.</p> <p>CTR Rio has incorporated measures to reduce negative impacts associated with increased runoff. As the project has affected the natural runoff of the site, a drainage system was implemented throughout the project area. These drains are meant to prevent stormwater from reaching the leachate and carrying pollutants to natural environment. All water collected by these devices is diverted into the Valão do Brejo and Valão dos Neves channels, and led to a water containment cistern before later being released into the closest river (the Piranema River). This measure is taken in order to avoid dramatically increasing the flow river of the river. The green belt around the CTR Rio has restored the water storage ability of the site, as it permits water absorption, infiltration, and evapotranspiration.</p> <p><i>Source:</i>  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>“Descrição do Projeto.”</i> in Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007), 61-64.  Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>“Análise dos Impactos Ambientais”</i> in EIA, 09.  Ciclus, <i>Manual de Operação CTR Seropédica(2011)</i>, 28-30.</p> <p><b>RECOMMENDATIONS</b></p> <p>CTR Rio has developed a drainage system to manage stormwater and help natural runoff. However, no plans have been presented for reusing rainwater, which should be presented. According to the environmental assessment study, the water that comes from leachate after being treated is locally reused, but there evidence of a rainwater harvesting plan should be presented. CTR Rio should evidence the percentage increase of soil permeability or storage capacity. The project may include rooftop gardens, green roofs, vegetated the swales, rain gardens, bioretention, and cisterns to reuse water, permeable pavement, and sidewalk storage.</p>
<p><b>NW2.2 Reduce Pesticides and Fertilizer Impacts</b></p>	<p><b>5</b></p>	<p><b>Superior</b></p> <p>This credit assesses efforts to reduce nonpoint-source pollution by reducing the quantity, toxicity, bioavailability, and persistence of pesticides and fertilizers. This is evaluated by the efforts made to reduce the quantity, toxicity, bioavailability, and persistence of pesticides and fertilizers used on-site, including the selection of plant species, and the use of integrated pest management techniques.</p> <p>Through the “Green Belt Program,” and with the National Environmental Institute (INEA), native plants to be grown in the green belt have studied and selected. This was done so that the plants which have been selected are potentially the best in adapting to soils, pests, and temperatures, thus decreasing the use of pesticides and fertilizers. However, as the soil presented a lack of nutrients in some areas, it was essential to fertilize the soil before planting. Periodically, insects have been controlled, especially ants (the most common type of pest in that area), but there is no evidence detailing which fertilizers and pesticides have been used. One of the</p>

		<p>greatest advantages of this green belt is that it helps to absorb stormwater, thus alleviating any risk of a floodplain. Additionally, the project uses a drainage system to control stormwater, avoid overload, and affect groundwaters and surface waters.</p> <p><i>Source:</i> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Análise dos Impactos Ambientais” in EIA, 09. Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Revisão do Projeto de Implantação do Cinturão Verde de Proteção Arbórea, transplântio e produção de mudas da espécie Eugenia villa novae da Central de Tratamento de Resíduos de Santa Rosa - CTR Rio.</i></p> <p><b>RECOMMENDATIONS</b> The green belt project is quite descriptive with regards to the species of plants which should be grown locally, as well for precautions that must be taken to help the growth of such plants. However, as the project has not detailed what fertilizers and pesticides have been used, and whether or not they could be harmful to the environment, efforts to reconcile these issues are strongly recommended.</p>
<p><b>NW2.3 Prevent Surface and Groundwater Contamination</b></p>	<p><b>18</b></p>	<p><b>Restorative</b> This credit assesses how projects preserve freshwater resources by incorporating measures to prevent pollutants from contaminating surface waters and groundwater, and monitor impacts throughout operations. This is measured by the designs, plans, and programs which are instituted to prevent and monitor surface and groundwater contamination.</p> <p>The CTR Rio project prevents groundwater and surface water contamination through the “Program for Monitoring the Quality of Surface and Groundwater.” The program executed by INEA monitors activities which are potentially polluting, and may cause impacts to water bodies and aquifers. It aims to evaluate the quality of effluents that are released into water bodies, assesses the effectiveness of the drainage system for stormwater, monitor water quality, and identify any negative impacts to the environment. The waterproofing system implanted in the project constitutes a multi-barrier system, complemented by a leachate drainage system, which will prevent the accumulation of liquids and gases. The system also has compacted clay, geotextile, bentonite blanket, a double layer of HDPE, and highly sensitive sensors to detect leaks, thus avoiding possible contamination to groundwater and surface water. The project team has foreseen the generation of potentially polluting substances such as leachate, which is treated and transforms into recycled water.</p> <p><i>Source:</i> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Descrição do Projeto” in EIA, 117-119. Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Programas de Gestão Ambiental” in EIA, 17. Cepollina Engenharia e Construções Ltda, Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica, (Seropédica, RJ: 2010), 46-64. AECOM, <i>Atualização do Plano de Monitoramento da Qualidade das Águas Superficiais e Subterrâneas da Área de Influência da CTR Rio</i> (2015), 8.</p> <p><b>RECOMMENDATIONS</b> As the maximum score for this credit was achieved, no further recommendations are provided at this stage.</p>
<p><b>NW3.1 Preserve Species Biodiversity</b></p>	<p><b>16</b></p>	<p><b>Restorative</b> This credit assesses efforts to protect biodiversity by preserving and restoring species and habitats. It is measured by the degree of habitat protection.</p> <p>The project demonstrated that it does not have a great impact to natural habitats, as the area had previously been modified by human activity. The environmental impact</p>

		<p>assessment (EIA) documented plants and animal species found on the site and surrounding areas. According to the EIA, the area did not have a large density of animals, or any rare or endangered species. The area was used by local birds to land and forage. As construction began, all areas where animals could possibly be found were visited by a biologist to ensure the safety of the animals. The 0.5 ha. of vegetation which was removed was formed by a remnant secondary forest and similar vegetation. No rare or endangered species of vegetation were found. In order to increase habitat and connectivity, the green belt project implemented around CTR Rio aims to reinstate vegetation, maintain local species, improve existing habitat, and provide for new habitat.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Meio Biotico.” Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos. Santa Rosa ( here after cited as EIA) (Seropédica, RJ: 2007), 81-95. Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Análise dos Impactos Ambientais” in EIA, 10. Vereda Estudos e Execução de Projetos Ltda and Ciclus, <i>Revisão do Projeto de Implantação do Cinturão Verde de Proteção Arbórea, transplântio e produção de mudas da espécie Eugenia villa novae da Central de Tratamento de Resíduos de Santa Rosa</i> (2010), 5.</p> <p><u>RECOMMENDATIONS</u> As the maximum score was achieved for this credit, no further recommendations are provided at this stage.</p>
NW 3.2 Control Invasive Species	11	<p><b>Restorative</b></p> <p>The intent of this credit is to encourage the use of appropriate noninvasive species, and control or eliminate existing invasive species. It is measured by the degree to which invasive species have been reduced or eliminated from the project area.</p> <p>In CTR-Rio, invasive species have been controlled by introducing locally appropriate and noninvasive species. The project team works with local agencies and other groups to identify and use only locally appropriate plants on-site, which has followed the completion of construction, and the commencement of operations.</p> <p>Through the green belt project, and in collaboration with the National Institute for the Environment (INEA), the best native plants to be grown in the green belt area around CRT Rio were identified. Native plants were chosen to help maintain the natural balance of the habitat as much as possible. Strategies to remove invasive pests, such as rats, fleas, and cockroaches, were also implemented. According to the “Pest Control Certificate” presented by CTR Rio, pests are being eliminated, and their removal is ensured by applying pesticides. The project team did not state which pesticides have been used.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “Programa de Gestão Ambiental” in EIA, 24. Def Inset Dedetização Ltda, <i>Certificado de Controle de Pragas referente ao mes agosto de 2015</i>(2015).</p> <p><u>RECOMMENDATIONS</u> The green belt project and the environmental impact assessment (EIA) should address preventative strategies for minimizing the potential for invasive species (both plants and animals), as well as strategies to remove invasive species that emerge on-site in the future. Special care should be given for pests such as rats, fleas, mosquitoes, and cockroaches, among others; which are mostly found in landfills.</p>
NW3.3 Restore Disturbed Soils	10	<p><b>Restorative</b></p> <p>This intent of this credit is to restore soils that were disturbed during construction and previous development, in order to restore ecological and hydrological functions. This is measured by the percentage of disturbed soils which have been restored.</p>

		<p>Efforts to clear the site primarily involved scraping the vegetal soil layer to eliminate any peat, clay, organic matter, and other inappropriate materials. The soil which was removed was deposited in an appropriate place, protected from erosion, and later used in the areas which were to be revegetated. According to the plan for degraded areas, some parts of the site presented degraded soils with a lack of nutrients. In order to implement the green belt around CTR Rio, this deficient soil was restored through fertilization and native plant growth.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Descrição do Projeto</i>” in EIA, 32. Signus Vitae, <i>Programa de Recuperação de Areas Degradadas</i> (2015),11-18.</p> <p><b>RECOMMENDATIONS</b> As the maximum level of achievement for this credit was met, no further recommendations are provided at this stage.</p>
<p><b>NW3.4 Maintain wetland and surface water functions.</b></p>	<p><b>19</b></p>	<p><b>Restorative</b></p> <p>This credit intends to maintain and restore the ecosystem functions of streams, wetlands, and waterbodies, as well as their riparian areas. It is measured by the number of functions which have been maintained and restored. There are four main ways to improve ecosystem functions, which include maintaining or enhancing hydrologic connections, water quality, natural habitat, and sediment transportation.</p> <p>CTR Rio supports all four ecosystem functions. The project includes a drainage system that collects all rainwater and channels it to two on-site swales. These swales (Valão do Brejo and Neves) were channeled when they cross the site. This measure has helped the control runoff, and leads the stormwater to its normal flow, which in turn has enhanced the hydrological connections, and helps to maintain sediment transportation. As the amount of sediment generated by the construction of the project was a concern, a local a cistern system was provisionally made for containing extra sediments, and avoiding overload of the Valão do Brejo and Neves streams.</p> <p>In maintaining aquifers and surface water quality, the project has implemented a plan for monitoring groundwater and surface waters. Before implementing the project, the surface waters and groundwaters were analyzed for comparisons with further analyses, which has helped to guarantee water quality.</p> <p>In helping to enhance natural habitat, CTR Rio has a green belt around its perimeter, and has helped in revegetating the banks of the Guandu River. In this manner, CTR Rio has fully restored disturbed functions.</p> <p><u>Source:</u> Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Meio Físico</i>” in EIA, 20-78. Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, “<i>Análise dos Impactos Ambientais.</i>” in EIA, 9</p> <p><b>RECOMMENDATIONS</b> As the maximum score was achieved for this credit, no further recommendations are provided at this stage.</p>
<p><b>NW 0.0 Innovate Or Exceed Credit Requirements</b></p>	<p><b>9</b></p>	<p><b>Innovate</b></p> <p><i>CTR Rio is helping to innovate the waste management industry in Brazil by installing technology to isolate waste contaminants and protect the environment. This isolation is achieved through a waterproofing system and monitoring sensors, which improve project performance by controlling leachate contamination.</i></p> <p><i>The waterproofing system which has been employed by CTR Rio is composed of several protective layers, these include clay, HDPE, sand, and geotextile fabric with a sensor network. The first level of the waterproofing sealant is composed of 18 inches layer of clay, 0.05 inches of HDPE, 7 inches of sand; the second layer contains 5</i></p>

	<p><i>inches of clay, a geotextile fabric with a sensor network, and 0.05 inches of HDPE; the third layer contains 4 inches of clay, a drainage system to capture biogas; and the final layer contains 5 inches of clay to cover the waste.</i></p> <p><i>Most landfills in Brazil are not deploying sensors in their waterproofing systems. Undoubtedly, the effort taken by CTR Rio to demonstrate the effectiveness of this technology may set a precedent for future adoption by other landfills. In each landfill cell, a network of sensors will be implemented with electrodes placed every 20 meters. If leaking is detected in the geotextile web, the electrode currents are shut off. When the circuit is cut, the electrical signal is not transmitted, and therefore the geotextile will not incur damage. By measuring whether there is a presence of electrical signals it is not only possible to detect that damage exists, but also to map the location where the damage has occurred; this information is transmitted in real-time to a control system. The data is analyzed by specific software that generates graphs and reports based on the results of monitoring. Due to high sensitivity, the electrodes can detect any leakage. In addition to the detection and isolation of waste, the project also includes a leachate treatment plant. The leachate, which is generated by the decomposition of organic matter, is captured by drains and led to reservoirs, where it is covered in order to avoid spreading disease and bad odors. After filling the reservoir, the system to treat the leachate is initiated. The leachate passes through a process to be transformed into reusable water. This water is stored in cisterns, and used for washing trucks, and humidifying internal roads. CTR Rio has overcome significant problems with regards to avoiding the contamination of ecosystems. Although CTR Rio is located in area that contains two micro-basins, the project has ensured surface and groundwater quality. To monitor surface water and groundwater, the project has included a program for monitoring the quality of surface water and groundwater, which conducts periodic activities to ensure water quality. Additionally, by channeling the Valão do Neves and Brejo streams, CTR Rio has improved the runoff for the site. All rainwater is collected by a drainage system and led to these channels, and then it is stored in a cistern, to be gradually released into the Piranema River. This measure is a result of concerns about wetland preservation, and has guaranteed that riparian habitats (especially in the Piranema and Piloto rivers) have not been affected by implementing CTR Rio.</i></p> <p><u>Sources:</u>  Cepollina Engenharia e Construções Ltda, <i>Memorial Descritivo do Projeto do Centro de Tratamento de Resíduos Sólidos de Seropédica</i>.(Seropédica, RJ: 2010), 46-64.  AECOM, <i>Atualização do Plano de Monitoramento da Qualidade das Águas Superficiais e Subterrâneas da Área de Influência da CTR Rio</i> ( 2015), 8.</p>
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CLIMATE AND RISK		
	Score	CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO
<b>CR1.1 Reduce Greenhouse Gas Emissions</b>	<b>13</b>	<b>Superior</b>
		The intent of this credit is to conduct a comprehensive life-cycle carbon analysis, and use this assessment to reduce the anticipated net amount of greenhouse gas emissions during the life of the project, thus reducing the project's contribution to climate change. The metric used for this credit is the reduction of life-cycle net carbon dioxide equivalent emissions.
		CTR Rio has a plan for mitigating greenhouse gas emissions from 2015 to 2018, which has been developed based on the requirements of the GHG Protocol, and verified by the British Standards Institution (BSI). The GHG inventory was measured to be about 1.3 million tCO <sub>2</sub> e in 2014, with 98.9% of these emissions coming from the decomposition of waste which was deposited in CTR Rio. The project aims to reduce about 41% of GHG emissions by 2018, and reduce about 50% of methane gas emissions through biogas flaring. In order to capture the biogas produced by the decomposition of organic matter, the project includes a pipe system which has been implemented throughout the landfill. All recovered biogas is planned to be provided: electricity generation (both domestic consumption and for sale through distributors); generation and distribution of natural gas after purification; flare the excess produced to avoid methane emissions to the atmosphere.
		By implementing this plan, CTR Rio contributes to reducing the emission of global warming gases into the atmosphere, and generates carbon credits to be exchanged with others countries. This measure is approved by the Clean Development Mechanism (CDM), which is a tool to assist developed countries in reducing GHG emissions, according to the Kyoto Protocol framework. CTR Rio was the first Brazilian institution to generate Certified Emission Reductions (CERs) approved by the U.N. Caixa Econômica Federal (a Brazilian bank that has provided financial assistance to the project) participates in the carbon market, and has guaranteed access to CER markets for CTR Rio. Additionally, by generating renewable energy through the biogas, CTR Rio will contribute to Brazil's efforts in achieving the goals outlined in the "National Climate Change Plan" to generate more renewable energy.
		<u>Source:</u> Ambio Soluções Ambientais, <i>Centro de Tratamento de Resíduos do Rio -Plano de Mitigação de Gases do Efeito Estufa 2015 - 2018</i> (2014), 20-27. CDM- Executive Board, <i>Component Project Activity Design Document Form Version 02.0</i> (2013),1-3. Ibid,8-10. Ibid,40-44.
		<b>RECOMMENDATIONS</b> Although the project has outlined a plan for mitigating GHG emissions, the project should aim to reduce emissions to a net negative level. This would translate to sequestering more CO <sub>2</sub> equivalent emissions than it produces.
<b>CR1.2 Reduce Air Pollutant Emissions</b>	<b>0</b>	<b>No score</b>
		This credit looks into reducing the emission of six criteria pollutants and noxious odors; the six criteria pollutants include particulate matter (including dust), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. The metric used for this credit is the measurement of air pollutants compared against baselines.
		The machinery and equipment used in the landfill have preventive maintenance conducted, in order to avoid large amounts of gas emissions into the atmosphere. CTR Rio also benefits overall gas emissions by reducing the number of trucks that operate on the site. Small dump trucks collect garbage from the nearby municipalities, which is then dumped into the nearest waste treatment station. Large dump trucks are responsible for collecting waste from the Waste transfer station and bringing it to CTR Rio. Therefore, fewer trucks run on these routes, thus



		<p>decreasing the amount of pollutant gases which are emitted by trucks. Additionally, the internal routes in CTR Rio are constantly humidified in order to avoid dust from being carried into the surrounding area. The project also launched a plan for mitigating GHG emissions, which monitors and controls the emissions of gases with a high global warming potential. The plan is based on the GHG Protocol Project and has been approved by the National Environmental Institute (INEA), as well as under all other governmental environmental legislation. CTR Rio team claims to monitor the air quality monthly through the equipment high volume PM10, however any report was presented to prove it. CTR Rio still needs to show calculations for reducing emissions of the six criteria pollutants, and how strategies that have been implemented have reduced air pollutants to pre-development levels.</p> <p><i>Source:</i> Ambio Soluções Ambientais, <i>Centro de Tratamento de Resíduos do Rio - Plano de Mitigação de Gases do Efeito Estufa 2015 - 2018</i> (2014), 20-27. Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>“Análise dos Impactos Ambientais.”</i> Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007), 22.</p> <p><b>RECOMMENDATIONS</b></p> <p>When considering all of the measures that CTR Rio has taken for reducing air pollutant emissions, the project has shown great results. When the plan for mitigating GHG emissions begins to reduce gases, a better score may be awarded. However, special attention must be paid to this topic by periodically assessing air quality based on Brazil’s “National Plan of Air Quality.” CTR Rio needs to periodically present reports and calculations in regards to air quality. Collaboration with Brazilian programs such as PRONAR, PROCONVE, the PROMPT can be made to manage air quality.</p>
<p><b>CR2.1 Assess Climate Threat</b></p>	<p><b>0</b></p>	<p><b>No score</b></p> <p>In terms of assessing climate treat, an infrastructure project should conduct a comprehensive climate impact assessment, and develop an adaptation plan. This is measured by the steps taken to prepare for climate variation and natural hazards.</p> <p>There is no evidence provided which indicates the development of a climate impact assessment and adaptation plan, that assesses the vulnerability, risk, and adaptation capacity of the project amid climatic threats.</p> <p><i>Source:</i> No evidences were found in the following documents: Ambio Soluções Ambientais, <i>Centro de Tratamento de Resíduos do Rio - Plano de Mitigação de Gases do Efeito Estufa 2015 - 2018</i> (2014). Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental: Central de Tratamento e Disposição Final de Resíduos Santa Rosa</i> (Seropédica, RJ: 2007). Arcadis Hidro Ambiente S.A, <i>Aspectos Gerais do Plano de Contingência</i></p> <p><b>RECOMMENDATIONS</b></p> <p>A plan for a climate impact assessment and adaptation should be developed. The plan must include a vulnerability assessment, risk assessment, and adaptation assessment. The process need to include collaboration with local emergency management departments, as well as meetings with the local community.</p>
<p><b>CR2.2 Avoid Traps And Vulnerabilities</b></p>	<p><b>0</b></p>	<p><b>No score</b></p> <p>In terms of avoiding traps and vulnerabilities, an infrastructure project should have a plan for high long-term costs and risks for affected communities. This is measured by presenting an assessment of potential long-term traps, vulnerabilities, and risks caused by long-term changes such as climate change; as well as through the degree to which such issues were addressed in the project and in community design criteria.</p> <p>There is no evidence provided on the avoidance traps and vulnerabilities which could affect communities in the documentation submitted by the project team.</p> <p><i>Source:</i></p>

		<p>No evidences were found in the following documents:          Ambio Soluções Ambientais, <i>Centro de Tratamento de Resíduos do Rio -Plano de Mitigação de Gases do Efeito Estufa 2015 - 2018 (2014)</i>.          Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007)</i>.          Arcadis Hidro Ambiente S.A, <i>Aspectos Gerais do Plano de Contingência</i></p>
		<p><u>RECOMMENDATIONS</u>          The project needs to evaluate the possible resource constraints and vulnerabilities that the community could face in the future, due to climate change, and identify potential approaches and practices to addressing them. The team should work directly with decision-makers and stakeholders in the community, in order to evaluate potential resource issues in more detail, and reach a more integrated risk assessment approach. Long term risks should be addressed, and alternatives considered; additionally, potential traps (resource, configuration, and standards traps) and vulnerabilities should be outlined, as well well as associated the respective potential costs and risks.</p>
<b>CR2.3 Prepare For Long-Term Adaptability</b>	<b>0</b>	<p><b>No score</b></p> <p>In terms of preparing for long term adaptability, an infrastructure project should be resilient to the consequences of long-term climate change, be able to perform adequately under altered climate conditions, or be capable of adapting to other long-term change scenarios. This is measured by the degree to which the project has been designed for long-term resilience and adaptation.          There is no evidence in the documentation that shows any preparations for long-term adaptability.</p> <p><u>Source:</u>          No evidences were found in the following documents:          Ambio Soluções Ambientais, <i>Centro de Tratamento de Resíduos do Rio -Plano de Mitigação de Gases do Efeito Estufa 2015 - 2018 (2014)</i>.          Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, <i>Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007)</i>.          Arcadis Hidro Ambiente S.A, <i>Aspectos Gerais do Plano de Contingência</i></p> <p><u>RECOMMENDATIONS</u>          The project needs to identify specific measures which have been taken to address the potential consequences of long-term climate change, such as a rise in sea level, increased intensity and frequency of extreme weather events, extended droughts, heat waves, and increased ambient temperatures, among others. Some of these strategies might include structural changes, decentralized systems, natural systems with green infrastructure solutions, alternative supply options, adaptive capabilities, and site selection. The team should implement strategies that prepare for, or mitigate the negative consequences of climate change, or other significant alterations in environmental and operating conditions.</p>
<b>CR2.4 Prepare For Short-Term Hazards</b>	<b>3</b>	<p><b>Improved</b></p> <p>In terms of preparing for short-term hazards, an infrastructure project should increase the resilience and long-term recovery prospects of the project and site from natural and human-induced short-term hazards. This is measured by the steps which have been taken to improve protective measures beyond existing regulations. In addition to long-term climate-related hazards, many infrastructure systems are subject to short-term hazards, such as earthquakes, flooding, and fires, which may or may not be related to climate change, or have other risk factors. Urban areas are increasingly vulnerable to human-induced hazards such as hazardous material spills, terrorist attacks, epidemics, and biohazards. Managing and preparing for short-term hazards helps to secure the longevity of infrastructure projects, protect investments, and secure the wellbeing of the surrounding community.</p> <p>CTR Rio was working on a plan for mitigating short-term hazards; also known as a</p>

		<p>contingency plan. At the time of this assessment, CTR Rio demonstrated a scope that explains the general aspects and the intentions of the contingency plan. This plan has been intended to contain the steps to be taken in cases of accidents and emergencies, measures that must be taken to control the damage caused either by human activities or natural catastrophes, responsibilities and obligations of the project team, and a plan for communicating cases of changes to groundwater quantity or quality that may pose risks to human health to the general public.</p> <p><u>Source:</u> Arcadis Hidro Ambiente S.A, <i>Aspectos Gerais do Plano de Contingência</i>.</p> <p><u>RECOMMENDATIONS</u> Although CTR Rio has presented the scope of a plan for mitigating short-term hazards, the project has not actually provided the plan. Aside from presenting the steps and measures that must be taken in cases of emergency, the project needs to provide a full list of anticipated natural hazards in the area, and their predicted frequency and severity; this list would include but not be limited to wildfires, floods, tornadoes, and hail storms. The plan must contain strategies for each type of event, and outline how they surpass existing codes and regulations; it should outline the chosen strategies, and how they minimize risks of future hazards by using environmental restoration.</p> <p>Additionally, CTR Rio needs to show better performance in moving from assessment to action. The team should implement strategies that prepare for, or mitigate against long-term changes. For example, plans and designs should be created and implemented in order to prepare for short-term hazards that have a one in 100 year, or higher chance of occurrence; this should be inclusive of both direct and indirect impacts. Such designs may limit the hazard itself, fortify against it, or allow for the project to adapt accordingly.</p>
<b>CR2.5 Manage Heat Island Effects</b>	<b>0</b>	<p><b>No score</b></p> <p>In terms of managing heat island effects, an infrastructure project should minimize surfaces with a low solar reflectance index (SRI) in order to reduce localized heat accumulation, and manage microclimates. This is measured through the percentage of the site area that meets solar reflective index criteria. The project has presented no evidence regarding the management of heat island effects, or any plans or strategies for such effects.</p> <p><u>Source:</u> No evidences were found in the following documents: <i>Ambio Soluções Ambientais, Centro de Tratamento de Resíduos do Rio -Plano de Mitigação de Gases do Efeito Estufa 2015 - 2018 (2014).</i> <i>Vereda Estudos e Execução de Projetos Ltda and S.A Paulista, Estudo de Impacto Ambiental:Central de Tratamento e Disposição Final de Resíduos Santa Rosa (Seropédica, RJ: 2007).</i> <i>Arcadis Hidro Ambiente S.A, Aspectos Gerais do Plano de Contingência</i></p> <p><u>RECOMMENDATIONS</u> The project needs to provide drawings that show all non-roof, non-vegetated areas of the site, and the respective surface materials (mainly on office buildings in this case). Additionally, the team should provide documentation of all shaded areas (assumed at noon on the summer solstice), and a list of the plant species which have been used, and the respective expected growth rates; showing projected shading five years from planting. Finally, the project has to provide documentation of roof or surface areas, and surface materials, as well as the corresponding SRI levels.</p>
<b>CR0.0 Innovate Or Exceed Credit Requirements</b>		N/A
	<b>16</b>	
<b>OVERALL:</b>	<b>357</b>	<b>CENTER FOR SOLID WASTE TREATMENT SEROPÉDICA- CTR RIO</b>

## APPENDIX E: SOURCES

DOCUMENTATION PROVIDED
<b>General Information.</b>
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