ZOFNASS PROGRAM
FOR SUSTAINABLE INFRASTRUCTURE
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MARANHÃO GRAIN TERMINAL - TEGRAM – BRAZIL

Figure 1: General image of the project
Sources: CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

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

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EXECUTIVE SUMMARY

TEGRAM is a private grain terminal located within the Port of Itaqui within the county of São Luís, in the state of Maranhão. One of the largest grain terminals in Brazil, it is also considered a logistics milestone for the national agribusiness, as it stimulates production and changes how grain exports are transported in Brazil by bringing the grain-producing areas closer to their global markets. The project sponsor is a consortium of four grain export business competitors. They envisioned TEGRAM as consisting of four warehouses and a set of conveyor belts and ship-loaders. The total project cost is estimated to be US $400 million. At the time of this evaluation, the project was in the commissioning stage of the first phase, which is expected to provide for the export of 5 million tons of soybeans, soybean meal, and corn annually to international destinations, such as China and Europe. The following two phases are expected to support exports of 10 and 15 million tons, respectively. TEGRAM can be regarded as a project that is supporting Brazil's position as one of the world's leading exporters of commodities for years to come.[1]

TEGRAM demonstrated a good approach in enhancing quality of life in the region. It should be noted that on a national scale, the project is stimulating sustainable growth and development by more closely connecting the northern growing region, where the production of grain has been increasing, to global export outlets. The region is better known as MAPITOBA, an area formed by the states of Maranhão, Piauí, Tocantins, and Bahia, as well as the northeastern part of Mato Grosso, eastern Pará, and northern Goiás; today it is the region with the fastest growth rate of farm acreage in the country.[2] Given the location of the project in an underutilized area of the Port of Itaqui, no community was fully engaged in the decision-making process. However, while the project is located in a remote area, the project team established some policies that improved the local quality of life. Such commitments can be found in the company's rate of hiring locally (about 90%) and the proper training provided for these workers, thus increasing local skills and capabilities, and consequently increasing operational capacity for business as well. Furthermore, TEGRAM enhances public health and safety by establishing programs to maintain the overall mental and physical health of the project's workers. The consortium made some efforts to enhance its relationship with the community through two social projects. The first involved students from a local school (Josefina Serrão) in a plan to build an orchard in collaboration with the Junior Agronomy Organization (Empresa Júnior de Agronomia) from the State University of Maranhão, to promote environmental education and responsibility among

[1] McKinsey Global Institute, "Connecting Brazil to the World: A Path to Inclusive Growth" (May 2014), 4.

[2] UOL, "Mapitoba: conheça a última fronteira agrícola do Brasil," accessed 2015, http://vestibular.uol.com.br/resumo-das-disciplinas/atualidades/mapitoba-conheca-a-ultima-fronteira-agricola-do-brasil.htm

the students. The other social program managed by the project team is focused on truck drivers and identifies opportunities for increasing their safety and overall workspace quality; among other things this has led to the identification of and plans to deal with child prostitution in the truck waiting lot.

In terms of leadership, the project has an outstanding approach in working together as a team, with its four sponsors (who are regularly business competitors in grain export) collaborating to design, deliver, and operate TEGRAM. Another aspect of collaboration concerns the social program for the truck drivers, which came in the form of meetings conducted by both the team and a third-party company. In managing any possible constraints to the project, the team is reaching out to authorities to improve the only access road, BR-135, which is currently facing traffic issues due to the increased volume of truck traffic which began during the project's commissioning phase. The project includes a parking lot for the trucks, close to 20 km from the port, in which they wait to be called to unload grain at the warehouses, thus reducing emissions by minimizing truck idling time.

A key point to consider when designing an infrastructure project is how resources are allocated. Projects should be concerned with the quantity, sources, and characteristics of all materials used to build the project, and should assess their impact on overall sustainability. TEGRAM took a good approach to reducing excavated materials taken off site; all of the project's cut-and-fill operations were conducted in a way that allowed all the excavated materials to remain on site or within the Port of Itaqui's limits for internal uses, such as filling or leveling. Furthermore, the warehouses' major structures are made premolded units, therefore providing for ease of deconstruction and recycling. Part of the project's water monitoring is the responsibility of the port administrator, with the rest being that of the project team. To avoid impacts to water quality, the project adopted watertight tanks for the wastewater and effluents generated by the warehouses, to be sent to treatment stations outside of the port area. The plans for water monitoring will be adopted as soon as the rainy season begins.

In terms of ecological impact, the project does not use prime habitat or farmland, as it is located in an area that was previously developed. The project does not require water in large volumes due to the nature of its activities; therefore water resources of the hydrographic basin of São Luís will not be compromised. The location of the grain terminal is in a coastal plain, a flat surface that is considered not to have risks from adverse geology. Efforts have also been made to identify and protect the fauna found on site. The Vegetation Suppression Plan established the needed procedures and actions to mitigate the impacts caused by flora and fauna suppression. In preserving the ecosystem, the TEGRAM team took proper actions to

handle all of the individual local fauna and flora, mitigating any possible impacts caused by the project. The project will not jeopardize wetland or surface water functions since, according to the environmental control plan, the project does not have a great influence on the local hydrology.

Climate and risk management is exemplified by overall reduction in greenhouse gas emissions, due to the project's strategic location: compared to more developed areas of southern Brazil, it is closer to the grain production sources in the country and (taking advantage of the Panama Canal expansion) to international export destinations such as China and Europe. As regards reducing emissions from air pollutants, the team has only worked within legal requirements, which relate to the reduction of particulate matter emissions; on this issue, TEGRAM has been working to carefully meet all of the required levels.

It is worth mentioning that the project still has room for improvements in sustainability. To improve the quality of life, the team should seek an approach that is more locally focused, and try to work with the surrounding community to enhance their quality of life. In particular, the project team should consider a social program for children who are susceptible to prostitution. TEGRAM is a large-scale project with many possible social, environmental, and economic impacts; thus it should also seek to improve the leadership regarding local communities, and that on a national level. As for how resources are allocated and how the natural world is managed, the team should be concerned with the project's impact on the environment, thus with the quantity, sources, and characteristics of all materials used to build the project. The area surrounding the project is comprised of a valuable natural fragile ecosystem, where the team could have created a buffer zone or taken other proactive compensatory actions. The site is in the port area that belongs to the EMAP, and according to the project team, there is not enough space to create a buffer. In addition, they state that compensation measures regarding vegetation interventions should be made by legal request. It is important to remember that the impact of contamination is often cumulative, especially in water bodies such as aquifers and streams, and that each project and site shares responsibility for protecting the quality of the larger system; thus the team should put in place a comprehensive plan for water and environmental monitoring. Considering climate and risk, TEGRAM should take more sustainable approaches with a more long-term view and build upon the project's resilience. Projects with long lifespans should be designed to consider all particularities that the future might hold for the projects' robustness.

Figure 2: People & Leadership award Summary of results

Figure 3: Climate & Environment award Summary of results

Figure 4: Infrastructure 360 award Summary of results

1. PROJECT DESCRIPTION AND LOCATION

The Maranhão Grain Terminal, better known as TEGRAM, is an expansion of the existing Port of Itaqui, which will be used to support the export of grains grown in the Northeast region of Brazil. TEGRAM changes the current routes for grain exports in Brazil by more closely connecting the northern regions, where the production of grain has been increasing, to global export outlets. As the current export options are limited due to fragmented transportation infrastructure, it has been more efficient to transport grains to the south of Brazil for international export. The project aims to greatly increase the economic efficiency of northern-grown grains by allowing them access for the first time to northern ports, which are closer to destination ports and able to take advantage of the Panama Canal expansion. TEGRAM was envisioned in three phases; the first one consisted of a new set of four 9,000 m² warehouses, as well as a set of conveyor belts and ship-loaders to adequately supply cargo vessels, in order to meet an expected shipping capacity of 5 million tons of grains per year; the second and third phases of the construction correspond to the installation of two extra conveyor belt systems and ship-loaders to help the project meet expected capacities of 10 and 15 million tons of shipping capacity, respectively. This evaluation focuses on the first two phases of the TEGRAM project.[3]

TEGRAM is expected to make Itaqui the main port in the North and Northeast regions of Brazil for the exportation of grain. The grain terminal is strategically located for international grain export in the northern state of Maranhão, as it is intended to support the expected increase in the volume of grains produced in Brazil and mainly shipped to Asia and Europe. TEGRAM's strategic location is expected to reduce freight charges for Asian routes by 20%.[4] The launch of operations for this infrastructure project is a logistical milestone for Brazil. The soybeans, soybean meal, and corn it handles are grown in the region known as MAPITOBA, an area formed by the states of Maranhão, Piauí, Tocantins, and Bahia, as well as northeastern Mato Grosso, eastern Pará, and northern Goiás.

The project is entirely funded by private investment, having been built and operated by a consortium of four co-sponsors, each with a 25% stake. The consortium is comprised of Terminal Corredor Norte S.A., Glencore Serviços S.A., Corredor Logística e Infraestrutura S.A., and Amaggi & LD Commodities Terminais Portuários S.A. Each of the four 22,550 m² warehouse lots are designated for the operations of one member. Additionally, the members equally share a common-use area of 29,124 m², as well as a 41,982 m² reception systems and dispatch

[3] Porto do Itaqui, "Plano de controle ambiental" (São Luís, 2011).
[4] CGG Trading, "TEGRAM – Terminal de Grãos do Maranhão," accessed in 2015, http://www.cggtrading.com/logistica/tegram.

facility. Thus, each member will lease a total area of 40,327 m². TEGRAM will be able to handle large cargo vessels, the Panamax ships, which have a total capacity of up to 150,000 tons of grain.[5]

Bidding for the project took place in 2011, with construction occurring from 2013 to 2015. TEGRAM is now in the commissioning process, a transitory phase between construction and operations. The total cost of the project was approximately US $400 million (BRL 1 billion).[6] Funding consisted of a two-phase investment of about US $240 million (BRL 600 million) and US $32 million (BRL 80 million), respectively; and the transshipment and storage facilities in the countryside cost US $160 million (BRL 400m).

Agricultural activities account for a quarter of Brazil's present-day GPD, and have been intensively expanding into the countryside. It is estimated that production will double in 15 years, and in order for this growth to continue, it is necessary to have an equivalent expansion in distribution routes as well. There is great doubt regarding the capacity of the existing ports to support an increase in grain production. Therefore, the Port of Itaqui expansion is necessary and vital for the country's economic growth and position as a grain exporter. In this context, to allow for an adequate supply intake and storage facilities, the Maranhão Port Administration Company[7] planned the implementation of the TEGRAM project.

The current logistical flow of soy is strongly geared to the ports of the South and the Southeast regions, especially the ports of Santos, Paranaguá, and Rio Grande. However, most of the soybean production is concentrated in the Central-West Region, specifically in the state of Mato Grosso. In the present scenario, certain issues, such as a lack of adequate infrastructure directed toward the north (e.g., waterways and railways), make it less expensive to transport grains from the Central-West to ports in the South and Southeast regions of Brazil. The siting of the project in Maranhão facilitates closer routes to Europe, Asia, North America, and North Africa.

In order for the project to achieve an exceptional performance rating in the future, indispensable and important elements, such as a railway branch line, must be implemented in order to internationally export 10 million tons of grain per year. The proposed railway will seamlessly guarantee the successful transportation of expected grain volumes, and will be more economically feasible than other types of ground-based transportation, such as

[5] Ibid.

[6] Exchange rate is based on an assumed approximate average of 2.5 for the period of construction in 2013–2015. All projects costs were incurred in BRL.

[7] Empresa Maranhense de Administração Portuária (EMAP)

emissions-heavy cargo trucks. This railway connection will provide the Port of Itaqui with a competitive advantage, both through its connection to the broader national grid and its strategic location in Maranhão. It is worth mentioning that the entire transportation infrastructure that will support TEGRAM is part of a greater project of national and state strategic interest. The Maranhão Grain Terminal depends on this transportation infrastructure for its economic and functional viability. The railway is part of the TEGRAM project, but it is under the responsibility of another entrepreneur, VLI (VALE Company). The railroad is already in operations and transporting part of soybean shipments to the TEGRAM consortium.

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[8] and Zofnass Program[9] websites.

[8] www.sustainableinfrastructure.org
[9] www.zofnass.org

3. QUALITY OF LIFE CATEGORY

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

Purpose

This section explores the project's impact on functional aspects of the community, such as growth, development, and job creation. It is noteworthy that the project team understands the need and importance for local employment as well as providing training for workers. The project performed well in stimulating sustainable growth and economic development, and especially in the incorporation of local labor to support port operations. However, the positive impact of TEGRAM could be much wider if the project team expanded the training programs to a community-wide level, thus enhancing their competitiveness and sustainability. The process for hiring local workers, and the social projects (represented by the creation of the school orchard), are still limited to a project level, or aimed at only a few individuals (in this case the students of the Josefina Serrão school).

It is important to note that the project scored low on improving community quality of life, because there are still a lot of opportunities not yet taken; TEGRAM could, for example, improve the infrastructure of local communities, regardless of whether they are located close to the warehouses. Considering the remote location of the project, the project team claimed that there was no involvement with key stakeholders, which, if done properly, could enhance community awareness and pride. However, the project is conducting social outreach with the truck drivers to raise awareness of the problems that directly affect them, such as child prostitution, which in turn will hopefully minimize these issues.

The project did a great job of utilizing and training local labor, although the training programs seem mostly to be project-focused. An emphasis has been placed on hiring local individuals and companies for services related to food and cleaning, and on providing necessary training to comply with the project's requirements (especially those specific to a port).

In stimulating sustainable growth and development, the project showed an excellent performance on a national scale. The creation of TEGRAM adds 5 million tons of grain-exporting capacity in its first phase, and a further 10 and 15 million tons during the next two expansion phases, respectively. It is worth mentioning that the grain route in Brazil has been directed to the south, due to better infrastructure; but TEGRAM aims to change this with the promotion of a new route, thus elevating Brazil to a higher growth potential, since the location is strategic for international exports. Locally, the project focused on the partnership with the Junior Agronomy Organization to promote environmental education for students, through the construction of an orchard.

In developing local skills and capabilities, the project gave consideration to hiring local people, and in offering courses to those hired; however, there is some room for the project to expand these training courses to a broader audience. This would make the community grow in a sustainable way and better equip it for development that may or may not be related to the project itself.

Well-being

This section focuses on how TEGRAM is addressing overall community well-being and livability within the scope project, including aspects such as health, individual comfort, and mobility.

It is clear that the project team understands the need for a safe working environment, and consequently scored well in enhancing public health and safety. The TEGRAM team adopted all of the safety and health measures recommended both by a third-party company, AON, who conducted a preliminary risk analysis, as well as by TEGRAM's own specialized team, who also managed risk analysis and minimization measures. The project was also evaluated by the city fire department, receiving its operations permit by meeting safety and health regulations.

In minimizing noise and vibration, the project performed poorly, as it conducted measurements only during TEGRAM's construction phase. While daytime noise levels were within the accepted standard at this time, the nighttime noise measurement was somewhat high. Thus, the project team should seek mitigation measures, despite the fact that the nighttime measurement was set up as the new reference standard for subsequent noise and vibration monitoring.

As for minimizing light pollution and encouraging alternative modes of transportation, TEGRAM is lacking in demonstrative proactive actions, without any meaningful information and documentation. It is important to mention that the project is designed to be functional at night as well, and therefore it is essential that the project team minimize light pollution and excessive

glare, either to preserve the night sky or to conserve energy, which can also reduce costs. As to alternative transportation, the team reported that the project is located in a remote area which can only be reached by the BR-135 road. There are no other feasible routes for trucks that lead to the port. The integration of additional transportation infrastructure that can provide access to public transit is urgently needed. Such actions could reduce the existing traffic problem on BR-135 caused, in part, by loaded trucks and workers commuting to and from TEGRAM.

The project tried to manage the arrival of trucks to unload grain by creating a waiting lot for the trucks, where drivers were given electronic pagers and waited to be called; this can also reduce overall emissions, since the trucks are not idling. However, a third-party company still found some gaps related to this system, and there is no information as to whether TEGRAM incorporated their recommendations. The project team is working with the authorities to reroute the national road, BR-135, in order to improve accessibility and safety between the city of São Luís and TEGRAM's warehouses. The team also made an effort to enhance wayfinding by inserting informational signage within the warehouses.

More attention needs to be given to the occurrence of child prostitution within the truck parking lot. The project team started a program with the truck drivers to better inform them of this issue, and they have also been trying to establish partnerships with public organizations to provide informational folders and safety instructions. However, there is still room for improvement if the team considers social programs for the vulnerable female community involved.

Community

This subcategory focuses on how the project respects and maintains or improves upon its surroundings through context-sensitive design. The project is not very close to any communities, with the closest being about 8 km away. Therefore, TEGRAM does not impact any landscapes in the visual range of nearby communities. The project is located in an industrial area next to the Port of Itaqui; however, natural features around the site can be considered, such as mangroves. With this in mind, the project team should focus on preserving the site's remaining natural features, or providing for the restoration of a wildlife refuge.

With regard to preserving historical and cultural resources, the project performed well because of the team's proactive identifying of historical and cultural resources and engaging stakeholders for input on these matters. A statement in the IPHAN report provides proof of on-site surveys and interviews with communities. Although the project is not located in an area

that endangers archaeological resources, a presentation was given to workers to increase their knowledge about the subject and the importance of conserving archaeological resources.

As regards public spaces, it is important to note the impact that TEGRAM is having on the existing route that leads to the port (BR-135), which has been more congested since TEGRAM's construction. Therefore, the team is working with local authorities to change the route to improve traffic flows. However, the project has no plans to construct public spaces, such as parks and plazas, for the closest communities, or for improvements to restore existing spaces. With that said, the team has been engaging with an existing public school (Josefina Serrão) to help build an orchard to be managed by the students. It is important to note the value that public spaces have in significantly impacting communities' quality of life. Opportunities remain for TEGRAM to improve upon the public spaces of the nearby communities that have been directly and indirectly affected by the project. The project team should consider approaches for improving upon public spaces, such as plazas and parks located in the natural surroundings of the warehouses, or in nearby communities.

Vulnerable Groups

The Vulnerable Groups subcategory concerns with the inclusion of women and vulnerable groups in infrastructure projects, especially with regard to their insertion into a competitive and fair economy. This is of tremendous importance for projects developed in northern Brazil, especially in Maranhão, which is one of the poorest states in the country. In this subcategory, the project team should seek out opportunities for, and conduct investigations of problems related to, vulnerable groups in order to encourage and promote their economic empowerment. Large-scale projects outside of cities and employing a large number of workers should consider improving access and mobility. TEGRAM should encourage better incorporation of the female population into its workforce.

Within the truck parking lot near the BR-135, child prostitution exists as one of the major social challenges that TEGRAM must deal with. This problem is considered to be affecting vulnerable groups, and the project team should provide appropriate help in dealing with this serious situation. The TEGRAM team should make this its first priority with regard to this subcategory, and help to improve upon the quality of life for those affected. This can be achieved by promoting gender equality in male-dominated sectors and by offering training, internships, education, and improvements in existing infrastructure, among other types of support.

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 looks into the organization responsible for the project and its external relations in identifying stakeholders and engaging them in the project development process. Commitment and leadership as well as communication within the team are extremely important to accomplishing the goals of this subcategory.

TEGRAM can make improvements in providing effective leadership and commitment, as the project's performance in this area was low. There is significant commitment in achieving the project's requirements, but mostly only as mandated by law. However, there is some proactiveness in TEGRAM's efforts to achieve a better and safer work zone for workers, and in mitigating environmental impacts. The project does not have a written public statement that commits to sustainability. The team did provide a preliminary risk analysis, but there is no evidence that the recognition of these risks is being accounted for through design changes.

There is also room for improvement in establishing a sustainability management system; although roles and responsibilities to improve sustainable performance were specified among the project members, a single-point authority at a high level within the overarching project is still missing. It was reported that a sustainability management system is to be created in the near future, but considering the impacts that the project has already had, and the fact that it is already in the commissioning phase, the current policies seem too generic and not sufficiently aligned with the project's scope and complexity.

TEGRAM performed exceptionally in fostering collaboration and teamwork, as the project is considered a benchmark for grain export logistics in Brazil. By the very nature of a consortium composed of four competitors, the project team recognized the importance of working as a team. The consortium found ways to collaborate and optimize the grain export industry of Brazil by creating this joint venture. The sharing of risks and rewards describes the overall collaboration well. The four cosponsors are business competitors in grain exporting but came

together to design, deliver, and operate TEGRAM. At the project site, each of these companies has its own warehouse, but the structures such as the set of conveyor belts and ship-loaders are for common use. This consortium allows for the four members to operate in collaboration; by not building four independent ports, they decreasing the overall environmental impact.

The project needs to improve upon its low performance in terms of providing for stakeholder involvement. There are serious concerns surrounding child prostitution around the project site involving the truck drivers. The project team should involve more local stakeholders in order to identify the affected persons in the community, such as workers or vulnerable youth that could be susceptible to prostitution, and assign an interdisciplinary team on site to work with these individuals. The project team involved some of the stakeholders for feedback, such as the truck drivers directly involved in TEGRAM's activities. The truck drivers were approached by two methods, one through an informational meeting with the TEGRAM team; the other involving a third-party company, AON, to identify the problems surrounding the parking lot that can negatively impact the truck drivers.

Management

For the Management subcategory, strong performance as well as opportunities for improvement can be found in regard to by-product synergies and infrastructural integration. This subcategory covers how the project takes into account the operational relationships with other elements of community infrastructure, either by pursuing synergies between systems or by optimizing the integration of the project with related systems in surrounding assets, thus resulting in an overall improvement in the project's sustainability.

The project provided little information on the identification of unwanted by-products or discarded materials from other nearby facilities. Unwanted by-products could be searched for and identified through a concerted research effort. TEGRAM is a port terminal that will be handling many materials coming in and out of the Port of Itaqui; therefore it is important to identify and aggressively pursue by-product synergy opportunities, not only during construction phases but also throughout the operational life of the project.

The project performed well in improving infrastructure integration on both a national and global scale. Overall, TEGRAM will tremendously improve the integration of grain exports infrastructure in northern Brazil. This project was designed to take into account operational relationships, among other elements of grain transportation infrastructure, which results in an overall improvement of infrastructure efficiency and effectiveness. At the local scale, the

project has not optimized integration, using the existing road (BR-135) to transport grains from other locations to the warehouses. It is worth mentioning that the project team is reaching out to authorities to change the route of BR-135 to improve the flow of traffic. While the project includes a parking lot where the trucks wait to unload the grains the warehouses, this lot is not well integrated into the rest of the infrastructural systems, according to documentation provided, and does not perform very well; no information was provided by the project team as to whether enhancements will be put in place.

Planning

The planning subcategory relates to the project's sustainability in the long term. To achieve a robust long-term view, it is necessary to obtain a comprehensive understanding of the local regulations, in order to avoid hindrances to sustainable goals, and to plan effectively for the future. TEGRAM shows room for improvement in planning for long-term monitoring and maintenance, as plans have not been provided on how to sustain the project's long-term vision.

TEGRAM performed well on addressing conflicting regulations; its project team approached decision makers to identify conflicts over current traffic regulations, policies, and standards that contradict efforts to improve the terminal's sustainable performance. The project is currently in its commissioning stage; thus the team is working on complying with the conditions enforced by the implementation license. The documentation that will contain information on plans and monitoring programs will be written in order to obtain the operating license, which will be the next step.

The assessment of conflicting regulations and policies was geared toward TEGRAM's optimal performance in terms of traffic issues. For example, the project team is proposing to reroute TEGRAM's access between the parking lot and the warehouses in order to improve accessibility and safety, as it currently uses the only route that connects the warehouses to the surrounding community, which was not designed for this level of use.

Regarding the extension of TEGRAM's useful life, the project performed well. TEGRAM's concession is for 25 years, with a possibility of renewal for another 25 years, after which the ownership of TEGRAM would need to change. The project team has expanded considerations beyond the point of project delivery, as port capacity is expected to increase from 5 million tons during the first phase to 10 million, and then 15 million during the following two phases, respectively. Considerations that are more specific to extending the useful life of the project relate to handling more grains and integrating rail cargo into the terminal's logistics.

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 TEGRAM team should seek for improvements in the Materials subcategory in order to minimize the amount of natural resources consumed in construction and operations. Though the project team paid attention to local materials procurement, this did not generate an overall strong performance due to a lack of documentation supporting such efforts.

Performance was low in reducing the net embodied energy of project materials over the project's life, as there was no documentation stating the percent reduction in net embodied energy from a life cycle energy assessment. A life cycle assessment is recommended to identify any reductions in energy consumption. The team could not provide any documentation evidencing improved procurement practices or the use of recycled materials. It is vital that the design team supports sustainable practices among its materials suppliers. To ensure sustainable procurement practices, material providers should comply with policies or practices that support the specific sustainable goals of the project.

The use of recycled materials in an infrastructure project must be documented in order to evaluate the impact of this practice. TEGRAM's use of recycled materials is unknown as there is no inventory showing the percentage of all project materials that are reused or recycled.

The use of regional materials helps to minimize transportation costs and impacts, and retains 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, sourced within the required distances, which range from 80 km to 800 km depending on the type of material. The level of local acquisition of materials is relatively low in this project compared with overall project need; nonetheless, the TEGRAM team did make an effort to pursue local materials whenever possible.

Diverting waste from landfills requires more attention from TEGRAM, as the performance was

low in this subcategory. Considering TEGRAM's scale and its handling of large grain loads, there are great opportunities to improve upon waste management, especially during the terminal expansion and operations phases. While the environmental control plan states that a waste management plan was to have been done for the construction and operations phases of the project, the project team has not provided any concrete information on a clear management plan to divert waste from landfills.

The grain terminal team performed best in reducing excavated materials taken off site. All of the earthwork was guided and permitted by the port administration and was successfully completed with minimal earth removal. The project managed the cut-and-fill operations well, with the excavated materials remaining within the Port of Itaqui's limits.

In regard to the eventual deconstruction and recycling of TEGRAM's infrastructure, there was a good performance. At least 50% of the components or prefabricated units can easily be separated for disassembly or deconstruction. According to the environmental control plan, the four warehouse storage areas account for about 74% of the entire site, in which the major structures are made of premolded units. Planning for future deconstruction of the warehouses and their supporting infrastructure is important, in addition to considering possible reuse of the remaining structure after its useful life for the project.

Energy

The Energy subcategory assesses the efforts made by the project team to reduce overall energy use, especially from nonrenewable fossil fuels. TEGRAM performed poorly in this subcategory and needs to greatly improve its performance, as no information has been provided regarding energy reductions accomplished by the project. It is important that the project team take a "whole systems design" approach when considering energy reductions, and achieve at least a 10% reduction in overall energy consumption.

In regard to the use of renewable energy sources, the project team has not provided any information on whether TEGRAM will be supplied by any nonpolluting energy sources, including active technologies such as photovoltaic solar panels. On commissioning and monitoring energy systems, the project has not considered assessments on operational energy consumption, and has not provided any documentation that specifies whether the project has had an independent commissioning to monitor the efficiency of TEGRAM's energy systems.

Water

In the Water subcategory the project needs to progress through planning and implementing strategies, in order to protect freshwater availability by practices that reduce potable water use and monitor water systems. The project team has assessed the project's water needs, and the environmental control plan has concluded that the project will not jeopardize the local aquifer, nor will it require a large amount of water for operations and maintenance.

In terms of reducing overall potable water consumption, infrastructure projects of TEGRAM's scale should encourage the use of graywater, recycled water, and stormwater to meet water needs. The project has not so far included any robust water management system; however, the team is responsible for stormwater monitoring, and interviews with the project team confirmed that plans were to be put in place at the beginning of the rainy season. To avoid impacts to local water quality, the project adopted watertight tanks for the wastewater and effluents generated at the warehouses, which are to be sent to treatment stations outside of the port area.

Projects should implement programs to monitor the performance of their water systems and their impact on receiving waters, and these monitoring programs must be commissioned to demonstrate that the monitoring authority is independent of both the design and construction teams, or that the collected data are periodically reviewed by an independent authority. It is important to consider that the project is located within the Port of Itaqui area, and that a port administrator is responsible for part of the water management. There is no information on when the port administrator will apply any of the water monitoring that they are responsible for; thus TEGRAM should ensure monitoring by creating an independent and comprehensive plan.

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 focuses on how projects should be sited to avoid direct and indirect impacts on important ecological areas. Projects should seek to 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 such environments, thus improving land value and remediating contaminated brownfields.

The Port of Itaqui, in which TEGRAM is located, presented the ideal conditions for this type of project: a large, flat site that is not good for agriculture. The terrain in which the warehouses are located had been previously developed as an old village, so the project avoided developing in prime habitat.

An extensive analysis has been done to determine the local geology, geomorphology, hydrology, and ground soil characteristics. The warehouses will not compromise the local aquifer's recharge process, and will conserve nearby bodies of water. Despite the project's limited water needs, the water use should be monitored; it will be in part by the Maranhão Port Administration Company, as well as by a team from the TEGRAM consortium. The project's monitoring of stormwater has been slated to be conducted when the rainy season begins.

The predominant soils on the site have low fertility and are unsuitable for agricultural use; thus the project is not located on prime farmland. However, it is important to mention that the area occupied by the warehouses only has tree and shrub vegetation and plant succession; thus it can be concluded that the project is entirely located within a greenfield. The location of the grain terminal is on a coastal plain, a flat surface; thus there are no risks caused by adverse geology such as steep slopes.

The soil investigation determined that the existing type of soil may be susceptible to erosion and flooding. An erosion mitigation plan was created, but there is no information as to whether the plan is aligned with project's scope. In regard to flooding, the lands on which TEGRAM is located are characterized by a floodplain, water body, and wetlands, yet no information regarding an emergency flood plan was provided.

Land and Water

The Land and Water subcategory covers how the project addresses possible impacts on the existing hydrologic and nutrient cycles and avoids the introduction of contaminants, whether through stormwater runoff or use of fertilizers and/or pesticides.

For stormwater management, the project team should consider retention and reuse in order to become self-sustaining, especially because the project does not demand a high amount of water; however, there is no evidence that the project team created or will create plans for

water retention and/or reuse. It is important to notice that for better performance in this assessment, a drainage plan and applicable runoff reports are desired. The reuse of runoff water for TEGRAM's operations could minimize freshwater usage and the costs for the overall project, and lead to an improvement of the water management and water storage capacity. The project team has a stormwater management plan that will be put in place during the rainy season, and a third-party laboratory will be hired to conduct tests and verify whether the water runoff is contaminated by any possible contaminant from the site. However, there is no further information on water retention and/or reuse, or whether the stormwater management plan is aligned with the project scope. It is highly recommended that the project consider enhancing water storage capacity.

TEGRAM showed a low performance on reduced use of pesticides and fertilizers, because no documentation was provided about the remaining green areas of the project and the management of pesticides and fertilizers. However, the Authorization for Vegetation Suppression mentions the prohibition of use of herbicides for the plants that would need to be cut in order to build TEGRAM's warehouses.

The TEGRAM project team understands the importance of resource preservation and the need for a surface and groundwater quality and quantity conservation plan. The team has provided documentation confirming its proactiveness in avoiding contamination through the use of watertight tanks rather than septic tanks for domestic wastewater. Furthermore, the project was designed in such a way as to reduce possible leakage sources. Visual monitoring is also performed by the project team to identify possible sources of contamination (e.g., truck oil, pump leaks). A stormwater plan will be put in place by the project team when the rainy season begins, but no further information was provided with regard to actual comprehensive water management plans made by the port administrator, or by the TEGRAM team.

It is important to remember that the impact of contamination is often cumulative, especially in bodies of water such as aquifers and streams, and that each project and site shares responsibility for protecting the quality of the larger system.

Biodiversity

The Biodiversity subcategory assesses how an infrastructure project minimizes negative impacts on natural species and their habitats, on and near the project site. Through careful design, projects can minimize habitat fragmentation and promote habitat connectivity and animal movement. Infrastructure should not adversely impact wetlands, ecosystems, or natural

biodiversity.

To preserve species biodiversity, the TEGRAM team has identified and protected the habitat. The project team worked with a local agency to identify existing habitats in or near the project site, ensuring that existing habitats were not harmed and compensating for any losses. Studies were conducted by an environmental technician from the DUCOL organization, and TEGRAM has taken the proper actions to handle all fauna and flora species. Achievement for this credit was low; to improve upon it, efforts need to be made not only to protect but also to restore and create new habitats.

The project scored low in controlling invasive species, as no information was provided regarding measures taken to control or eliminate existing invasive species on site. It is important that the team eliminate any invasive species on site, and also rehabilitate and restore habitats to a preinvasive state. The team must include a site plan of the landscaping strategy that includes all vegetation species.

Regarding the restoration of disturbed soils, the project showed strong performance; studies were conducted to identify any possible action that might impact the soils of the area in which the warehouses were to be constructed. All the identified changes made on site are changes to the natural topographic relief, and thus can trigger erosion in the intervention area. As such, the project provided a plan that considers a series of recommendations to restore the soils that were disturbed during construction. Interviews with the project team also identified that fertile soils were removed during earthworks, and were stored for usage in areas to be rehabilitated and/or revegetated.

In protecting freshwater availability, the project scored well by not impacting any of the local aquifers. Furthermore, the environmental control plan also declared that the project does not need a high volume of water for its operations and maintenance. Water monitoring is the responsibility of both TEGRAM and the port administrator; TEGRAM's monitoring of stormwater has been set to commence at the beginning of the rainy season. Additionally, the team adopted the use of watertight tanks to be able to send all effluents generated at the warehouses to treatment stations outside of the port area, to ensure water quality. To further enhance the level of achievement for this credit, infrastructure projects need to restore ecosystem functions.

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 general scope of the Emissions subcategory is to evaluate whether the project team understands the need for the reduction of dangerous emissions, including greenhouse gas (GHG) emissions and other dangerous pollutants. From this perspective, it is clear that the project helps reduce overall GHG emissions, either by being closer to grain production sources in Brazil, or by being closer to the international grain destinations, such as China and Europe. However, no levels of GHG emissions are shown, and no life cycle carbon assessment, or footprint analysis that evidences a reduction in GHG emissions from the strategic location of the project, was provided.

With regard to the mitigation of the six criteria air pollutants (particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead), in addition to noxious odors, the project team is only working with what is enforced by law (particulate matter concentration) so that the project can receive its installation license. During both the construction and commissioning stages of the project, the mitigation measure chosen by the team was to wet soils with groundwater using tanker trucks. Also, the areas of the hoppers, all tunnels, and conveyor belts were installed with particulate material containment equipment. Furthermore, all of the personnel that work in places with particulate matter concerns must use personal protective equipment.

Resilience

Projects with a long lifespan should be designed not only for the present but also the future, and should consider all particularities that might impact the project's resilience in the future. The Resilience subcategory includes the project's ability to withstand short-term risks and its ability to adapt to changing long-term conditions. Understanding all of the possible risks may minimize the project's overall vulnerability. Improvements in this subcategory can be found if the project team considers the assessment of climate threat and long-term adaptability, and incorporates strategies to avoid vulnerabilities and heat island effects.

There is no evidence that the project team conducted studies on the effects of climate change on TEGRAM's warehouses and supporting infrastructure. All projects, especially those with long lifespans such as TEGRAM, should be designed and better prepared for changes related to climatic threats. Also, there is no reference to an evaluation of possible vulnerabilities that the community may face due to project's construction.

In regard to long-term adaptability, the project team has not provided any evidence that plans and mitigation measures are going to be implemented to address the project's adaptability to consequences of climate change, such as those related to extreme weather events, sea level rise, water scarcity, energy shortages, and floods. The project has addressed short-term adaptability by putting contingency plans in place to combat hazards such as fire within the project facilities. The installation of pumps will help extinguish fire in areas next to storage tanks and equipment susceptible to fire. Furthermore, all the workers have been provided with proper training to handle possible fires.

A further important consideration that all infrastructure projects should address is heat island effects. The Port of Itaqui has been growing at a rapid rate for the last few years, and therefore all the projects located within its terrain should take into consideration their possible heat island effects. It is unknown whether TEGRAM used design strategies such as minimizing surfaces with a low solar reflectance index, the use of lighter-colored roofs, or even considerations for green roofs.

APPENDIX:

APPENDIX A: PROJECT PICTURES AND DRAWINGS

Figure 5: General picture of the project
Sources: CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

Figure 6: Location map.
Sources: Google Maps

Figure 7: Aerial view of project TEGRAM's site
Sources: CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

Figure 8: Conveyor belt.
Sources: CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

Figure 9: Ship loaders
Sources: CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

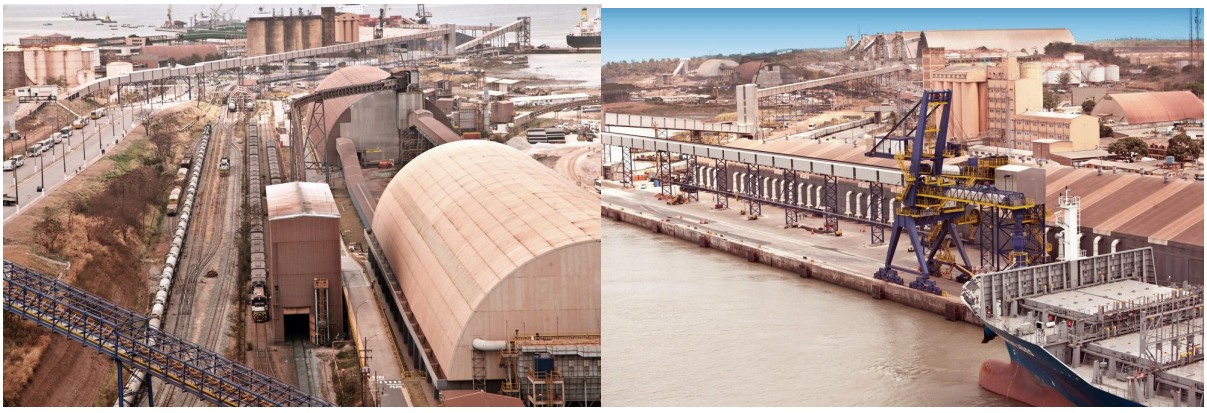

Figure 10: Aerial view of the TEGRAM warehouses and the Itaqui Port
Sources: CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

Figure 11: Panamax ships
Sources: CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

Figure 12: Truck hopper
Sources: CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

Figure 13: Truck entering the warehouse
CGG Trading, TEGRAM - Terminal de Grãos do Maranhão, accessed in 2015, http://www.cggtrading.com/logistica/tegram.

Figure 14: Josefina Serrão School patio area destined for the plantation of an orchard
Sources: TEGRAM, *Relatório de Andamento 4* (São Luís, MA: 2015).

Figure 15: Training and social programs provided for TEGRAM's workers.
Sources: TEGRAM, *Relatório de Andamento 4* (São Luís, MA: 2015).

Figure 16: Safety signage within the warehouses
Sources: TEGRAM, *Apresentação Sinalização Interna* (São Luís, MA: 2015).

Figure 17: Noise levels measurement
Sources: ENFASE, *Relatório de Monitoramento Ambiental de Ruidos nas Instalações do Consórcio TEGRAM-ITAQUI* (São Luís, MA: 2013).

Figure 18: Relocation of fauna off-site.
Sources: STCP. *Prestação de Serviços de Resgate e Translocação de Fauna e Flora* (Curitiba, PR: 2012), 18-27.

Figure 19: Vegetation Suppression.
Sources: Ducol Engenharia LTDA, *Relatório de Supressão Vegetal* (São Luís, MA: 2012), 11.

Figure 20: TEGRAM's supporting railway.
Sources: TEGRAM, *Reunião Comitê Operacional* (São Luís, MA: 2015) 7.

Figure 21: TEGRAM's warehouse in construction.
Sources: NovaAgri – Evolução das obras TEGRAM, accessed in 2015, http://www.novaagri.com.br/evolucao-obras-porto-tegram.

Figure 22: Particulate matter contention through tanker trucks.
Sources: Ducol Engenharia LTDA, Relatório de Supressão Vegetal (São Luís, MA: 2012) 17.

APPENDIX B: ENVISION POINTS TABLE

ENVISION POINTS TABLE

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

ENVISION POINTS TABLE

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

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

Figure 23: Envision credits with scores by achievement level. This table includes experimental "Vulnerable Groups" credits developed in collaboration with the Inter-American Development Bank.
Sources: Envision™ and the Zofnass Program for Sustainable Infrastructure.

APPENDIX C: GRAPHS

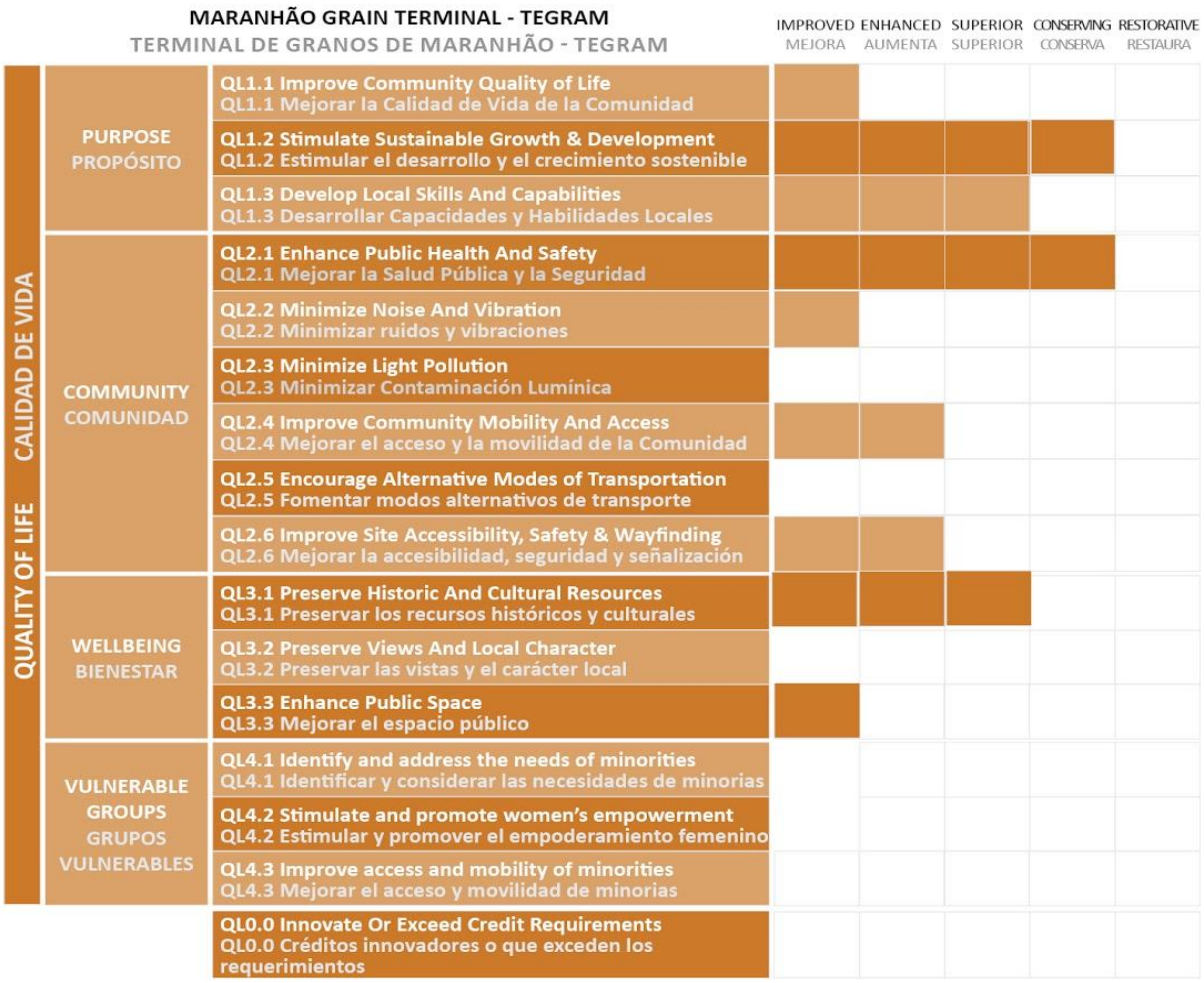

Figure 24: Quality of Life category_ Summary of results

Figure 25: Leadership category_ Summary of results

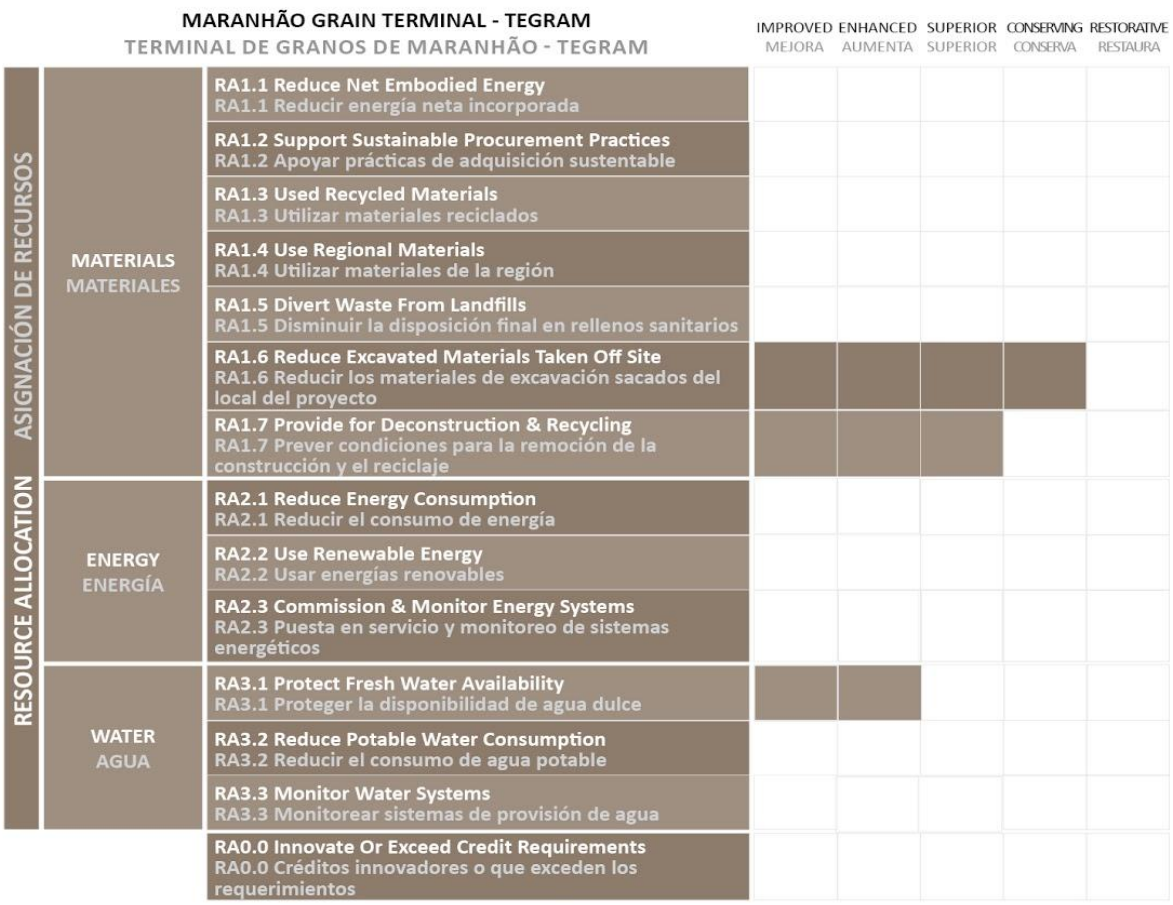

Figure 26:Resource Allocation category_ Summary of results

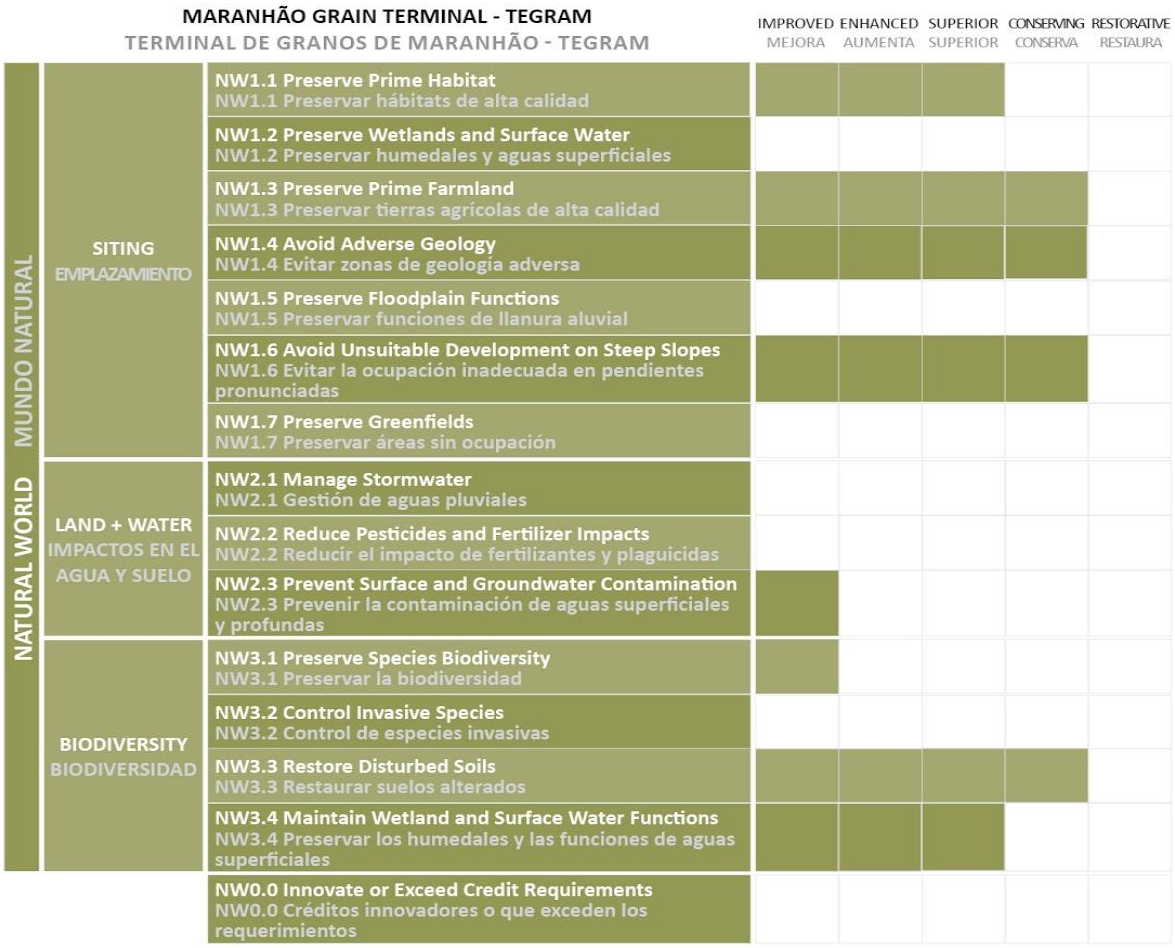

Figure 27: Natural World category_ Summary of results

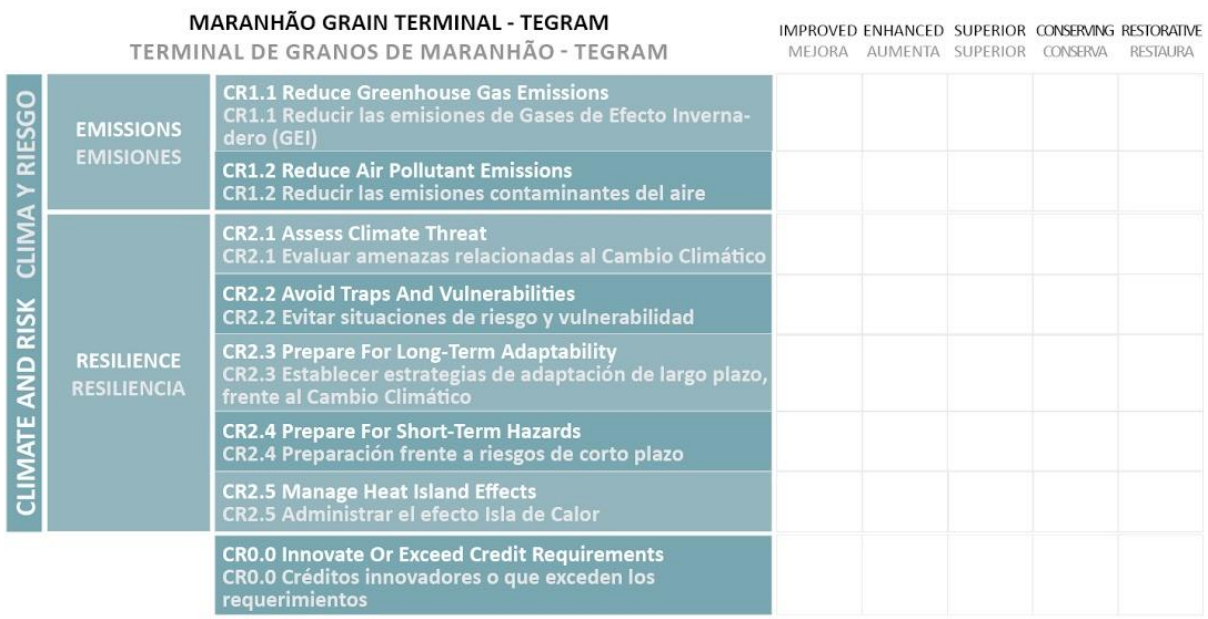

Figure 28: Climate & Risk category_ Summary of results

APPENDIX B: ENVISION POINTS TABLE

			MARANHÃO GRAIN TERMINAL - TEGRAM, BRAZIL	PT.	Performance
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life	2	Improved
2			QL1.2 Stimulate Sustainable Growth & Development	13	Conserving
3			QL1.3 Develop Local Skills And Capabilities	5	Superior
4		COMMUNITY	QL2.1 Enhance Public Health And Safety	16	Conserving
5			QL2.2 Minimize Noise And Vibration	1	Improved
6			QL2.3 Minimize Light Pollution	0	No Score
7			QL2.4 Improve Community Mobility And Access	4	Enhanced
8			QL2.5 Encourage Alternative Modes of Transportation	0	No Score
9			QL2.6 Improve Site Accessibility, Safety & Wayfinding	3	Enhanced
10		WELLBEING	QL3.1 Preserve Historic And Cultural Resources	7	Superior
11			QL3.2 Preserve Views And Local Character	0	No Score
12			QL3.3 Enhance Public Space	1	Improved
		VULNERABLE GROUPS	QL 4.1 Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)	0	No Score
			QL4.2 Stimulate and promote women's economic empowerment	0	No Score
			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	N/A
			QL	52	

			MARANHÃO GRAIN TERMINAL - TEGRAM, BRAZIL	PT.	Performance
13	LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	2	Improved
14			LD1.2 Establish A Sustainability Management System	1	Improved
15			LD1.3 Foster Collaboration And Teamwork	15	Conserving
16			LD1.4 Provide For Stakeholder Involvement	1	Improved
17		MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	0	No Score
18			LD2.2 Improve Infrastructure Integration	7	Superior
19		PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	0	No Score
20			LD3.2 Address Conflicting Regulations & Policies	4	Superior
21			LD3.3 Extend Useful Life	3	Enhanced
			LD0.0 Innovate Or Exceed Credit Requirements	0	N/A
			LD	33	

			MARANHÃO GRAIN TERMINAL - TEGRAM, BRAZIL	PT.	Performance
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	No Score
23			RA1.2 Support Sustainable Procurement Practices	0	No Score
24			RA1.3 Used Recycled Materials	0	No Score
25			RA1.4 Use Regional Materials	0	No Score
26			RA1.5 Divert Waste From Landfills	0	No Score
27			RA1.6 Reduce Excavated Materials Taken Off Site	6	Conserving
28			RA1.7 Provide for Deconstruction & Recycling	8	Superior
29		ENERGY	RA2.1 Reduce Energy Consumption	0	No Score
30			RA2.2 Reduce Pesticide and Fertilizer Impacts	0	No Score
31			RA2.3 Commission & Monitor Energy Systems	0	No Score
32		WATER	RA3.1 Protect Fresh Water Availability	4	Enhanced
33			RA3.2 Reduce Potable Water Consumption	0	No Score
34			RA3.3 Monitor Water Systems	0	No Score
			RA0.0 Innovate Or Exceed Credit Requirements	0	N/A
			RA	**18**	

			MARANHÃO GRAIN TERMINAL - TEGRAM, BRAZIL	PT.	Performance
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	9	Superior
36			NW1.2 Preserve Wetlands and Surface Water	0	No Score
37			NW1.3 Preserve Prime Farmland	12	Conserving
38			NW1.4 Avoid Adverse Geology	5	Conserving
39			NW1.5 Preserve Floodplain Functions	0	No Score
40			NW1.6 Avoid Unsuitable Development on Steep Slopes	6	Conserving
41			NW1.7 Preserve Greenfields	0	No Score
42		L & W	NW2.1 Manage Stormwater	0	No Score
43			NW2.2 Reduce Pesticides and Fertilizer Impacts	0	No Score
44			NW2.3 Prevent Surface and Groundwater Contamination	1	Improved
45		BIODIVERSITY	NW3.1 Preserve Species Biodiversity	2	Improved
46			NW3.2 Control Invasive Species	0	No Score
47			NW3.3 Restore Disturbed Soils	8	Conserving
48			NW3.4 Maintain Wetland and Surface Water Functions	9	Superior
			NW0.0 Innovate or Exceed Credit Requirements	0	N/A
			NW	52	

			MARANHÃO GRAIN TERMINAL - TEGRAM, BRAZIL	PT.	Performance
49	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	0	No Score
50			CR1.2 Reduce Air Pollutant Emissions	0	No Score
51		RESILENCE	CR2.1 Assess Climate Threat	0	No Score
52			CR2.2 Avoid Traps And Vulnerabilities	0	No Score
53			CR2.3 Prepare For Long-Term Adaptability	0	No Score
54			CR2.4 Prepare For Short-Term Hazards	1	Improved
55			CR2.5 Manage Heat Island Effects	0	No Score
			CR0.0 Innovate Or Exceed Credit Requirements	0	N/A
			CR	1	
			Total points	**156**	**0**

Figure 29: 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	**MARANHÃO GRAIN TERMINAL - TEGRAM**
QL1.1 Improve Community Quality of Life	**2**	**Improved** This section focuses on assessing whether or not infrastructure projects are in line with community needs and improve upon members' quality of life, while mitigating negative impacts. The location of the project is in the remote area of the Itaqui Port, where there are no nearby human settlements. For these reasons, the project team has stated that no community was engaged in the project's decision-making process. However, while the project is located in a remote area of São Luís, it does have some implications for the surrounding community. The project team is trying to address negative impacts that the port expansion is bringing; such as higher volumes of traffic from trucks. One major problem for the surrounding vicinity of TEGRAM is that of child prostitution, which occurs near the BR-135, within the parking lot used for truck. The project team has initiated an effort to address this problem by meeting with truck drivers. These meetings were also intended to create partnerships with public agencies that are already working on issues related to child prostitution, and allow them to distribute materials such as brochures and prophylactic contraceptives. Although the project team has not identified and considered local community needs, this project has improvements on a national scale that enhanced the net quality of life for Brazilians. The project furthers the goals for making exports from the grain producing region in northern Brazil more efficient. The TEGRAM has been planned to reduce transit time and improve upon the logistics and other issues related to grain exports. Therefore this project improves upon the quality of life for Brazilians as a whole, by boosting productivity, and reducing travel miles and emissions. At the local level, the project added jobs through the hiring process. A local workforce was requested by the contractors; therefore about 90% of the hired personnel were local citizens. Proper training was provided for the workers, thus increasing their qualifications and thus more capable for being hired by other companies as well.

		Moreover, the project team is working on infrastructure improvements on the Josefina Serrão School. Additionally, TEGRAM proposed a partnership with the Junior Agronomy Organization (Empresa Júnior de Agronomia) of the State University of Maranhão, in order to promote environmental education through the creation of an orchard managed by the students.
		Source: 1. TEGRAM, *Apresentação Projeto de Educação Ambiental* (São Luís, MA: 2015), 1-4. 2. EJAGRO, *Solicitação de Parceria* (São Luís, MA: 2015). 3. TEGRAM, *Relação Atualizada de Colaboradores* (São Luís, MA: 2015). 4. TEGRAM, *Reunião de Gestão do Calendário Social & SSMA* (São Luís, MA: 2015).
		RECOMMENDATIONS It is important to make more efforts to improve the local communities' quality of life, as well as for mitigating the impacts that TEGRAM is having on them; such as the changes and improvements resulting from the project, as well as its associated programs and initiatives. Better performance is hinged upon strong evidence of community acceptance. The team should perform further outreach and involve the community more, such as by better explaining the project's purpose and associated impacts. Actions should be carried out improve upon the closest community's infrastructure assets, which could lead to enhanced social and economic conditions.
QL1.2 Stimulate Sustainable Growth & Development	**13**	**Conserving** This credit is with regards to the project's impact on the community's sustainable economic growth and development. The state of Maranhão is one of the most economically depressed states in Brazil. Sustainable growth & development is expected to be stimulated by this project on regional, national, and global scales. The logistical change to export grains directly from the northern production regions is creating new jobs and market opportunities in the region. In addition, both nationally and globally polluting emissions will be reduced by shortened grain export routes, and expanded shipping capacity for vessels that will take advantage of the Panama Canal expansion. TEGRAM has an initial annual expected shipping capacity of 5 million tons of grain, which is planned to be expanded through two phases to meet expected capacities of 10 and 15 million tons, respectively. This growth in export capacity is expected to benefit the both the region and Brazil's overall GDP; of which 25% percent relies on agriculture.

		Currently there is a lack of adequate grain transportation infrastructure in northern Brazil, which makes it cost-effective to transport grains from the Central-West Region to more distant ports in the southern and southeastern regions of Brazil; which contain the more affluent states of the country. There is no evidence that the project improves local community productivity, or identifies existing community assets for restoration, such as recreational or cultural resources. It is worth mentioning the locally proposed partnership with the Junior Agronomy Organization (Empresa Júnior de Agronomia), which is aimed to enhance the environmental knowledge of students. However, the project has not yet started, and therefore there is no evidence of how the project's results can count as an improvement action.
		Source: 1. TEGRAM, *Apresentação Projeto de Educação Ambiental* (São Luís, MA: 2015), 1-4. 2. EJAGRO, *Solicitação de Parceria* (São Luís, MA: 2015), 1. 3. TEGRAM, *Relação Atualizada de Colaboradores* (São Luís, MA: 2015). 4. SENAI, *Contrato de Prestação de Serviços entre SENAI e TEGRAM* (São Luís, MA: 2014). 5. Porto do Itaqui, *Plano de Controle Ambiental* (São Luís, MA: 2011), (hereafter cited as PCA).
		RECOMMENDATIONS An appreciable next step would be to more fully consider the local impact of actions, such as by expanding the idea of environmental education to people that are not related to the Josefina Serrão School. In addition to restoring natural or cultural resources, efforts such as those that could lead to improvement in job creation not directly related to the project itself, could promote a more livable community, and stimulate sustainable growth and development. It will be useful to keep track of all of the influence that the project has on local, regional, national, and global metrics for sustainable growth. The project team should also consider creating or restoring public spaces, or improving local infrastructure. Although the project is located away from the communities, the project owners and team should propose the improvement of infrastructure assets for the closest community.
QL1.3 Develop Local Skills	**5**	**Superior**

and Capabilities		In terms of developing local skills and capabilities, in general there has been a specific-skills outreach. The TEGRAM project has placed an emphasis on contracting and hiring locally for the construction and commissioning phases, as well as in providing proper training, such as in first aid; radio communication to facilitate internal correspondence; emergency situation training; and activity-specific training that is necessary for TEGRAM's proper functioning. A third-party course was also provided for port logistics operations assistants, thus improving the local workers' capabilities. Some of the hiring and educational program emphasis shifted from specific project needs, to local capacity development that supports the operation of the port. The project sponsors have provided specific types of training to support port operations with local labor, which is expected to expand during future phases. According to the list of employees which was provided, the contractors prioritized using local labor during the construction and commissioning phases (the transitory phase between construction and operations). Local companies were also contracted for services such as food and cleaning. Currently, over 90% of the employees are from the state of Maranhão. The hired workforce has been going through training courses, either through an intern process, or those offered by SENAI, a third-party company. This training ultimately increases the operational capacity for business. It's useful to note that workers with expanded skill levels were brought in from other states and there is no information if minority groups have been emphasized in hiring and training.
		Source: 1. SENAI, *Contrato de Prestação de Serviços entre SENAI e TEGRAM* (São Luís, MA: 2014). 2. TEGRAM, *Ações SSMA* (São Luís, MA: 2015).
		RECOMMENDATIONS Better performance asks for the project team to commit to working with the local community to assess local employment and educational needs, as well as to address future community competitiveness. This can be achieved by identifying and working with community leaders, and establish programs that will identify educational and employment needs and shortfalls. The TEGRAM team should work with the community to improve upon, and retrofit the local skills base, thereby enhancing the long-term competitiveness of the terminal.

		The project team should consider the creation of a permanent center for job training for local inhabitants, as well as to not restrict the training of TEGRAM workers, and not only provide training on an as-needed basis. It is important to support local economies, as well as to provide community building blocks for its competitiveness and sustainability.
QL2.1 Enhance Public Health And Safety	**16**	**Conserving**
		The health and safety programs of TEGRAM aim to maintain and/or conserve the overall mental and physical health of the project workers. A third-party company, AON, was hired to identify and provide recommendations for possible risks, for both the operations and maintenance phases of the grain terminal. AON was hired to conduct a preliminary risk analysis (APP) to evaluate possible emergency scenarios that could occur during the useful life of TEGRAM, and propose prevention and mitigation measures if necessary. One example would be improper execution of activities involving hot machinery in places with explosive potential, for which it was recommended to provide proper training to the workers (implemented by the TEGRAM team). Moreover, the TEGRAM internal team conducted a simplified risk analysis to ensure the integrity of all people involved in the project, and to minimize the risks to which workers are exposed. In addition to all risk analysis conducted, the TEGRAM was evaluated by the fire department, which determined that the project had all of the necessary fire and emergency safety measures, and thus approved the project for operations.
		Source: *1.* AON, *Análise Preliminar de Perigos* (São Paulo, SP: 2013). 2. TEGRAM, *Análise de Risco Simplificada* (São Luís, MA: 2015). 3. Corpo de Bombeiros Militar, *Certificado de Aprovação 7322/2015* (São Luís, MA: 2015) 4. Corpo de Bombeiros Militar, *Certificado de Aprovação 7323/2015* (São Luís, MA: 2015). 5. Corpo de Bombeiros Militar, *Licença Vinculada 0005/2015* (São Luís, MA: 2015). 6. Corpo de Bombeiros Militar, *Licença Vinculada 0014/2015* (São Luís, MA: 2015). 7. Corpo de Bombeiros Militar, *Licença Vinculada 0015/2015* (São Luís, MA: 2015). 8. Corpo de Bombeiros Militar, *Licença Vinculada 0005/2015* (São Luís, MA: 2015).
		RECOMMENDATIONS The team should include systematic identification and assessment of any new or non-standard technologies, materials, and/or methodologies which are to be used in the project.

		A better explanation of how the health and safety measures were presented to workers would be helpful in understanding TEGRAM's commitment to enhance public health and safety.
QL2.2 Minimize Noise And Vibration	**1**	**Improved** A third-party consulting firm, ENFASE, was hired to study and monitor noise levels during TEGRAM's construction. All of the noise measurements conducted during the construction phase demonstrated results within the acceptable levels, according to law. However, there is no information of if other noise measurements were conducted after the phase one construction had transitioned to the commissioning stage in which operations began. The places chosen for noise measurement included several points along the Itaqui Port, and one point in the nearest community, Vila Maranhão, located about 15 km from the site. The results showed that all daytime measurements were within the standard level established by law, but nighttime measurements at some points had higher peaks than are permitted by law. However, in accordance with the law, if the ambient noise level is higher than the standard noise level before the project development, the ambient noise level should replace the standard noise level as the assumed benchmark for future measurements. No information regarding post-development noise measurements was provided. *Source:* 1. ENFASE, *Relatório de Monitoramento Ambiental de Ruídos nas Instalações do Consórcio TEGRAM-ITAQUI* (São Luís, MA: 2013). *RECOMMENDATIONS* The project team should conduct a post-development analysis of noise and vibration in order to compare levels both before and after the development of the project, and develop possible mitigation measures for noise produced during the operations phase. A level of higher achievement could be reached if the project was designed in a way that would reduce ambient noise in the area, as local and community noise levels were slightly above the desired benchmark. Further documentation is needed to assess if the TEGRAM implemented noise and vibration mitigation measures, such by as planting trees, which could also enhance overall quality of life and community livability.
QL2.3 Minimize Light	**0**	**No Score**

Pollution		The concept of "preserving the night sky" is to conserve as much darkness at night as possible by preventing a project's excessive glare, nighttime light emissions, and the directing of light skyward, so as to conserve energy, as well as reduce obtrusive lighting and excessive glare. For this credit, the metric is to meet minimum lighting safety standards without spillage into areas beyond site boundaries, and not creating obtrusive and disruptive glare. At this point, no documentation was provided indicating that an assessment of lighting needs has been done for the project, that non-lighting alternatives were used, or if mitigation measures were considered. The minimization of light pollution and excessive glare would help TEGRAM conserve energy and should be considered for implementation. Systems using automatic turn-offs are an alternative for projects like TEGRAM that are designed to also be functioning at night.
		Source: 1. PCA
		RECOMMENDATIONS As TEGRAM is designed to be functional at night, for the surrounding areas that may be sensitive to excessive nighttime light, in order to preserve the night-sky the project team should consider the use of light barriers (e.g. trees, shrubs, and high barriers) to reduce light spillage, and full-cutoff lighting fixtures. Full-cutoff light fixtures refer to those designed to specifically consider a dark sky as they direct light downwards, preventing spillage and projection onto horizontal planes. The project team should consider a lighting assessment to discover where lighting would be most effective, as well as the implementation of lighting zones and removal of unnecessary lighting; these measures could lead to reduced energy costs.
QL2.4 Improve Community Mobility And Access	**4**	**Enhanced** Improving community mobility and access is done through efforts to locate, design, and construct the project to ease traffic congestion, improve mobility and access, prevent urban sprawl, and otherwise improve community livability. This credit is measured through how a project improves access and walkability and reduces commute and traverse times to existing facilities and transportation. Improves user safety considering all modes of transportation (e.g., personal vehicle, commercial vehicle, transit, and bike/pedestrian).

		In terms of improving local access and walkability, the project performs to a lesser extent. The location of TEGRAM has limited access by road systems. There is only one feasible way of getting to the TEGRAM, and that is by the BR-135 national road. The other possible way would be to go through the city of São Luís, which is not feasible for many reasons, including safety and time. In addition to that, the trucks that come from other states and other parts of Maranhão must have their deliveries scheduled at TEGRAM, and have the visit arranged in advance. In a separate lot from the warehouses, with a capacity of 300 parking spaces, the trucks are given an electronic pager so that when their time comes, they are notified to head to the site in which the discharge will occur, thus avoiding any kind of traffic congestion at the TEGRAM, as well as reducing emissions by eliminating idling during wait times. However, Projectual, a third-party consulting company was hired to identify possible gaps in the system, such as long queues at the parking lot entrance, and lack of internal communications; they proposed possible solutions to any problem which was found. The investigation was conducted without TEGRAM being fully operational, yet Projectual found issues that can be studied and solved by the project team. Further documentation will help to inform how the project team followed Projectual's recommendations. In addition, the project team reached out to the responsible authorities to change the route of BR-135, in order to mitigate any risks that the drivers may face while driving on this road; this not not only related to TEGRAM's truck drivers, but all drivers in general as it is national road. This re-routing could enhance public safety and mobility.
		Source: 1. Projectual, *Estudo de Impactos de Tráfego do TEGRAM na BR-135* (São Luís, MA: 2015). 2. Câmara dos Deputados, *Estudo de tráfego/ BR -135/ PAC - 3* (Brasília, DF: 2014).
		RECOMMENDATIONS The project team should seek to create alternatives for entering the parking lot to avoid long waiting lines for the trucks at the entrance. Alternatives should be proposed, such as creating an additional waiting lot to serve during peak hours, so that drivers do not congest or park obstructively on streets because they cannot enter the lot.

		The team should consider creating a space for truck cleaning, so as to minimize the risks faced by drivers parking on BR-135's shoulder to clean their trucks, and also to avoid the large amount of grain which falls onto the ground and impacts the environment. Internal communications between the support lot and unloading terminals should be improved so that communication with the drivers can become more open, and thus more accommodating to personal schedules. The project team should conduct an assessment study of access, mobility, and/or traffic levels to understand and address the effects of the constructed works under full operation. Recommendations of the "TEGRAM traffic impact on the BR-135 study" should be followed, and reports showing the results should be provided.
QL2.5 Encourage Alternative Modes of Transportation	**0**	**No Score** "Encouraging alternative modes of transportation" helps to improve accessibility to non-motorized transportation and public transit. This is measured by the degree to which the project has increased walkability, the use of public transit, and non-motorized transit. Considering the location of TEGRAM, and its restrictions, the accessibility between the city and the project is completely limited and difficult. A project can improve accessibility to non--motorized transportation and public transit by encouraging alternative modes of transportation to, and from the project site by improving connections to public transportation. For instance, having alternative transportation such as bike infrastructure, and better access to public transit can reduce congestion. Even though the project team provided the employees with transportation during the construction phase, there is no information about having encouraged alternative modes of transportation from the city of Sao Luis to the TEGRAM facilities for permanent workers. The integration of additional transportation infrastructure that can provide access is urgently needed. Alternative modes of transportation could be developed to reduce emissions of air pollutants from staff traveling to work by car, and also could reduce the existing traffic problem on BR-135, which is caused, in part, by loaded trucks and workers going to TEGRAM. *Source:* *1.* Projectual, *Estudo de Impactos de Tráfego do TEGRAM na BR-135* (São Luís, MA: 2015). 2. Câmara dos Deputados, *Estudo de tráfego/ BR -135/ PAC - 3* (Brasília, DF: 2014). *RECOMMENDATIONS*

		The project team should consider providing design drawings and specifications for upgrading and incorporating transportation elements into the existing infrastructure. Location and design drawings should be provided, showing proximity and accessibility to transportation facilities, parking availability, bicycle and pedestrian walkways and networks, as well as other modes of transportation.
QL2.6 Improve Site Accessibility, Safety & Wayfinding	**3**	**Enhanced**
		The intent of this credit is to improve user accessibility, safety, and wayfinding at the site and surrounding areas. This is measured through the clarity, simplicity, readability, and the reliability that general-population has in wayfinding, user benefit, and safety. There is onsite wayfinding in TEGRAM facilities, where the project has increased the ability of users and safety personnel to understand and safely access the completed project and its respective site. The grain terminal design incorporates signage within the TEGRAM area. Signs that notify of safety equipment requirements or of restricted access for specific areas are used throughout the warehouses. The project is currently in the commissioning stage (the transitional phase between construction and operations). In this early moment the focus has been on truck drivers and truck traffic. A major problem found in TEGRAM's surroundings is that of child prostitution, which takes place within the truck's parking lot. In response to this problem, the project team started a mobilization, which began with meetings with truck drivers. Other important topics discussed in the meetings were intended to create partnerships with the public agencies already working with issues related to child prostitution to distribute materials such as brochures and prophylactic contraceptives, among others. Further documentation is needed to assert that the project is improving user accessibility, safety and wayfinding on the site and in surrounding areas.
		Source: 1. TEGRAM, A*presentação Sinalização Interna* (São Luís, MA: 2015). 2. TEGRAM, *Reunião de Gestão do Calendário Social & SSMA* (São Luís, MA: 2015).
		RECOMMENDATIONS The team should improve the signage outside of TEGRAM, such as on BR-135 and all access roads that lead to the site. Efforts should continue to project against child prostitution, and the project should consider having some sort of social program for the vulnerable female community. The project team should consider enhancing the streets and areas impacted by the intense truck traffic generated by TEGRAM. This approach could also improve the communities' quality of life.

QL3.1 Preserve Historic and Cultural Resources	**7**	**Superior**
		This credit addresses the need and importance of preserving and enhancing historical and cultural resources and is measured through the summary of steps taken to identify, preserve, or restore cultural resources. According to the Brazilian National Historic and Artistic Heritage Institute (Instituto do Patrimônio Histórico e Artístico Nacional; IPHAN), the construction of the project will not endanger any archaeological resources. Prior to the start of the construction, on-site exploratory activities were performed in regards to archaeological investigation, by an appropriate regulatory and resource agency; there was also additional contact with the community. Both investigations came to the conclusion that TEGRAM would not be located in an area with archaeological remains.
		Aside from the investigation with a proper agency, and the coordination with the community, the project team also provided TEGRAM's workers with a course in which they had the opportunity to learn the characteristics of the regional archeology, as well as the care that should be taken with regards to archaeological remains.
		Source: *1.* Scientia, *Prospecção Arqueológica na Área do TEGRAM* (São Paulo, SP: 2013). 2. IPHAN, *Relatório Final das Atividades de Campo referente à Pesquisa Arqueológica* (São Luís, MA: 2012).
		RECOMMENDATIONS The project team should aim for broader coordination for preservation interests, and further explore and identify resources that define the character of the community. Improvements to the preservation of historical and cultural resources in the closest settlements to TEGRAM's location should be considered. Improvements should be made to preserve and protect historical and cultural heritage sites, which would increase the project's level of achievement for this credit.
QL3.2 Preserve Views and Local Character	**0**	**No Score**
		This credit evaluates if the project is designed in a way that maintains the local character of the community, and thus does not have a negative impact on community views. The thoroughness of efforts to identify important community views is the metric which is used for this credit. The siting of the project (a consolidated port area), had made no major change to the local character. All of the closest communities are located far enough away from the Itaqui Port, thus TEGRAM is out of their visual range.

		It is worth mentioning that of the all vegetation removal that was required was performed according to legally established criteria, and by following the best practices for mitigating environmental impacts. No information was provided with regards to the reforestation plan, and/or the location in which the restoration will take place.
		Source: 1. Ducol Engenharia LTDA, *Relatório de Supressão Vegetal* (São Luís, MA: 2012).
		RECOMMENDATIONS The team should identify important elements of the site character, including landforms, views, natural landscape features, materials, planting, style/detailing, scale, and landscape/townscape patterns. An inventory of all natural landscape features and view resources should be developed to protect and plan for addressing public views in the project design. The project team should consider reforestation actions in an area close to TEGRAM, and specify the use of native species; this is extremely relevant to restoring the landscape's natural condition that existed prior to the introduction of activities related to the Itaqui Port. The project team could also identify environmentally-sensitive areas around the closest communities, and propose the creation of a protected area, such as a Private Reserves of Natural Heritage (Reserva Particular do Patrimônio Natural - RPPN).
QL3.3 Enhance Public Space	**1**	**Improved**
		In order to enhance public space, a project team should work with the community, property owner, and required regulatory and resource agencies to identify public space resources and develop possible measures. This credit evaluates the improvements made to public spaces, including parks, plazas and recreational facilities, thus enhancing community livability. The construction of TEGRAM did not have any adverse impacts on existing public spaces such as parks, plazas, or recreational facilities, and therefore the team has not included any improvements to such spaces as part of the project. It is important to mention a social program that is taking place to build an orchard in a public school (Josefina Serrão); in this regard it can be concluded that the team is making an effort to enhance public space. With regards to accessibility, the project is impacting the BR-135 since it requires a lot of truck circulation within the route and causes intense traffic. However, the project team is reaching out to authorities in order to change the existing route so that traffic can better flow. Considering the importance of the impacts of public spaces to communities' quality of life, the project could promote the creation of a new public space.
		Source:

		1. Câmara dos Deputados, *Estudo de tráfego/ BR -135/ PAC - 3* (Brasília, DF: 2014). 2. TEGRAM, *Reunião de Gestão do Calendário Social & SSMA* (São Luís, MA: 2015). 3. Projectual, *Estudo de Impactos de Tráfego do TEGRAM na BR-135* (São Luís, MA: 2015).
		<u>*RECOMMENDATIONS*</u> The team should perform more feasibility analyses for incorporating preservation, enhancement, and/or the creation of new spaces into the project scope. The project team and owner should take advantage of the natural surrounding areas of the warehouses, and consider the creation of new public spaces, or the enhancement of existing public spaces within the closest communities, to enhance their livability. It is recommended to closely work with stakeholders and community leaders to identify, preserve, conserve, and/or restore defining elements of the community, prior to port construction. Regarding the location of the project which is in a sparsely populated place, the project team should consider providing improvements to wildlife refuges for local fauna.
QL 4.1- Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)	**0**	**No Score** This credit assesses the degree to which the project has identified the needs of women and diverse communities. It is important for TEGRAM to consider the creation of a policy that gives priority to hiring women and diverse groups, based on their respective limitations. No information was found with regards to the identification of women's and diverse communities' needs. It is important to note that there is a significant negative effect from child prostitution around the BR-135 road; specifically at the truck parking lot. This lot is part of the project, thus needs more attention from the authorities, TEGRAM stakeholders and team.
		<u>*Source:*</u> 1. TEGRAM, *Relação Atualizada de Colaboradores* (São Luís, MA: 2015). 2. TEGRAM, *Reunião de Gestão do Calendário Social & SSMA* (São Luís, MA: 2015). 3. TEGRAM, *Ações SSMA* (São Luís, MA: 2015). 4. SENAI, *Contrato de Prestação de Serviços entre SENAI e TEGRAM* (São Luís, MA: 2014).
		<u>*RECOMMENDATIONS*</u>

		The project team should make efforts to prioritize placing members from vulnerable groups in positions in which they can sustainably succeed. For instance, more attention can be placed on the victims of child prostitution, which can be regarded as a vulnerable group that TEGRAM should focus on. The project team should concentrate beyond just the truck drivers, and begin to focus on the respective children, in order to better work towards possible solutions. The project also benefit from incorporating input from women and diverse communities, and by trying to reduce the potential negative effects that the project may have on them.
QL4.2 - Stimulate and promote women's economic empowerment	**0**	**No Score**
		This credit addresses the extent to which a project hires local women and strengthens their skills-base. Infrastructure projects cause a significant impact on the location in which they are sited, and therefore have the ability to create many jobs and stimulate development. It is important for the project team to realize the responsibility that they have with regards to labor barriers that the infrastructure may impose, and begin to think of ways in which to include women in business.
		Source: 1. TEGRAM, *Relação Atualizada de Colaboradores* (São Luís, MA: 2015). 2. TEGRAM, *Reunião de Gestão do Calendário Social & SSMA* (São Luís, MA: 2015). 3. TEGRAM, *Ações SSMA* (São Luís, MA: 2015). 4. SENAI, *Contrato de Prestação de Serviços entre SENAI e TEGRAM* (São Luís, MA: 2014).
		RECOMMENDATIONS
QL4.3 - Improve access and mobility of women and diverse communities (indigenous or afro-descendant peoples)	**0**	**No Score**
		"Improvements in access and mobility of women and diverse communities" is evaluated by assessing the ways in which the project has been located, designed, and constructed, so as to understand the differences between the access and mobility limits that women and diverse communities may have. It is important that a large-scale infrastructure project team evaluates the differences between the mobility of men and women, and their respective imposed limitations.
		Source: 1. TEGRAM, *Relação Atualizada de Colaboradores* (São Luís, MA: 2015).

		2. TEGRAM, *Reunião de Gestão do Calendário Social & SSMA (*São Luís, MA: 2015). 3. TEGRAM, *Ações SSMA* (São Luís, MA: 2015).
		RECOMMENDATIONS
QL0.0 Innovate Or Exceed Credit Requirements		N/A
	52	

SUB CATEGORY:LEADERSHIP		
	Score	MARANHÃO GRAIN TERMINAL - TEGRAM
LD1.1 Provide Effective Leadership And Commitment	**2**	**Improved** Providing effective leadership and commitment helps to achieve a project's sustainability goals. This credit recognizes the need for action in addressing the consequences of operating in an unsustainable environment. Infrastructure projects have the key role of exercising leadership among their surrounding communities, due to the direct and indirect impacts that projects have on them. It is not clear if the TEGRAM team has made public the sustainable goals for port expansion project. There appears to be a limited commitment from the project team as there are few substantive examples of how a commitment to the principles of sustainability translates into practice. A certain level of concern was shown within the project team in achieving environmental sustainability goals. In order to support their proactiveness in not damaging the environment, and avoid putting workers in a dangerous work zone, the team hired a third-party to assess the risks of the project. The TEGRAM team has provided a preliminary risk analysis as part of their strategy for not polluting. Additionally, AON, the company responsible for the preliminary risk assessment (PRA) has also provided recommendations on how the risks can be avoided to better the quality and safety of the working space. The project team has been concerned in meeting the social and environmental constraints for the project as stipulated by law. TEGRAM is currently in the process of hiring a company to prepare an environmental management system (SGA). It is also important to mention that the team is working on the construction of an orchard in the Josefina Serrão public school, in order to provide the students with environmental education and responsibility.
		Source: *1.* AON, *Análise Preliminar de Perigos* (São Paulo, SP: 2013).

		2. TEGRAM, *Apresentação Projeto de Educação Ambiental* (São Luís, MA: 2015). 3. EJAGRO, *Solicitação de Parceria* (São Luís, MA: 2015).
		RECOMMENDATIONS TEGRAM should publicly communicate its sustainability goals, as well as the plans to mitigate and reduce the project's negative environmental impacts as recommended by the third-party company AON. Public communications can range from written public statements to commitments published on the project's website. It is recommended that the sustainability policy created by the project is fully aligned with best management practices, and therefore addressing the three pillars of sustainability (economic, environmental, and social) during all three phases of the project (design, construction and operation). AON's recommendations are extremely important for reducing the frequency and/or mitigating the consequences of the hazards identified in TEGRAM's activities analysis. However, such hazards have only been identified for the operational and maintenance phases of the project, therefore a risk analysis should be done to identify construction risks as well. Community participation is important, even if the project is not located within the limits of a community. The project team should consider defining roles and responsibilities, identifying stakeholders, engaging public consultation, and putting forth a disclosure plan, among other measures. The commitment of the organization to the community must be clear and evident, showing a great effort to incorporate community input on the project. The project team should provide clear documentation of how community input was included in the design.
LD1.2 Establish A Sustainability Management System	**1**	**Improved** In order to establish a sustainability management system, a project must create a management system that can incorporate the scope, scale and complexity of a project in seeking to improve sustainable performance. This is measured through organizational policies, delegation of authority, mechanisms and business processes that are put in place, and the assurance that they are sufficient for the scope, scale and complexity of the project.

For TEGRAM, sparse mechanisms for sustainability have been found. For instance, the consortium claims to have a specific team for health and operational safety, as well as the environment and the community; however, a written statement of this is lacking. The project team should recognize the importance of sustainability by assigning a single point of high-level authority within the project. TEGRAM's approach essentially with regards to not damaging the environment by means of doing what is stipulated by Brazilian law. These approaches are not fully aligned with project's scope and complexity. The team also states that an environmental management system (EMS) is to be done in the near future. Nonetheless, TEGRAM is a large-scale project, with many possible social, environmental, and economic impacts; therefore, the EMS should have been implemented during the design phase in order to have also made the construction process sustainable.

With regards to the societal aspects of the project, the team assessed the surrounding communities and held meetings with the truck drivers. TEGRAM is working on the construction of an orchard at the Josefina Serrão school, where in 2016 the students will have the opportunity to plant and learn about planting practices. In addition, the team is looking to work with the truck drivers for better inform and educate them about the child prostitution which is happening within the truck parking lot near BR-135; as well as to better understand their needs and concerns. The approaches of the social aspects and mechanisms by the TEGRAM team seem well-intended, but limited in scope.

Source:

1. TEGRAM, *Apresentação Projeto de Educação Ambiental* (São Luís, MA: 2015).

2. EJAGRO, *Solicitação de Parceria* (São Luís, MA: 2015).

3. TEGRAM, *Reunião de Gestão do Calendário Social & SSMA* (São Luís, MA: 2015).

RECOMMENDATIONS

The project's first goal in achieving sustainability should be to follow basic, passive practices, such as the use of architecture which is based on site-specific conditions to maximize acoustic and thermic comfort from natural ventilation and lighting; however, no information has been found for this type of strategy. The project's sustainability management system needs to become sufficient in managing significant changes in the environmental operating conditions, or in key design variables. In the case of this project, changing environmental conditions have not been taken into account. TEGRAM is located in a port area which is susceptible to flooding. One of the team's first priorities should be in establishing prevention and risk control measures or contingency plans, to address possible flooding or any other potential natural hazards.

		The project team should increase the clarity of the roles and responsibilities for sustainable performance of the overall project; this should be done under a written statement, as to avoid possible confusion regarding the responsibilities related to sustainable performance. It is important that the social assessment is aligned with the project scope. Exclusively approaching the truck drivers is not a complete solution to eradicate child prostitution, therefore more attention should be focused on the vulnerable children; thus the team should find appropriate assistance that is capable of alleviating the problem.
LD1.3 Foster Collaboration And Teamwork	**15**	**Conserving** In fostering collaboration and teamwork, the project team should look for ways to eliminate conflicting design elements, and optimize the system by using integrated design and delivery methodologies, as well as collaborative processes. This is measured by the extent of collaboration within the project team, and the degree to which project delivery processes incorporate whole-systems design and delivery approaches. One of the basic strategies in achieving high levels of sustainable performance is in the recognition by the owner and the project team of the importance of working together as a team. The TEGRAM consortium found ways to collaborate and optimize the grain export industry in Brazil by creating this joint venture. The sharing of risks and rewards describes the overall collaboration well. The four sponsors are regularly business competitors in grain exports, however, they were able to come together to design, deliver, and operate TEGRAM. Each of these companies has its own warehouse at the project site, but the structures such as the set of conveyor belts, and ship-loaders are for common-use. This consortium allows the four members to operate collaboratively, thus not building four independent ports, and thereby decreasing the overall environmental impact.

		Interviews with the project team explained how they work together to find ways to improve sustainable performance, commensurate with the owners' goals and objectives, technical feasibility, and cost considerations. The collaboration for TEGRAM has eliminated duplicate functions and unnecessary redundancies regarding grain exports. Achieving high levels of performance involves the incorporation of new and relatively untried technologies and methodologies in Brazil, such as the expansion and upgrading of the Itaqui Port structure to handle large cargo vessels with grain loads of up to 150,000 tons. TEGRAM's operation is described on the website as a "logistic benchmark for Brazil." Another new technology which has been implemented is the use of beepers to let truck drivers shut off their trucks' engines and wait for a signal to unload their grains at the warehouses. The stakeholders behind TEGRAM work effectively to foster collaboration at the top level, but it is important that projects of such magnitude also establish and foster collaboration with the surrounding communities. There were some activities which were instituted in collaboration with the closest communities, but more work is needed to have a systems-view for local stakeholders. The project team has the intention of constructing an orchard so that the students from the Josefina Serrão School, whom are instructed by the Junior Agronomy Organization (Empresa Júnior de Agronomia), have the opportunity to plant and learn how to appreciate and enhance the planting practice. It is important to notice that this type of commitment can generate a change of attitude, and foster youth leadership and environmental responsibility.
		Source: 1. TEGRAM, *Apresentação Projeto de Educação Ambiental* (São Luís, MA: 2015). 2. EJAGRO, *Solicitação de Parceria* (São Luís, MA: 2015). 3. CGG, *TEGRAM - Terminal de Grãos do Maranhão*, accessed 2015, http://www.cggtrading.com/logistica/tegram/. 4. TEGRAM, *Conference calls and e-mail messages with the case-study team*, Fall 2015.
		RECOMMENDATIONS In order to maintain this high score it is important to provide documentation of any meetings held between key team members to demonstrate continued coordination and teamwork efforts. The team should identify how community input was addressed in the design. Documentation should be provided that explains how the integration of the project and contractor teams was achieved, and identify how these employees communicated.

LD1.4 Provide For Stakeholder Involvement	**1**	**Improved** The importance of approaching infrastructure projects in a broader regional and national context should be recognized. This credit evaluates the permanent channels of communication with community members, local governments, and national environmental authorities. No information has been found regarding communications campaigns, or if educational programs have been developed for the broader community. By not hosting meetings and workshops to involve a set of local stakeholders, the project does not show signs of incorporating principles of collaboration and teamwork into the design, construction, and commissioning phases of the project, on a broader scale. The project team should have started the identification of the affected persons in the community during the design phase, such as workers or vulnerable youth that could be susceptible to prostitution, and assign an on-site interdisciplinary team to work with these individuals. This type of social work generates a sense of ownership and pride in the project amongst the community. The project team is currently establishing a communication channel with the truck drivers through meetings to better address certain subjects, such as child prostitution, and blood glucose tests, as well as to distribute informational brochures. A third-party company was hired to work with the truck drivers and receive their input in identifying the problems surrounding the parking lot, as well as gain an understanding of how such issues are impacting overall performance.
		Source: 1. TEGRAM, *Reunião de Gestão do Calendário Social & SSMA* (São Luís, MA: 2015). 2. Projectual, *Estudo de Impactos de Tráfego do TEGRAM na BR-135* (São Luís, MA: 2015).
		RECOMMENDATIONS

		The project team should reach out to residents in neighboring communities to collect their opinions about how the project might positively, or negatively affect them, as well as inquire about recommendations that they may have. A good approach could be in identifying the Itaqui Port's effects, or any other previous local infrastructure project's impacts on the communities. Programs for social communication could be created, not only with the truck drivers, but also with the community as a whole, in order to develop different community-related activities, and thus establishing a link between project developers and all relevant stakeholders. The relationships with the community can assist in freeing up bottlenecks. The team should provide letters, memoranda, notes, and minutes of meetings with stakeholder groups.
LD2.1 Pursue By-Product Synergy Opportunities	**0**	**No Score** No information was found in the documentation regarding waste reduction, improvement of the project's sustainable performance, or the reduction of costs that could be realized by identifying and using unwanted by-products or discarded materials from nearby locations. As TEGRAM is a port terminal that will be handling many materials coming in and out the Itaqui Port, it is important to identify and aggressively pursue by-product synergy opportunities, not only during the construction phase, but also throughout the operational life of the project. *Source:* 1. Porto do Itaqui, *Plano de Controle Ambiental* (São Luís, MA: 2011), (hereafter cited as PCA). 2. TEGRAM, *Relatório de Andamento 4* (São Luís, MA: 2015). *RECOMMENDATIONS* To achieve points for this credit, the project team should communicate with managers of nearby facilities to pursue by-product synergy opportunities, and provide documentation demonstrating a broad and comprehensive effort to identify nearby discarded materials that can be used by the project. TEGRAM has been envisioned in three phases, and only the first part is fully constructed, therefore identification and characterization of nearby facilities could contribute to the pursuit of potential by-product synergy opportunities for phases two and three. Documentation provided demonstrates the reuse and recycling of materials used during the construction and operations phases would increase the level of achievement for this credit.
LD2.2 Improve	**7**	**Superior**

Infrastructure Integration		On the whole, TEGRAM will tremendously improve the integration of grain export infrastructure in northern Brazil. This project was designed to take into account the operational relationships throughout other elements of grain transportation infrastructure, which results in an overall improvement in infrastructure efficiency and effectiveness. The project is planned and designed to work in harmony with infrastructure elements that are external to the project, such as shipping vessels, destination ports, cargo trucks, and the grain-producing areas of MAPITOBA in northern Brazil, as well as cargo railways in the future. However, the project is not fully integrated at the local scale or in synergy with local community assets. When looking at the location of the site, the project is in a remote area of the city with only one access road (BR-135). However, it can be mentioned that the project is also part of a broader infrastructure transportation logistics project, which will connect a railway to carry 80% of the total grain capacity of MAPITOBA. Nonetheless, the railway is not part of the TEGRAM project itself, and thus it will not be assessed in this evaluation; it is also unclear when the railway will be fully operational. Therefore, it can only presently be considered that TEGRAM has one route of integration with the city, which is the same for its workers and for the trucks fully loaded with grain, and that this situation will exist for an indefinite period. The approach for integration is composed of the waiting lot, which is located rather far from the Port of Itaqui (nearly 20 km), where trucks park and wait to be called for unloading at the warehouses. However, this lot is suboptimal, due to its lack of component-integration and poor operational performance, which is caused by internal communications problems. It is worth mentioning that a third-party company, AON, was hired to study the lot performance, but there is no information as to whether the project team has incorporated or will incorporate improvements to the existing road infrastructure (BR-135), or the lot itself. Furthermore, the project team is working with local authorities to change the existing route of BR-135 to improve the flow of traffic, and therefore optimize transportation efficiency on the highway.
		Source: 1. Projectual, *Estudo de Impactos de Tráfego do TEGRAM na BR-135* (São Luís, MA: 2015). 2. CGG, *TEGRAM-Terminal de Grãos do Maranhão,* accessed 2015, http://www.cggtrading.com/logistica/tegram/. 3. Câmara dos Deputados, *Estudo de tráfego/ BR -135/ PAC - 3 (*Brasília, DF: 2014).
		RECOMMENDATIONS

		The project should be planned and designed to take into account the other related community infrastructure elements, and how its design and operations will synergize with external infrastructure elements. For instance, TEGRAM has increased the volume of traffic on BR-135, and will continue to increase it until the railway is operational, or the existing BR-135 route is altered; nonetheless, the project team should, in addition to planning to use the railway in the long-term, also plan to the demonstrate how TEGRAM is impacting transportation to other locations along BR-135. There is likely greater wear on the road from this increase, through which opportunities for improvement can be found; such as in repairing and refurbishing the road and integrating it with communities, and therefore improving upon the project's overall integration with the community, as well as upon its quality of life. The project team could consider identifying existing community assets in the natural or built environment, which, when restored, would improve economic growth and the development capacity of the community. In order to improve the level of achievement for this credit, the project developers should provide documents demonstrating the efforts to integrate the project within the community as a whole.
LD3.1 Plan For Long-Term Monitoring & Maintenance	**0**	**No Score** In planning for long-term monitoring and maintenance, an infrastructure project must look to what extent the design of the completed project integrates with existing and planned community infrastructure, and results in a net improvement in efficiency and effectiveness. This is measured by the plans that have been put in place and the provision of sufficient resources to ensure that ecological protection, impact mitigation, and enhancement measures are incorporated into the project and can be carried out to a practical extent. Since the project's commissioning stage, the TEGRAM team has been working to fundamentally comply with the conditions of the implementation license. The next step taken by the project team will aim to write a report for obtaining the operating license, which will contain information on the plans and monitoring programs that will be implemented, as the project was designed to be able to operate under normal conditions for an indefinite time, as long as it is still feasible to have this type and size of a project for grain exportation. Planning for long-term monitoring and maintenance must be encouraged by the project sponsors. So far TEGRAM has a concession for 25 years that can be renewed for another 25 years, after which TEGRAM would need to change ownership. <u>*Source:*</u> 1. TEGRAM, *Arrendamento do Terminal de Grãos do Maranhão no Porto do Itaqui - Lotes I, II, III e IV* (São Luís, MA: 2011), 24, 31-32.

		2. PCA
		RECOMMENDATIONS It is important to maintain optimal performance of the programs and subprograms stated on the environmental control plan, and that these components are fully executed. The team should provide documentation showing how operations and maintenance workers will be trained to monitor the project. To improve the level of achievement for this credit, the project owner needs to provide an explanation of how funding will be provisioned, allocated, and maintained at sufficient levels to fund the necessary monitoring and maintenance.
LD3.2 Address Conflicting Regulations & Policies	**4**	**Superior** "Address Conflicting Regulations & Policies" relates to projects working with officials to identify and address laws, standards, regulations, and/or policies that may unintentionally create barriers to the implementation of sustainable infrastructure. The TEGRAM owners and project team have approached decision makers and identified conflicts related to current traffic regulations, policies, and standards that contradict efforts to improve the sustainable performance of the terminal. The metrics for this credit look for the efforts made to identify and change laws, standards, regulations, and/or policies that may unintentionally contradict sustainability goals, objectives, and practices. The assessment of conflicting regulations and policies was geared towards the optimal performance of TEGRAM, specifically regarding truck traffic issues. Since there is only one route connecting the warehouses to the surrounding community, the road (BR-135) does not allow for an efficient flow of trucks going to the warehouses, because it was not planned and designed for this type of demand. The team has been trying to contact the authorities to change the route of the highway, so as to increase the safety of the truck drivers, and all others who use BR-135, as well as to improve the route between TEGRAM and the truck waiting lot, which is located approximately 20 km from the project site.
		Source: 1. Câmara dos Deputados, *Estudo de tráfego/ BR -135/ PAC - 3* (Brasília, DF: 2014). 2. Projectual, *Estudo de Impactos de Tráfego do TEGRAM na BR-135* (São Luís, MA: 2015).
		RECOMMENDATIONS

		To encourage the sustainable operation of TEGRAM, the project team should work with decision makers to change the laws and regulations that could hinder sustainable practices, or make them more difficult to be addressed. It should be ensured that all of the changes, if implemented, improve the overall traffic flow; not just that of the TEGRAM truck drivers, but that of the whole community that uses BR-135 as well.
LD3.3 Extend Useful Life	**3**	**Enhanced**
		The performance in this credit is measured by the degree to which the project team incorporates full life-cycle thinking in improving the durability, flexibility, and resilience of the project to extend its useful life by designing a completed project that is more durable, flexible, and resilient. Extending useful life of TEGRAM should be a core value to pursue, as there are robust projections for growth in exports for this grain terminal. The project team has expanded considerations beyond the point of project delivery, as port capacity is expected to increase from 5 million tons annually, to 10 million, and then 15 million during the first phase and the following two phases of the project, respectively. TEGRAM's concession is for 25 years, with the possibility of renewal for another 25 years; after these 50 years with the current four cosponsors, TEGRAM would need to change ownership. TEGRAM is testing the boundaries of useful life by projecting to handle larger amounts of grain exports from northern Brazil. There are a few direct extensions of the design that address flexibility, durability, and resilience. Considerations that are more specific to extending the useful life of the project are related to handling more grains and integrating rail cargo into the terminal's logistics. TEGRAM seeks to expand the useful life of the delivered project by adding additional considerations for functionality that are of use to the owners, such as durability, flexibility, resilience, and the ease expansion and upgrades.
		Source:
		1. CGG, *TEGRAM-Terminal de Grãos do Maranhão*, accessed 2015, http://www.cggtrading.com/logistica/tegram. 2. PCA. 3. TEGRAM, *Arrendamento do Terminal de Grãos do Maranhão no Porto do Itaqui - Lotes I, II, III e IV* (São Luís, MA: 2011), 24, 31-32.
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		Better performance hinges upon further documentation that gives evidence of actions that add to the project's useful life; improve upon its durability, flexibility, and resilience; and facilitate ease for retrofittings and repairs. The team should perform a feasibility study to determine areas for potential long-term cost savings with regards to designing for future expansions, reconfigurations, enhanced durability, and reduced maintenance, among other similar considerations.
LD0.0 Innovate Or Exceed Credit Requirements		*N/A*
	33	

CATEGORY II: CLIMATE AND ENVIRONMENT		
RESOURCE ALLOCATION		
	Score	MARANHÃO GRAIN TERMINAL - TEGRAM
RA1.1 Reduce Net Embodied Energy	**0**	**No Score** A goal of an infrastructure project should be to conserve energy by reducing the net embodied energy of project materials over over the life of the project. This credit is measured strictly by the percent reduction in net embodied energy, as measured by a life-cycle energy assessment. The environmental control plan does not address the reduction of net embodied energy, nor does any other document provided prove that a life cycle assessment (LCA) was conducted in accordance with recognized and accepted methodologies to determine the net embodied energy for the project. *Source:* 1. Porto do Itaqui, *Plano de Controle Ambiental* (São Luís, MA: 2011), (hereafter cited as PCA). *RECOMMENDATIONS* In order to achieve points for this credit, an estimate of net embodied energy of project materials is required, as indicated by conducting a life cycle assessment (LCA). This assessment shall include the required energy for materials extraction, transportation, refinement, manufacturing, and the undertaken process overall, until the material is ready to be transported to the construction site. It is recommended that the project design and implement strategies to reduce net embodied energy.
RA1.2 Support Sustainable	**0**	**No Score**

Procurement Practices		The intent of "supporting sustainable procurement practices" is to obtain materials and equipment from manufacturers and suppliers that implement sustainable practices. This is measured by the percentage of materials sourced from manufacturers that meet sustainable practices requirements. It is not clear if TEGRAM obtained its construction materials and equipment from manufacturers and suppliers who implement sustainable practices. Furthermore, there is no specific data about suppliers' performance in regards to sustainable procurement; therefore it is unknown if the materials which were purchased were produced under sustainable procurement practices.
		Source: 1. Porto do Itaqui, *Plano de Controle Ambiental* (São Luís, MA: 2011).
		RECOMMENDATIONS It is important that the project team evaluates and reviews the policies and criteria for supplier identification, and prioritize suppliers that have implemented sustainable policies and practices. An inventory should be kept of the materials which were used in the project, as well as their sources, by total weight or volume of input materials. The cost of materials is also an acceptable measure in assessing the sustainability of procurement. The project should encourage the purchase of materials and supplies that are certified by third party accreditation and standard-setting organizations. Furthermore, the supplier should have a comprehensive practice with respect to social and ethical considerations, such as worker health and safety, in addition to environmental violations. Therefore, a substantial fraction of the materials and equipment should be certified by a third-party company.
RA1.3 Use Recycled Materials	**0**	**No Score** The use of recycled materials in an infrastructure project must be documented in order to evaluate the impact of this practice. Proper use of recycled materials can be demonstrated by reducing the use of virgin materials and avoiding sending useful materials to landfills by specifying which materials are reusable, including structures, and materials with recycled content.

		The basic metric in assessing the use of recyclables is in comparing the percentage of project materials that are reused or recycled, with the total volume or weight of all main materials used in the project. It is unknown if a reduction in the use of virgin materials was achieved for TEGRAM. The information provided does not refer to any inventory of existing materials or structures that could potentially be reused, or the use of any recycled materials during project construction, or a list of specific materials used with recycled content. Appropriate reuse of structures and parts of structures can significantly reduce the demand for new construction materials and other environmental burdens resulting from project development.
		Source: 1. Porto do Itaqui, *Plano de Controle Ambiental* (São Luís, MA: 2011).
		RECOMMENDATIONS It is important that any project that claims to be sustainable use recycled materials in order to reduce the overall virgin material use, and therefore the amount of environmental impact embedded in manufacture. In the specific case of TEGRAM, the majority of its construction materials are pre-molded, and pursuing materials from suppliers that support sustainable practices and sell recycled materials should be considered. To be able to achieve points for this credit, the project team needs to provide an inventory of materials and quantify the percentage (by volume or weight) that are reused or recycled. In addition, the team can perform an inventory of existing materials or structures that may have reuse potential, especially in Itaqui Port area. Design documents should be provided, showing the location and weight or volume of reused structures or materials. Consideration should be taken to improve efforts in supporting the use of recycled and reused materials. A good approach would be to build phase two and three of the project by using recycled materials, and also reuse any materials, if possible, from the phase one construction.
RA1.4 Use Regional Materials	**0**	**No Score**
		Through the use of regional materials, projects should try to minimize transportation costs and impacts, and retain regional benefits by using local sources. The metrics used to assess this credit are the percentage of project materials by type, and by weight or volume which are sourced within the required distance. Envision recommends the following distances for these materials: soils (80 km), aggregates (80 km), concrete (160 km), plants (400 km), all other materials (800 km).

		Interviews with the project team explained how the region where TEGRAM is located makes it difficult to procure significant proportions of materials and supplies for construction. Given the complexity and specific needs of the project, the level of local acquisition of materials is relatively low, when compared with the overall project need; nonetheless, the TEGRAM team did make an effort to pursue local materials whenever possible.
		Source: 1. PCA. 2. TEGRAM, *Conference calls and e-mail messages to case study team*, Fall 2015.
		RECOMMENDATIONS To receive points for this credit, the project team needs to evaluate and provide the percentage of total project materials which were used and locally procured. The percentage of project materials by type and weight, or volume, and sourced from within the required distance should be tracked. An inventory of materials should be created in order to increase the percentage of locally sourced materials, plants, and soils.
RA1.5 Divert Waste From Landfills	**0**	**No Score** "Divert Waste from Landfills" concentrates on reducing waste, and changing waste stream management from disposal to recycling and reuse. This is measured through the percentage of total waste that is diverted from disposal methods to recycling and reuse. Identification and evaluation of options for recycling and reuse are the first steps in the development of effective plans for handling, segregating, and storing materials. It is important to determine which materials must be separated, and which can be commingled. TEGRAM's environmental control plan states that the project shall have a waste management subprogram, which will define necessary procedures and actions for the disposal of certain types of waste generated by the construction and operations phases. However, the project team was still working on the waste management policies at the time of the Envision assessment, and has not provided any documentation in regards to waste management; thus, the project is not able to receive points for this credit. It is worth mentioning that TEGRAM is collecting grains that fall from trucks, and reusing them. Nonetheless, no further information was provided on such efforts.
		Source: 1. PCA, 329-330.

		RECOMMENDATIONS To be able to receive points for this credit, the project team needs to provide accurate data and evidence regarding the percentage of the total waste diverted from landfills to recycling and/or reuse, overall waste reduction, and materials sent to manufactures for post-consumer use, among others. A strong performance for TEGRAM will hinge upon increased efforts to reduce waste generation, and divert waste from landfills for recycling, above industry norms. It is important that the project team develop the waste management plan as soon as possible, in order to document the volume or weight of anticipated waste generation, and also in order to document usage from construction to phases two and three, thus improving the project's overall sustainability.
RA1.6 Reduce Excavated Materials Taken Off Site	**6**	**Conserving**
		Through the reduction of excavated materials taken off-site, projects can minimize the movement of soils and other excavated materials off-site, so as to reduce the transportation and environmental impacts. This credit is strictly measured by the percentage of excavated material that is retained on-site. The project was constructed with minimal earth removal from the site. The TEGRAM team, along with the port administration's guidance and permission, executed the project's cut and fill operations in a way that all of the excavated materials could remain on-site or within the Itaqui Port's limits, for internal uses such as filling or leveling. According to the interviews done with the project team, all excavated material have remained on the TEGRAM site.
		Source: 1. TEGRAM, *Conference calls and e-mail messages to case study team*, Fall 2015.
		RECOMMENDATIONS To support this high performance, the team should provide the design documents demonstrating how the project was designed to balance the cut and fill operations. During planning and design, project teams should identify opportunities to minimize grading, retain all soil on-site, and/or eliminate the need to transport additional soil to the site. The project team should also document and provide the amount of earth excavated which remained on-site, and any that was taken off-site, if relevant.
RA1.7 Provide for	**8**	**Superior**

Deconstruction & Recycling		The "Providing for Deconstruction & Recycling" credit's main goal 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. It is expected that the span of the project's concession as property of the current consortium will last 25 years, with the possibility of renewal of another 25 years. After these 50 years, the current consortium needs to have the warehouses and its infrastructure in perfect condition for a new bid. The warehouses' major structures are made pre-molded units. The project was created with the intention of operating indefinitely, as long as the market keeps the business feasible. There is no specific plan for the end of its concession period, such as specific percentages for reconstruction or reuse of materials after the lifetime. The project owners have expanded considerations beyond the point of project delivery, thinking to the end of the project's useful life, which is the period that the project is economically feasible for exports. Considering the nature of the port architecture and warehouse structures, there is a primary concern for the end of its concession period, as the project owner expands considerations to those that will likely entail future owners. Generally, at least 50% of the components or prefabricated units can easily be separated for disassembly or deconstruction. According to the environmental plan, the four warehouse storage areas account for about 74% of the 161,306 m² total project area, with 119.324 m² dedicated to storage, and 41.982 m² for logistics. Planning for the future deconstruction of the warehouses (and the respective supporting infrastructure) should be considered by the project team. Furthermore, the team should also think of disassembly and possible reuse of the remaining infrastructure at the end of the project's not only its concession period.
		Source: 1. TEGRAM, *Arrendamento do Terminal de Grãos do Maranhão no Porto do Itaqui - Lotes I, II, III e IV* (São Luís, MA: 2011), 24, 31-32. 2. PCA, 19. 3. TEGRAM, *Conference calls and e-mail messages to case study team*, Fall 2015.
		RECOMMENDATIONS

		The scope should be expanded to include more life-cycle elements that go beyond construction, moving outside of typical the owners' considerations of functionality. For example, the design might include enhanced flexibility for increasing the possibility of alternative future uses. Additionally, the scope should be further extended to include end-of-life considerations. The project should be designed and constructed in a way that the materials' connections ease disassembly, and encourage reuse and recycling, especially during TEGRAM's deconstruction, as the majority of its materials are pre-molded. To score higher this credit the project team must provide an inventory of the materials incorporated into the design that retain some value for future use. Also, the design team should have considered the minimization of combining recyclable materials with non-recyclable materials, or materials that can limit recyclability.
RA2.1 Reduce Energy Consumption	**0**	**No Score** To reduce energy consumption infrastructure projects can conserve energy by reducing the overall consumption of operations and maintenance energy throughout the project life. This is strictly measured by the percentage of reductions that have been achieved. There is no evidence within the submitted documentation that the owner and the project team conducted feasibility and cost analysis to determine effective methods for energy reduction. To receive points for this credit, the project needs to have reduced its energy consumption by at least 10% throughout its life-cycle. *Source:* 1. PCA. *RECOMMENDATIONS* Energy generation is the primary source of greenhouse gas emissions, therefore the primary goal of the project should be to reduce the overall energy consumed by as much as possible. The project team should identify and analyze options for energy savings within the design, as well as the percentage of reductions above the industry norm benchmark.
RA2.2 Use Renewable Energy	**0**	**No Score** Sustainable infrastructure must try to meet energy needs through the use of renewable energy sources. This effort is measured by the extent to which renewable energy sources are incorporated into the project.

		There is no evidence within the submitted documentation that states if TEGRAM has incorporated the use of renewable energy into its operations.
		Source: 1. PCA.
		RECOMMENDATIONS To qualify for this credit the project team needs to provide documentation of the amount of energy consumed annually, and calculate the percentage that is provided by renewable sources. At least 10% of the project's energy needs must be supplied from renewable energy in order to receive points for this credit. Conducting a feasibility study on how the project can incorporate the use of renewable energy sources would help to understand the sustainable goals for TEGRAM. Even if the project does not incorporate the use of an external sustainable energy source, the team could consider the use of photovoltaic solar panels to supply a part of the energy needs of the project.
RA 2.3 Commission & Monitor Energy Systems	**0**	**No Score** Energy systems performance can ensure that efficient functioning and useful life be extended by specifying criteria for the commissioning and monitoring of energy systems. The assessment looks for third-party commissioning of electrical and/or mechanical systems, and documentation of the incorporation of systems-monitoring equipment into the design. This credit assesses if the project team is making an effort to ensure efficient functioning and an extended useful life, by specifying the commissioning and monitoring procedures for energy systems. Long-term monitoring that is developed by third-party companies can help to improve the performance of energy systems. However, in the available information there is no mention of any independent commissioning that has been contracted to evaluate the performance of the project's energy systems, or if the project has included any such internal commissioning; therefore, TEGRAM cannot receive points for this credit.
		Source: 1. PCA. 2. TEGRAM, *Relatório de Andamento 4* (São Luís, MA: 2015).
		RECOMMENDATIONS

		It is important for the project team to train operations and maintenance workers on the requirements for monitoring energy systems, in addition to hiring an independent contractor for the project to monitor energy systems efficiency.
RA3.1 Protect Fresh Water Availability	**4**	**Enhanced**
		"Protect Fresh Water Availability" is to reduce the net negative 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. It was stated in the environmental control plan that TEGRAM will not impact any local aquifers. It was also declared that the project does not need a large volume of water for operations and maintenance. The project will be supplied by groundwater through wells, which are authorized for up to 480 m^3/day in one well, and 120 m^3/day in another. The environmental control plan also mentions a subprogram for surface water, groundwater, and sediments monitoring. However, the surface water and sediments monitoring subprogram is the responsibility of the port's administrator, and thus out of TEGRAM's prerogative. The project team is responsible for groundwater monitoring; however, further evidence should be provided to support this. In addition, the team is responsible for stormwater monitoring, and interviews with the project team confirmed that plans will be implemented at the beginning of the rainy season. Nonetheless, to avoid impacts to water quality the project's design adopted watertight tanks to contain wastewater and effluents generated at the warehouses, which are to be sent to treatment stations outside of the port area.
		Source: 1. PCA, 130, 331-332. 2. Louzeiros Engenharia e Consultoria Ambiental, *Laudo de Estanqueidade* (São Luís, MA: 2015). 3. Governo do Estado do Maranhão, *Autorização do Uso da Água* (São Luís, MA: 2012).
		RECOMMENDATIONS

		Better performance in this credit would include having a comprehensive assessment on water consumption that incorporates the following: estimations of average peak demands and long term needs; a report on the long-term availability and replenishment or recharge rates of the freshwater supply; an inventory of opportunities for water reuse or groundwater recharge on-site; calculations of the volume of freshwater discharge after use; the location of discharge; and the impacts of discharge on receiving water quality and quantity, including those of temperature and salinity. Better performance would be achieved by having the project replenish the quantity and quality of freshwater, surface water, and groundwater supplies to an agreed upon, undeveloped native ecosystem condition. It is important that regardless of the port administrator being responsible for part of the water management, the project team should include an independent, comprehensive water management system that provides for sediment separation, accumulation of water in ponds, and rainwater harvesting and reuse within the warehouses, as the project's water needs are low. Methods for achieving this may include closed-loop recycling of water within the project.
RA3.2 Reduce Potable Water Consumption	**0**	**No Score** This credit addresses the project efforts to reduce overall potable water consumption, and encourage the use of graywater, recycled water, and stormwater to meet water needs. This credit is measured through the percentage of reduction in water use. According to the information provided, TEGRAM will use groundwater from a well as its water supply source. No evidence was made available documenting measures to reduce potable water consumption, neither for the construction stage nor the operations phase. *Source:* 1. Governo do Estado do Maranhão, *Autorização do Uso da Água* (São Luís, MA: 2012). *RECOMMENDATIONS*

		To be able to receive points for this credit, the design team must focus on reducing potable water use by at least 25%, a reduction estimated to be over industry norms. Although the project does not need a significant volume of water for its operation, it is important that the team considers reductions of the project's water consumption that is supplied by potable water. TEGRAM should incorporate ways for using graywater or water recycled within the project site's limits obtained through rainwater harvesting. The team should provide a report or documentation of sound and comprehensive plans and design reviews that identify potable water use reduction strategies.
RA3.3 Monitor Water Systems	**0**	**No Score** This credit assesses how projects implement programs to monitor the performance of water systems and their impact on receiving waters. This credit is measured through documentation of systems monitoring in the design. The project is located on a consolidated port area, in which there is a company responsible for managing the port itself (EMAP), while some issues are related to the private enterprises that operate within the port area. In this sense, it is understood that the port administrator has some responsibilities regarding water monitoring, but TEGRAM has certain obligations as well. The project team mentioned that plans for water monitoring are currently in preparations or procurement phases, yet no further information was provided to support the evaluation of this credit. To be eligible for this credit, the project needs to implement programs to monitor water systems performance during operations. Scoring for this credit starts with at least an initial commissioning of the project's water systems, specified to validate design objectives, but in the case of this project, little to no effort has been made to incorporate and facilitate long-term monitoring. *Source:* 1. TEGRAM, *Relatório de Andamento 4* (São Luís, MA:2015). *RECOMMENDATIONS* It is recommended that a plan for monitoring water systems is considered. The commissioning of a monitoring authority, independent of the design and construction team, should collect data that allows for the improvement of the operational efficiency of the systems. Providing quality data and independent validation is the first step towards achieving sustainability goals. Monitoring programs are designed to verify that pollution-control measures are working for pollutants of interest, when applicable.

RA 0.0 Innovate Or Exceed Credit Requirements		*N/A*
	18	

NATURAL WORLD		
	Score	MARANHÃO GRAIN TERMINAL - TEGRAM
NW1.1 Preserve Prime Habitat	**9**	**Superior** 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 through the avoidance of high ecological value sites, and the establishment of protective buffer zones. According to the IPHAN, the National Institute of Historic and Artistic Heritage (Brazil), TEGRAM avoids the use of prime habitat as it is located in a previously developed area. This statement is supported by meetings held with the surrounding community as well as by the soil's natural sedimentation that was modified by the previous development. In the area where the warehouses are located, the ground had been already flattened, undergone earthwork, it also contained building material agglomerations, and recently demolished buildings. These building remains belonged to an old village that has been unoccupied for the five years leading up to the project. However, the area surrounding the project site is comprised of valuable and fragile natural ecosystems, such as the nearby mangroves. Therefore, during the construction and operations phases, the workers avoided releasing wastes that might be carried by the tidal movements into the nearby basins of Arappopaí, Buenos Aires, Irinema, Itaqui and Boqueirão. Any contamination could have impacts on ground areas, which could further contribute to the reduction of vegetation coverage. Furthermore, water discharges could allow for a greater likelihood of erosion by silting waterways and consequently decreasing the flow of water; this could even cause possible stresses to aquatic life due to habitat loss. In relation to the mangrove within the Itaqui Port expansion limits, this area not inside TEGRAM's terrain, but the project team could protect it better through the creation of a buffer zone, or implement other compensation measures, knowing that the mangrove may have been harmed by the port expansion. *Source:*

		1. PCA 2. IPHAN, *Relatório Final das Atividades de Campo referente à Pesquisa Arqueológica* (São Luís, MA: 2012), 1-3.
		RECOMMENDATIONS The team should develop a restoration plan in order to significantly increase the prime habitat connectivity, both in the direct and indirect areas of impact. Documentation should be provided that outlines the locations of areas of restoration, conservation, and overall development within the site area. To improve the performance of the project, the creation of a 300 ft. (91m) buffer zone next to the mangrove should be considered, even if it is not required by the project's jurisdiction.
NW1.2 Preserve Wetlands and Surface Water	**0**	**No Score** In order to preserve wetlands and surface waters, 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 established around all wetlands, shorelines, and water bodies. The project team analyzed TEGRAM's impact within the direct and indirect areas of influence. During the construction and operation phases of TEGRAM, special care was taken by the construction workers regarding all nearby waterbodies and local hydrographic basins in order to avoid possible waste releases that might be carried by the tidal movements and promote impacts within the terrain. These impacts could further contribute to the reduction of the areas covered by vegetation, allowing a greater likelihood of erosion, silting watercourses and consequently decrease the flow, causing even possible stresses on aquatic biota due to habitat loss. According to the Environmental Control Plan, the project does not consume large amounts of water, due to the nature of the port activity, meaning that the water resources of the hydrographic basins of São Luis will not be compromised by TEGRAM'S activities.

		The only action that could impact the local basins is the construction of the railway, which despite favoring TEGRAM, is not part of the project, and thus is not part of this evaluation. The water, such as groundwater, surface water and stormwater, within the Itaqui Port's limits is to be managed by EMAP, the port administrator, as well as a team from the TEGRAM consortium. It is important to mention that according to interviews with the project team, the plans for water management, that are responsibility of TEGRAM, will only take place when the rainy season starts. Prior to the construction, the project team conducted a study of the biotic and water baselines within the perimeter of the grain terminal. These studies reviewed the hydrology and the flora and fauna, which could help in the creation of actionable recommendations to mitigate and minimize possible impacts during construction and operations phases, In addition, the project team states that compensation measures regarding vegetation interventions should be made by legal request, however no further information was found to support the evaluation of this credit. To be able to score points in this credit, the project needs to create a buffer zone of at least 50 ft. (15.24 m.), even if it is not required by the project's jurisdiction.
		Source: 1. PCA, 130-331. 2. TEGRAM, *Conference calls and e-mail messages with case study team*, Fall 2015.
		RECOMMENDATIONS It is recommended to provide more documentation regarding the waterbody locations in relation to the project site, as well as for vegetation and soil protection zones (VSPZ) in the area. To receive points, the buffer or VSPZ must be at least 50 ft (15.24 m) wide. The team should include a restoration plan outlining any efforts to restore wetlands or waterbodies, as well as the size of the buffer zone created. Revegetation using native plant species should be considered, as well as the restoration of previously degraded buffer zones to a more natural state, as the project is located in a port.
NW1.3 Preserve Prime Farmland	**12**	**Conserving** This credit has the purpose to identify and protect soils designated as "prime farmland," "unique farmland," or "farmland of statewide importance". It is measured through the percentage of prime farmland avoided during development.

		The environmental control plan study for TEGRAM shows that the predominant soils on-site have low fertility, or are unsuitable for agricultural use. The site presents undulated dissected hills, and small deep valleys with laminar erosion and grooves. These formations are in the higher parts of the terrain, and there is presence of continuous concretionary material which creates water accumulation problems during periods of heavy rain. All of these areas already have large degraded eroded portions. Therefore, the soils surrounding the project show high sensitivity due to the respective consistencies, thus are susceptible to erosion, and consequently not of agricultural potential. The project team provided information on a subprogram for recovering degraded areas and erosion control, however there is no information if previously developed areas deemed prime farmland were restored to a productive stage.
		Source: 1. PCA, 160-168. 2. TEGRAM, *Subprograma de recuperação de áreas degradadas e controle de erosão* (São Luís, MA: 2015).
		RECOMMENDATIONS To receive the highest score, a restorative level, the project team should restore previously degraded areas which have been deemed as farmland, and implement a plan to mitigate possible erosion.
NW1.4 Avoid Adverse Geology	**5**	**Conserving** This credit assesses efforts to avoid development on adverse geologic formations, and safeguard aquifers to reduce risks of natural hazards and preserve high-quality groundwater resources. The metric behind this credit is the degree to which natural hazards and sensitive aquifers are avoided, and geologic functions are maintained. Before the project's construction, a study was performed in TEGRAM's area of influence regarding the geology and geomorphology of the area. The study aimed to characterize the bedrock and the partitioning of the relief. The physical environment in the area was listed as being highly susceptible to marine erosion. The topographic relief on the direct area of influence is characterized by coastal plains and tableland. These units, although are locally presenting different sized topographical dimensions, may be classified as low-elevation reliefs.

		According to the hydrogeology studies, the site is located in a safe area with no adverse geologic features and no possible negative effects on aquifers. The predominant aquifer and formation in the area of influence of TEGRAM is the "Formação Barreiras" aquifer, which is semi-confined to confined by layers of mudstone and siltstone. The main influence of the project on the local hydrology would be due to the construction of the railway, which is not part of the TEGRAM project itself, and therefore is not included in this evaluation. However, the railway installation will occur on existing structures, so it is understood that it should not impose major influences on the local hydrogeology.
		Source: 1. PCA, 135-138.
		RECOMMENDATIONS Even if the warehouses are considered as not having a great influence on the local hydrology, it is recommended to conduct continuous monitoring of the aquifer areas in order to avoid changes in water quality, either by lack of sanitation or by saline intrusions. The team should provide more information on the strategies used to avoid damage to sensitive geology or damage from adverse geology; and/or present monitoring plans for high quality groundwater resources.
NW1.5 Preserve Floodplain Functions	**0**	**No Score**
		The credit addresses actions taken to preserve floodplain functions by limiting development and the impacts of development to maintain water management capacities and capabilities. This is measured through efforts to avoid floodplains, or maintain pre-development floodplain functions. Surface water resources, groundwater and soils can be affected by the spill of fuels, oils and greases; the carrying of construction, industrial, and/or domestic solid waste; and the carrying of soil (erosion). Plans were put in place to manage and mitigate these impacts during the construction and operations phases. In TEGRAM's direct influence area, the coastal plains correspond to flat land, formed by depositional action of fluvial channels. These lands are characterized by the presence of the floodplain, waterbody, and wetlands. In addition to the fluvial action, these plains show tidal influence downstream, further transitioning to marine plains. These plains comprise the predominant relief unit in the area of direct influence of the project. However, no information on the development of a floodplain drainage system, and/or flood emergency management plans was provided.
		Source:

		1. PCA, 120-130.
		RECOMMENDATIONS
		The project should limit or eliminate the use of impervious surfaces to allow for groundwater infiltration. Since the project is located in a coastal plain, and thus being susceptible to flooding, it is important that the project team provide documentation of an emergency plan for floods for all components of the infrastructure that includes provisions for emergency operations and/or evacuation. The team should also provide an estimation of pre-development floodplain infiltration capacity, as well as an estimation of post-development infiltration capacity. The project should maintain pre-development floodplain storage capacity, and should not increase flood elevations. Minimum scores hinge on avoiding or limiting new development within the design frequency floodplain for waterways of all sizes, unless the project is a type of water-dependent infrastructure that must cross, or be adjacent to a waterway. If relevant, the team should design water-dependent infrastructure that minimizes floodplain impacts or waterway crossings.
NW1.6 Avoid Unsuitable Development on Steep Slopes	**6**	**Conserving**
		This credit evaluates 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 is avoided, or to which erosion controls and other measures are used to protect the completed project, as well as down-slope structures.
		According to the documentation provided, the project is located in a coastal plain, therefore it can be concluded that steep slopes were avoided. However, for the implementation of the TEGRAM structures, there was some earthwork conducted. These modifications have been conducted as modifications of the natural relief, and can trigger erosion in the intervention area. In such cases, corrective actions were implemented to control erosion, such as concreting for earth retainment. Moreover, the local soils are naturally susceptible to erosion, thus a subprogram for recovering degraded areas and implementing erosion controls was mentioned in the environmental control plan. The subprogram stated that identification measures of degraded areas that are in need of erosion control is to be done through the use of satellite images and a field inspection (conducted by a professional).
		Source:

		1. PCA, 195-196; 296-299. 2. TEGRAM, *Subprograma de recuperação de áreas degradadas e controle de erosão* (São Luís, MA: 2015). 3. TEGRAM, *Relatório de Andamento 4* (São Luís, MA: 2015), 16.
		RECOMMENDATIONS The team should provide documentation (such as plans) that shows that the project minimized drastic topographic alterations, as the warehouses are located on terrain that is susceptible to erosion, and no information was found regarding the implementation of the control plan. The team should also provide further information on the subprogram for recovering degraded areas and for erosion controls, and confirmation that the program mitigation measures are being implemented and are fully aligned with the project's needs.
NW1.7 Preserve Greenfields	**0**	**No Score** The intent of the credit is to conserve undeveloped land by locating projects on previously developed greyfields, and/or sites that are classified as brownfields. Metrics for the credit consist of the percentage of area that is a greyfield, or the use and cleanup of a site which has been classified as a brownfield. For this evaluation, the project needs to have at least 25% of the site as a greyfield. Envision states that all land dedicated to agricultural use or forestry use is qualified as greenfield, even if it contains pre-existing paving, construction, or altered landscapes. According to the Prestação de Serviços de Resgate e Translocação de Fauna e Flora report, the area in which the warehouses are located, and the railway, are classified as mangroves (16.5%), urbanized (22.2%), tree and shrub vegetation (26.6%), and plant succession (34%). However, it is important to mention that the area occupied by the warehouses only has tree and shrub vegetation, and plant succession, thus it can be concluded that the project is entirely located within a greenfield. The tree and shrub vegetation, and plant succession present a general landscape with babaçu palms, which are characterized as secondary vegetation due to the intense use of the area for subsistence agriculture; therefore this area is not considered to be a greyfield.
		Source: 1. STCP, *Prestação de Serviços de Resgate e Translocação de Fauna e Flora* (Curitiba, PR: 2012), 18-27.
		RECOMMENDATIONS

		The team should develop compensation strategies related to the existing greyfields, and provide more detailed documentation for the compensatory planting which is used to protect species. Using the pre-babaçu palm, endemic vegetation species could be a good approach for this credit.
NW2.1 Manage Stormwater	**0**	**No Score** This credit assesses efforts to minimize the impact of infrastructure on stormwater runoff quantity and quality. This is measured through the infiltration and evapotranspiration capacity of the site, and the respective return to pre-development capacities. Specific information regarding stormwater quantity and quality was not provided by the project team, neither the infiltration, nor the evaporation capacity. However, the project does have a stormwater management plan, stating that storm effluents in the drainage passages within the operational areas of each of the four lots will be monitored, as these areas are potential generators of contaminants that may be carried by rainwater (grains, oil loss by equipment, etc.). The climate of the area is tropical and humid, without a cold season, and is characterized by a well-defined rainfall distribution; with the occurrence of a rainy season from January to July, and a dry season from July to December. Monitoring should be performed during each rainfall event in the summer months for the first half hour of rainfall, as well as once a week during the winter months, or during the first half hour of any rainfall. Furthermore, a specialized laboratory will be hired to manage the stormwater and run tests to inspect and analyze it. The laboratory shall be accredited by INMETRO (Instituto Nacional de Metrologia, Qualidade e Tecnologia), a third-party company responsible for national water monitoring, quality, and technology. *Source:* 1. PCA, 73-78. 2. TEGRAM, *Procedimento Gestão de Efluentes Consórcio TEGRAM e lotes 1 a 4* (São Luís, MA). *RECOMMENDATIONS*

		In order to receive points for this credit, the project team should assess strategies to increase stormwater storage capacity, and provide documentation of initial and post-development water storage, infiltration, evaporation, water harvesting, and/or cistern storage. A robust strategy may be in regards to rainwater harvesting, by accumulating and depositing rainwater for reuse on-site, rather than allowing it to run off, as the project does not need a large amount of water, and is not located in a dry-climate area. This process reduces the need for potable water use and reduces the cost of purchasing water.
NW2.2 Reduce Pesticides and Fertilizer Impacts	**0**	**No Score**
		This credit assesses efforts to reduce nonpoint-source pollution by reducing the quantity, toxicity, bioavailability, and persistence of pesticides and fertilizers. This is measured 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. In the documentation provided, no evidence has been found regarding operational policies or programs designed to control the use of pesticides and/or fertilizers in the green areas of the project. However, in the "Authorization for Vegetation Suppression" (Autorização de Supressão de Vegetação), the use of herbicides is prohibited for the plants that would be cut, but it is not clear if this action would also be taken for the green areas that are to remain in the project area, or if pesticides and fertilizers would be prohibited as well.
		Source: 1. Ducol Engenharia LTDA, *Relatório de Supressão Vegetal* (São Luís, MA: 2012), 23.
		RECOMMENDATIONS For a better performance, the team should gather documentation that can give evidence of landscaping plans that show the mix of plant species required, in addition to design specifications which show that no herbicides, pesticides, and/or fertilizers will be used on the project site.
NW2.3 Prevent Surface and Groundwater Contamination	**1**	**Improved**
		This credit assesses efforts to preserve freshwater resources by incorporating measures to prevent pollutants from contaminating surface and groundwater, and to monitor impacts over periods of operation. This is measured by the designs, plans, and programs which have been instituted to prevent and monitor surface and groundwater contamination.

		The TEGRAM team understands the need for constant water monitoring activities in order to prevent the pollution of the resources in question. These efforts can be seen by the reduced amount of possible leakage sources, which are concentrated in pumps and motors in the warehouses and in waste disposal areas. These areas have been designed in accordance with applicable Brazilian standards. Visual monitoring is performed by the project team to identify possible sources of contamination (eg. truck oil, pumps leaks). Also, the team was concerned with contamination from septic tanks; therefore they implemented watertight tanks for domestic wastewater, thus avoiding such sources of contamination. Actual plans for water management are, in part, the responsibility of EMAP (the port administrator), and also that of the TEGRAM team. The stormwater management plan, which is the responsibility of the TEGRAM team, states that storm effluents in the drainage passages located within the operational areas of each of the four lots will be monitored, due to the potential generation of contaminants that might be carried by rainwater, such as grains or oil leakage from equipment. Furthermore, a specialized laboratory will be hired to manage the stormwater, as well as run tests to assess and analyze it. The laboratory shall be accredited by INMETRO (Instituto Nacional de Metrologia, Qualidade e Tecnologia), a third-party company which is responsible for national water monitoring, quality and technology. However, no further information was provided in regards to other plans that could minimize or prevent surface and groundwater contamination.
		Source: 1. Louzeiros Engenharia e Consultoria Ambiental, *Laudo de Estanqueidade* (São Luís, MA: 2015). 2. TEGRAM, *Procedimento Gestão de Efluentes Consórcio TEGRAM e lotes 1 a 4* (São Luís, MA).
		RECOMMENDATIONS The team should provide documentation of long-term surface and groundwater quality monitoring programs, as well as the response plans for possible spills and leaks.

NW3.1 Preserve Species Biodiversity	**2**	**Improved** This credit looks at efforts to protect biodiversity by preserving and restoring species and habitats. It is measured by the degree of habitat protection. TEGRAM has identified and protected habitat. The project team works with state and local agencies to identify existing habitats, in or near the project site, ensuring that existing habitats are not harmed and also compensating for losses where relevant. Due to the characteristics of the ecosystem, and a commitment to have the least possible impact on the site, the project team has commissioned studies from an environmental technician from the DUCOL organization, and has taken the proper actions to handle all of the fauna and flora species. The studies mention that the site shows signs of human actions and intervention in this area, and in its surroundings. This human presence is noted by a reduction in the biodiversity of the environment, and negative effects on the fauna and local flora. This fact can be related to constant, non-selective cutting of tree species, as well as nearby local agriculture practices. The "Environmental Report" (Relatório Ambiental) and the "Report on the Rescue and Translocation of Fauna and Flora" (Resgate e Translocação de Fauna e Flora) states all of the good practices conducted within the project framework, such as the relocation of fauna to nearby areas, within the same environmental conditions to their natural habitat. With regards to the fauna, 80 animals were captured and recorded, of these, 64 individuals (80%) were translocated and released, followed by six individuals (8%) collected for scientific study, and one individual (1%) which was hospitalized; nine individuals (11%) were discarded due to anatomical distortion. The report concluded that the capture and relocation of the animals was successful. With regards to the local flora, it was concluded that the suppression did not result in a significant loss of biodiversity.
		Source: 1. Ducol Engenharia LTDA, *Relatório de Supressão Vegetal* (São Luís, MA: 2012). 2. STCP, *Prestação de Serviços de Resgate e Translocação de Fauna e Flora* (Curitiba, PR: 2012).
		RECOMMENDATIONS The team should perform additional efforts to not only protect, but also to upgrade existing habitats; a better sustainability performance would include restoring and creating new habitats. The team should also improve and expand wildlife corridors and link existing habitats together.

NW 3.2 Control Invasive Species	**0**	**No Score**
		This credit's intent is to encourage the use of appropriate, noninvasive species, and control or eliminate existing invasive species. It is measured through the degree to which invasive species have been reduced or eliminated. In the submitted documentation there is no mention of any measures taken with regards to the control or elimination of existing invasive species on-site.
		Source: 1. Ducol Engenharia LTDA, *Relatório de Supressão Vegetal* (São Luís, MA: 2012). 2. STCP, *Prestação de Serviços de Resgate e Translocação de Fauna e Flora* (Curitiba, PR: 2012).
		RECOMMENDATIONS The project team should provide documentation that evidences that all species introduced on-site are noninvasive; in addition, the team must include a site plan for the landscaping strategy that informs of all vegetation species. For a better performance, documentation should be provided of collaboration with state or local agencies/personnel that are qualified for environmental consulting and analysis, and not only a private third-party company. The project should have a management plan for a possible flora and fauna invasion that may emerge on-site and affect the project in the future.
NW3.3 Restore Disturbed Soils	**8**	**Conserving**
		This credit's intent 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. The project team conducted studies to identify the possible actions that may impact the soils of the areas where the warehouses were to be constructed. The major actions that may lead to soil disturbance are spillage and leakage of fuels, oils, and greases; the movements of construction/industrial/household solid waste; erosion; and the need to conduct earthworks in the area directly affected by project implementation. Such modifications are changes to the natural topographic relief, and can trigger erosion in the intervention area.

		According to the documentation provided, the project considered a series of recommendations to restore the soils which were disturbed during construction, as well as for land stabilization and erosion control measures to avoid problems related to TEGRAM's construction. Interviews with the project team also identified that fertile soils were removed during earthworks, but were stored to be used in areas that would be rehabilitated and/or revegetated.
		Source: 1. PCA. 296-299. 2. TEGRAM, *Subprograma de recuperação de áreas degradadas e controle de erosão* (São Luís, MA: 2015). 3. TEGRAM, *Conference calls and e-mail messages with case study team*, Fall 2015. 4. TEGRAM, *Relatório de Andamento 4* (São Luís, MA: 2015), 16.
		RECOMMENDATIONS The soil restoration improves the soil's ability to support the plant health, biological communities, water storage, and water infiltration. Disturbed soils cannot hold water, thus making them less capable of absorbing floodwaters, and also less able to sustain vegetation that helps to prevent floods. Documentation of soil restoration activities is necessary for the evaluation of this credit, as well as of disturbed and restored areas. Appropriate authorities must verify that 100% of the disturbed soils from construction have been restored.
NW3.4 Maintain wetland and surface water functions.	**9**	**Superior** This credit intends to maintain and restore the ecosystem functions of streams, wetlands, waterbodies, and respective riparian areas. It is measured by the number of functions which are maintained and restored. There are four main ways to improve ecosystem functions: maintain or enhance hydrologic connection; maintain or enhance water quality; maintain or enhance habitats; and maintain or enhance sediment transport. The environmental control plan mentions a subprogram to monitor surface water, groundwater, and sediments. According to the documentation provided, the TEGRAM maintains the following three ecosystems functions: hydrologic connection, water quality and sediment transport. The environmental control plan states that the project does not consume water in high quantities, due to the nature of the port activity, meaning that the water resources of the hydrographic basins of São Luis will not be compromised by TEGRAM's activity, which helps in preserving hydrologic connection.

		As for maintaining water quality, the project team has established a stormwater runoff plan to mitigate any possible contamination from substances such as oil from pumps and grains that have fallen to the ground. Interviews with the project team confirmed that plans for stormwater runoff will be implemented at the beginning of the rainy season. Furthermore, the team has provided documentation confirming its proactiveness trying to avoid contamination through the use of watertight tanks for domestic wastewater, thus avoiding any source of contamination from not using septic tanks. Moreover, the sediment transport will not be jeopardized because the project is not located within a steep slope, which decreases the possibility of erosion occurrence, and the team has also provided plans for recovery of degraded areas and erosion mitigation.
		Source: 1. Louzeiros Engenharia e Consultoria Ambiental, *Laudo de Estanqueidade* (São Luís, MA: 2015). 2. TEGRAM, *Procedimento Gestão de Efluentes Consórcio TEGRAM e lotes 1 a 4* (São Luís, MA). 3. PCA, 130, 331-332. 4. TEGRAM, *Subprograma de recuperação de áreas degradadas e controle de erosão* (São Luís, MA: 2015).
		RECOMMENDATIONS To maintain and enhance the level of achievement for this credit, the team needs to provide documentation of any restorative methods of ecosystem functions, such as wetland restoration as well as strategies and description of any restoration of disturbed functions.
NW 0.0 Innovate Or Exceed Credit Requirements		***N/A***
	52	

CLIMATE AND RISK		
	Score	**MARANHÃO GRAIN TERMINAL - TEGRAM**
CR1.1 Reduce Greenhouse Gas Emissions	**0**	**No Score**
		The intent of this credit is to conduct a comprehensive life-cycle carbon analysis, and use this assessment to reduce the anticipated amount of net GHG emissions during the life-cycle of the project, thus reducing the project's contribution to climate change. The metric for this credit is the reduction of life-cycle net carbon dioxide equivalent emissions. The documents provided did not demonstrate that the project team conducted a life-cycle carbon assessment to help reduce the anticipated amount of net GHG emissions throughout the life cycle of the project. Therefore, the project does not qualify for any points in this credit.
		Source: 1. PCA.
		RECOMMENDATIONS It is important to conduct studies to establish a comprehensive life-cycle carbon assessment, and that actions and strategies are suggested to reduce the anticipated amount of GHG emissions; by using recognized and accepted methodologies, data sources, and software. A good opportunity to show how TEGRAM reduces the overall GHG emissions at national level is to conduct studies showing the amount of gas emissions released by grain transportation before, and after TEGRAM's construction; either by terrestrial routes and aquatic transportation. It will be interesting to conduct studies to understand the impact on GHG emissions at the global scale.
CR1.2 Reduce Air Pollutant Emissions	**0**	**No Score**
		This credit looks into reducing the emissions of six criteria pollutants: particulate matter (including dust), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. Noxious odors are also included for reduction. The metrics used are the measurements of air pollutants compared to standards.

		TEGRAM is seeking to mitigate air pollution from particulate matter concentration, which is enforced by Brazilian law, in order for the project to receive its installation license. During the project's construction, especially during the dry season, the mitigation measure adopted by the team was to wet soils by tanker trucks with groundwater. The project will also generate dust during its operations, which was foreseen during the commissioning stage, due to the movement of trucks and heavy grain transportation. Wetting the roads has also been chosen as the strategy for this type of pollution, moving forward. Moreover, the areas of the hoppers, all tunnels, and conveyor belts were installed with particulate material containment equipment. Furthermore, all the personnel that work near the places in where particulate matter is of concern must use personal protective equipment.
		Source: 1. TEGRAM, *Procedimento de Controle de Emissão de Material Particulado* (São Luís, MA: 2015).2. 2. TEGRAM, *Relatório de Andamento 4* (São Luís, MA: 2015).
		RECOMMENDATIONS Although the project team conducted mitigative actions to reduce particulate matter emissions, the project team could consider a comprehensive air quality assessment, following the U.S National Ambient Air Quality Standards (NAAQS), in order to further collect data and reduce emissions of the other five criteria pollutants (ground level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead and noxious odors).
CR2.1 Assess Climate Threat	**0**	**No Score**
		This credit looks at efforts to develop a comprehensive climate impact assessment, and adaptation plan. It also looks at the summary of steps taken to prepare for climate variation and natural hazards. The documentation provided by the project team does not contain any studies on the effects of climate change on TEGRAM's infrastructure to receive points for this credit. Considering the threat of climate change and extreme weather conditions around the world, all projects, especially large projects like TEGRAM with no predicted end of life, should be designed in order to be better prepared for these changes.
		Source: 1. PCA.
		RECOMMENDATIONS

		The project team should consider performing a climate impact assessment and/or adaptation plan that identifies climate change risks and possible responses for TEGRAM. The soil in which the warehouses are located is susceptible to floods; therefore, the project design should consider changes in operating conditions in case of events such as an increased frequency or intensity of storms, and outline strategies for reconciliation.
CR2.2 Avoid Traps And Vulnerabilities	**0**	**No Score**
		This credit assesses efforts to avoid traps and vulnerabilities that could create high, long-term costs and risks for the affected communities. The metric used is in having an assessment of potential long-term traps, vulnerabilities, and risks caused by long-term changes, such as climate change, and the degree to which these were addressed in the project design and in community design criteria. Within the documentation provided, there is no reference to the evaluation of possible vulnerabilities that the community may face due to climate change or other causes, as a result of the project's construction. However, a certain vulnerability exists in the increased road congestion, especially along BR-135 which is Itaqui Port's only access road from the city; this has been identified and is being handled by a third-party company. Also, the team requested that the authorities change the road's route in order to improve upon the congestion, as well as drivers' safety.
		Source: 1. Câmara dos Deputados, *Estudo de tráfego/BR -135/ PAC - 3* (Brasília, DF: 2014).
		RECOMMENDATIONS The project team should foster efforts in regards to climate change, especially for a project with a long lifespan such as TEGRAM. A plan to assess the vulnerabilities linked to the project's construction should be conducted by the project team. For example, it is important that calculations on flood elevation are done in order to develop an inventory of the structures of the project that may suffer from inundation, and possibly have operations harmed due to the flooding. The team should provide documentation, and outline potential traps and vulnerabilities, as well as associated costs and risks, and show how the project's design took into consideration the need to reduce significant risks and traps.

CR2.3 Prepare For Long-Term Adaptability	**0**	**No Score** Infrastructure systems should be designed to be prepared and handle the consequences of long-term changes in climate conditions, thus being able to perform adequately under altered conditions, and to adapt to future scenarios. It is unknown if plans have been created to address long-term adaptability and climate change consequences, such as extreme weather events, sea level rise, water scarcity, increased ambient temperature, and energy shortages. *Source:* 1. PCA. *RECOMMENDATIONS* To be able to receive points for this credit, the project team needs to provide strategies to manage long-term changes, including backup systems, or decentralized, distributed networks. Strategies may include natural systems with green areas, such as planting specific trees that can absorb water to prevent flooding; or alternative supply options, such as stormwater retention, which may protect the project against extended droughts, or the use of solar panels, which can supply the project with energy and protect it from shortages. Strategies for managing long-term changes in TEGRAM may include: structural changes, to expand the range of conditions in which the system can function; decentralized systems, which depend on many small facilities instead of a single large facility, and distributed networks to distribute overall risk; natural systems, by choosing environmentally friendly solutions for infrastructure provision (e.g. using wetlands to treat stormwater, which also helps protect against flooding); alternative supply options, through the identification of methods or locations for resources that are important for the infrastructure project (water sources, energy sources, materials, etc.); adaptive capabilities, by including ways for the system to learn or change over time to be more prepared to deal with altered conditions; site selection, by choosing sites that are less vulnerable to potential impacts of climate change (e.g. farther away from coasts to reduce impact of increasing sea levels, at higher elevations where flooding is less likely, etc.).
CR2.4 Prepare For Short-Term Hazards	**1**	**Improved** This credit accesses if the project had its resilience increased for natural and man-made, short-term hazards, which can lead to long-term hazards. This is measured by the steps taken to improve protection measures beyond existing regulations.

		Documents were provided by the project team in order to prove efforts put in place to combat hazards such as fire within the project facilities. Potential fires are related to project's operation such as incorrect use of machinery and low maintenance of materials. The project has pumps installed against fire next to storage tanks and equipment susceptible to fire. Furthermore, all the workers are provided with proper training to handle possible fires.
		Source: *1. T*EGRAM, Matriz de Treinamento de Saúde e Segurança Administrativo (São Luís, MA: 2015). **2. TEGRAM, Matriz de Treinamento de Saúde e Segurança Manutenção (São Luís, MA: 2015).** 3. TEGRAM, Matriz de Treinamento de Saúde e Segurança Operação (São Luís, MA: 2015). 4. TEGRAM, Matriz de treinamento Planejamento TEGRAM (São Luís, MA: 2015). 5. TEGRAM, Relatório de Andamento 4 (São Luís, MA: 2015), 28-29. 6. TEGRAM, Procedimento operacional para descarregamento de vagões (São Luís, MA: 2015), 3.
		RECOMMENDATIONS Many hazards may be worsened by degraded environments. The team should restore and rehabilitate natural systems, such as wetlands and forests, as a valid strategy to minimize natural risks. It is important that the project team assesses all possible natural or man-made hazards, and understand how the frequency and severity of these disasters may change over the life-cycle of the project.
CR2.5 Manage Heat Island Effects	**0**	**No Score**
		It is important to consider that the cumulative impact of the heat island effect across large areas can alter the microclimate and contribute to larger climate-related impacts. This credit is measured through the percentage of the site area that meets solar reflective index criteria. The Itaqui Port has been growing over the last several years, thus, with a lot of development happening, it is important that this new infrastructure project considers the impact that it may have on heat island effects. However, no information was provided that the project used strategies to minimize surfaces with a low solar reflectance index (SRI), or if a lighter color on the roofs was used, and/or if green roofs were considered.
		Source:

		1. PCA.
		RECOMMENDATIONS A better performance for this credit relies on an improvement in actions related to heat island reductions and an improved microclimate. There is room for improvement for TEGRAM; the project team should consider the use of surfaces with a high solar reflectance index (SRI), lighter roof colors, increased vegetation on-site, and also the incorporation of green roofs, where possible and feasible. Not considering strategies to minimize the heat island effects not only affects energy consumption, because of the need for additional cooling, but can also impact local vegetation and wildlife. The urban heat island effect, caused by the cumulative heat effects across large areas can also contribute to larger climate related effects.
CR0.0 Innovate Or Exceed Credit Requirements		***N/A***
	1	

OVERALL:	**156**	**MARANHÃO GRAIN TERMINAL - TEGRAM**

APPENDIX E: SOURCES

DOCUMENTATION PROVIDED
General Information.
IPHAN. *Relatório Final das Atividades de Campo referente à Pesquisa Arqueológica.*São Luís, MA: 2012.
Scientia. *Prospecção Arqueológica na Área do TEGRAM.* São Paulo, SP: 2013.
Ducol Engenharia LTDA. *Relatório de Supressão Vegetal.* São Luís, MA: 2012.
STCP. *Prestação de Serviços de Resgate e Translocação de Fauna e Flor.* Curitiba, PR: 2012.
SENAI. *Contrato de Prestação de Serviços entre SENAI e TEGRAM.* São Luís, MA: 2014.
Porto do Itaqui. *Plano de Controle Ambiental.* São Luís, MA: 2011.
ENFASE. *Relatório de Monitoramento Ambiental de Ruídos nas Instalações do Consórcio TEGRAM-ITAQUI.*São Luís, MA: 2013.
TEGRAM. *Apresentação Projeto de Educação Ambiental.*São Luís, MA: 2015.
EJAGRO. *Solicitação de Parceria.* São Luís, MA: 2015.
TEGRAM. *Relação Atualizada de Colaboradores.* São Luís, MA: 2015.
TEGRAM. *Ações SSMA.*São Luís, MA: 2015.
AON. *Análise Preliminar de Perigos.*São Paulo, SP: 2013.
TEGRAM. *Análise de Risco Simplificada.* São Luís, MA: 2015.
Corpo de Bombeiros Militar. *Certificado de Aprovação 7322/2015.* São Luís, MA: 2015.
Corpo de Bombeiros Militar, *Certificado de Aprovação 7323/2015.* São Luís, MA: 2015.
Corpo de Bombeiros Militar. *Licença Vinculada 0005/2015.* São Luís, MA: 2015.
Corpo de Bombeiros Militar. *Licença Vinculada 0014/2015.* São Luís, MA: 2015.
Corpo de Bombeiros Militar. *Licença Vinculada 0015/2015.* São Luís, MA: 2015.
Corpo de Bombeiros Militar. *Licença Vinculada 0005/2015.* São Luís, MA: 2015.
Projectual. *Estudo de Impactos de Tráfego do TEGRAM na BR-135.* São Luís, MA: 2015.

TEGRAM. *Apresentação Sinalização Interna.* São Luís, MA: 2015.
TEGRAM. *Reunião de Gestão do Calendário Social & SSMA.* São Luís, MA: 2015.
Louzeiros Engenharia e Consultoria Ambiental. *Laudo de Estanqueidade.* São Luís, MA: 2015.
TEGRAM. *Relatório de Andamento 4.* São Luís, MA: 2015.
TEGRAM. *Procedimento de Controle de Emissão de Material Particulado.* São Luís, MA: 2015.
Câmara dos Deputados. *Estudo de tráfego/ BR -135/ PAC - 3.* Brasília, DF: 2014.
TEGRAM. *Subprograma de recuperação de áreas degradadas e controle de erosão.* São Luís, MA: 2015.
TEGRAM. *Arrendamento do Terminal de Grãos do Maranhão no Porto do Itaqui - Lotes I, II, III e IV.* São Luís, Ma: 2011.
Governo do Estado do Maranhão. *Autorização do Uso da Água.* São Luís, MA: 2012.
TEGRAM. *Procedimento Gestão de Efluentes Consórcio TEGRAM e lotes 1 a 4.* São Luís, MA.
TEGRAM. *Procedimento Gestão de Efluentes Consórcio TEGRAM e lotes 1 a 4.* São Luís, MA.
TEGRAM. *Matriz de Treinamento de Saúde e Segurança Administrativo.* São Luís, MA: 2015.
TEGRAM. *Matriz de Treinamento de Saúde e Segurança Manutenção.*São Luís, MA: 2015.
TEGRAM. *Matriz de Treinamento de Saúde e Segurança Operação.* São Luís, MA: 2015.
TEGRAM. *Matriz de treinamento Planejamento TEGRAM.*São Luís, MA: 2015.
TEGRAM. *Procedimento operacional para descarregamento de vagões.* São Luís, MA: 2015.