



**ZOFNASS PROGRAM**  
FOR SUSTAINABLE INFRASTRUCTURE

Graduate School of Design  
Harvard University

Graduate School of Design  
Harvard University  
George Gund Hall  
48 Quincy Street  
Cambridge, MA 02138  
December 5, 2014 - REV. 1

## EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA – COLOMBIA



Figure 01: General view of the project  
Sources: Picture provided by Contecar

Mariana Llano prepared this case study under the supervision of Judith Rodriguez and Cristina Contreras ENV-SP as part of the Harvard-Zofnass program directed by Dr. Andreas Georgoulas by initiative of IDB for the purposes of research and education. Editing and Proofing: Laurel Schwab.

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

Copyright © 2014 by the President and Fellows of Harvard College. Permission is granted for use for nonprofit education purposes for all of the work, with attribution, except for third party materials incorporated in the work which may require permission from the authors of such material. For permission to use this work in other circumstances, write to Dr. Andreas Georgoulas, Harvard Graduate School of Design, 48 Quincy Street, Cambridge, MA 02138.

The authors would like to thank Ana Maria Vidaurre-Roche member of IDB for her leadership role in the IDB Infrastructure 360 Awards Project and César Augusto Paez Rodríguez, Juan Carlos Acosta from Contecar for their input; this case would have not been possible without their contribution.

## 1. PROJECT DESCRIPTION & LOCATION

The "Expansion of Port Capacity and Logistics of the Container Terminal (Contecar)" project is part of an integrated master plan to enlarge the existing port system in Cartagena, Colombia. The Regional Port Society of Cartagena (SPRC) carries out this project, which benefits from its strategic location in the Atlantic Ocean, as it takes advantage of the Panama Canal's extension, in order to become a key node for the international transfer of goods. Furthermore, it is part of a larger collaboration between the private sector, the Colombian State and the following entities: the Ministry of Transport, the National Planning Department (DNP), the Maritime and Port Division of the Ministry of Transport and the Superintendent of Ports and Transport.<sup>1</sup>

The port has a current capacity of 2.5 million twenty-foot equivalent units (TEUs) per year, and the project aims to double this number. The port will carry out services to the general public, move containers, vehicles, combustibles, liquid and solid bulks, and other loads. The development includes the operation and management of containers, warfare, storage, container maintenance, cruise administration, dredge, towing, and several additional subcontracted services.<sup>2</sup>

The port structure in Cartagena is managed by a 40-year concession of the SPRC that comprises two terminals: the Manga terminal for cruises and tourism, and the CONTECAR terminal for containers. In 2008, CONTECAR renewed its concession for 30 more years over the beaches and the low-rise bays, to extend the piers and dredge the access zone to allow operation of the terminal.<sup>3</sup>

The port has been awarded six times the "Best Port of the Caribbean." The Regional Port Society of Cartagena plans on investing US \$600 million for the *Integrated Development Master Plan* in the CONTECAR Terminal between 2013 and 2019.<sup>4</sup> The size of the project is approximately 46 hectares, which represents 0.56% of Cartagena's Bay. The construction of the project will take place in an area 1,200 meters long by 356 meters wide.<sup>5</sup>

---

<sup>1</sup> Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, *Impacto económico y social del puerto de Cartagena*. (Bogotá: Fedesarrollo, 2014), 3-6.

<sup>2</sup> CONTECAR and Puerto de Cartagena, *SGI Sistema de Gestión Integrado*. (Cartagena, 2010), 6.

<sup>3</sup> José Barrios González. *Informe de inspección*. (Cartagena: Willis, 2013), 8-9.p.8-9

<sup>4</sup> Astrid Martínez Ortiz et al. *Impacto económico y social del puerto de Cartagena*. (Bogotá: Fedesarrollo, 2014), 11.

<sup>5</sup> José Barrios González. *Informe de inspección*. (Cartagena: Willis, 2013), 37-40.

The CONTECAR's *Integrated Development Master Plan* expansion was approved by the end of 2007. The first phase started in February 2008 with the restoration of the existing container terminal. The second phase comprised the expansion of 600m of the terminal; started in November 2007 and ended in December 2010. Phase 3 took place from July 2010 until April 2013, concluding the full build out of the CONTECAR terminal. The warehouse and logistics areas, the site preparation and the building of the sheds took place from October 2008 to August 2013. The estimated year of completion is 2018 with the deep draft and dredging for the CONTECAR terminal.<sup>6</sup> Additionally, the plan incorporates 88,924 m<sup>2</sup> of green spaces into the project, equivalent to 10.8% of the site.<sup>7</sup>

Cartagena is a port city in Colombia with historical importance. It was part of the West Indies route for the Spanish colonies and has been a commercial maritime port since the 16th century.<sup>8</sup> The history of the modern maritime terminal includes both public and private stakeholders. In the 1930s, the American firm Frederick Snare Corporation, contracted by the Colombian government, completed the construction and opened the marine terminal in the island of Manga. The firm managed this terminal until 1947 when it was taken over by the Ministry of Public Works. In 1961, the state agency “Colpuertos” undertakes management of all of the country’s ports and took control of the operation. By 1991, the Colombian Congress liquidated the port, setting the basis for privatization, and the SPRC was established. In 2005 the SPRC acquired the CONTECAR terminal, which underwent improvement investments, updating of the facilities, acquisition of equipment, assessment of the zone, terminal orientation for the handling of containers, staff training and a broadening of operations with the acquisition of other piers.<sup>9</sup>

The CONTECAR Terminal is located in the Mamonal district, an industrial sector of the city, and south of the SPRC Manga terminal, which is located in the northern end of Cartagena’s bay. The expansion of the site will go north from the existing terminal. The “Canal del Dique,” is located south of the project, it is an artificial connection to the Magdalena River, the main navigable river that gives access to the center of Colombia.<sup>10</sup> Cartagena’s bay is divided into the inner and outer bay: Bocagrande and Bocachica, respectively, the latter being the best for navigation due

---

<sup>6</sup> Astrid Martínez Ortiz et al. *Impacto económico y social del puerto de Cartagena*. (Bogotá: Fedesarrollo, 2014), 15.

<sup>7</sup> Arquitectos e Ingenieros Asociados S.A., *PLAN MAESTRO, Sistemas de movilidad peatonal interna*, 11.

<sup>8</sup> UNESCO, CLT, and World Heritage Convention. “Port, Fortresses and Group of Monuments, Cartagena.” Accessed October 20, 2014. doi: <http://whc.unesco.org/en/list/285>

<sup>9</sup> Natalia Salazar Suárez and Olga Lucía López Londoño, *Sistematización proceso de intervención social para la caracterización socioeconómica grupos de interés Fundación Puerto de Cartagena* (Fundación Carvajal, 2012), 8-9.

<sup>10</sup> *Caracterización Ambiental del Área de Influencia del Proyecto*, 2-3.

to its depth. There is a diversity of land uses surrounding the project; residential zones, mixed use (commercial-residential or vice versa), industrial, port, touristic and recreational, and conservation places.<sup>11</sup>

The site is located close to a complex of islands that have certain environmental importance. However, the area of influence has been significantly impacted by the surrounding activities, causing pollution, thus reducing the vegetation, fauna and flora. There is a network of birds in the area but there is a lack of amphibians due to the contaminated conditions of the water. The pollution is trapped in the roots of the mangroves that grow in saline coastal areas. The erosion in the bay's seafloor is most likely due because of disruptions created by the ships entering the Port.<sup>12</sup>

The energy matrix of Colombia has a large hydropower percentage, which is considered an affordable and clean energy source. This is the main source of energy used by the port. The port's buildings are designed to benefit from natural ventilation and illumination in order to save energy. The project also employs a rational and efficient use of energy, with new technologies for lighting and energy reactive control equipment. Furthermore, it has upgraded the luminaries from mercury to sodium.<sup>13</sup> Additionally, the project has a pilot plan for the use of photovoltaic energy.<sup>14</sup>

Regarding carbon emissions, the CONTECAR terminal has several practices to reduce the greenhouse gases. They have converted 10 out of 31 rubber-tired gantry (RTG) cranes energy use from petroleum to electric power; the substitution of fossil fuels for electrical cranes prevents 212,538 kg per year of CO<sub>2</sub> from being released into the atmosphere.<sup>15</sup> This positively impacts the environment, reduces costs and lowers the noise for the neighboring community.<sup>16</sup> Furthermore, they have mitigation measures to reduce dust from the roads and to frequently monitor air quality (PST and PM<sub>10</sub>).<sup>17</sup>

---

<sup>11</sup> *Caracterización Ambiental del Área de Influencia del Proyecto*, 1-46.

<sup>12</sup> CONTECAR and Aqua & Terra, *Caracterización Del Componente Biótico in Estudio de impacto ambiental para la construcción y operación de la terminal portuaria multipropósito de Albornoz*, 16.

<sup>13</sup> CONTECAR, *Actividades Ambientales 2013*. (Cartagena, 2013), 9.

<sup>14</sup> Sociedad Portuaria Regional de Cartagena, *Revista Pórtico: 20 años de cambio* (Bogotá: Editorial Semana, 2013), 125. AND: CONTECAR and Puerto de Cartagena, *Características sistema paneles solares CONTECAR*, 1.

<sup>15</sup> CONTECAR and Puerto de Cartagena, *Environmental Impacts*, 1.

<sup>16</sup> CONTECAR and Puerto de Cartagena, *Electrificación RTG* (Cartagena, 2014), 1-4.

<sup>17</sup> CONTECAR, *Actividades Ambientales 2013*. (Cartagena, 2013). 7

## **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. In this case study, the infrastructure to be assessed is the expansion of the Container Terminal Port in Cartagena, Colombia.

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 if the qualifications for each level of achievement have been met for a particular credit. In each of the five categories there is a specific credit called “Innovate or exceed credit requirements”. This is an opportunity to reward exceptional performance that applies innovative methods within the subjects that Envision evaluates.

The criteria for the levels of achievement vary from credit to credit, but generally an ‘improved’ level of achievement is awarded for performance that slightly exceeds regulatory requirements. ‘Enhanced’ and ‘superior’ levels indicate additional gradual improvement, while ‘conserving’ often indicates performance that achieves a net-zero or neutral impact. ‘Restorative’ is the highest level and is typically reserved for projects that produce an overall net positive impact. The Envision system weighs the relative value of each credit and level of achievement by assigning points. Credit criteria are documented in the Envision Guidance Manual, which is available to the public on the ISI<sup>18</sup> and Zofnass Program<sup>19</sup> websites.

---

<sup>18</sup> [www.sustainableinfrastructure.org](http://www.sustainableinfrastructure.org)

<sup>19</sup> [www.zofnass.org](http://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 respective wellbeing. More specifically, it distinguishes infrastructure projects that are in line with community goals, clearly established as parts of existing community networks, as well as consider the long-term community benefits and aspirations. Quality of Life incorporates guidance related to community capacity building and promotes infrastructure users and local members as important stakeholders in the decision making process. The category is further divided into three subcategories: Purpose, Community, and Wellbeing.

#### **Purpose**

The SPRC and CONTECAR project team is committed to improve the quality of life of the neighboring communities. In this sense, the project performed well in establishing education and social enhancement programs. The agenda includes plans for children and parents to reduce domestic violence and to improve child development in the project's area of influence. Elementary, high school and undergraduate educational programs were provided to the workers who had not attained any of these education levels, and in addition several other programs were offered to their families. They also built 105 homes for port workers who were living in precarious housing without proper infrastructure or public services. The port's Landscape Department works to make the urban context more harmonic with the city and its people by enhancing public spaces and parks.

Plans and responsibilities for the acceptable use of resources make part of the project's good performance in quality of life that is linked to how the project stimulates sustainable growth and development. The plans include the rational use of water and energy; avoidance of accidents that could harm the environment; adequate management of waste; reliable disposal of dangerous waste; the development of a successful recycling plan; control of gas emissions into the atmosphere; measurements to identify and reduce noise sources; environmental control for dredging activities; bay water testing for pollution; residual water treatment; and to increase awareness of the environment among workers and contractors.

The project has a wide economic reach that improves local productivity by creating new jobs, training new people, and having a large impact on indirect jobs. In terms of employment, the project has 1,866 direct jobs and reaches around 11,366 people in its productive chain. It is

constantly growing and bringing economic rebirth to the city and to the entire country. The project also helps the trade and tourism sectors. New jobs and opportunities are created for the local people by identifying human talent as an advantage for economic growth and the enhancement of the port, and by having training programs and educational plans for the surrounding communities. The project offers training in technical courses, with simulators for equipment operators, for industrial security, occupational health, stowage and other tasks. In addition to specific trainings, there are employment programs, informal education and courses given by the Logistic and Port Training Center that was created by the SPRC. In order to increase the local families' incomes, several other programs for worker family members are being implemented in collaboration with the SENA- the Colombian National Service of Learning a technical education institution.

## **Community**

The project provides a positive impact in the growth, development, and improvement of the quality of life. According to the project team, human life and the environment are priorities in their agendas. For example, to enhance local public health, the Port of Cartagena Foundation has several programs for the nourishment of children in the communities. They conduct parent trainings on how to monitor a child's weight and size, as well as having medical teams focused on children. Children are evaluated and treated in oral health, size and weight control, vaccination, deworming and delousing. Likewise, all workers use safety equipment and accessories required for certain activities. The security and safety features of the port's operation follow the parameters regulated by the authorities. Training for industrial safety is given to the port operators. Simulations are held to ensure that the safety features are working properly; additionally, emergency instructions are given to all people involved in the project. However, the project still needs to improve the emergency plans for the surrounding communities.

The mitigation of noise and vibration is discussed with the community. Crane silencers and the use of electrical RTGs reduce noise disturbances. Likewise, the project uses the minimum amount of light required for the safe use of the port and the wellbeing of the employees. The project has not made a greater effort to examine the real impact of light pollution on the surroundings and the night sky, but during different times of the day, the design is efficient and the lighting is regulated.

There is room for improvement in encouraging alternative modes of transportation to the

neighboring communities. In terms of mobility and accessibility to the port, the main road surrounding the project makes it accessible by public transportation. Furthermore, the project has a proposal for a separate motorway to the site to allow trucks to avoid public roads, helping reduce asphalt damage, noise, air pollution and traffic.

In terms of safety, accessibility and wayfinding, the site has an emergency plan for the identified risks and strategic plans to avoid accidents and deal with them in case they occur. A drainage infrastructure plan is developed to lower the risk of flooding. This benefits the surrounding communities when dealing with various issues such as avoiding rodents and skin disease generated by stagnant water; avoiding having waste blocking the canals; and using illumination installations to improve security.

## **Wellbeing**

The scale of the project makes it difficult to preserve the views and local character of the site. However, the project team has completed studies on the biodiversity, topography, landscape and cultural values of the surroundings. A licensed archeological intervention was made following the instructions given by the Colombian Anthropology and History Institute (ICANH) that looks over Cartagena's historic and culturally significant sites for preservation or restoration. The dredging sensors and monitors that covered the entire area did not find anything of historical value in the zone, which had already been highly disturbed by the dredging process.

Although the CONTECAR terminal did not require any further analysis, they decided to implement geophysical media as a basic tool to inspect the archeological features of the area and to help the authorities with their research. Furthermore, their interest in the preservation of the cultural and archaeological heritage is evident in the effort of the team to further investigate the closest forts and cultural sites. Additionally, there are no perturbations from the dredging observed in the surrounding areas, which is very important for the conservation of heritage.

The scale of the site and the magnitude of the port's machinery and infrastructure blocks views to the waterfront from the surrounding communities. However, to enhance public space, a plan was designed according to what the authorities in the neighboring areas suggested. Inside the project, the Landscape Department is doing its best to enhance green areas; outside, the rehabilitation of public spaces such as parks and the preservation of historic sites are part of the



project's plan. The master plan also includes a considerable number of new green spaces. The Landscape Department has proposed the restoration of Santa Clara Park, an existing community park. The restoration improves access through secondary ways and creates recreation areas with easy pedestrian access and benches; it also includes public restrooms, protected children's play spaces, parking spots, plazas, cultural places, and access routes.

#### **4. LEADERSHIP CATEGORY**

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

##### **Collaboration**

The project had an enhanced performance in collaborating and enhancing teamwork providing leadership and commitment. Collaboration is not only fostered between the SPRC and CONTECAR; it is also cultivated between the project, the communities, and other stakeholders. Among the collaborations we find the SENA (National Service for Learning) for education purposes; the "Bienestar Familiar," an agency for children's rights and care, to help with their development and to confront abuse and other social problems; and the Carvajal Foundation that has studied the development of other ports and logistics enterprises and their challenges. The entrepreneurial strengthening program fostered seven other enterprises to develop their business strategies, worker development and opportunities for them and their families in order to support surrounding communities. Additionally, the Colombian national government, the United States government, the Environment Ministry and other institutions and corporations, support the project. Governmental actors and international governments are part of the security and economic improvements of the port, which are of great importance to the entire country.

The project performed well in delivering stakeholder involvement in decision-making. The Carvajal Foundation in collaboration with CONTECAR has agreed with the other port logistics companies to get involved in the process of community improvement. Communication between the community and other groups is achieved through public meetings where residents can express their concerns; these are documented for possible implementation. Furthermore, the

project created the Sustainability Committee to apply a strategic plan for social investment, which listens to the community about their concerns for sustainability and develops ways of working with the people.

The objectives of the project have a clear interest in establishing a sustainability management system. The activities and goals of the plan cover most of the issues that could possibly emerge from the CONTECAR Port Expansion project. The Port of Cartagena Foundation, the committee for sustainability, and the human resources department are in charge of discussing and communicating the concerns to the community; nevertheless they could still improve in community involvement. They focus on the management of energy resources, accident prevention, waste management, monitoring of water and air quality, development of social programs for quality of life enhancement, and the disclosure of sustainability plans to all interested parties. In addition, they have given the environmental management plan to the contractors to prevent or correct any environmental issues identified that could take place during construction and to evaluate the project's sustainability factors. There are several plans projected into the future to achieve overall sustainability despite the large scale of the project. Furthermore, the endeavor is committed to exceeding health and safety standards and achieving overall social harmony.

### **Management**

The project achieved a satisfactory performance using synergy opportunities for management, reducing waste and costs. For example, the debris from the transformation and demolition of the building site is used for filling other locations, hence increasing their resistance capacity. Additionally, waste is managed by third party agencies that must follow sustainability rules, avoiding environmental impact. The project is committed to recycling and waste is separated for reuse, giving these materials the potential for other synergistic use opportunities.

The project has plans to improve infrastructure integration with the surrounding communities. CONTECAR is constructing canals in surrounding neighborhoods to avoid flooding and to amend the fluvial water runoff. This also helps in the public health sector by avoiding backwaters that create sickness and attract rodents. The construction of the works is constantly inspected for environmental control and hydraulic consultants have studied better implementation of the plans. Furthermore, meetings with the community are frequently held to keep them aware of the developments. However, the magnitude of the project makes it difficult to integrate the human scale, considering the ways in which people move in and around the area. The project needs to better integrate people to the project. This could be achieved by creating viewpoints

of the port, walkable trails, and better urban conditions in the surrounding communities. They should also plan ahead for the integration of the urban surroundings and consider how the expansion of the city will affect the project and vice-versa.

The project's goal is to integrate with other ports and marine structures in other countries due to its privileged location on the Atlantic Ocean. The expansion of the Panama Canal is likely to have a great impact on the CONTECAR terminal, and the security regulations of the port are developed in such a way that there is a better integration with the United States market and the rest of the world.

### **Planning**

The project had a good performance in long term monitoring and maintenance. The port is constantly planning ahead for long-term monitoring and has enacted proper maintenance of the port structure. A sustainability plan has been implemented, to make proper use of the resources. Likewise, the project has implemented an IBM system called MAXIMO for the management of fixed assets. Frequently, subcontracting is carried out by CONTECAR for the maintenance of the installations and machinery, as well as maintenance for the dredging and the equipment used for this purpose, for plumbing networks, waste management, water treatment, and other processes that need constant maintenance. Resiliency measures for sea level rise and flooding should be considered in the project since the location is close to the ocean.

In addressing conflicting regulations and policies the team had an excellent performance. The project not only follows the existing regulations and policies, but willingly implements sustainability standards. The project found a conflicting regulation and solved the procedures. Until recent years the authorities inspecting the shipping containers for exterior commerce proceeded independently, resulting in containers being detained longer and sometimes transported back and forth from the inspection zone before finally shipping. This increased the costs to the importer/exporter and negatively impacted the productivity of the port and increased energy use and carbon footprint. Therefore, the creation of a shared information system was developed, allowing access to all the stakeholders for the inspection procedures. Additionally, another project to create an inspection zone for both the SPRC Manga and CONTECAR terminals is under development. The norms to make the new inspection zone were developed to avoid the piling of containers and the displacement of the containers to the inspection zone, which will lower costs and reduce energy consumption.

The project is an expansion of the already existing port of the container terminal in Cartagena, and therefore it did a good job in extending the port's useful life. However, continuous development of the site as a port structure results in a lack of flexibility of uses in the future. The contract shows that the project is expected to have a longer life than that of its concession; such a large project would be challenging to move somewhere else. However, the structures can be dismantled and taken somewhere else in case of an end to port activity, and the materials may be reused. Lastly, the large esplanade may easily change uses in the future.

## **5. RESOURCE ALLOCATION CATEGORY**

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

### **Materials**

The project needs to improve performance in the material resource allocation subcategory. The project has monitoring plans in place with the aim to reduce the energy consumed by the project. However, it is recommended to develop a life cycle assessment considering the energy associated with the extraction, processing, manufacturing, and transport of materials and components. It is important to reduce maintenance and repairs, using the natural resources appropriately so that during the lifespan of the project the use of materials is considerably lowered. A reduction of net embodied energy study should be done before beginning operations.

Although the percentage of materials obtained through sustainable practice has not been provided, according to the marketing strategies, suppliers have priority if they have sustainable practices. Likewise, some of the project's infrastructure was conceived in order to enable dismantling of the materials to be reused somewhere else.

The use of regional materials is a priority for the project, especially the construction materials that are being used in the expansion of the project. These local suppliers need to follow environmental law and requirements needed for the exploitation of such materials. The

reduction of waste and its diversion from landfills is amply considered by the project by transferring the excavation material to other adjacent zones. This stabilizes the terrains for later developments, minimizing the movement of excavated materials and reducing transportation needs. There is also a selection process in which the materials from the building sites are selected and divided by technical qualities into the ones that can be reused for building. Additionally, all of the other waste is separated for recycling within the facilities and they either go to the city public services or to specialized third parties who are in charge of the final disposal of the waste.

### **Energy**

The project has made some efforts in reducing overall energy consumption and decreasing the use of non-renewable fossil fuel sources. Practices such as having electric RTG cranes replacing fossil fueled ones; architecture designed to save energy with natural illumination and ventilation; enforcing the replacement of mercury lighting; and in addition, there is a timed control system and poles that allow time gaps to adapt to the lighting necessities of the time of day. Furthermore, there is a monthly control of the electric energy consumption. There is also a future pilot plan for the use of a sustainable solar pv plant. However, the project still lacks most of the documentation needed to achieve higher in this subcategory.

The use of renewable resources in the project such as eolic and solar energy has been studied but has not been implemented due to the inability to meet economic requirements. Therefore, there is no use of renewable energy on the site. The project team has monitoring plans in place to ensure efficient functioning and monitoring of the energy systems. Subcontracted companies inspect the machinery and workers are trained in the Center for Logistics and Port Training to minimize energy consumption, keeping up with management plans. The project should consider the environmental benefits of the location for the implementation of other types of renewable energy; solar power could be very effective in Cartagena due to the excellent amount of sunlight during the entire year; additionally, strong wind currents could make eolic energy and waves a viable option.

To commission the energy systems, the machinery and equipment has been upgraded, the infrastructure expanded and new advanced information systems implemented. Simultaneously, the project understands that it is training that will make the project successful in monitoring the energy systems.

### **Water**

The project performed fairly well in terms of the protection of water resources. To protect fresh water and to reduce the negative impact on the availability of this resource, the project has an environmental management plan that includes water protection. The project is in an urban area and uses the city public services to receive fresh water, using less than 5% of the capacity available from the aqueduct system. The CONTECAR management plan manages residual waters during operation by collecting and treating industrial waters. Additionally there is a periodic upkeep of the solid and grease traps, with a weekly frequency of maintenance and a daily survey on the collection grids. The greases and solid wastes are removed manually, the tanks and walls are cleaned with biodegradable soap, and the sludge accumulated in the bottom is also cleaned. The water retained after the entire process may go to the final receptor with careful procedures to avoid mud transfer. Furthermore, there is monitoring for the physiochemical characteristics to evaluate the quality of the treatment by tracing caudal, SST, dissolved oxygen, PH, greases and oils. The liquid waste management plan wants to completely avoid discharge of water into the ocean.

The performance in reducing potable water consumption was improved. There are tanks to store rainwater for gardening and for fire prevention. Additionally, there are 7 potable water storage tanks with a total storage capacity of 1,200 cubic meters. The project could improve by developing its own treatment plant, liberating the aqueduct from dealing with residual waters.

The aqueduct of Cartagena monitors the water supply. Additionally, the port has information systems to identify and monitor the networks. The Chief of Environmental Management and General Services is responsible for the supervision and maintenance of the hydro sanitary networks as well as the potable water systems. External contractors execute preventive and corrective monitoring. Furthermore, the monitoring of the pumps is done every three days to clean the floors and tubes, and each year the tanks are cleaned on the inside, repaired and painted.

## **6. NATURAL WORLD CATEGORY**

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

## **Siting**

The project performed well in terms of preserving the prime habitat of the site and in preserving prime farmland, but less well in preserving wetlands and surface water. The project identified the surrounding areas that needed conservation mechanisms. They carried out a study to detect conservation zones including natural islands around the project, finding natural habitat more than 100m away where the project does not plan to intervene. Nonetheless, the project has taken into account the impact on the terrain during construction and operation. The project site is among other port industries where CONTECAR cannot control the existing chemical properties and sediments, such as those in the Canal del Dique, but they have done some reforestation with mangrove jungles.

To preserve wetlands and surface water, the CONTECAR project has destined 10.8% of the terrain for green spaces for the protection of the canals, which represents 88,924m<sup>2</sup> of green areas. The site of the port was previously developed as an industrial port zone without prime farmland or forest to preserve. However, the project could improve with other simple techniques like planting edible gardens in the green spaces to provide food for the community and composting. In order to protect the water, organic compost can replace the chemical fertilizers.

To avoid adverse geology and instability in the zone, the project has contemplated all of the geological studies relevant to the project, and the soft terrains were improved by overloading processes. Natural risks have been identified such as lightning, storms, floods, earthquakes and tsunamis. Furthermore, the project was located on an earlier developed terrain that was already suitable for port logistics, achieving a good performance in avoiding unstable developments. To prevent sediments, it underwent some protection processes to avoid marine erosion.

To preserve floodplain function the infrastructure of the canals was modified. The drainage of the surrounding areas was improved by being channelized to avoid floods. Due to the pre-existing contamination of the floodplains, the marine life has been highly affected. Studies have reported anoxia, or a complete lack of oxygen in most of the marine surroundings. Therefore, under such undermined conditions, the dredging processes of the maintenance and deepening of the canal will eventually improve the marine habitat. This also benefits the zone because it avoids pollutants and stimulates better characteristics for biotic species. Additionally, some mangrove zones are preserved for floodplain functions. Nonetheless, the project could also create a restoration plan to protect the water bodies and avoid sedimentation of the canals by

planting native species.

### **Land & water**

An enhanced performance was achieved in managing stormwater, but the project needs to improve in reducing pesticide and fertilizer impacts. The project has made some efforts to have minimal impact on existing hydrology and to avoid contaminants. The large scale of the project is a limitation in avoiding ecological impact. To protect hydrology, there is a 500 cubic meter storage capacity for the collection of rainwater and the management of stormwater. The rainwater is used for gardens and secondary purposes, which reduces the consumption of potable water. Additionally, the project constantly monitors and controls water quality of the bay and a qualified contractor does microbiological evaluations of the potable water used in Cartagena. Besides, there are sand traps located near the project to prevent sediments from getting into the bay.

To reduce pesticide and fertilizer use, the project has planted local species that are more resistant to environmental conditions. These native species and grasses will make the landscape of the project more locally appropriate and will increase the green vegetative areas of the project. However, according to the maintenance procedures for the gardens and the control of plagues and rodents in the area, the products used for the treatment of rodents and gardening are classified as illegal in several countries and represent a risk for toxicity. The project could improve by not using pesticides but use physical controls instead; chemicals can alter the nutrient levels in surrounding waters. One example is to compost the organic matter and use it as fertilizer in the green areas of the project, which would also reduce landfill waste volumes. As a port, there is a greater risk of new invasive species coming from elsewhere, so it is important to have a control center when the containers are inspected. Additionally, the project should have a management plan that helps eliminate invasive species on site.

The project performed poorly in the surface and groundwater contamination evaluation, since prevention is focused in avoiding spills and leaks. To prevent surface and groundwater contamination, the project has developed a characterization of the hydrological features and has implemented it through the environmental management plan. There is also an emergency plan that follows the spillage and filtration risks. In the contracts for civil works there are policies that aim to reduce potential risks that may derive from potentially polluting substances. Additionally, the ground has been paved to avoid groundwater contamination produced by the port operations.



## **Biodiversity**

The project showed improved performance in protecting species biodiversity. The project has identified protected areas inside the indirect influence area of the terminal. There have been exertions on the adjacent canals to improve the conditions of the biotic fauna of the area, allowing an interaction amongst the different habitats found in the project zone. The project's design has 88,924m<sup>2</sup> of green spaces with native plants that could also serve as biodiversity refuges. However, the project does not fully restore the connection of habitats and does not easily facilitate the movement of species.

By the end of the project, the landscape of the terminal will have green spaces with vegetation native to the Caribbean coast of Colombia. This serves as a type of invasive species control that is locally appropriate. The project's estimate of disturbed soil recovery is more than 10% of the total area of the project. The project uses the dredging material for the stabilization of the site terrains. However, this estimate is not supported by evidence and the ecological and hydrological functions of the project are not fully restored.

The project performed very well in maintaining wetland and surface water functions; the project has made several efforts. Due to the site being a historically intervened urban area, the canals and water bodies were already contaminated. However, maintenance has been conducted on the canals that pass through the project site. The solid residue shedding will be eliminated, improving the quality of water on the canals and the Cartagena Bay and maintenance plans on the canals will further eliminate sediment transport.

The project maintains efforts to preserve the hydrologic connection, sediment transport, habitat, and water quality ecosystems functions. Interventions on the surrounding canals allow hydraulic connection for species to navigate in the surrounding waters. The water quality was already in a critical condition and is being restored by the collection of rainwater and by providing an emergency management plan. The project researched the habitat and species in the ecosystems near the project, which they have maintained. The site and surrounding areas were already developed; after the project started the project team has made efforts to restore the ecosystem functions that were left.

## **7. CLIMATE & RISK CATEGORY**

Envision aims to promote infrastructure development that is 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 project achieved superior performance in reducing greenhouse gas emissions. CONTECAR implemented an evaluation project for the electrification of the RTG cranes to change from fossil fueled electric energy. Additionally, the air quality inside the port installations is being constantly monitored. The study for the RTG crane conversion from diesel fuel to electric energy shows a 70% reduction in greenhouse gas emissions, preventing 212.538 kg of CO<sub>2</sub> per year to be expelled into the atmosphere. However, some of the non-electrified machinery may cause pollutants to be emitted and is not considered in the total life cycle carbon analysis. A complete study of the life cycle analysis for greenhouse gas emissions is needed to improve the project's efforts. The project is currently only considering the RTG cranes, and not other machinery like the transportation buses running inside the project.

To reduce air pollutant emissions the project needs to improve their performance. However, they have paved all of the roads and they use barrier machinery to maintain the port without waste and dust that may go into the atmosphere. The paving of the project also prevents the moving of particulate waste from other areas that are generated by the winds in the port. During the construction there has been control over the petro material accumulated, and it has been used in the infrastructure. The port constantly monitors the air quality, verifying that it meets the national standards. These studies have to be done in an accredited lab by the environmental authority. However, the project should also consider pollutants other than dust, such as ground level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead and other noxious odors. The requirements for the California Ambient Air Quality Standards or South Coast Air Quality Management organizations are recommended as guidelines.

### **Resilience**

The project is lacking in many of the requirements to assess climate threats, and needs better performance for most of the evaluation for adaptability, hazards, vulnerabilities, and effects of climate change. The port follows the national and international operational security laws to protect the physical integrity of the people. The infrastructure is evaluated to see if it can adapt to climate change, but there are no concrete plans for a climate impact assessment and

adaptation plan. However, there is monitoring of the port with cameras, protection against fire following the NFPA norm, and public health and industrial security processes that allow recovery in case of any emergency events. A plan that identifies the possible climate change risks can help to design infrastructure for potential change over the life of the project, which will improve the project's performance.

Prior to the development plan, an evaluation of risk and vulnerability was assessed to find traps that could generate environmental problems in the infrastructure and the surrounding communities. For this reason the environmental management plan was generated and has been approved by the environmental authority. Likewise, to reduce or eliminate flooding risk the project has also developed canals and stabilized running water. This allows drainage and avoids possible floods. Nonetheless, the project should consider working with the community as a whole to prepare and mitigate threats to infrastructure. This collaboration can result in more resilient infrastructure prepared to adapt to climate change threats such as sea level rise, increased storm frequency, extended heat waves, among other risks.

To prepare the project for long-term adaptability, the infrastructure is designed following flooding risks. The construction of collectors and enhancement of the conditions of the surrounding canals and the implementation of subterranean water tanks allows the collection of rainwater that is used to support the fire network and green space irrigation. Additionally, the port makes a constant effort to improve and conserve the ecosystems in the area of influence, thus protecting the coastline and restoring mangrove zones in the Cartagena district. The project should consider new strategies for managing long-term changes by considering the structural changes needed for the decentralization of systems, the natural system infrastructure, alternative supply options, adaptive capabilities and site selection or adaptation.

To prepare for short-term hazards, the port has developed a risk analysis about the possible natural or human perils. There is no evidence of having a plan for the dangers in the next 25 years. Nonetheless, the risk analysis allows the project to determine preventive and corrective actions that should be implemented in order to overcome the dangers and advance the project. Furthermore, the modular infrastructure and the pavement style of the patios allow the port infrastructure to recover with little cost in the case of an event generated in the short-term. A list of the expected natural hazards, such as wildfires, floods, tornadoes, hurricanes, earthquakes, tsunamis or man-made hazards followed by strategies to cope with each event and to restore the environment is recommended.

To manage heat island effects, the project considers 10% of the site to be destined for green spaces and tree plantations. The infrastructure of these green spaces is designed to allow the wind currents to generate a natural difference in temperature in the work areas and the rest of the site. Even though this reduces heat in surfaces, the project has not considered the solar reflectance index (SRI) criteria and does not calculate the percentage of the reduction. The SRI calculation is intended to identify heated surfaces and reduce the localized accumulation of heat to manage microclimates.

## **8. SUMMARY AND CONCLUSION**

The expansion of Cartagena's container terminal port has followed successful sustainable practices even though it still has a long way to go in achieving overall sustainability standards. The project is of fundamental importance to the country due to the resulting connectivity of global supply chains with the ground transportation links in Colombia, as it is a key node for the international transfer of goods. The current expansion will increase capacity by 150% enabling access by the most efficient and modern vessels found in the global maritime industry. The project will take advantage of its strategic location in the Atlantic Ocean, connecting routes from Asia, North, South, and Central America, the Caribbean Islands and Europe, as well as the resulting benefits from the expansion of the Panama Canal. This project will have a positive impact for Colombia and for the surrounding communities by providing 1,866 direct jobs and reaching around 11,366 people in its productive chain. It will also have a positive impact on education and social empowerment, by implementing programs to increase the quality of life of neighboring communities.

The Quality of Life category is the best performing one due to an increased overall quality of life of the community, which has been improved with the plan's aim of enhancing social and economic aspects of both the city and the entire country. It is expected that the positive economic effects of the capacity expansion of the port will increase the number of jobs and opportunities among the people of Cartagena. In addition to the economical positive effects, they have developed foundations and collaborations with governmental entities to improve the education system for the kids and initiatives for the workers' education and their families' wellbeing. Further, the kids' wellbeing is also looked after with programs for their health and nourishment enhancing the local public health. Moreover, emergency plans for identified risks have been developed and public works have been done to lower the risk of flooding.

Studies on the biodiversity, topography, landscape and cultural values of the surroundings have

been done in order to maintain the quality of the site, enhancing the environment and cultural sites. Archaeological interventions were made following the instructions looking over Cartagena's historic and culturally significant sites for preservation or restoration. Additionally, the Landscape Department, created by the project is doing its best to enhance green areas inside the project and outside, with the rehabilitation of public spaces such as parks and the preservation of historic sites are part of the plan.

In the Leadership category, the project has a good overall performance by developing collaboration and teamwork with the communities and other stakeholders. Communication between the community and other groups involved in the project is achieved through public meetings where residents can express their concerns. The Sustainability Committee created for social investment, listens to the community about their concerns for sustainability and develops ways of working with the people; however, there is still the need to improve the involvement of the community.

In addition, the project is located in the Touristic and Cultural District of Cartagena de Indias, in the Caribbean Sea and North Coast of Colombia. Its geographic position makes it a strategic commercial and touristic site. It is an international connection point and has the advantage of being close to the Panama Canal therefore a good place for market development. Furthermore, it is located in a strategic point in the Caribbean Sea where the vast majority of the routes from Asia to Europe and North America cross.<sup>20</sup> The cultural and economic aspects of the city are positively affected by the exchange of goods and touristic attractions bringing jobs and economic development. However, this needs to be regarded carefully, because it may also create inequity if the project does not invest back in projects for community development. The strategic location and the interaction with other national and international stakeholders make the port among the best ports in the Caribbean. The project's goal is to integrate with other ports and marine structures in other countries allow international access to an exchange of goods that is of great importance to Colombia.

The project has found synergy opportunities for reducing waste and costs by improving its management performance. For instance, the debris from the transformation and demolition is reutilized for the construction filling of other sites that need a better resistance capacity. The port is constantly planning ahead in long-term monitoring and has enacted proper maintenance of the port structure. A sustainability plan has been implemented, to make proper use of the resources. Additionally, the constant re-evaluation about conflicting regulations allowed

---

<sup>20</sup> Astrid Martínez Ortiz et al. *Impacto económico y social del puerto de Cartagena*. (Bogotá: Fedesarrollo, 2014), 4.

innovation in a shared information system for inspection allowing shared access to authority procedures. This has led also to a further project of an inspection site that enhances the overall sustainability, due to the reduction of energy in transportation, long time storage and costs.

Even though the project has good intentions in procuring sustainable practices, the Resource Allocation did poorly due to the lack of precise information on the strategies being implemented. Developing a life cycle assessment considering the energy associated with the extraction, processing, manufacturing, and transport of materials and components would improve the overall performance of this category. It is important to reduce maintenance and repairs, and to use the natural resources appropriately for extending the lifespan of the project reducing the use of materials considerably.

The project aims to improve its energy use, and although the project was not certified with the LEED (Leadership in Energy and Environment Design), it has voluntarily followed these sustainability standards. The terminal has a pilot plan for the use of photovoltaic energy, landscaping and water treatment, but has not implemented any renewable source of energy. However, they perform monitoring control and have reduced the use of energy by renovating the illumination technologies.

The project's performance in the Natural World Category is valuable for their aspiration on sustainability standards. To protect the environment and local species, the project identified the surrounding areas that needed conservation. They carried out a study to detect conservation zones including natural islands around the project and have assessed management plans for conservation. Additionally, the project has destined 10.8% of the terrain as green spaces, which represents 88,924m<sup>2</sup> of green areas.

For safety reasons and to avoid adverse geology and instability in the zone, the project has contemplated all of the geological studies relevant to the project and the soft terrains were improved by overloading processes. Furthermore, the infrastructure of the canals was modified due to the risk of sedimentation and flooding. The surroundings of the site were already contaminated; the port has done some efforts to remove the contaminated sediments from the bay and surrounding canals to improve the environmental conditions.

Furthermore, the project has made an effort to have minimal impact on existing hydrology and to avoid contaminants. However, pesticides and fertilizers are still used in the landscaping areas, provoking additional water contamination.

Although ecological and hydrological functions of the project are not fully restored, the project made some efforts to protect species biodiversity. Identifying protected areas inside the direct and indirect influence area of the terminal has helped in preserving the natural habitat. There have been efforts on the adjacent canals to improve the conditions of the biotic fauna of the area, allowing an interaction among the different habitats found in the project zone. Furthermore, the project maintains efforts to preserve the hydrologic connection, sediment transport, habitat and the water quality ecosystems functions.

Lastly, the Climate and Risk Category is an area for improvement. However, some good efforts have been done to reduce greenhouse gas emissions. To improve the project's efforts a complete study of the life cycle analysis for greenhouse gas emissions is needed; additionally, there are no concrete plans for a climate impact assessment and adaptation plan. An evaluation of risk and vulnerability prior to the development plan was assessed to find traps that could generate environmental problems in the infrastructure and the surrounding communities. Nonetheless, the project should consider working with the community as a whole to prepare and mitigate threats to infrastructure.

A risk analysis was developed allowing the project to determine preventive and corrective actions. This should be regarded for implementation of preventive plans in order to overcome the dangers and advance the project. The project should consider new strategies for managing long-term changes by considering the structural changes needed the decentralization of systems, the natural system infrastructure, alternative supply options, adaptive capabilities and site selection or adaptation.

This report evaluates the sustainability performance of the expansion of the Cartagena's Container Terminal Port project according to the Envision™ Rating System. The report identifies areas in which the project scored highly, as well as low-scoring areas that represent opportunities for which the project team can learn and improve on in future projects, as they strive to achieve sustainable project design and construction methodologies.

APPENDIX:

APPENDIX A: PROJECT PICTURES AND DRAWINGS



Figure 02: Map indicating location of the project.  
Sources: 11\_CR21 Inspección Riesgos ago 2014 p.13

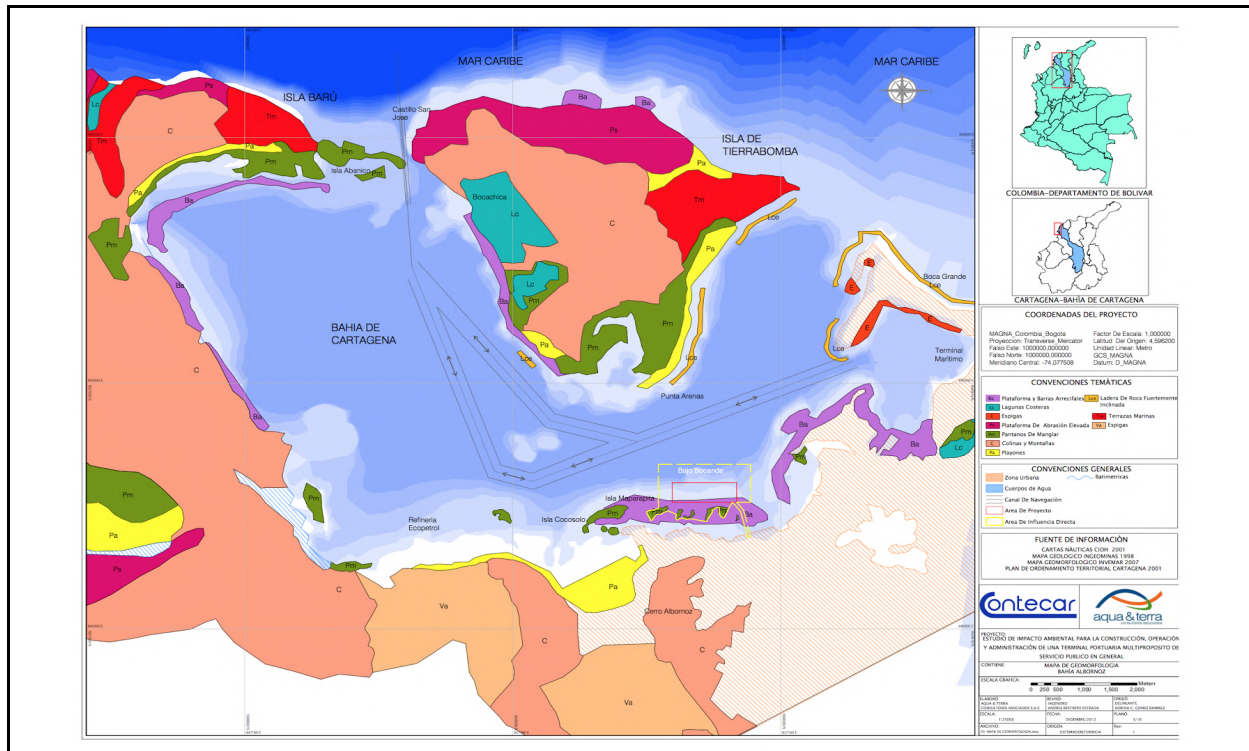


Figure 03: Map of the area.  
Sources: 11\_NW14\_Mapa geomorfológico



Expansion of Port Capacity and Logistics in the Container Terminal in Cartagena, Colombia

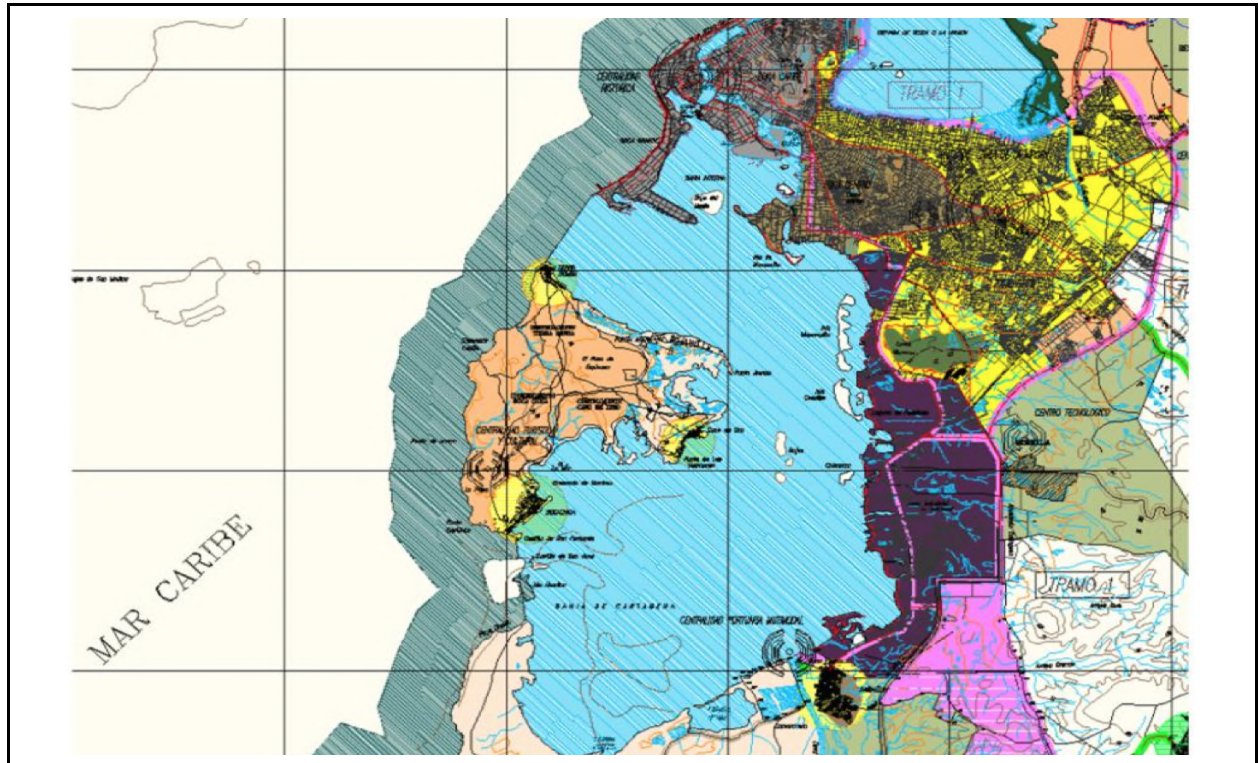


Figure 04: Cartagena's Bay Location  
Sources: Planeación Distrital 2007

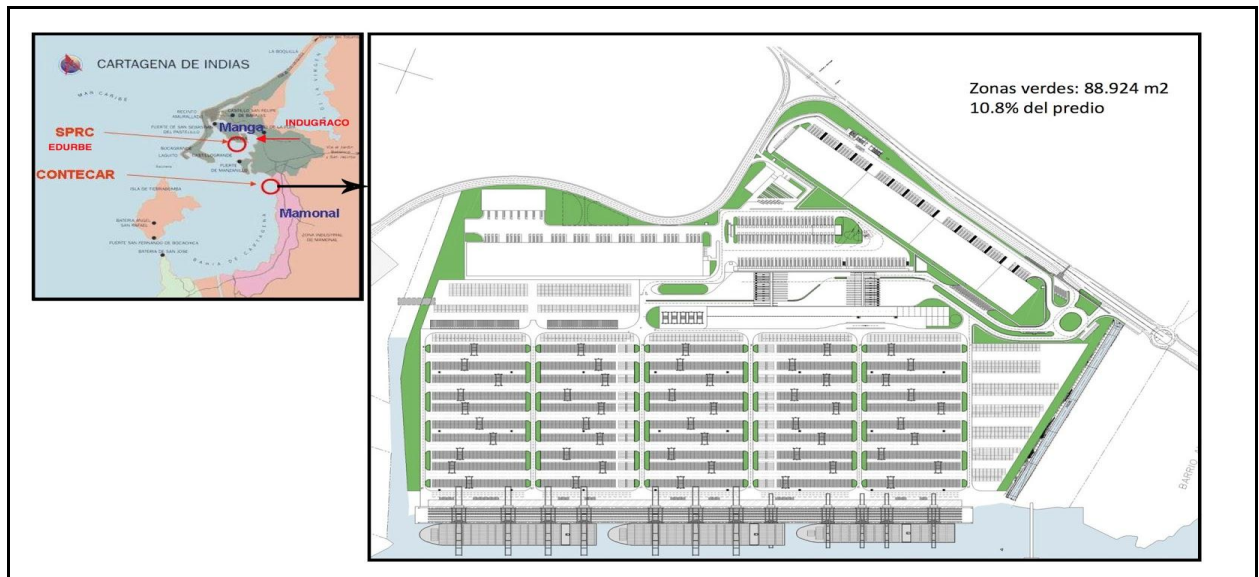


Figure 05: Green areas  
Sources: Arquitectos e Ingenieros Asociados S.A., PLAN MAESTRO Zonas verdes. 11

Expansion of Port Capacity and Logistics in the Container Terminal in Cartagena, Colombia

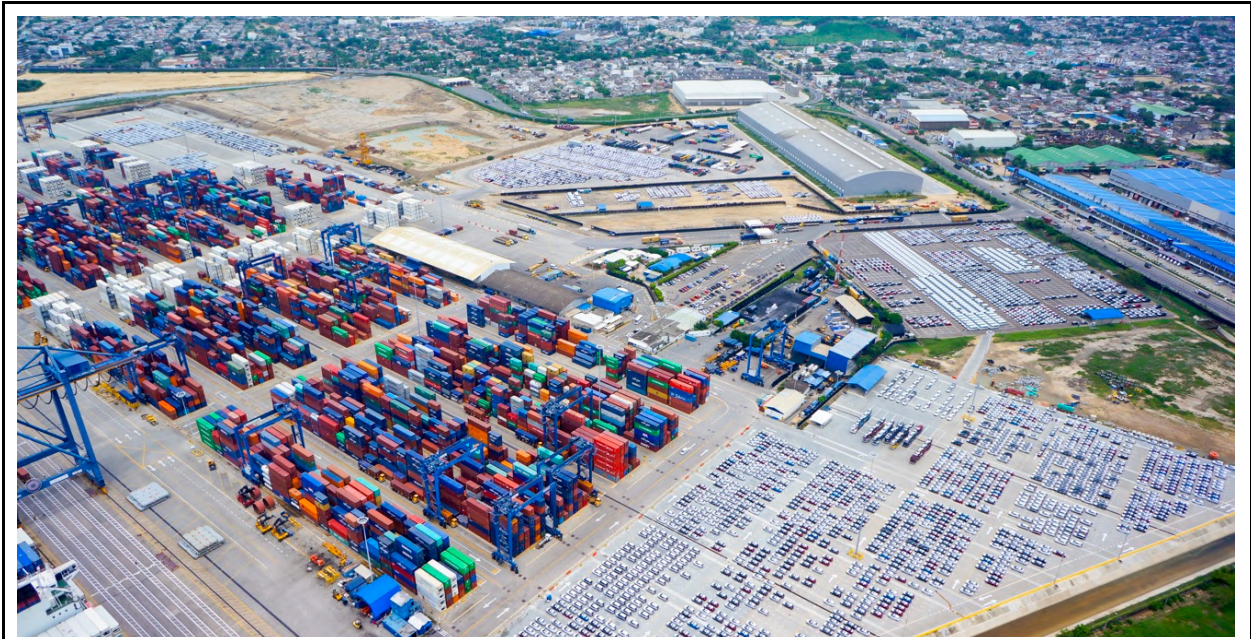


Figure 06: General picture of the port  
Sources: Picture provided by Contecar



Figure 07: General picture of the port  
Sources: Picture provided by CONTECAR

Expansion of Port Capacity and Logistics in the Container Terminal in Cartagena, Colombia

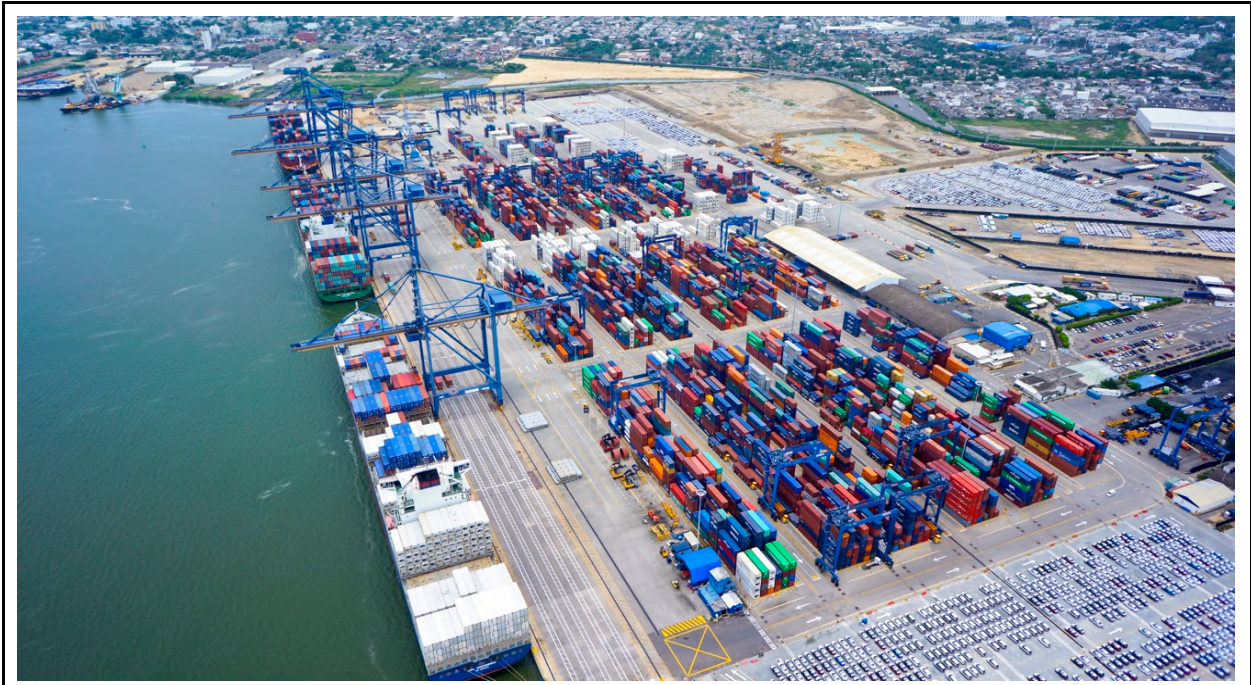


Figure 08: General picture of the port  
Sources: Picture provided by CONTECAR



Figure 09: General picture of the port  
Sources: Picture provided by CONTECAR

Expansion of Port Capacity and Logistics in the Container Terminal in Cartagena, Colombia



Figure 10: General picture of the port  
Sources: Picture provided by CONTECAR

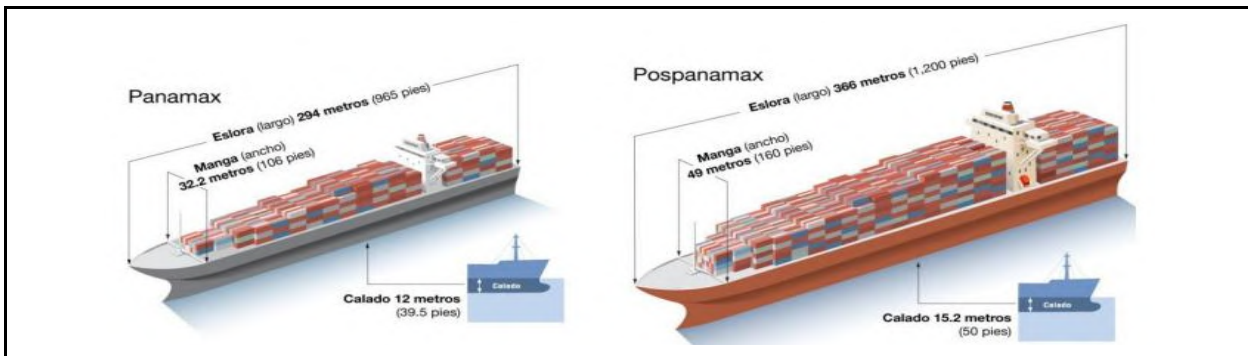


Figure 11: Change in the ship size due to the Panama Canal expansion  
Sources: Impacto económico y social del puerto de Cartagena page 10

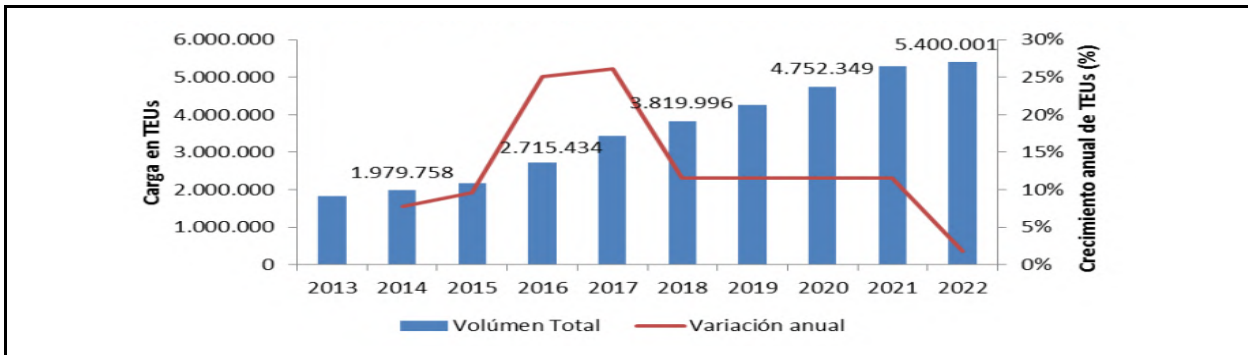


Figure 12: Cargo volumes projected 2013-2022 Port of Cartagena  
Sources: Impacto económico y social del puerto de Cartagena page 34



Figure 13: Colegio Almirante Padilla  
Sources: Sistematización Proceso de Intervención Social Fundación Puerto de Cartagena, page 25



Figure 14: Urbanización Jardines de San Pedro  
Sources: Sistematización Proceso de Intervención Social Fundación Puerto de Cartagena, page 26 / 58



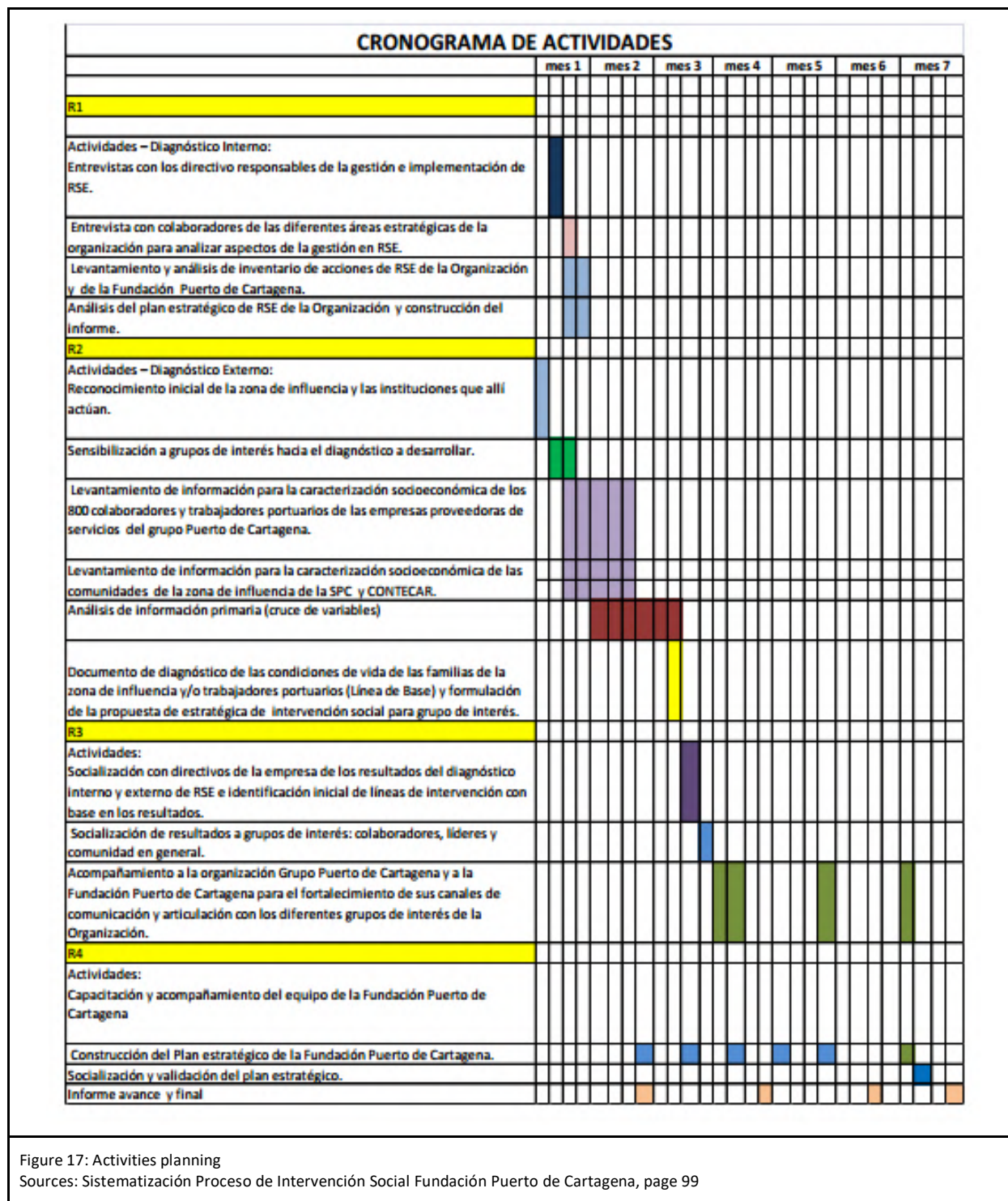


Figure 17: Activities planning  
Sources: Sistematización Proceso de Intervención Social Fundación Puerto de Cartagena, page 99

APPENDIX B: ENVISION POINTS TABLE

Expansion of Port Capacity and Logistics in the Container Terminal in Cartagena, Colombia

**CREDIT SCORING**

		IMPROVED    ENHANCED    SUPERIOR    CONSERVING    RESTORATIVE						
1	<b>QUALITY OF LIFE</b>	<b>PURPOSE</b>	QL1.1 Improve community quality of life	2	5	10	20	25
2			QL1.2 Stimulate sustainable growth and development	1	2	5	13	16
3			QL1.3 Develop local skills and capabilities	1	2	5	12	15
4		<b>COMMUNITY</b>	QL2.1 Enhance public health and safety	2			16	
5			QL2.2 Minimize noise and vibration	1			8	11
6			QL2.3 Minimize light pollution	1	2	4	8	11
7			QL2.4 Improve community mobility and access	1	4	7	14	
8			QL2.5 Encourage alternative modes of transportation	1	3	6	12	15
9			QL2.6 Improve site accessibility, safety and wayfinding		3	6	12	15
10		<b>WELLBEING</b>	QL3.1 Preserve historic and cultural resources	1		7	13	16
11			QL3.2 Preserve views and local character	1	3	6	11	14
12			QL3.3 Enhance public space	1	3	6	11	13
		Maximum points possible:						<b>181</b>
13	<b>LEADERSHIP</b>	<b>COLLABORATION</b>	LD1.1 Provide effective leadership and commitment	2	4	9	17	
14			LD1.2 Establish a sustainability management system	1	4	7	14	
15			LD1.3 Foster collaboration and teamwork	1	4	8	15	
16		<b>MANAGEMENT</b>	LD1.4 Provide for stakeholder involvement	1	5	9	14	
17			LD2.1 Pursue by-product synergy opportunities	1	3	6	12	15
18			LD2.2 Improve infrastructure integration	1	3	7	13	16
19		<b>PLANNING</b>	LD3.1 Plan for long-term monitoring and maintenance	1	3		10	
20			LD3.2 Address conflicting regulations and policies	1	2	4	8	
21			LD3.3 Extend useful life	1	3	6	12	
		Maximum points possible:						<b>121</b>
22	<b>RESOURCE ALLOCATION</b>	<b>MATERIALS</b>	RA1.1 Reduce net embodied energy	2	6	12	18	
23			RA1.2 Support sustainable procurement practices	2	3	6	9	
24			RA1.3 Use recycled materials	2	5	11	14	
25			RA1.4 Use regional materials	3	6	9	10	
26			RA1.5 Divert waste from landfills	3	6	8	11	
27			RA1.6 Reduce excavated materials taken off site	2	4	5	6	
28			RA1.7 Provide for deconstruction and recycling	1	4	8	12	
29		<b>ENERGY</b>	RA2.1 Reduce energy consumption	3	7	12	18	
30			RA2.2 Use renewable energy	4	6	13	16	20
31			RA2.3 Commission and monitor energy systems		3		11	
32		<b>WATER</b>	RA3.1 Protect fresh water availability	2	4	9	17	21
33			RA3.2 Reduce potable water consumption	4	9	13	17	21
34	RA3.3 Monitor water systems		1	3	6	11		
		Maximum points possible:						<b>182</b>
35	<b>NATURAL WORLD</b>	<b>SITING</b>	NW1.1 Preserve prime habitat			9	14	18
36			NW1.2 Protect wetlands and surface water	1	4	9	14	18
37			NW1.3 Preserve prime farmland			6	12	15
38			NW1.4 Avoid adverse geology	1	2	3	5	
39			NW1.5 Preserve floodplain functions	2	5	8	14	
40			NW1.6 Avoid unsuitable development on steep slopes	1		4	6	
41			NW1.7 Preserve greenfields	3	6	10	15	23
42		<b>LAND &amp; WATER</b>	NW2.1 Manage stormwater		4	9	17	21
43			NW2.2 Reduce pesticide and fertilizer impacts	1	2	5	9	
44			NW2.3 Prevent surface and groundwater contamination	1	4	9	14	18
45		<b>BIODIVERSITY</b>	NW3.1 Preserve species biodiversity	2			13	16
46			NW3.2 Control invasive species			5	9	11
47	NW3.3 Restore disturbed soils					8	10	
48	NW3.4 Maintain wetland and surface water functions		3	6	9	15	19	
		Maximum points possible:						<b>203</b>
49	<b>CLIMATE &amp; RISK</b>	<b>EMISSIONS</b>	CR1.1 Reduce greenhouse gas emissions	4	7	13	18	25
50			CR1.2 Reduce air pollutant emissions	2	6		12	15
51			CR2.1 Assess climate threat				15	
52		<b>RESILIENCE</b>	CR2.2 Avoid traps and vulnerabilities	2	6	12	16	20
53			CR2.3 Prepare for long-term adaptability				16	20
54			CR2.4 Prepare for short-term hazards	3		10	17	21
55	CR2.5 Manage heat islands effects	1	2	4	6			
		Maximum points possible:						<b>116</b>
		*The five innovation credits are bonus points and not included in total point tallies						<b>803</b>

**APPENDIX C: GRAPHS**



EXPANSION ON THE CONTAINER TERMINAL, CARTAGENA EXPANSIÓN DE LA TERMINAL DE CONTENEDORES, CARTAGENA		IMPROVED MEJORA	ENHANCED AUMENTA	SUPERIOR SUPERIOR	CONSERVING CONSERVA	RESTORATIVE RESTAURA	
QUALITY OF LIFE CALIDAD DE VIDA	PURPOSE PROPÓSITO	QL1.1 Improve Community Quality of Life QL1.1 Mejorar la Calidad de Vida de la Comunidad					
		QL1.2 Stimulate Sustainable Growth & Development QL1.2 Estimular el desarrollo y el crecimiento sostenible					
		QL1.3 Develop Local Skills And Capabilities QL1.3 Desarrollar Capacidades y Habilidades Locales					
	COMMUNITY COMUNIDAD	QL2.1 Enhance Public Health And Safety QL2.1 Mejorar la Salud Pública y la Seguridad					
		QL2.2 Minimize Noise And Vibration QL2.2 Minimizar ruidos y vibraciones					
		QL2.3 Minimize Light Pollution QL2.3 Minimizar Contaminación Lumínica					
		QL2.4 Improve Community Mobility And Access QL2.4 Mejorar el acceso y la movilidad de la Comunidad					
		QL2.5 Encourage Alternative Modes of Transportation QL2.5 Fomentar modos alternativos de transporte					
		QL2.6 Improve Site Accessibility, Safety & Wayfinding QL2.6 Mejorar la accesibilidad, seguridad y señalización					
	WELLBEING BIENESTAR	QL3.1 Preserve Historic And Cultural Resources QL3.1 Preservar los recursos históricos y culturales					
		QL3.2 Preserve Views And Local Character QL3.2 Preservar las vistas y el carácter local					
		QL3.3 Enhance Public Space QL3.3 Mejorar el espacio público					
		QL0.0 Innovate Or Exceed Credit Requirements QL0.0 Créditos innovadores o que exceden los requerimientos					

Figure 18: Quality of Life category\_ Summary of results

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

Figure 19: Leadership category\_ Summary of results

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

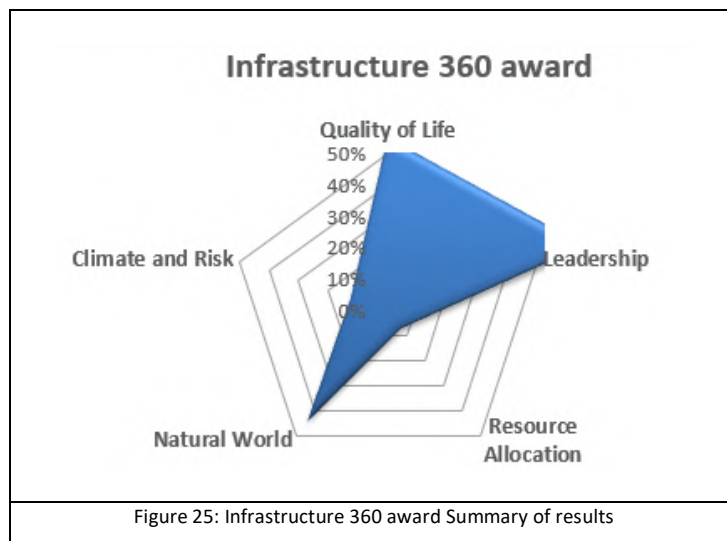
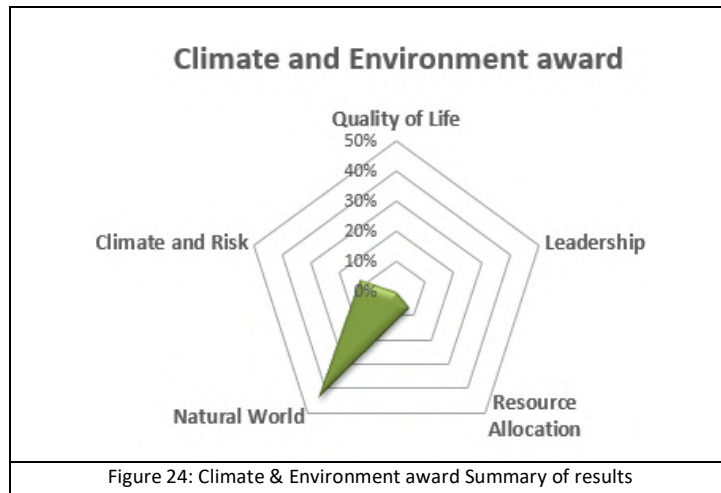
Figure 20:Resource Allocation category\_ Summary of results

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

Figure 21: Natural World category\_ Summary of results

EXPANSION ON THE CONTAINER TERMINAL, CARTAGENA EXPANSIÓN DE LA TERMINAL DE CONTENEDORES, CARTAGENA			IMPROVED MEJORA	ENHANCED AUMENTA	SUPERIOR SUPERIOR	CONSERVING CONSERVA	RESTORATIVE RESTAURA
EMISSIONS EMISIONES	CR1.1 Reduce Greenhouse Gas Emissions CR1.1 Reducir las emisiones de Gases de Efecto Invernadero (GEI)						
	CR1.2 Reduce Air Pollutant Emissions CR1.2 Reducir las emisiones contaminantes del aire						
RESILIENCE RESILIENCIA	CR2.1 Assess Climate Threat CR2.1 Evaluar amenazas relacionadas al Cambio Climático						
	CR2.2 Avoid Traps And Vulnerabilities CR2.2 Evitar situaciones de riesgo y vulnerabilidad						
	CR2.3 Prepare For Long-Term Adaptability CR2.3 Establecer estrategias de adaptación de largo plazo, frente al Cambio Climático						
	CR2.4 Prepare For Short-Term Hazards CR2.4 Preparación frente a riesgos de corto plazo						
	CR2.5 Manage Heat Island Effects CR2.5 Administrar el efecto Isla de Calor						
CR0.0 Innovate Or Exceed Credit Requirements CR0.0 Créditos Innovadores o que exceden los requerimientos							

Figure 22: Climate & Risk category\_ Summary of results



Expansion of Port Capacity and Logistics in the Container Terminal in Cartagena, Colombia

EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA, COLOMBIA				PT.	Performance
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life	20	Conserving
2			QL1.2 Stimulate Sustainable Growth & Development	16	Restorative
3			QL1.3 Develop Local Skills And Capabilities	5	Superior
4		COMMUNITY	QL2.1 Enhance Public Health And Safety	16	Conserving
5			QL2.2 Minimize Noise And Vibration	8	Conserving
6			QL2.3 Minimize Light Pollution	1	Improved
7			QL2.4 Improve Community Mobility And Access	1	Improved
8			QL2.5 Encourage Alternative Modes of Transportation	1	Improved
9			QL2.6 Improve Site Accessibility, Safety & Wayfinding	6	Superior
10		WELLBEING	QL3.1 Preserve Historic And Cultural Resources	13	Conserving
11			QL3.2 Preserve Views And Local Character	6	Superior
12			QL3.3 Enhance Public Space	6	Superior
		QL0.0 Innovate Or Exceed Credit Requirements	0	0	
		<b>QL</b>	<b>99</b>		
EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA, COLOMBIA				PT.	Performance
13	LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	17	Conserving
14			LD1.2 Establish A Sustainability Management System	7	Superior
15			LD1.3 Foster Collaboration And Teamwork	4	Enhance
16			LD1.4 Provide For Stakeholder Involvement	9	Superior
17		MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	6	Superior
18			LD2.2 Improve Infrastructure Integration	13	Conserving
19		PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	10	Conserving
20			LD3.2 Address Conflicting Regulations & Policies	8	Conserving
21			LD3.3 Extend Useful Life	6	Superior
			LD0.0 Innovate Or Exceed Credit Requirements	0	N/A
		<b>LD</b>	<b>80</b>		
EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA, COLOMBIA				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	4	Enhanced
28			RA1.7 Provide for Deconstruction & Recycling	0	No score
29		ENERGY	RA2.1 Reduce Energy Consumption	0	No score
30			RA2.2 Use Renewable Energy	0	No score
31			RA2.3 Commission & Monitor Energy Systems	0	No score
32		WATER	RA3.1 Protect Fresh Water Availability	2	Improved
33			RA3.2 Reduce Potable Water Consumption	4	Improved
34			RA3.3 Monitor Water Systems	3	Enhanced
		RA0.0 Innovate Or Exceed Credit Requirements	0	N/A	
		<b>RA</b>	<b>13</b>		

Expansion of Port Capacity and Logistics in the Container Terminal in Cartagena, Colombia

EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA, COLOMBIA				PT.	Performance
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	14	Conserving
36			NW1.2 Preserve Wetlands and Surface Water	0	No score
37			NW1.3 Preserve Prime Farmland	12	Conserving
38			NW1.4 Avoid Adverse Geology	2	Enhanced
39			NW1.5 Preserve Floodplain Functions	5	Enhanced
40			NW1.6 Avoid Unsuitable Development on Steep Slopes	6	Conserving
41			NW1.7 Preserve Greenfields	10	Superior
42		L & W	NW2.1 Manage Stormwater	4	Enhanced
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	5	Superior
47			NW3.3 Restore Disturbed Soils	0	No score
48			NW3.4 Maintain Wetland and Surface Water Functions	15	Conserving
		NW0.0 Innovate or Exceed Credit Requirements	0	N/A	
		<b>NW</b>	<b>76</b>		
EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA, COLOMBIA				PT.	Performance
49	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	13	Superior
50			CR1.2 Reduce Air Pollutant Emissions	0	No score
51		RESILENCE	CR2.1 Assess Climate Threat	0	No score
52			CR2.2 Avoid Traps And Vulnerabilities	2	Improved
53			CR2.3 Prepare For Long-Term Adaptability	0	No score
54			CR2.4 Prepare For Short-Term Hazards	0	No score
55			CR2.5 Manage Heat Island Effects	0	No score
			CR0.0 Innovate Or Exceed Credit Requirements	0	N/A
			<b>CR</b>	<b>15</b>	
<b>Total points</b>				<b>283</b>	<b>0</b>

**APPENDIX D: CREDIT DETAIL**

EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA: CREDIT SPREADSHEET WITH DETAILS		
CATEGORY I, PEOPLE AND LEADERSHIP		
SUB CATEGORY: QUALITY OF LIFE		
	Score	EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA
QL1.1 Improve Community Quality of Life	20	<p><b>Conserving</b></p> <p>The SPRC and CONTECAR created a foundation through which they have education and social enhancement programs to increase the quality of life of the neighboring communities. They have educational plans for children and for parents to reduce domestic violence and to improve child development. Furthermore, elementary, high school and undergraduate programs were provided to the workers who had not attained any of these education levels, and several other programs were offered to their families. Additionally, they have built 105 homes for port workers who were living in precarious housing without proper infrastructure or public services. The project also helps the trade and tourism sectors, which has a positive impact on the city. There is a Landscape Department that tries to make the urban context more harmonic with the city and its people. The enhancement of public spaces such as parks is also contemplated by the Landscape Department.</p>
		<p><u>Source:</u></p> <p>-Fundación Puerto de Cartagena and Bienestar Familiar and Fundación Carvajal, Programa de educación inicial Saberes, 1-15.                      -Fundación Puerto Cartagena, Proyecto Parque Santa Clara, 1-31.                      -Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, Impacto económico y social del puerto de Cartagena. (Bogotá: Fedesarrollo, 2014), 71-72.                      -Fundación Puerto de Cartagena, Informe de Gestión Inversión Social: Implementación Plan Estratégico 2013 – 2017 (Cartagena, 2014), 1-9.                      -Fundación Puerto de Cartagena, Proceso de formación de líderes para la autogestión (Cartagena, 2013), 1-2.                      -SENA Regional Bolívar, Convenio de cooperación No. 000018 de 2012 entre el servicio nacional de aprendizaje y la Fundación Puerto Cartagena (2012), 1-8.                      -Natalia Salazar Suárez and Olga Lucía López Londoño, Sistematización proceso de intervención social para la caracterización socioeconómica grupos de interés Fundación Puerto de Cartagena (Fundación Carvajal, 2012), 45.</p>
		<p><b>RECOMMENDATIONS</b></p> <p>The project has made remarkable efforts on the social impact. However, to improve the conditions of the space, the Landscape Department could integrate the communities with the project, making the green spaces into public parks in the vast area of the port and making the project an attraction. In future housing projects for the employees, try to combine types of housing and mixed uses in the neighborhoods to achieve more equality in the city.</p>
QL1.2 Stimulate Sustainable Growth & Development	16	<p><b>Restorative</b></p> <p>The project stimulates sustainable growth, not only with community programs but also by having development plans and responsibilities for the acceptable use of resources. On the one hand, the team has implemented educational programs and believes that the best opportunity for sustainable growth comes from the people. The project has a wide economic reach, improving local productivity by creating new jobs, training new people to continue to grow their skills, and a large impact in indirect jobs. In terms of employment, the project has 1,866 direct jobs and reaches around 11,366 people in the productive chain. It is constantly growing and bringing economic rebirth to the city and to the entire country. The training programs and educational plans for the surrounding communities create new jobs and opportunities for the local people. On the other hand, the development plans to promote sustainable growth include the rational use of water and energy; avoidance of accidents that could harm the environment;</p>



	<p>adequate management of waste; reliable dangerous waste disposal; the development of a successful recycling plan; control of gas emissions into the atmosphere; measurements to identify noise sources in order to reduce them; environmental control for dredging activities; bay water testing for pollution; residual water treatment; and increased awareness of the environment in workers and contractors. This plan is developed by the SGA (Environmental management and general services).</p> <p><u>Source:</u>          _SGA. <i>Planificación DEL SGA</i>, 1-2.          _Contecar, “Capítulo 8. Plan de manejo ambiental” in <i>Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006)</i>, 1-76.          _Contecar, <i>Actividades Ambientales 2013. (Cartagena, 2013)</i>, 1-26.          _SGS Colombia, <i>Programa de Caracterización de Agua Residual Industrial. (Cartagena: Environmental Services, 2013)</i>, 13.          _Félix González and Orlando Vecino, <i>Control ambiental de dragado (Sistema de Gestión Ambiental, 2014)</i>, 1-23.          _Contecar, <i>Puerto de Cartagena, and Dirección de Ingeniería y Proyectos - Superintendencia de Mantenimiento de Equipos Portuarios, Ahorro energético</i>, 1-6.          _Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, <i>Impacto económico y social del puerto de Cartagena. (Bogotá: Fedesarrollo, 2014)</i>, 71-72.          _Fundación Puerto de Cartagena, <i>Proceso de formación de líderes para la autogestión (Cartagena, 2013)</i>, 1-2.          _Fundación Puerto de Cartagena, <i>Informe de Gestión Inversión Social: Implementación Plan Estratégico 2013 – 2017 (Cartagena, 2014)</i>, 1-9.</p> <p><u>RECOMMENDATIONS</u>  <i>Since the project is of such a large scale and high value, sometimes it is difficult to know if the considerable environmental impact is worth the economic benefit. It is good to always have the environment and wellbeing of the people as a first priority.</i></p>
<p><b>QL1.3 Develop Local Skills and Capabilities</b></p>	<p><b>5 Superior</b></p> <p>The project identifies human talent as an advantage for economic growth and enhancement of the port. Therefore it has training programs for the local people in technical courses, training with simulators for equipment operators, training for industrial security, occupational health, stowage and store for the jobs needed in the project. In addition to specific training, there are employment formation programs, academic formation, informal education and courses for the Logistic and Port Training Center created by the SPRC. Moreover, there are several other programs for worker family members with the SENA, a Colombian technical education institution, in order to increase the families’ incomes.</p> <p><u>Source:</u>          _RS Noticias, <i>Emprendimiento para el bienestar de la comunidad portuaria. (Cartagena, www.rsnoticias.com)</i>, 1-2.          _Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, <i>Impacto económico y social del puerto de Cartagena. (Bogotá: Fedesarrollo, 2014)</i>, 67-72.          _CELP Centro de Entrenamiento Logístico y Portuario, <i>La Escuela de Alto Rendimiento de la Organización Puerto de Cartagena (Cartagena, 2013)</i>, 6-7.          _Contecar, <i>Actividades Ambientales 2013. (Cartagena, 2013)</i>, 24-26.          _SENA Regional Bolívar, <i>Convenio de cooperación No. 000018 de 2012 entre el servicio nacional de aprendizaje y la Fundación Puerto Cartagena (2012)</i>, 1-8.</p> <p><u>RECOMMENDATIONS</u>          Women are a minority on the project and are more vulnerable to lower incomes even while having to raise children. Try to consider ways of integrating them in the project, creating jobs for single mothers or creating more options for the development of their skills in some other area. Also, try to consider handicapped people and how they may fit into some of the employment opportunities.</p>

<p><b>QL2.1 Enhance Public Health And Safety</b></p>	<p>16</p>	<p><b>Conserving</b></p> <p>The security and safety features of the port’s operation follow the parameters regulated by the authorities. All of the regulations are adhered to and training for industrial safety is given to the port operators. Additionally, all workers use safety equipment and accessories required for certain activities. The information about the material’s components, toxicity and safety measurements are also given. Human life and environment are the priority in all of the safety features, and simulations are held to ensure that the safety features are working properly. All of the emergency instructions are given to the people involved in the project, including safety on chemical spills and natural disasters. To enhance local public health, the Foundation Port of Cartagena has several programs for the nourishment of children in the proximate communities. Additionally, they have parent trainings on how to monitor a child’s weight and size. There are also medical teams focused on children, who are evaluated and treated in oral health, size and weight control, vaccination, deworming and delousing.</p> <p><u>Source:</u></p> <p>_ Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, <i>Impacto económico y social del puerto de Cartagena. (Bogotá: Fedesarrollo, 2014), 72.</i></p> <p>_ Terminal De Contenedores De Cartagena, <i>Manual del Plan de Emergencias (2003), 1-65.</i></p> <p>_ Contecar, <i>Contrato de Obra (2014), 10-11.</i></p> <p><b>RECOMMENDATIONS</b></p> <p>Although the project meets all of the requirements and focuses on prevention, make sure that all of the possible disasters identified in the Emergency Plan are completely covered with all of the workers and possibly with the surrounding communities.</p>
<p><b>QL2.2 Minimize Noise And Vibration</b></p>	<p>8</p>	<p><b>Conserving</b></p> <p>To minimize noise and vibration in the operation in the port, RTG crane silencers were installed. Studies show that the use of electrical RTGs instead of those operated by diesel also mitigates sound. The project discusses this topic with the community to take actions to reduce noise in the surrounding areas.</p> <p><u>Source:</u></p> <p>_ Contecar and Puerto de Cartagena, <i>Electrificación RTG (Cartagena, 2014), 1-4.</i></p> <p>_ Contecar and Puerto de Cartagena, <i>Instalación de silenciador equipo T19 (Cartagena, 2013), 1-9.</i></p> <p>_ Contecar, “Capítulo 8. Plan de manejo ambiental” in <i>Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006), 5, 6, 37, 46, 75.</i></p> <p><b>RECOMMENDATIONS</b></p> <p>Even with the efforts that have been implemented, the project has such a big scale that specialized noise studies should be contemplated. Consider other alternatives to reduce the noise of the port, such as strategic plants and vegetation that are not only a good barrier but could be developed as a linear public park for the adjacent neighborhood and the entire city.</p>
<p><b>QL2.3 Minimize Light Pollution</b></p>	<p>1</p>	<p><b>Improved</b></p> <p>The project uses the minimum amount of light that is required for the safe use of the port and the well-being of the employees, but it has not done a greater effort on examining the real impact of light pollution on the surroundings. However, the design is efficient and the lighting is regulated during the different times of the day. Measures include the replacement of interior and exterior lighting with LED tubes and luminaries, in addition to a timed control system and poles that allow time gaps to adapt to the lighting necessities of the time of day. Energy consumption is reduced by using LED technology and cleaner energy sources.</p> <p><u>Source:</u></p> <p>_ Contecar, <i>Puerto de Cartagena, and Dirección de Ingeniería y Proyectos - Superintendencia de Mantenimiento de Equipos Portuarios, Ahorro energético, 1-6.</i></p> <p>_ Contecar and Puerto de Cartagena, <i>Características sistema paneles solares CONTECAR, 1.</i></p> <p>_ Contecar, <i>Actividades Ambientales 2013. (Cartagena, 2013), 9.</i></p> <p><b>RECOMMENDATIONS</b></p> <p>Even though the project minimizes light pollution and encourages energy efficiency, they should</p>

		<p>provide specific studies on the environmental impact of the light pollution in the zone, how it affects people and nature surrounding the project, and seek ways to reduce light to the minimum output possible. The project could also consider the use of non-lighting alternatives for signage.</p>
<p><b>QL2.4 Improve Community Mobility And Access</b></p>	<p>1</p>	<p><b>Improved</b></p> <p>In terms of mobility and accessibility to the port, the project’s proposal for a separate motorway to the site would allow trucks to avoid 1.5 km of public roads, which would help notably in reducing asphalt damage, noise, air pollution and traffic. There are online appointments for the trucks to reduce waiting time and skip lines. This decisions were made in order to benefit the port operation but there is no evidence of betterment in transportation infrastructure for community mobility and access.</p>
		<p><u>Source:</u></p> <p>_ <i>Contecar and Puerto de Cartagena, Retorno Vial Corredor de Carga (Cartagena, 2010), 1-7.</i></p>
		<p><u>RECOMMENDATIONS</u></p> <p>Take into consideration the mobility of the rest of the community and how construction will affect mobility. Also consider how the workers get into and out of the project and, if possible, provide green space for the city. Community mobility and access to the project should be encouraged by public transportation, walking or by bicycle.</p>
<p><b>QL2.5 Encourage Alternative Modes of Transportation</b></p>	<p>1</p>	<p><b>Improved</b></p> <p>To encourage alternative modes of transportation, the master plan includes internal pedestrian walks through green spaces inside the project, although it doesn’t consider the ways in which people could get to them. Additionally, buses for the internal transportation of the workers are subcontracted by Metrocar.</p>
		<p><u>Source:</u></p> <p>_ <i>Arquitectos e Ingenieros Asociados S.A., PLAN MAESTRO, Sistemas de movilidad peatonal interna, 1-32.</i></p> <p>_ <i>Metrocar, S.A., Contrato Contecar 055-13. (Cartagena de Indias, 2014), 1-8.</i></p>
		<p><u>RECOMMENDATIONS</u></p> <p>Consider how workers get to the project and what mode of transportation they use. Bike routes could be built to connect the port to the city and the interior of the project. The pedestrian walks inside the port should be open to the public, and they could also consider creating viewing points to make the project site attractive to the community. Also consider how pedestrians get to the project if there is a highway surrounding it.</p>
<p><b>QL2.6 Improve Site Accessibility, Safety &amp; Wayfinding</b></p>	<p>6</p>	<p><b>Superior</b></p> <p>To improve safety, accessibility and wayfinding, the site has an emergency plan for all identified risks and strategic plans to avoid accidents or deal with them if they occur. The main road surrounding the project makes it accessible by public transportation. The project also has a drainage infrastructure plan to lower the risk of flooding, not only for the port, but by benefiting the surrounding communities with water canals. This deals with various issues such as avoiding rodents and skin disease generated by stagnant water; avoiding waste that blocks the canals; using illumination installations to improve the security of the port; and planting vegetative fences.</p>
		<p><u>Source:</u></p> <p>_ <i>Contecar, Presentación a la Comunidad de las Obras del Sector Norte. (2013), 4.</i></p> <p>_ <i>Jaime Torres and A. Tatis R. Rosero, Estudio microbiológico del agua potable. (Gestión Ambiental, 2014), 6-11.</i></p> <p>_ <i>Terminal de Contenedores de Cartagena, Manual del Plan de Emergencias (2003), 12-21.</i></p> <p>_ <i>Contecar, “Capítulo 8. Plan de manejo ambiental” in Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006), 41</i></p>
		<p><u>RECOMMENDATIONS</u></p> <p>The design of pedestrian and bike access to the project is not present in the documentation. The project is clearly divided by a large highway that prevents people from coming near the site by means other than vehicles, so please consider pedestrian sidewalks, physical barriers to prevent</p>

		speeding and bike lanes to promote access to the project.
QL3.1 Preserve Historic and Cultural Resources	13	<p><b>Conserving</b></p> <p>The project had a licensed archeological intervention, following the instructions given by the Colombian Anthropology and History Institute ICANH that looks over Cartagena’s historic and culturally significant sites for preservation or restoration. The dredging sensors and monitors that covered the entire area did not find anything of historical value in the zone, which has already been highly disturbed by the dredging process.</p> <p>Although the CONTECAR terminal did not require any further analysis, they decided to implement geophysical media as a basic tool to inspect the archeological features of the area and to help the authorities with their research. Furthermore, their interest in the preservation of the cultural and archaeological heritage is evident in the effort of the team to further investigate the closest forts and cultural sites. Additionally, there are no perturbations from the dredging observed in the surrounding areas, which is very important for the conservation of heritage.</p> <p><u>Source:</u> _Marcela Bernal Arévalo, Lucero Aristizábal Losada, Camilo Augusto Rojas Alfonso, and Julián Andrés Gallego, Exploración y diagnóstico arqueológico en el área de dragado del canal de Bocachica, Cartagena de Indias - Bolivar, (Bogotá: Güe Quyne – Grupo de Investigación y Protección del Patrimonio Cultural, 2014), 34-35.</p> <p><u>RECOMMENDATIONS</u> Document any resources that are culturally relevant to the surrounding communities. If the surrounding forts and cultural sites need restoration, assist with that process and document what efforts are to be done. Initiate community meetings to discuss their insights into what should be preserved.</p>
		<p><b>Superior</b></p> <p>To preserve the views and local character of the site, the project team has completed studies on the local biodiversity, topography, landscape and cultural values. The plan was designed according to what the authorities in the different socio-spatial areas suggested. Inside the project, the landscape department is doing its best to enhance green areas; outside, the rehabilitation of public spaces such as parks and the preservation of historic sites are part of the project plan. However, the vast expanse and enormity of the machinery and infrastructure blocks views to the waterfront from the surrounding communities.</p> <p><u>Source:</u> _ O. Vecino and Jaime Torres R. Rosero. <i>Mantenimiento de Jardines y Zonas Verdes. (Gestión Ambiental, 2014)</i> _ Contecar, <i>Caracterización Ambiental del Área de Influencia del Proyecto, 1-46.</i> _ Contecar and Aqua &amp; Terra, <i>Estudio de impacto ambiental para la construcción y operación de la terminal portuaria multipropósito de Albornoz (Capítulo 4 - Caracterización Del Componente Biótico), 1-90.</i> _ Arquitectos e Ingenieros Asociados S.A., <i>Plan Maestro, Sistemas de movilidad peatonal interna, 1-32.</i> _ Marcela Bernal Arévalo, Lucero Aristizábal Losada, Camilo Augusto Rojas Alfonso, and Julián Andrés Gallego. <i>Exploración y diagnóstico arqueológico en el área de dragado del canal de Bocachica, Cartagena De Indias – Bolívar (Bogotá: Güe Quyne – Grupo de Investigación y Protección del Patrimonio Cultural, 2014), 1-46.</i></p> <p><u>RECOMMENDATIONS</u> The contecar terminal has enormous machinery and infrastructure blocking the view from many angles for the community. Try to integrate public spaces with elevated viewpoints, walks that integrate the community to the waterfront, or create locations for people to watch the port’s operation and the ships arriving in the bay.</p>
		<p><b>Superior</b></p> <p>To enhance public space, the Landscape Department’s plan includes the restoration of the</p>
QL3.2 Preserve Views and Local Character	6	
QL3.3 Enhance Public Space	6	

		<p>existing Santa Clara Park. The restoration will improve access on the secondary ways and create sports areas with easy pedestrian access and benches, a kiosk that includes public restrooms, protected children’s play spaces, parking spots, plazas, the preexisting Virgin Mary altar, and access routes. The master plan also includes a considerable number of new green spaces.</p> <p><u>Source:</u>                  _ O. Vecino and Jaime Torres R. Rosero. <i>Mantenimiento de Jardines y Zonas Verdes. (Gestión Ambiental, 2014)</i>                  _ Arquitectos e Ingenieros Asociados S.A., <i>PLAN MAESTRO Zonas verdes.</i>                  _ Fundación Puerto Cartagena, <i>Proyecto Parque Santa Clara.</i></p> <p><u>RECOMMENDATIONS</u>                  The new green spaces in the container terminal should be open to the community to provide public space to the city, following concerns of the surrounding communities. The project could also create an arborized buffer zone to make a linear park on the perimeter of the expansion for different purposes like the reduction of noise and the creation of recreational areas.</p>
<b>QL0.0 Innovate Or Exceed Credit Requirements</b>		
	<b>99</b>	

<b>SUB CATEGORY: LEADERSHIP</b>		
	<b>Score</b>	<b>EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA</b>
<b>LD1.1 Provide Effective Leadership And Commitment</b>	<b>17</b>	<p><b>Conserving</b></p> <p>The SGA (Environmental management and general services) has a scheme to maintain sustainability with the objectives, goals, program, activities, the responsible sector and the indicators needed. They focus on the management of energy resources, accident prevention, waste management, monitoring of water and air quality, development of social programs for quality of life enhancement, and the disclosure of sustainability plans to all interested parties. Furthermore, the project also created the Sustainability Committee to implement a strategic plan for social investment, which listens to the community about their concerns for sustainability and develops ways of working with the people to achieve sustainability. In addition, they have the environmental management plan given to the contractors to prevent or correct any environmental issues identified that could take place during construction and to evaluate the project’s sustainability factors.</p> <p><u>Source:</u>                  _ SGA. <i>Planificación DEL SGA, 1-2.</i>                  _ Contecar and Puerto de Cartagena, <i>SGI Sistema de Gestión Integrado. (Cartagena, 2010), 8.</i>                  _ Contecar, “Capítulo 8. Plan de manejo ambiental” in <i>Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006), 1-76.</i></p> <p><u>RECOMMENDATIONS</u>                  Make further studies of the expansion of the canal to see what impact it may have in the long term. The deviation of water channels is always complicated.</p>
		<p><b>Superior</b></p> <p>The objectives of the project have a clear interest in establishing a sustainability management system and achieving all aspects of sustainability. The activities and goals of the SGA sustainability plan cover most of the issues that could possibly emerge from the Contecar Port Expansion project. The committee for sustainability, the Port of Cartagena Foundation, and the human resources department are in charge of discussing and communicating the concerns to the community. Because it is still under construction, there are several plans projected into the future to achieve overall sustainability. The large scale of the project has some negative impacts on the environment and the community that they are trying to solve. Furthermore, the project is committed to exceeding health and safety standards and achieving overall social harmony.</p>
		<b>7</b>

		<p><u>Source:</u>                  _SGA. <i>Planificación DEL SGA</i>, 1-2.                  _Contecar and Puerto de Cartagena, <i>SGI Sistema de Gestión Integrado</i>. (Cartagena, 2010), 6-14.                  _Contecar, “Capítulo 8. Plan de manejo ambiental” in <i>Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias</i> (2006), 1-76.</p> <p><u>RECOMMENDATIONS</u>                  Resiliency measures for sea level rise and flooding of the area should be considered in the project, since the location is vulnerable due to its proximity to the ocean. If sea level is expected to rise, the project should develop policies for sustainable management to deal with the changing conditions of the rising water and to prevent flooding in the project and surrounding communities.</p>
LD1.3 Foster Collaboration And Teamwork	4	<p><b>Enhance</b>                  Collaboration and teamwork is not only fostered between the SPRC and CONTECAR; it is also cultivated between the project and the communities, and with other stakeholders. The project is constantly keeping up with community and client needs. The collaboration of the different areas is also constant in the process and the community has access to programs for the development of workers and their families in collaboration with the SENA (Servicio Nacional de Aprendizaje) institute for education. Another important collaboration is an alliance with the Carvajal Foundation, which has studied the development of other ports and logistics enterprises and their challenges. They then added seven other enterprises to this program for entrepreneurial strengthening and have helped to develop their business strategies, worker development and opportunities for them and their families in order to support surrounding communities. Additionally they have worked with “Bienestar Familiar”, an agency for children’s rights and care, to help with their development and to confront abuse and other social problems. The project is supported by the national government, other corporations, the United States government, the Environment Ministry, Andi and other institutions due to the high impact of the port on the entire country. There is no evidence of risk and reward sharing with basic workers in project documents, but there are rewards through education and housing and charrettes with the community.</p> <p><u>Source:</u>                  _Contecar and Puerto de Cartagena, <i>SGI Sistema de Gestión Integrado</i>. (Cartagena, 2010), 7.                  _Natalia Salazar Suárez and Olga Lucía López Londoño, <i>Sistematización proceso de intervención social para la caracterización socio económica grupos de interés Fundación Puerto de Cartagena</i> (Fundación Carvajal, 2012), 1-133.                  _SENA Regional Bolívar, <i>Convenio de cooperación No. 000018 de 2012 entre el servicio nacional de aprendizaje y la Fundación Puerto Cartagena</i> (2012), 1-8.                  _Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, <i>Impacto económico y social del puerto de Cartagena</i>. (Bogotá: Fedesarrollo, 2014), 1-88.                  _Fundación Puerto Cartagena, <i>Acta de Entrega: Cancha múltiple a jac del barrio Ceballos</i>, (2013), 1-2.                  _Sandra Beltrán, <i>Formato Ayuda de Memoria o Acta de Reunión</i>, (Fundación Puerto de Cartagena, 2013), 1-2.                  _Sandra Beltrán, <i>Formato Ayuda de Memoria o Acta de Reunión</i>, (Fundación Puerto de Cartagena, 2014), 1-3.                  _Fundación Puerto Cartagena and Contecar, <i>Control de Asistencia Socialización PMA y PMD Contecar- San Isidro</i>, (2013), 1.</p> <p><u>RECOMMENDATIONS</u>                  Try to integrate the basic workers into the process of making the port better; ask them what they think about their work and how can they be motivated to work better. The project should be willing to share risk and rewards with specific actions.</p>
LD1.4 Provide For Stakeholder	9	<p><b>Superior</b>                  To deliver stakeholder involvement in the decision making, the Carvajal Foundation in</p>

<p><b>Involvement</b></p>		<p>collaboration with CONTECAR, has agreed with the other port logistics companies to get involved in the process of community improvement. Constant communication between the community and other groups involved in the project is achieved through public meetings in the communities where residents can express their concerns; these are documented for the decisionmaking purposes. Programs for the involvement of the community in the project are also held. One example is a painting contest for the children of the surrounding neighborhoods to decorate the noise barrier wall; the winners will have their design painted on the wall. Furthermore, governmental actors and international governments are part of the security and economic improvements of the port, which are of great importance to the entire country.</p> <p><u>Source:</u>          _ Contecar and Puerto de Cartagena, SGI Sistema de Gestión Integrado. (Cartagena, 2010), 7.          _ Contecar and Puerto de Cartagena, Referentes Portuarios (2011) 1-10.          _ Natalia Salazar Suárez and Olga Lucía López Londoño, Sistematización proceso de intervención social para la caracterización socio económica grupos de interés Fundación Puerto de Cartagena (Fundación Carvajal, 2012), 1-133.          _ Opinionmeter, Estudio De Satisfacción De Clientes (2014) 1-100.          _ Contecar and Puerto de Cartagena, Informe De Revisión Por La Dirección Sistema De Gestión Integrado (2013) 4,18,20.          _ ANDI Asociación Nacional de Empresarios de Colombia, Proceso de Formulación del Plan de Ordenamiento (complejo y con muchas instancias) (Cartagena, 2014), 1-90.          _ Sociedad Portuaria Regional de Cartagena, Revista Pórtico: 20 años de cambio (Bogotá: Editorial Semana, 2013), 1-164.          _ Fundación Puerto Cartagena, Acta de Entrega: Cancha múltiple a jac del barrio Ceballos, (2013), 1-2.          _ Sandra Beltrán, Formato Ayuda de Memoria o Acta de Reunión, (Fundación Puerto de Cartagena, 2013), 1-2.          _ Sandra Beltrán, Formato Ayuda de Memoria o Acta de Reunión, (Fundación Puerto de Cartagena, 2014), 1-3.          _ Fundación Puerto Cartagena and Contecar, Control de Asistencia Socialización PMA y PMD Contecar- San Isidro, (2013), 1.</p> <p><u>RECOMMENDATIONS</u></p> <p>Surveys across the city could be helpful to identify what the broader community needs are and how the project is viewed by residents. It is a very large infrastructure project, so it is not always easy to have a positive image in all residents’ eyes. Additionally, the project could have better communication with the surrounding neighborhoods and allow community groups to engage with the project. They should also keep evidence of frequent communication and meetings with the community.</p>
<p><b>LD2.1 Pursue By-Product Synergy Opportunities</b></p>	<p>6</p>	<p><b>Superior</b></p> <p>The project team identified synergy opportunities to reduce waste and costs, which improve project performance. Inside the project the utilization of the debris left from the transformation and demolition of the north site called “Ceballos” and from the construction of an interceptor concrete canal for the landfill, for the filling of another site that is then left with a better resistance capacity. Waste, is managed by third agencies that follow sustainability rules for environmental impact, and the material is separated into recycling cans. The separation and gathering places for the reuse of materials is in order to accomplish synergistic opportunities utilized by other partners.</p> <p><u>Source:</u>          _ Contecar, Presentación A La Comunidad De Las Obras Del Sector Norte. (2013), 1-16.          _ O. Vecino A. Tatis, Monitoreo de emisiones atmosféricas y material particulado (Sistema de Gestión Ambiental, 2014), 1-19.          _ Jaime Torres, Mantenimiento de Redes Hidrosanitarias (2014), 4-6.          _ Contecar, Puerto de Cartagena, and Dirección de Ingeniería y Proyectos - Superintendencia de Mantenimiento de Equipos Portuarios, Ahorro energético, 1.</p> <p><u>RECOMMENDATIONS</u></p>

		<p>Integrate nearby facilities that could recycle what is left from the operations. The container structures have proven to be very attractive for architecture and housing developments. You could make housing for the surrounding communities with the containers left and create new dynamics in the port. For waste, see if you can manage to create new synergies with enterprises who can profit from the surplus, and you can even make an alliance with a local university to develop new technologies to create new materials out of the recycling processes and even manage to create a zero waste network to make the project sustainable.</p>
<p><b>LD2.2 Improve Infrastructure Integration</b></p>	<p>13</p>	<p><b>Conserving</b></p> <p>The project has ongoing plans to improve infrastructure integration with the surrounding communities and within the existing port structure. The expansion is integrating the old port to the larger context and is foreseeing a better integration in different scales. In a community level, CONTECAR is constructing canals in surrounding neighborhoods to avoid flooding and to amend the fluvial water runoff. This also helps in the public health sector by avoiding backwaters that create sickness and attract rodents. Meetings with the community are held to listen to their needs and to keep them aware of the developments. The construction of the canal is constantly inspected for environmental control and hydraulic consultants did the research when the plans were made. Furthermore, lighting will be installed in the surrounding area for better security and an alternative road is being built for the container trucks in order to avoid traffic jams that affect the surrounding communities.</p> <p>Likewise, on a larger scale, the project’s goal is to integrate with other ports and marine structures in other countries due to its privileged location on the Atlantic ocean. The expansion of the Panama canal is likely to have a great impact on the CONTECAR terminal, and the security regulations of the port are developed in such a way that there is a better integration with the United States market.</p> <p><u>Source:</u>          _Contecar, Presentación A La Comunidad De Las Obras Del Sector Norte. (2013), 1-16.          _Fotografía canal veinte de julio.          _Sociedad Portuaria Regional de Cartagena, Revista Pórtico: 20 años de cambio (Bogotá: Editorial Semana, 2013), 1-164.          _Contecar, Puerto de Cartagena, and Dirección de Ingeniería y Proyectos - Superintendencia de Mantenimiento de Equipos Portuarios, Ahorro energético, 1-6.          _Contecar, Centro de Distribución Internacional de Contecar, 1-4.</p> <p><b>RECOMMENDATIONS</b></p> <p>The magnitude of the project makes it difficult to integrate with the human scale and consider how people inhabit and move in and around the area. Adding pedestrian and bike roads that connect the project to the city and surrounding communities, could improve the transportation infrastructure. They can integrate people to the project by making viewpoints of the port, walkable trails, and better urban conditions in the surrounding communities. They should also plan ahead for the integration of the urban surroundings and consider how the expansion of the city will affect the project or viceversa.</p>
<p><b>LD3.1 Plan For Long-Term Monitoring &amp; Maintenance</b></p>	<p>10</p>	<p><b>Conserving</b></p> <p>The port is constantly planning ahead for long-term monitoring and has enacted proper maintenance of the port structure. It has implemented an IBM system called MAXIMO for the management of fixed assets. Frequently, subcontracting is carried out by CONTECAR for the maintenance of the installations and machinery, as well as maintenance for the dredging and the equipment used for this purpose, for plumbing networks, waste management, water treatment, and other processes that need constant maintenance. Likewise, a sustainability plan is also implemented, to make proper use of the resources.</p> <p><u>Source:</u>          _Contecar and Puerto de Cartagena, Plan de Mantenimiento (2013), 1-36.          _Ing. Ricardo Alberto Rosero Cardona, Gestión Ambiental y Servicios Generales (2014), 1-4.          _Jaime Torres, Mantenimiento de Redes Hidrosanitarias (2014), 1-17.          _Félix González and Orlando Vecino, Control ambiental de dragado (Sistema de Gestión Ambiental, 2014), 1-23.</p>



		<p>_SGA. Planificación DEL SGA, 1-2.</p> <p><u>RECOMMENDATIONS</u> Keep the maintenance up to date with the current environmental regulations and if chemicals are needed, they should revise the toxicity maintenance procedure and consider how to diminish their use.</p>
LD3.2 Address Conflicting Regulations & Policies	8	<p><b>Conserving</b></p> <p>The project follows the existing regulations and policies, willingly ensuing sustainability standards and looking towards the future of the port. One of the conflicting regulations they have found is that until recent years the authorities inspecting the shipping containers for exterior commerce, including agencies like the DIAN, anti-narcotic police, ICA, and INVIMA, proceeded independently. This resulted in containers being detained longer and sometimes transported back and forth from the inspection zone before finally shipping. This increased the costs to the importer/exporter and negatively impacted the productivity in the port, added to the pollution, carbon, energy, that was being wasted. Therefore, the creation of a shared information system was developed by the Ministry of Commerce with the help of IFC (International Finance Corporation) that allows shared access to the inspection procedures. In consequence, this has changed a whole system of bureaucracy regulations that permits transparency.</p> <p>Additionally, with the help of the USTDA (United States Trade and Development Agency) another project to create an inspection zone for both the SPRC Manga and CONTECAR terminals is under development. Thanks to this project the norms to make the new inspection zone were developed with consulting agencies like Sandler &amp; Travis and the Colombian governmental authorities. This projects avoids the piling of containers, the displacement of the containers to the inspection zone, lowers costs and reduces energy consumption. All the authorities are committed to improve the tools that allow this to happen.</p> <p><u>Source:</u> _INCO, Contrato de concesión portuaria No. 003 de 2008 suscrito entre el Instituto Nacional de Concesiones – INCO y la Sociedad Terminal de Contenedores de Cartagena S.A. Contecar (Instituto Nacional de Concesiones: República de Colombia, 2008), 2. _Gomez Cajiao, Certificación de normas técnicas y vida útil (2014), 1-2.</p> <p><u>RECOMMENDATIONS</u> Continue to monitor law and regulations to look for any laws that may conflict with any sustainable practices.</p>
LD3.3 Extend Useful Life	6	<p><b>Superior</b></p> <p>The project is an expansion of the already existing port of the container terminal in Cartagena. Therefore it will have an extended useful life as a port once the project is completed. For this reason, the project has not thought about flexibility of uses in the site's future. The contract shows that the project is expected to have a longer life than that of its concession (30 year concession and 50 year life). They are expecting to keep expanding the port and renewing the contract because it is such a large project that it would be difficult to move it somewhere else. The structures can be dismantled and taken somewhere else in case of an end to port activity, and the materials may be reused. The large esplanade may easily change uses in the future.</p> <p><u>Source:</u> _ANDI Asociación Nacional de Empresarios de Colombia, Proceso de Formulación del Plan de Ordenamiento (complejo y con muchas instancias) (Cartagena, 2014), 1-90. _INCO, Contrato de concesión portuaria No. 003 de 2008 suscrito entre el Instituto Nacional de Concesiones – INCO y la Sociedad Terminal de Contenedores de Cartagena S.A. Contecar (Instituto Nacional de Concesiones: República de Colombia, 2008), 1-30.</p> <p><u>RECOMMENDATIONS</u> They should try to plan ahead for different uses that can be applied to the port after it is not useful anymore; technology change so rapidly that it is conceivable ports will no longer be</p>

		needed someday. Also consider how, with sea level rise, the port maybe be affected the port in the next decade.
<b>LD0.0 Innovate Or Exceed Credit Requirements</b>		N/A
	<b>80</b>	

<b>CATEGORY II: CLIMATE AND ENVIRONMENT</b>		
<b>RESOURCE ALLOCATION</b>		
	<b>Score</b>	<b>EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA</b>
<b>RA1.1 Reduce Net Embodied Energy</b>	<b>0</b>	<b>No score</b>
		To reduce the net embodied energy, the credit asks for a long-term plan contemplated in advance to reduce the energy that may be consumed in the future of the project. This is done before starting the operations and considers the energy associated with the extraction, processing, manufacturing, and transport of materials and components. It is also done to reduce the need for maintenance and repairs, using the natural resources appropriately so that during the lifespan of the project the use of materials is considerably reduced. Additionally, the credit asks for a life cycle assessment to show the reduction in net embodied energy.
		<u>Source:</u> _Contecar and Puerto de Cartagena, <i>Electrificación RTG (Cartagena, 2014)</i> , 1-4. _Contecar and Puerto de Cartagena, <i>Environmental Impacts</i> , 1. _Contecar, Puerto de Cartagena, and Dirección de Ingeniería y Proyectos - Superintendencia de Mantenimiento de Equipos Portuarios, <i>Ahorro energético</i> , 2-6.
		<u>RECOMMENDATIONS</u> The project can develop a life cycle assessment, planned in advance, to reduce energy and materials for the expected lifespan of the project. Research other materials and technologies that may allow the reduction of energy consumption.
<b>RA1.2 Support Sustainable Procurement Practices</b>	<b>0</b>	<b>No score</b>
		To support sustainable practices, the project aims to obtain materials and equipment from suppliers who meet certain requirements. However, the percentage of materials obtained through sustainable practice has not been provided. According to the marketing strategies, suppliers have priority if they have sustainable practices; the soaps and detergents, for example, must be biodegradable. Switching the RTG cranes from fossil fueled electrical power is another example of sustainable practices, as are the LED luminaires and tubes.
		<u>Source:</u> _Quimecca, <i>Ficha técnica jabón líquido para manos Bañol (2011)</i> , 1-8. _Contecar, <i>Proceso Gestión de Compras de Insumos y materiales</i> , 1-4. _Contecar and Puerto de Cartagena, <i>Electrificación RTG (Cartagena, 2014)</i> , 1-4.
		<u>RECOMMENDATIONS</u> To support sustainable procurement practices, find suppliers that use new technologies that replace conventional materials with sustainable ones, like substituting plywood with bamboo panels in the container floors. The project can explore new sustainable technologies that are being developed in Colombia and determine how to integrate them into the project.
<b>RA1.3 Used Recycled Materials</b>	<b>0</b>	<b>No score</b>
		In terms of using recycled materials, some of the project’s infrastructure was designed to be dismantled and reused somewhere else. Additionally, some of the materials that may be technically recycled and have been previously used in other projects are planned to have priority of use. However, the percentage of recycled materials is not present in the documentation.
		<u>Source:</u> _Contecar, <i>Presentación A La Comunidad De Las Obras Del Sector Norte</i> . (2013), 1-16. _Orlando Vecino, <i>Registro del Transporte, Tratamiento y Disposición final de los residuos (Gestión Ambiental, 2014)</i> , 15. _Ing. Ricardo Alberto Rosero Cardona, <i>Traslado CDI Patio Vehicular (2014)</i> , 1-3.

		<p><b>RECOMMENDATIONS</b></p> <p>Composting the organic waste produced in the facilities could be used for the maintenance of the green zones. Additionally, the containers and other wood materials are very easily recycled for furniture. New offices and other structures in the project could contemplate the use of such materials. The project can also have an inventory of existing materials or structures that have the potential to be reclaimed and recycled such as containers, pallets, boxes, etc. The materials should be listed by the quantity in weight or volume.</p>
RA1.4 Use Regional Materials	0	<p><b>No score</b></p> <p>The use of regional materials is a priority for the project. These local suppliers are expected to follow environmental law and requirements needed for the exploitation of such materials. However, the construction of the project needs materials such as steel and other finishing materials that are not specified in the project, and the total percentage of regional materials used is not specified.</p> <p><u>Source:</u> Ingeominas, Permisos minero ambientales, 1-107.</p> <p><b>RECOMMENDATIONS</b></p> <p>For the interiors, there are local enterprises that produce good and durable finishes; the project should prioritize these for the construction of the offices. Furniture and other decorative items can be obtained from local artisans, or manufacturers that follow the requirements. The project should create an inventory of materials, plants, aggregates, and soils used for construction that meet the specific criteria. The extraction of soils and aggregates must not exceed a distance of 50 miles, while if any plants are used at the facilities they should be sourced from within 250 miles, and other manufactured materials within 500 miles.</p>
RA1.5 Divert Waste From Landfills	0	<p><b>No score</b></p> <p>To reduce waste and divert waste from landfills, the project tries to use all of the excavation material for terrain stability at other sites prior to their development. There is also a selection process in which certain suitable materials from the building sites are reused for building. Additionally, all of the other waste is separated for recycling within the facilities and they either go to the city public services or to third parties who are in charge of the final disposal of the litter. The materials and amounts of waste generated and recycled are documented by the employees. However, the total percentage of waste that is diverted from landfills is not specified in the documentation.</p> <p><u>Source:</u> _Contecar, Presentación A La Comunidad De Las Obras Del Sector Norte. (2013), 1-16. _Orlando Vecino, Generación y Transportes de residuos solidos (Gestión Ambiental, 2014), 1-26. _Orlando Vecino, Registro del Transporte, Tratamiento y Disposición final de los residuos (Gestión Ambiental, 2014), 1-20. _Gestión Ambiental, Incineración de Residuos Solidos (2014), 1-16. _Terminal de Contenedores de Cartagena S.A., Anexo No. 5: Copia de los permisos ambientales de la escombrera utilizada por contecar para el retiro de los residuos sólidos y los volúmenes dispuestos en la misma (Cartagena, 2012), 1-16.</p> <p><b>RECOMMENDATIONS</b></p> <p>The project should document the volume of waste, the types, and the methods used to reduce each type. Implement strategies for systemic waste reduction such as education for the workers. The project could pursue technologies like nitrogen production from waste and composting. Likewise, they can help third parties develop such objectives, to produce good quality organic material for gardening and agriculture. This would help reduce the contamination of surrounding waters and reduce landfilling.</p>
RA1.6 Reduce Excavated Materials Taken Off Site	4	<p><b>Enhanced</b></p> <p>To minimize the movement of excavated materials and reduce transportation needs, all of the material from the excavations at the site is transferred to other adjacent zones for the stabilization of terrain for later developments. All of the material that comes to the port is from quarries that have all of the necessary licences for exploitation, but they come from different zones so it is not clear whether they come from nearby places. Moreover, 70% of the material</p>

		<p>from dredging was suitable and used for filling and stabilizing the new site's terrain.</p> <p><u>Source:</u>                  _Contecar and Puerto de Cartagena, Patios Contecar (2013), 1-4.                  _Ingeominas, Permisos minero ambientales, 1-107.                  _Contecar, "Capítulo 8. Plan de manejo ambiental" in Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006), 34, 47-50.</p> <p><b>RECOMMENDATIONS</b>                  The project should include documentation to list the estimations for the excavated and dredged materials. There are rubble crusher machines that can be used for recycling instead of buying raw material that has to be transported from other areas. It is also possible to use the rubble produced in nearby city sites or to encourage a new enterprise that can make this material used in the project.</p>
<b>RA1.7 Provide for Deconstruction &amp; Recycling</b>	<b>0</b>	<p><b>No score</b></p> <p>To encourage future recycling and efficiency in the deconstruction of the project at the end of its life, the metal structures are easily dismantled and it is possible to move them if they need to go somewhere else or be recycled. However, the percentages of reusable infrastructure is not present in the documentation.</p> <p><u>Source:</u>                  _Contecar and Puerto de Cartagena, Pavimentación Patios Contecar (2013), 1-4.                  _Contecar and Puerto de Cartagena, Centro de Distribución No.1 Fase 2 (2013), 1-5.                  _Orlando Vecino, Registro del Transporte, Tratamiento y Disposición final de los residuos (Gestión Ambiental, 2014), 1-20.                  _Orlando Vecino, Generación y Transportes de residuos solidos (Gestión Ambiental, 2014), 1-26.</p> <p><b>RECOMMENDATIONS</b>                  Make an inventory of the materials that may be used in the future for different purposes, including the structures that are movable. Additionally, keep track of the providers and materials that are recyclable and avoid non-recyclable materials. Provide the design documents for the disassembly of the structures and reusable infrastructure.</p>
<b>RA2.1 Reduce Energy Consumption</b>	<b>0</b>	<p><b>No score</b></p> <p>Energy consumption is being reduced through the use of LED technology and cleaner energies, but the percentage of reduction is not specified. The use of electric RTG instead of fossil fuels, architecture designed to save energy with natural illumination and ventilation, an efficient use of energy, and the replacement of mercury lighting for sodium are all examples. There is also a future pilot plan for a sustainable solar plant. They have incorporated LED tubes and luminaries for interior lighting, in addition to a timed control system and poles that allow time gaps to adapt to the lighting necessities of the hour. Furthermore, there is a monthly calculation of energy consumption.</p> <p>Largely due to the electrification of RTG cranes, 212.538 kg of CO2 per year are avoided. The project also plans to use LED lights fed by solar energy. The replacement of interior and exterior lighting with LED tubes and luminaries, in addition to a timed control system and poles that allow time gaps to adapt to the lighting necessities of the horary. Furthermore, there is a monthly control of the electric energy consumption and by the electrification of RTG cranes, the energy is changed from fossil fuels to electrical energy and prevents CO2 in the atmosphere.</p> <p><u>Source:</u>                  _Contecar, Puerto de Cartagena, and Dirección de Ingeniería y Proyectos - Superintendencia de Mantenimiento de Equipos Portuarios, Ahorro energético, 1-6.                  _Contecar and Puerto de Cartagena, Características sistema paneles solares CONTECAR, 1.                  _Contecar, Actividades Ambientales 2013. (Cartagena, 2013), 9.</p> <p><b>RECOMMENDATIONS</b></p>

		Keep reports of the meetings discussing the energy reduction strategies considered by the project team. The project could have an inventory of energy saving methods to document the saving strategies. Submit calculations for the estimated annual consumption of energy and the percentage of reduction after the efforts made. Additionally, keep a consistent unit of energy to support the documentation.
RA2.2 Use Renewable Energy	0	<b>No score</b> The use of renewable energy sources, such as eolic and solar energy, has been studied but has not been implemented. Therefore the project is unable to meet the Envision requirements of using at least 10% renewable energy.  <u>Source:</u> _Contecar and Puerto de Cartagena, Características sistema paneles solares CONTECAR, 1.
		<u>RECOMMENDATIONS</u> Consider using sources of renewable energy such as eolic energy and solar energy in the surrounding areas. Due to the strong maritime wind currents in Cartagena, this kind of energy may be easily utilized for such purposes. Even though most electricity in Colombia comes from hydropower and is relatively cheap, the project does not consider any other sources. Hydroelectric plants often have a huge impact on the environment so the project should consider other types of renewable energy. Additionally, solar power could be very effective in Cartagena due to the excellent amount of sunlight during the entire year. The project should strive to have other electrical resources in case of an electrical blackout.
RA 2.3 Commission & Monitor Energy Systems	3	<b>Enhanced</b> The project has engaged in commissioning the monitoring of machinery and project's energy systems to Bureau Veritas to maintain the performance of the equipment. Additionally, they have training simulators for maintenance that according to the ROI simulator, decrease energy use.  <u>Source:</u> _ABB CRANE SYSTEMS, ROI Simulator vs. Real Crane (2011), 1-6. _Contecar, Certificado de inspección, (Cartagena, 2014), 1-8.
		<u>RECOMMENDATIONS</u> Prepare an inventory of the type of equipment that is monitored and provide information about to what extent the trained workers can monitor the energy systems. Establish a long term monitoring schedule.
RA3.1 Protect Fresh Water Availability	2	<b>Improved</b> To protect fresh water and to reduce the negative impact on the availability of this resource, the project has an environmental management plan that includes water protection. The project is in an urban area and uses city public services to get fresh water; however, the port uses less than 5% of the capacity available in the aqueduct system. The Contecar management plan manages residual waters during operation by collecting and treating industrial residual waters. Industrial residues are minimized with an adequate ditch maintenance system and a fuel dispenser. Additionally, there is periodic upkeep of the solid and grease traps, weekly of maintenance of the grease trap, and a daily survey on the collection grids. The greases and solid wastes are removed manually, the tanks and walls are cleaned with biodegradable soap, and the sludge accumulated in the bottom is also cleaned up. The water retained after the entire process goes to a final receptor, with careful monitoring to avoid mud transference. Furthermore, there is monitoring for the physiochemical characteristics to evaluate the quality of the treatment by tracing caudal, SST, dissolved oxygen, PH, greases and oils. For the liquid waste, the plan aims to avoid any discharge into the ocean.  <u>Source:</u> _Contecar, Caracterizacion Ambiental del Area de Influencia del Proyecto, 1-46. _Paola Meñaca, Plano, 1. _Aguas de Cartagena, Reporte de Sostenibilidad 2013 (2013), 1-2. _Contecar, "Capítulo 8. Plan de manejo ambiental" in Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006), 22.

		<p>_Jaime Torres, Mantenimiento a los depósitos de Agua Potable (Gestión Ambiental, 2014), 1-14.</p> <p><b>RECOMMENDATIONS</b> To improve the freshwater availability the project could recycle water. There are treatment plants that can clean grey water for several purposes. The project could then use the recycled water for toilets, gardens and washing trucks and containers. Perform calculations of water requirements and avoid discharging untreated water into the bay.</p>
<b>RA3.2 Reduce Potable Water Consumption</b>	<b>4</b>	<p><b>Improved</b> To reduce potable water consumption the project utilizes tanks to store rainwater for gardening and to put out fires. The use of a 500 cubic meter water tank to store rain water has reduced potable water consumption by 25%. Additionally, there are seven potable water storage tanks with a total capacity of 1200 cubic meters. This system also has activated carbon filters and six pumps.</p> <p><b>Source:</b> _Ing William H Velásquez R, PUNTO RA 3.2 Control del consumo de agua potable en las diferentes áreas de CONTECAR S.A. (2014), 1-2. _Paola Meñaca, Plano, 1. _Jaime Torres, Mantenimiento a los depósitos de Agua Potable (Gestión Ambiental, 2014), 3.</p> <p><b>RECOMMENDATIONS</b> On the one hand, by filtering rainwater you can also use it for other purposes such as toilet water. On the other hand, the nitrogen and other elements in grey waters are useful for composting and fertilizers. Additionally, make an inventory of the measures taken to reduce potable water consumption during operations and incorporate the strategies in the design processes.</p>
<b>RA3.3 Monitor Water Systems</b>	<b>3</b>	<p><b>Enhanced</b> The aqueduct of Cartagena in charge of provisioning water monitors the water supply. Additionally, the port has information systems to identify and monitor the network. The Chief of Environmental Management and General Services is responsible for the supervision and maintenance of the hydro-sanitary networks as well as the potable water systems. Preventive and corrective monitoring is executed by external contractors. Furthermore, monitoring of the pumps is conducted every three days to clean the floors and tubes, and each year the tanks are cleaned on the inside, repaired and painted.</p> <p><b>Source:</b> _Agua de Cartagena, Acta de Visita, 1-5. _Paola Meñaca, Plano, 1. _Jaime Torres, Mantenimiento a los depósitos de Agua Potable (Gestión Ambiental, 2014), 3-5. _Jaime Torres, Mantenimiento de Redes Hidrosanitarias (Gestión Ambiental, 2014), 3-7.</p> <p><b>RECOMMENDATIONS</b> The project should conduct its own monitoring of the water systems coming from the municipal supply and have specialized workers to protect them. Keep record of the external monitoring to ensure the performance of the systems.</p>
<b>RA 0.0 Innovate Or Exceed Credit Requirements</b>		N/A
	<b>24</b>	

NATURAL WORLD		
	<b>Score</b>	<b>EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA</b>
<b>NW1.1 Preserve</b>	<b>14</b>	<b>Conserving</b>

<p><b>Prime Habitat</b></p>		<p>Due to the nature of the project, no prime habitat was identified on this area, therefore not destroyed. They carried on a study to detect conservation zones including natural islands around the project; some natural habitat more than 100m away was found and the project does not plan to intervene. The site of the port was previously developed, so according to the Zoning Plan it is an industrial port zone. Nonetheless, the project has taken into account the impact on the terrain during construction and operation. The project site is among other port industries where Contecar cannot control the physico-chemical properties of the ground (such as the sediments in the Dique Canal). However, the project has done some reforestation with mangle jungles and is planning the urban development in the area to have a positive impact on the adjacent zones.</p> <p><u>Source:</u>          _Contecar and Aqua &amp; Terra, <i>Estudio de impacto ambiental para la construcción y operación de la terminal portuaria multipropósito de Albornoz (Capítulo 4 - Caracterización Del Componente Biótico)</i>, 1-90.          _Contecar, “Capítulo 8. Plan de manejo ambiental” in <i>Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006)</i>, 1-76.          _Contecar, <i>Actividades Ambientales 2013. (Cartagena, 2013)</i>, 1-26.</p> <p><u>RECOMMENDATIONS</u>  <i>To improve the preservation of the natural habitat, the project could make a restorative plan on which the natural conditions that were lost with the port-industrial zone are restored. The project could increase the area of prime habitat and connectivity of marine and terrestrial habitats. They could also participate with other stakeholders for the preservation of native species.</i></p>
<p><b>NW1.2 Preserve Wetlands and Surface Water</b></p>	<p>0</p>	<p><b>No score</b></p> <p>No information has been provided about terrestrial water bodies. However, to preserve wetlands and surface water, the Contecar project has designated 10.8% of the terrain as green space for the protection of the canals, which represents 88,924 square meters of green space. The project is not located in an environmentally vulnerable site or near any wetlands. However, this credit is not applicable to the port because there is no buffer zone from the shoreline due to the port’s operations.</p> <p><u>Source:</u>          _Contecar, “Capítulo 8. Plan de manejo ambiental” in <i>Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006)</i>, 1-76.          _“Plan de Ordenamiento Territorial del Distrito Turístico y Cultural de Cartagena de Indias” in <i>Decreto No 0977 de 2001</i>          _“Por medio del cual se adopta el Plan de Ordenamiento Territorial del Distrito Turístico y Cultural de Cartagena de Indias” (Cartagena, 2001), 1-186.          _Arquitectos e Ingenieros Asociados S.A., <i>Plan Maestro, Sistemas de movilidad peatonal interna</i>, 11.</p> <p><u>RECOMMENDATIONS</u>  <i>To preserve the conditions of wetlands the project should avoid harmful development and create buffer zones in the wetlands. The ideal distance would be 300 feet. They may also create a restoration plan to protect the water bodies and the sediments of the canals, by planting native species that help with this problem.</i></p>
<p><b>NW1.3 Preserve Prime Farmland</b></p>	<p>12</p>	<p><b>Conserving</b></p> <p>The project is located in an urban area and therefore there is no prime farmland nearby to preserve. According to the Land Use Plan the project is located in an industrial port zone.</p> <p><u>Source:</u>          _“Plan de Ordenamiento Territorial del Distrito Turístico y Cultural de Cartagena de Indias” in <i>Decreto No 0977 de 2001</i></p>

		<p>“Por medio del cual se adopta el Plan de Ordenamiento Territorial del Distrito Turístico y Cultural de Cartagena de Indias” (Cartagena, 2001)</p> <p>—Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, <i>Impacto económico y social del puerto de Cartagena</i>. (Bogotá: Fedesarrollo, 2014), 1-88.</p> <p><b>RECOMMENDATIONS</b></p> <p>The project may create some gardens in the green spaces to provide food for the community. The fertilizers should be organic to protect the water, but they can be created with the composting of the port. Additionally, the project could also help restore the harms done to the fish habitat and help the community establish a safe fishing area near the port.</p> <p>—</p>
<b>NW1.4 Avoid Adverse Geology</b>	2	<p><b>Enhanced</b></p> <p>The project uses sound risk management in avoiding adverse geology. To avoid adverse geology and instability in the zone, the soft terrains were improved by overloading processes. Natural risks have been identified such as lightning, storms, floods, earthquakes and tsunamis. To prevent lightning dangers, the SPRC has 17 lightning rods and Contecar has 7. In terms of possible seismic activity, there is a policy restricting the permitted height of the containers.</p> <p><b>Source:</b></p> <p>—Aqua &amp; Terra, “Mapa De Geomorfología – Bahía Albornoz” in <i>Estudio de impacto ambiental para la construcción y operación de la terminal portuaria multipropósito de albornoz (2012)</i>, 1.</p> <p>—Contecar and Puerto de Cartagena, <i>Pavimentación Patios Contecar (2013)</i>, 1-14.</p> <p>—José Barrios González. <i>Informe de inspección</i>. (Cartagena: Willis, 2013), 1-73.</p> <p><b>RECOMMENDATIONS</b></p> <p>Look for strategies for avoiding damage in case of adverse geology and preventing spills, like adding buffers around the coastline, runoff control, and cleanup plans. Additionally, create plans to reduce risk and clean up in the case of an emergency.</p> <p>—</p>
<b>NW1.5 Preserve Floodplain Functions</b>	5	<p><b>Enhanced</b></p> <p>To preserve floodplain functions, the infrastructure of the canals was modified. The drainage of the surrounding areas was improved by being channeled in order to floods. Due to the pre-existing contamination of the floodplains, the marine life has already been highly affected. Studies have reported anoxia, or complete lack of oxygen in most of the marine surroundings, and high levels of pollutants like mercury. Therefore, under such contaminated conditions, dredging processes of the maintenance and deepening of the canal will eventually improve the marine habitat. This also benefits the zone because it avoids build-up of pollutants and stimulates better habitats for biotic species. Additionally, some mangrove zones are preserved for floodplain functions.</p> <p><b>Source:</b></p> <p>—Contecar, “Capítulo 8. Plan de manejo ambiental” in <i>Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006)</i>, 1-76.</p> <p>—Contecar, <i>Actividades Ambientales 2013</i>. (Cartagena, 2013), 12.</p> <p>—Contecar and Puerto de Cartagena, <i>SGI Sistema de Gestión Integrado</i>. (Cartagena, 2010), 17-19.</p> <p>—Terminal De Contenedores De Cartagena, <i>Manual del Plan de Emergencias (2003)</i>, 1-65.</p> <p>—Contecar, <i>Presentación A La Comunidad De Las Obras Del Sector Norte</i>. (2013), 1-16.</p> <p>—Canal veinte de Julio. <i>Fotografía</i>, 1.</p> <p>—Félix González and Orlando Vecino, <i>Control ambiental de dragado (Sistema de Gestión Ambiental, 2014)</i>, 4-7.</p> <p>—EPA, <i>Resolución No. 478 “Por medio de la cual se modifica una Licencia Ambiental y se dictan otras disposiciones”</i> (Cartagena), 1.</p> <p>—Contecar and Aqua &amp; Terra, <i>Estudio de impacto ambiental para la construcción y operación de la terminal portuaria multipropósito de Albornoz (Capítulo 4 - Caracterización Del Componente Biótico)</i>, 1-90.</p> <p>—Anoxia, Taken from: <a href="http://definicion.de/anoxia/">http://definicion.de/anoxia/</a></p>



		<p><b>RECOMMENDATIONS</b>  <i>The project should be located taking into account a 100 year floodplain. Additionally, the project should have an emergency plan in case of flooding and a plan to mitigate the sediment in the bay to improve aquatic habitat connectivity. See if there is any current damage from flooding and modify or remove this infrastructure. Take measures to limit impervious surfaces, enhance the vegetation of the surrounding floodplains, and demarcate soil protection zones.</i></p> <p>-</p>
<p><b>NW1.6 Avoid Unsuitable Development on Steep Slopes</b></p>	<p>6</p>	<p><b>Conserving</b>                      The project was not developed on steep slopes. The project is located on Cartagena’s coastline and therefore is located on flat terrain. Furthermore, the project is located on an earlier developed terrain that was already suitable for port logistics. It also underwent protection processes to avoid marine erosion.</p> <p><u>Source:</u>                      _Paola Meñaca, Plano, 1.</p>
		<p><b>RECOMMENDATIONS</b>                      Not applicable.</p> <p>-</p>
<p><b>NW1.7 Preserve Greenfields</b></p>	<p>10</p>	<p><b>Superior</b>                      The project is on a previously developed site, and at least 75% of the project was located in a greyfield site. The Contecar site was acquired by the SPRC in 2005. The existing port infrastructure had some failings and therefore they invested in enhancing the port to allow operation under high quality standards. The site was previously contaminated, so the port has made some efforts to remove the sediment from the bay and surrounding canals to improve environmental conditions.</p> <p><u>Source:</u>                      _“Plan de Ordenamiento Territorial del Distrito Turístico y Cultural de Cartagena de Indias” in Decreto No 0977 de 2001                      _“Por medio del cual se adopta el Plan de Ordenamiento Territorial del Distrito Turístico y Cultural de Cartagena de Indias” (Cartagena, 2001)                      _Contecar, “Capítulo 8. Plan de manejo ambiental” in Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006), 1-76.                      _Aqua &amp; Terra, “Mapa De Geomorfología – Bahía Albornoz” in Estudio de impacto ambiental para la construcción y operación de la terminal portuaria multipropósito de albornoz (2012), 1.</p>
		<p><b>RECOMMENDATIONS</b>                      The project should document whether there are any contaminated areas near the dredged sites for them to repair. Continue to remediate the bay and surrounding water bodies until the project reaches a high environmental quality standard.</p> <p>-</p>
<p><b>NW2.1 Manage Stormwater</b></p>	<p>4</p>	<p><b>Enhanced</b>                      The project has improved infrastructure for the collection of rainwater that allows a better management of stormwater. With a capacity is of 500 cubic meters, rainwater is collected to subsequent use for gardens. Additionally, the project constantly monitors the water quality of the bay. A qualified contractor carries out microbiological evaluations of the potable water used in Cartagena. There are also sand traps located near the project to prevent sediments from getting into the bay.</p>
		<p><u>Source:</u>                      _Contecar, “Capítulo 8. Plan de manejo ambiental” in Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006), 1-76.                      _Jaime Torres – A. Tatis R. Rosero, Estudio microbiológico del agua potable. (Gestión Ambiental, 2014), 1-14.                      _Miguel Torres Benedetti, Programa de Vigilancia Bacteriológica de Alimentos (2014), 1-3.                      _ICA, Estado de cumplimiento de los programas que conforman el plan de manejo ambiental</p>

		<p>(2006), 1.                  _Arquitectos e Ingenieros Asociados S.A., Plan Maestro, Sistemas de movilidad peatonal interna, 1-32.                  _Paola Meñaca, Plano, 1.                  _Ing William H Velásquez R, PUNTO RA 3.2 Control del consumo de agua potable en las diferentes áreas de CONTECAR S.A. (2014), 1-2.</p> <p><b>RECOMMENDATIONS</b>                  The project should make an effort to increase the storage capacity and document the achievement of target water storage levels. Additionally, any new technologies for the green spaces that filter and absorb water with bacteria or any other techniques, to clean the storm water and avoid contamination.</p>
NW2.2 Reduce Pesticides and Fertilizer Impacts	0	<p><b>No score</b></p> <p>To reduce pesticide and fertilizer use, the project has planted local species that are more resilient to environmental conditions. These native species and grasses will make the landscape of the project more local and will increase the green vegetative areas of the project. However, according to the maintenance procedures for gardens and the control of plagues and rodents in the area, the products used are Basudin, Nuvan, Lorsban, Tamaron K-Othrine, Deltametrina, Solfac, and Durban-Pro among others and for rodents, Musal, Klerat, Racumin, and Rodilon among others. These products are classified as illegal in several countries and represent a risk for toxicity.</p> <p><b>Source:</b>                  _T. Rabat, R. Rosero – A. Tatis, Fumigación y Control de Roedores en las instalaciones (Gestión Ambiental, 2014), 1-17.                  _Arquitectos e Ingenieros Asociados S.A., Plan Maestro, Sistemas de movilidad peatonal interna, 7.</p> <p><b>RECOMMENDATIONS</b>                  The project should try not to use pesticide at all and use physical controls instead of chemicals, which can alter the nutrient levels in surrounding waters. One example is to compost the organic matter and use it as fertilizer in the green areas of the project, which would also reduce landfill waste volumes.</p>
NW2.3 Prevent Surface and Groundwater Contamination	1	<p><b>Improved</b></p> <p>The surface and groundwater contamination prevention effort is focused on avoiding spills and leaks. To prevent surface and groundwater contamination, the project has developed a characterization of the hydrological features and has implemented it through the environmental management plan. There is also an emergency plan that outlines the spillage and leakage risks. In the contracts for civil work there are policies that aim to reduce potential risks that may derive from potentially polluting substances. Additionally, the ground has been paved to avoid groundwater contamination produced by the port operations.</p> <p><b>Source:</b>                  _Terminal De Contenedores De Cartagena, Manual del Plan de Emergencias (2003), 1-65.                  _Contecar, Contrato de Obra (2014), 1-29.                  _Contecar and Puerto de Cartagena, Pavimentación Patios Contecar (2013), 1-4.</p> <p><b>RECOMMENDATIONS</b>                  The project could improve their efforts to reduce hazardous or potentially polluting materials such as pesticide and rodent control chemicals. They could also canalize the waters and take it to filtration and treatment before releasing it back into the water bodies. Be sure to note the complexity of water bodies when designing projects and keep track of long-term surface and groundwater quality through monitoring programs.</p>
NW3.1 Preserve	2	<p><b>Improved</b></p>

<p><b>Species Biodiversity</b></p>		<p>To protect the species biodiversity, the project has identified protected areas inside the area of indirect influence. There have been changes to the canals in the perimeter in order to improve the conditions of the nearby fauna. The dredging operations for maintenance allow the functioning zone of the terminal to be free of contaminating materials produced by sedimentation, thus maintaining ecosystem biodiversity. The project's design has 88,924 square meters of green space with native plants that could also benefit biodiversity. However, the project does not fully restore the connection of habitats and does not easily facilitate the movement of species.</p> <p><u>Source:</u>                  _Contecar, <i>Caracterización Ambiental del Área de Influencia del Proyecto</i>, 1-46.                  _Contecar, "Capítulo 8. Plan de manejo ambiental" in <i>Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006)</i>, 1-76.</p> <p><u>RECOMMENDATIONS</u>                  Try to create and restore habitat in the site to improve wildlife corridors as much as possible. Document and map the migration of birds and fish to bring back animal life to the area.</p>
<p><b>NW 3.2 Control Invasive Species</b></p>	<p>5</p>	<p><b>Superior</b></p> <p>The Contecar terminal grows endogenous plants, which limit the need for pesticides and fertilizers. By the end of the project, the landscape of the terminal will have green spaces with species native to the Caribbean coast of Colombia. This type of control is a locally appropriate and hands-off strategy for invasive species control.</p> <p><u>Source:</u>                  _T. Rabat, R. Rosero – A. Tatis, <i>Fumigación y Control de Roedores en las instalaciones (Gestión Ambiental, 2014)</i>, 1-17.                  _Arquitectos e Ingenieros Asociados S.A., <i>Plan Maestro, Sistemas de movilidad peatonal interna</i>, 1-32.</p> <p><u>RECOMMENDATIONS</u>                  Because it is a port, there is a greater risk of new invasive species coming from elsewhere. Have a control center when the containers are opened to control what arrives in the port. Additionally, the project should have a management plan that helps eliminate invasive species on site.</p>
<p><b>NW3.3 Restore Disturbed Soils</b></p>	<p>0</p>	<p><b>No score</b></p> <p>The project's estimate of disturbed soil recovery is more than 10% of the total area of the project. The project uses dredging material for the stabilization of the site's terrain. However, this estimate is not supported by evidence and the ecological and hydrological functions of the project are not fully restored.</p> <p><u>Source:</u>                  _O. Vecino and Jaime Torres R. Rosero. <i>Mantenimiento de Jardines y Zonas Verdes. (Gestión Ambiental, 2014)</i>, 1-18.                  _Arquitectos e Ingenieros Asociados S.A., <i>Plan Maestro, Sistemas de movilidad peatonal interna</i>, 1-32</p> <p><u>RECOMMENDATIONS</u>                  Document soil restoration efforts of both the disturbed and restored areas. Soils should also be reused for their original functions or comparable to their original function in order to bring back their ecological and hydrological characteristics.</p>
<p><b>NW3.4 Maintain wetland and surface water functions.</b></p>	<p>15</p>	<p><b>Conserving</b></p> <p>To maintain wetland and surface water functions, the four ecological functions (water quality, hydrological connections, sediment transport, and natural habitat) are maintained. The project is being built on a previously developed urban area where the canals and water bodies were contaminated. However, maintenance and updates have been carried out on the canals that pass through the project; the shedding of solid residues will be eliminated, improving the quality of water on the canals and in Cartagena Bay. The protected areas inside the influence zone have</p>

		<p>been identified and protected. The project maintains efforts to preserve hydrological connections, sediment transport, natural habitat, water quality, and ecosystem function. The project has deepened the surrounding canals, allowing for aquatic species to better navigate the surrounding waters. The water quality is being restored through the reuse of rainwater and the emergency management plan, but it was already in a critical condition. The project and surrounding areas were already developed, so they have made efforts to restore the ecosystem functions that remained.</p> <p><u>Source:</u>                  _Contecar and Puerto de Cartagena, <i>Estabilización Orilla Canal Ceballos (2014)</i>, 1-8.                  Canal veinte de Julio, <i>Fotografía</i>, 1.                  _SGS Colombia, <i>Programa de Caracterización de Agua Residual Industrial. (Cartagena: Environmental Services, 2013)</i>, 1-26.                  _Contecar, <i>Caracterización Ambiental del Área de Influencia del Proyecto</i>, 1-46.</p> <p><u>RECOMMENDATIONS</u>                  The project has developed a good study about the characterization of species, the habitat and the environmental surroundings; therefore, these efforts to restore the identified ecosystems should be present in the project as a priority. For hydrologic connectivity, maintain frequent cleanups and surveys of both the canals and the bay, and keep them clear from pollutants and sediments. The water quality may be improved by avoiding the use of chemicals and by having a clear channeling of all rainwater.</p>
NW 0.0 Innovate Or Exceed Credit Requirements		N/A
	76	

CLIMATE AND RISK		
	Score	EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA
CR1.1 Reduce Greenhouse Gas Emissions	13	<p><b>Superior</b></p> <p>To reduce greenhouse gas emissions, the project evaluates and controls the generation of emissions. Contecar will implement an evaluation project for electrification of the RTG cranes. The study for the RTG crane conversion from diesel fuel to electric energy shows a 70% reduction in greenhouse gas emissions. However, some of the non-electrified machinery still emit pollutants, and this is not considered in the total life cycle carbon analysis. On the other hand, the air quality inside the port facility is constantly monitored.</p> <p><u>Source:</u>                  _Contecar and Puerto de Cartagena, <i>Electrificación RTG (Cartagena, 2014)</i>, 1-4.                  _Jorge Barrera Villarreal, <i>Informe técnico de estudio de calidad de aire por partículas suspendidas totales (PST), partículas respirables (PM10), gases SOX, NOX y monóxido de carbono (CO) (Barranquilla: Serambiente S.A.S., 2013)</i>, 1-108.                  _O. Vecino A. Tatis, <i>Monitoreo de emisiones atmosféricas y material particulado (Sistema de Gestión Ambiental, 2014)</i>, 1-19.</p> <p><u>RECOMMENDATIONS</u>                  Make a complete study of the life cycle analysis for greenhouse gas emissions. Other methods for the reduction of CO2 emissions will be needed in other areas. The project is currently only considering the RTG cranes, but not other machinery like the indoor transportation buses. Include all emissions in the lifecycle evaluation to avoid omitting information.</p>
		<p><b>No score</b></p> <p>To reduce air pollutant emissions the project has paved all of the roads and uses barrier machinery to maintain the port without waste and dust that may enter the atmosphere. The paving also allows them to move particulate matter from other areas that are generated by the winds in the port. During construction there is control over the petrochemical material accumulated and used in the infrastructure. The port monitors the air quality, verifying that it</p>
CR1.2 Reduce Air Pollutant Emissions	0	

		<p>meets national standards. These studies have to be done in an accredited lab by the environmental authority.</p> <p><u>Source:</u>                  _Jorge Barrera Villarreal, Informe técnico de estudio de calidad de aire por partículas suspendidas totales (PST), partículas respirables (PM10), gases SOX, NOX y monóxido de carbono (CO) (Barranquilla: Serambiente S.A.S., 2013), 1-108.                  _O. Vecino A. Tatis, Monitoreo de emisiones atmosféricas y material particulado (Sistema de Gestión Ambiental, 2014), 1-19.</p> <p><u>RECOMMENDATIONS</u>                  The project should also consider pollutants other than dust, such as ground level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead and other noxious odors. Documentation about the implementation and plans for reduction of these pollutants should be provided. You can also check for the requirements of the CAAQS (California Ambient Air Quality Standards) or SCAQM (South Coast Air Quality Management) to follow air quality standards.</p> <p>-</p>
<b>CR2.1 Assess Climate Threat</b>	<b>0</b>	<p><b>No score</b></p> <p>To assess climate threats the port follows the national and international operational security laws to protect the physical integrity of the workers and the community. The infrastructure is evaluated to see whether it can adapt to climate change and the effects of the winds, but there are no concrete plans for a climate impact assessment and adaptation plan. However, there are certain public health and industrial security processes that allow recovery in case of an emergency, including monitoring with cameras and protection against fire following the the NFPA norm.</p> <p><u>Source:</u>                  _José Barrios González. Informe de inspección. (Cartagena: Willis, 2013), 1-73.</p> <p><u>RECOMMENDATIONS</u>                  Create a plan that identifies the possible climate change risks to design for potential change over the life of the project.</p> <p>-</p>
<b>CR2.2 Avoid Traps And Vulnerabilities</b>	<b>2</b>	<p><b>Improved</b></p> <p>Prior to the development plan an evaluation of risk and vulnerability was carried out in order to find traps that could generate environmental problems for the infrastructure and the surrounding communities. For this reason the environmental management plan was generated and has been approved by the environmental authority. Likewise, to reduce or eliminate flooding risk the project has also developed canals and stabilized the surrounding waters. This allows drainage and avoids possible floods. Nonetheless, there is no evidence of community interaction in conducting an integrated risk assessment.</p> <p><u>Source:</u>                  _José Barrios González. Informe de inspección. (Cartagena: Willis, 2013), 1-73.                  _Contecar, Presentación A La Comunidad De Las Obras Del Sector Norte. (2013), 1-16.                  _Contecar, “Capítulo 8. Plan de manejo ambiental” in Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006), 5, 6, 46, 75.                  _Canal veinte de Julio, Fotografía, 1.                  _Contecar and Puerto de Cartagena, Pavimentación Patios Contecar (2014), 1-9.</p> <p><u>RECOMMENDATIONS</u>                  The project should consider working with the community as a whole to prepare and mitigate threats to infrastructure. This collaboration can result in in more resilient infrastructure prepared to adapt to climate change threats such as sea level rise, increased storm frequency, extended heat waves, etc.</p> <p>-</p>
<b>CR2.3 Prepare For</b>	<b>0</b>	<b>No score</b>

<p><b>Long-Term Adaptability</b></p>		<p>To prepare the project for long-term adaptability, an infrastructure that avoids flooding risks has been developed. The construction of water collectors, the enhancement of the surrounding canals and the implementation of subterranean water tanks allow the collection of rainwater for fire safety and green space irrigation. Additionally, the port makes a constant effort to improve and conserve the ecosystems in the area of influence, protecting the coastline and restoring mangle zones in the Cartagena district.</p> <p><u>Source:</u>                  _Canal veinte de Julio, Fotografía, 1.                  _Contecar and Puerto de Cartagena, Pavimentación Patios Contecar (2014), 1-9.                  _Contecar and Puerto de Cartagena, Estabilización Orilla Canal Ceballos (2014), 1-8.                  _Salazar, Rafael, Plano de red hidráulica general (Contecar, 2012), 1.                  _Paola Meñaca, Plano, 1.                  _Arquitectos e Ingenieros Asociados S.A., Plan Maestro, Sistemas de movilidad peatonal interna, 1-32.                  _Contecar, Actividades Ambientales 2013. (Cartagena, 2013), 1-26.</p> <p><b>RECOMMENDATIONS</b>                  Consider new strategies for managing long-term changes by considering the structural changes needed, the decentralization of systems, the natural system infrastructure, alternative supply options, adaptive capabilities and site selection or adaptation.</p>
<p><b>CR2.4 Prepare For Short-Term Hazards</b></p>	<p>0</p>	<p><b>No score</b></p> <p>To prepare for short-term hazards, the port has developed a risk analysis of possible natural or human perils. However, there is no evidence of a plan for the next 25 years. Nonetheless, the risk analysis allows the project to determine preventive and corrective actions that should be implemented in order to overcome existing dangers and advance the project. Furthermore, the modular infrastructure and the pavement style of the patios allow the port infrastructure to recover with little cost in the case of an event generated in the short-term.</p> <p><u>Source:</u>                  _José Barrios González. Informe de inspección. (Cartagena: Willis, 2013), 1-73.                  _Ing. Ricardo Alberto Rosero Cardona, Traslado CDI Patio Vehicular (2014), 1-3.                  _Contecar and Puerto de Cartagena, Centro de Distribución No.1 Fase 2 (2013), 1-5.                  _Canal veinte de Julio, Fotografía, 1.</p> <p><b>RECOMMENDATIONS</b>                  The project should provide a list of the expected natural hazards, such as wildfires, floods, tornadoes, hurricanes, earthquakes, tsunamis or man-made hazards and explain the strategies to cope with each event. Also consider strategies to restore the environment.</p>
<p><b>CR2.5 Manage Heat Island Effects</b></p>	<p>0</p>	<p><b>No score</b></p> <p>To manage heat island effects, the project sets aside 10% of the site for green spaces and tree plantings. These green spaces are designed to allow the wind currents to pass through, generating a natural difference in temperature in the work areas and the rest of the site. Even though this reduces heat-producing surfaces, the project has not considered the solar reflectance index (SRI) criteria and does not calculate the percentage of reduction in heat. The SRI calculation is intended to identify heated surfaces and reduce the localized accumulation of heat to manage microclimates.</p> <p><u>Source:</u>                  _Arquitectos e Ingenieros Asociados S.A., Plan Maestro, Sistemas de movilidad peatonal interna, 1-32.                  _Contecar, Actividades Ambientales 2013. (Cartagena, 2013), 9, 1-26.</p> <p><b>RECOMMENDATIONS</b>                  Consider the high solar reflectance index (SRI) to reduce localized heat accumulation. Drawings and designs should consider the non-vegetated areas and roofs as places where heat could accumulate, so the material should be chosen according to the SRI to avoid localized heat generation. Additionally, take into account the sun's movement, shaded areas and reflections.</p>

<b>CR0.0 Innovate Or Exceed Credit Requirements</b>		N/A
	<b>15</b>	
<b>OVERALL:</b>	<b>299</b>	<b>EXPANSION OF PORT CAPACITY AND LOGISTICS IN THE CONTAINER TERMINAL IN CARTAGENA</b>

## APPENDIX E: SOURCES

DOCUMENTATION PROVIDED
General Information.
Fundación Puerto de Cartagena and Bienestar Familiar and Fundación Carvajal, Programa de educación inicial Saberes.
Fundación Puerto Cartagena, Proyecto Parque Santa Clara.
Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, Impacto económico y social del puerto de Cartagena. (Bogotá: Fedesarrollo, 2014).
Fundación Puerto de Cartagena, Informe de Gestión Inversión Social: Implementación Plan Estratégico 2013 – 2017 (Cartagena, 2014).
Fundación Puerto de Cartagena, Proceso de formación de líderes para la autogestión (Cartagena, 2013).
SENA Regional Bolívar, Convenio de cooperación No. 000018 de 2012 entre el servicio nacional de aprendizaje y la Fundación Puerto Cartagena (2012).
Natalia Salazar Suárez and Olga Lucía López Londoño, Sistematización proceso de intervención social para la caracterización socioeconómica grupos de interés Fundación Puerto de Cartagena (Fundación Carvajal, 2012).
SGA. Planificación DEL SGA.
Contecar, Estudio de impacto ambiental para construcción de línea de muelle, dragado de profundización y otras obras complementarias (2006).
Contecar, Actividades Ambientales 2013. (Cartagena, 2013).

SGS Colombia, Programa de Caracterización de Agua Residual Industrial. (Cartagena: Environmental Services, 2013).
Félix González and Orlando Vecino, Control ambiental de dragado (Sistema de Gestión Ambiental, 2014).
Contecar, Puerto de Cartagena, and Dirección de Ingeniería y Proyectos - Superintendencia de Mantenimiento de Equipos Portuarios, Ahorro energético.
Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, Impacto económico y social del puerto de Cartagena. (Bogotá: Fedesarrollo, 2014).
Fundación Puerto de Cartagena, Proceso de formación de líderes para la autogestión (Cartagena, 2013).
RS Noticias, Emprendimiento para el bienestar de la comunidad portuaria. (Cartagena, <a href="http://www.rsnoticias.com">www.rsnoticias.com</a> ).
Astrid Martínez Ortiz, Jonathan Malagón and Isabella Muñoz, Impacto económico y social del puerto de Cartagena. (Bogotá: Fedesarrollo, 2014).
CELP Centro de Entrenamiento Logístico y Portuario, La Escuela de Alto Rendimiento de la Organización Puerto de Cartagena (Cartagena, 2013).
Terminal De Contenedores De Cartagena, Manual del Plan de Emergencias (2003).
Contecar, Contrato de Obra (2014).
Contecar and Puerto de Cartagena, Electrificación RTG (Cartagena, 2014).
Contecar and Puerto de Cartagena, Instalación de silenciador equipo T19 (Cartagena, 2013).
Contecar and Puerto de Cartagena, Características sistema paneles solares CONTECAR.
Contecar and Puerto de Cartagena, Retorno Vial Corredor de Carga (Cartagena, 2010).
Arquitectos e Ingenieros Asociados S.A., PLAN MAESTRO.
Metrocar, S.A., Contrato Contecar 055-13. (Cartagena de Indias, 2014).
Contecar, Presentación a la Comunidad de las Obras del Sector Norte. (2013).
Jaime Torres and A. Tatis R. Rosero, Estudio microbiológico del agua potable. (Gestión Ambiental, 2014).
Marcela Bernal Arévalo, Lucero Aristizábal Losada, Camilo Augusto Rojas Alfonso, and Julián Andrés Gallego, Exploración y diagnóstico arqueológico en el área de dragado del canal de Bocachica, Cartagena de Indias - Bolivar, (Bogotá: Güe Quyne – Grupo de Investigación y Protección del Patrimonio Cultural, 2014).
O. Vecino and Jaime Torres R. Rosero. Mantenimiento de Jardines y Zonas Verdes. (Gestión Ambiental, 2014).



Contecar, Caracterización Ambiental del Área de Influencia del Proyecto.
Contecar and Aqua & Terra, Estudio de impacto ambiental para la construcción y operación de la terminal portuaria multipropósito de Albornoz (Capítulo 4 - Caracterización Del Componente Biótico).
Arquitectos e Ingenieros Asociados S.A., PLAN MAESTRO Zonas verdes.
Contecar and Puerto de Cartagena, SGI Sistema de Gestión Integrado. (Cartagena, 2010).
Natalia Salazar Suárez and Olga Lucía López Londoño, Sistematización proceso de intervención social para la caracterización socio económica grupos de interés Fundación Puerto de Cartagena (Fundación Carvajal, 2012).
Fundación Puerto Cartagena, Acta de Entrega: Cancha múltiple a jac del barrio Ceballos, (2013).
Sandra Beltrán, Formato Ayuda de Memoria o Acta de Reunión, (Fundación Puerto de Cartagena, 2013).
Fundación Puerto Cartagena and Contecar, Control de Asistencia Socialización PMA y PMD Contecar- San Isidro, (2013).
Contecar and Puerto de Cartagena, Referentes Portuarios (2011).
Opinionmeter, Estudio De Satisfacción De Clientes (2014).
Contecar and Puerto de Cartagena, Informe De Revisión Por La Dirección Sistema De Gestión Integrado (2013).
ANDI Asociación Nacional de Empresarios de Colombia, Proceso de Formulación del Plan de Ordenamiento (complejo y con muchas instancias) (Cartagena, 2014).
Sociedad Portuaria Regional de Cartagena, Revista Pórtico: 20 años de cambio (Bogotá: Editorial Semana, 2013).
O. Vecino A. Tatis, Monitoreo de emisiones atmosféricas y material particulado (Sistema de Gestión Ambiental, 2014).
Jaime Torres, Mantenimiento de Redes Hidrosanitarias (2014).
Contecar, Centro de Distribución Internacional de Contecar.
Contecar and Puerto de Cartagena, Plan de Mantenimiento (2013).
Ing. Ricardo Alberto Rosero Cardona, Gestión Ambiental y Servicios Generales (2014).
INCO, Contrato de concesión portuaria No. 003 de 2008 suscrito entre el Instituto Nacional de Concesiones – INCO y la Sociedad Terminal de Contenedores de Cartagena S.A. Contecar (Instituto Nacional de Concesiones: República de Colombia, 2008).

Gomez Cajiao, Certificación de normas técnicas y vida útil (2014).
Contecar and Puerto de Cartagena, Environmental Impacts.
Quimecca, Ficha técnica jabón líquido para manos Bañol (2011).
Contecar, Proceso Gestión de Compras de Insumos y materiales.
Orlando Vecino, Registro del Transporte, Tratamiento y Disposición final de los residuos (Gestión Ambiental, 2014).
Ing. Ricardo Alberto Rosero Cardona, Traslado CDI Patio Vehicular (2014).
Ingeominas, Permisos minero ambientales.
Orlando Vecino, Generación y Transportes de residuos solidos (Gestión Ambiental, 2014).
Gestión Ambiental, Incineración de Residuos Solidos (2014).
Terminal de Contenedores de Cartagena S.A., Anexo No. 5: Copia de los permisos ambientales de la escombrera utilizada por contecar para el retiro de los residuos sólidos y los volúmenes dispuestos en la misma (Cartagena, 2012).
Contecar and Puerto de Cartagena, Patios Contecar (2013).
Contecar and Puerto de Cartagena, Pavimentación Patios Contecar (2013).
Contecar and Puerto de Cartagena, Centro de Distribución No.1 Fase 2 (2013).
Contecar and Puerto de Cartagena, Características sistema paneles solares CONTECAR.
Contecar, Certificado de inspección, (Cartagena, 2014).
CELP Centro de Entrenamiento Logístico y Portuario, La Escuela de Alto Rendimiento de la Organización Puerto de Cartagena (Cartagena, 2013).
ABB Crane Systems, ROI Simulator vs. Real Crane (2011).
Aguas de Cartagena, Reporte de Sostenibilidad 2013 (2013).
Jaime Torres, Mantenimiento a los depósitos de Agua Potable (Gestión Ambiental, 2014).
Ing William H Velásquez R, PUNTO RA 3.2 Control del consumo de agua potable en las diferentes áreas de CONTECAR S.A. (2014).
Aguas de Cartagena, Acta de Visita.

<p>“Plan de Ordenamiento Territorial del Distrito Turístico y Cultural de Cartagena de Indias” in Decreto No 0977 de 2001</p> <p>“Por medio del cual se adopta el Plan de Ordenamiento Territorial del Distrito Turístico y Cultural de Cartagena de Indias” (Cartagena, 2001).</p>
<p>Aqua &amp; Terra, “Mapa De Geomorfología – Bahía Albornoz” in Estudio de impacto ambiental para la construcción y operación de la terminal portuaria multipropósito de albornoz (2012).</p>
<p>José Barrios González. Informe de inspección. (Cartagena: Willis, 2013).</p>
<p>EPA, Resolución No. 478 “Por medio de la cual se modifica una Licencia Ambiental y se dictan otras disposiciones” (Cartagena).</p>
<p>Miguel Torres Benedetti, Programa de Vigilancia Bacteriológica de Alimentos (2014).</p>
<p>ICA, Estado de cumplimiento de los programas que conforman el plan de manejo ambiental (2006).</p>
<p>T. Rabat, R. Rosero – A. Tatis, Fumigación y Control de Roedores en las instalaciones (Gestión Ambiental, 2014).</p>
<p>Contecar and Puerto de Cartagena, Estabilización Orilla Canal Ceballos (2014).</p>
<p>Jorge Barrera Villarreal, Informe técnico de estudio de calidad de aire por partículas suspendidas totales (PST), partículas respirables (PM10), gases SOX, NOX y monóxido de carbono (CO) (Barranquilla: Serambiente S.A.S., 2013).</p>
<p>Rafael Salazar, Plano de red hidráulica general (Contecar, 2012).</p>