

Caracol Industrial Park (PIC) Haiti



Figure #: Construction of industrial facilities at the PIC
Sources: Serge-Henri Troch. E-mail to Maria Ignacia Arrasate. October 20, 2015.

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EXECUTIVE SUMMARY

The primary objective of the Caracol Industrial Park (PIC)¹ is to promote the sustainable socioeconomic development of northern Haiti by creating conditions to attract investors and encourage the establishment of firms to generate new employment. Besides, the investment also ensures the adequate management and long-term sustainability of the industrial park by building new local capacities.²

The park was created in 2008 after an agreement between the Government of Haiti (GOH), the U.S. Government (USG), and the Inter-American Development Bank (IDB)³ to foster economic growth outside the major center of development of the country, the capital Port-au-Prince. The construction of the PIC started in November of 2011,⁴ and it has been managed by a national public agency with administrative and financial autonomy named *Société Nationale des Parcs Industriels* (SONAPI) since May 1st, 2014.

Preliminary studies, construction of facilities and buildings, operational and administrative costs of the 242 hectares that conform the PIC is the result of five grants provided by the IDB totaling an amount of USD\$256.5 million.⁵ Four of the five grants have been disbursed through a period of 5 years. The first operation was approved in 2011, and the fifth and final grant will consist of USD \$41 million and the expected implementation of the operations related to this grant is two years.^{6,7} The IDB's operations in the PIC are expected to be finished in 2019.⁸

The future success of the PIC depends on several elements that need to be in place to ensure the long term sustainability of the investment. It is necessary to strengthen the institutions of the region to enforce policies and standards. Moreover, building new capacities is a key factor to ensure the appropriate management of the park. Accordingly, the IDB has been playing a role in building institutional capacity to address the implementation of plans to include

¹ PIC: *Parc Industriel de Caracol*

² Inter-American Development Bank. Environmental and Social Management Report (ESMR). *Haiti Productive Infrastructure Program IV*. By Serge-Henri Troch et al. (September, 2015) pg 8.

³ Inter-American Development Bank. ESS-Productive Infrastructure Program IV (HA-L1101). Pg 1.

⁴ Inter-American Development Bank. Environmental and Social Management Report (ESMR). *Haiti Productive Infrastructure Program IV*. By Serge-Henri Troch et al. (September, 2015) pg 8.

⁵ Inter-American Development Bank. ESS-Productive Infrastructure Program IV (HA-L1101). Pg 3-5.

⁶ Inter-American Development Bank. Environmental and Social Management Report (ESMR). *Haiti Productive Infrastructure Program IV*. By Serge-Henri Troch et al. (September, 2015) pg 4.

⁷ Inter-American Development Bank. ESS-Productive Infrastructure Program IV (HA-L1101). Pg 17.

⁸ Inter-American Development Bank. Strengthening of the PIC's environmental, health and safety capacity. (HA-T1209). Accessed October 7th, 2015 <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=39687389>

elements related to institutions responsible for services including transport, energy, water, sanitation, solid waste, natural resources, security, education, and social services, planning and inter-institutional coordination; land use planning; and the protection of air resources. However, Haiti's is a country with complex socio economic conditions and multiple challenges to be addressed, such as lack of resources, technical knowledge, housing, security and gender based violence, basic social services, transportation, food among others. The combination of all these factors could jeopardize the efforts made by the PIC.

The PIC has a positive impact on stimulating sustainable growth and development including improvement in job growth, capacity building, productivity, business attractiveness, and livability. The park has created an increasing number of jobs from 1,200 in 2012 to 6,201 in the first quarter of 2015.⁹ The new employment generated by the PIC in the local communities has been reinforced by the establishment of kiosks in the surrounding communities where people can drop off their resumes in order to be hired by the companies located at the industrial park. Besides, the resultant creation of jobs from the industrial park has created an attractive community for smaller business as well. According to a survey conducted in the PIC's surrounding area, 700 small and micro enterprises were opened in 2014.

The PIC is a key component of the Cap-Haïtien - Ouanaminthe Development Corridor Regional Comprehensive Plan by the GOH that is making investments in industry (the PIC), education, transportation, mining, housing, agriculture, and solid waste, water and sanitation. This plan is an effort to bring growth; better integration from regional, municipal to local community scales; improved management of resources; and to provide enhanced quality of life to the communities in northern Haiti. In order to obtain these objectives, the goals have been separated in four different clusters: resource protection, economic growth, infrastructure support, and capacity building.¹⁰

Accordingly, assessments have been completed to evaluate the current mobility including the surrounding communities of the park, and transportation is being provided with a fleet of 42 buses which ensure transportation for more than 5,400 people to adhering with labor laws in Haiti.¹¹ In addition, the PIC is working with the Emerging Sustainable Cities Initiative (ESCI)¹² that will be developing a long-term transportation plan along with studies for land-use and

⁹ Sonapi. PIC Quarterly Report Final. *2015 Q1 PIC REPORT*. 2015. Pg 8.

¹⁰ American Institute of Architects. Cap-Haitien-Ouanaminthe Development Corridor. *Regional Comprehensive Plan - Volume 1*. By Erica Rioux Gees. (December 10, 2012). pg 19-24.

¹¹ Inter-American Development Bank. Application System de Transport du PIC. pg. 6-9.

¹² The Emerging Sustainable Cities Initiative (ESCI) help cities to improve their environmental, urban and fiscal sustainability through the identification of key bottlenecks, weighing and prioritizing identified problems, finding adequate solutions, and following up on progress and advances.

development plans, completing a business plan for a multimodal business park that serves the PIC and the northern region, and addressing urban development of the areas surrounding the PIC.¹³

Despite the efforts to provide extensive transportation, the PIC can only cover transportation for the main surrounding cities, therefore cannot cover transportation for all employees, including those who live in rural or remote areas, this is especially complex for the women who live in remote areas. Looking towards the future, the PIC is evaluating ways to improve the infrastructure for the community by including a bicycle lane connecting the PIC to Caracol, and paving several streets in the urban surrounding areas.

The PIC demonstrated commitment to have sustainability as a core value by providing plans in accordance with technical cooperations provided by the IDB to address plans and strategies such as the environmental health and safety management system, disaster risk management plan, emergency response plan, climate change adaption plan, and contributing to the creation of the Three Bay National Park (PN3B).¹⁴

Additionally, a complex operation like the PIC has had the cooperation from the IDB to promote plans that cover different needs throughout the park's operation such as food, water, solid waste, wastewater, transportation, labor, health and safety, gender and diversity equality, grievance management systems, and resources to cover for the seed money for a social corporate sustainability fund.¹⁵⁻¹⁶ Furthermore, by working closely with the IDB, the PIC has created linkages that build institutional capacity with several institutions, such as *Autorité d'Aménagement du Nord et du Nord-Est (AANNE)*, the *Comité Interministériel d'Aménagement du Territoire (CIAT)*, and *Agence Nationale des Aires Protégées (ANAP)* to improve the synergies between the park and different types of infrastructure, including transport, energy, water, sanitation, solid waste, natural resources, security, education, and social services.¹⁷

Despite management plans, technical cooperations, and efforts made to foster collaboration through institutional partnerships, the lack of local capacities could hinder implementation and enforcement of policy and guidelines established by the plans. Therefore, providing resources and support to build those capacities over time is key to ensure the long-term sustainability of

¹³ Inter-American Development Bank. Environmental and Social Management Report (ESMR). *Haiti Productive Infrastructure Program IV*. By Serge-Henri Troch et al. (September, 2015) pg 31.

¹⁴ Inter-American Development Bank. ESS-Productive Infrastructure Program IV (HA-L1101).pg 19.

¹⁵ Inter-American Development Bank. Environmental and Social Management Report (ESMR). *Haiti Productive Infrastructure Program IV*. By Serge-Henri Troch et al. (September, 2015). pg 14-15.

¹⁶ Ibid., pg 7.

¹⁷ Ibid., pg 6.

this initiative.

In a sustainable project is vital to assess the resources needed to build the infrastructure and keep it operating including water, soils, and materials. The PIC took limited actions to address the identification of important factors such as quantity, source, and characteristics of resources utilized and strategies to make better use of those resources.

The PIC demonstrated the use of regional materials as a key component to retaining regional benefits by obtaining local materials such as paints from manufacturing companies within the park; sand, gravel, and filling material from communities surrounding the park; sourcing concrete from a local quarry and metal from the neighboring country of the Dominican Republic. Furthermore, the PIC minimized the movement of soils and other excavated materials by storing and reusing topsoil. These reduced amounts of excavated materials taken off-site have a positive environmental impact, and it helps avoiding expensive operational costs. The PIC has demonstrated their commitment to reduce negative impacts on the availability, quantity, and quality of fresh water through the implementation of a quality monitoring program, and by conducting a study to determine the available water resources in the area.

The PIC can make better use of energy resources by implementing strategies in park's operations to reduce energy consumption with clear targets in the short and long-term. Additionally, reducing the consumption energy could present a potential opportunity to produce less greenhouse gases and avoid contributions to climate change. An initiative to reduce energy consumption should also be accompanied by a reliable monitoring system to ensures efficient functioning and the extension of the useful life of the park and its operations. Additionally, the increased use of renewable energy could also be part of future considerations.

The construction and operation of the PIC, or any other infrastructure project, has impacts on the natural world around them including habitats, species, and non living natural systems. Accordingly, the PIC has contributed to the protection of important natural habitat; identified the natural hazards related to the site's conditions; and implemented strategies to minimize effects on water resources.

A relevant initiative to protect important prime habitat in the Caracol Bay was the implementation of mitigation measures from previous operations that provided resources critical to support the establishment and functioning of the Three National Park Bay (PN3B).¹⁸ The objective of creating the PN3B is to preserve coral reefs and mangroves. The mangroves in

¹⁸ Inter-American Development Bank. Environmental and Social Management Report (ESMR). *Haiti Productive Infrastructure Program IV*. By Serge-Henri Troch et al. (September, 2015) pg 36.

the Trou du Nord River represent more than 18% of the remaining mangroves in Haiti, and provide protection against storm surges.¹⁹⁻²⁰ If mangroves are depleted, the livelihoods of local communities, and potential for expanding the economic base of the area can be jeopardized.²¹ Furthermore, the coral reef along with historic sites represent a potential for tourism.²² The PIC will be completing the biological and socio-biological baselines for the PN3B to develop a management plan for the protected area.²³

Sites may have geologic formations that are difficult to deal with which is why the PIC identified disadvantageous geological features including earthquakes and flooding. In order to address these adverse geological characteristics, the park took considerations in the design of all buildings to be seismic resistant and to be elevated to avoid flooding. In addition, the PIC also made a basin to control the storm runoff.

In relation with water bodies, it is important to note that the PIC is bisected by the Trou-du-Nord River and it was built on land that was mostly used for agriculture. Strategies to prevent erosion in areas close to the river have been implemented like having well-drained pathways, protecting banks by using gabions and rocks by the bridge that crosses the river and where the effluents from the wastewater plant are discharged into the river. Also, in order to avoid affecting aquatic life, the PIC conducts a monitoring plan to maintain the chemical and physical quality of water in the river Trou-du-Nord.

Nonetheless, from a biodiversity perspective, the PIC can implement strategies to minimize the impacts caused by the construction of the park on important ecological areas by developing a vegetation and soil protection to areas close to the Trou-du-Nord river. Also, a restoration plan including efforts to stabilize stream channel or shorelines, and the completion of revegetation with native plant communities would lessen the impacts on natural habitats. Furthermore, control of future expansion or development to preserve soils identified as prime farmland or greenfields is a key component for sustainable growth that goes beyond the PIC's operation. The PIC also has the opportunity to avoid contaminating water and land resources by implementing programs to reduce the use of pesticides and fertilizers.

The PIC has outstandingly acknowledged the several challenges and long-term risks caused by climate change to ensure the park's sustainable growth and development. The PIC's efforts are

¹⁹ Ibid., 9.

²⁰ Ibid., 36.

²¹ Ibid., 34.

²² Ibid.,

²³ Ibid., 20.

focused on completing strategies to increase resiliency to short-term hazards, to avoid vulnerabilities, and to adapt to long-term changing future conditions. In relation to this, an effort in development is the Disaster Risk Assessment (DRA) that includes risks posed by climate change such as hurricanes, inland flooding, coastal flooding, sea level rise, salt intrusion and drought. Also, two complementary strategies will be developed based on the DRA: Climate Change Adaptation and Disaster Risk Management plans.

Although the PIC approach to risks posed by climate change is focused mostly on having resilient buildings and operations, the park has the opportunity to expand their focus on emissions. The PIC can establish a plan to reduce greenhouse gas emissions by considering a comprehensive life-cycle carbon assessment and providing ways to sequester carbon by planting new forest. Additionally, control and reduction of dangerous air pollutants should be considered by implementing air quality monitoring programs and pollutants reduction measures.

Overall, despite the considerable efforts made by the PIC to promote sustainable growth and development along with building institutional capacity; many opportunities are presented to make improvement to further sustainability. A gravitating aspect for the future is the successful completion and implementation of management plans such as the Environmental Health and Safety Management System, the Water Resource Management System, the Climate Change Adaption plan, the Emergency Response Plan, among others. The successful implementation and enforcement of these guidelines will advance further in the long-term sustainability of the park.

1. PROJECT DESCRIPTION & LOCATION

The Caracol Industrial Park (PIC)²⁴ is an effort to promote sustainable socioeconomic development in Caracol Bay in northern Haiti, as part of a partnership between the Government of Haiti (GOH), the U.S. Government (USG), and the Inter-American Development Bank (IDB).²⁵ The GOH has been provided with a series of grants to continue the development of the industrial park. In order to ensure the success of the program, the Ministry of Economy and Finance, through its Technical Execution Unit (MEF/UTE) is responsible for the implementation of the construction phase, and the Société Nationale des Parcs Industriels (SONAPI) will manage operations. The implementation of the construction and technical cooperation programs funded by the last grant are expected to be completed in two years.²⁶ The PIC is a component of a larger coordinated effort to bring growth and better quality of life to the communities in northern Haiti.

The PIC has been the result of several grants provided by the IDB. USD \$55 million in funding for the first PIC operation was approved in July of 2011. This stage involved infrastructure developments such as industrial buildings, perimeter walls, and a temporary water treatment plant; in addition to compensation for farmers affected by construction, environmental mitigation programs, and the inclusion of important studies like the Cumulative Impact Assessment.²⁷ The second PIC operation was part of a Productive Infrastructure Program, with a grant of USD \$50 million approved in September of 2012, with most of the physical works completed during 2015.²⁸ This grant funded the construction of: four industrial buildings; smaller utility buildings; a permanent waste water treatment plant; a solid waste management facility; an operations and maintenance management firm; an Environmental Health and Safety (EHS) manager; support for workers' transportation; social and environmental studies and mitigation plans, including the protection of Caracol Bay; and small scale urban investments in communities close to the PIC.²⁹ The third operation was funded by a grant of USD \$40.5 million, approved in December of 2013; this grant financed the construction of new buildings, service facilities, urban projects in the communities mainly access roads, and support for SONAPI.³⁰ The fourth granted US\$70 million to fund the expansion of PIC's

²⁴ *Parc Industriel de Caracol*

²⁵ Inter-American Development Bank. Environmental Safeguards Unit (VPS/ESG). *Haiti Social Impact Assessment: Key Impacts and Recommendations for Stakeholders of the Caracol Industrial Park*. By Jonathan Renshaw et al. (February 10, 2012) pg 3.

²⁶ Inter-American Development Bank. *Environmental and Social Due Diligence (ESDD) for the operation - the Productive Infrastructure Program IV (HA-L1101)*. By Serge-Henri Troch et al.

²⁷ Inter-American Development Bank. ESS-Productive Infrastructure Program IV (HA-L1101).

²⁸ Ibid.

²⁹ Ibid., 3.

³⁰ Ibid.

infrastructure and equipment; the construction of additional factory, utility, and service buildings; small urban projects surrounding the PIC; and providing support to SONAPI with operation and maintenance. The fifth and final grant will consist of USD \$41 million that is comprised of three main components: the provision of infrastructure, including the construction of an industrial wastewater treatment plant; the strengthening of SONAPI, to guarantee a self-sustaining and well managed industrial park; and support for administrative costs that fund administrative, monitoring, and auditing activities implemented by the MEF/UTE.³¹ The IDB's operations in the PIC are expected to be finished in 2019.³²

The PIC is a key component of the Cap-Haïtien - Ouanaminthe Development Corridor Regional Comprehensive Plan that has made several investments made by the GOH throughout the northern coastline, from the city of Cap-Haitien to Ouanam, including roads, tourism, port facilities, housing, and a pilot urban plan for sustainable cities (an effort to spur economic growth outside of Port-au-Prince).³³⁻³⁴ In order to attain these main objectives, necessary conditions to attract investors and to encourage the establishment of firms need to be provided, along with adequate management capacities that ensure the expansion of, and the long term financial, social, and environmental sustainability of the PIC.³⁵

The expansion of the industrial park drives demands for new services and businesses, social infrastructure, food security, among others. All of these demands, driven by population growth, represent an environmental impact to the neighboring ecosystem in the Caracol bay because of the risk of ecological, water and groundwater degradation. Poorly mismanagement of population growth influx and the non-compliance with national labor standards also pose social, economic, and urban impacts.³⁶ Social impacts include informal housing, security and gender-based violence, satisfactory access to basic social services, transport related issues, among others.³⁷ All things considered, these challenges are presented not only by the continuing, and expanding, operation of the industrial park but also by several factors from the Haitian context such as the limited capabilities from institutions, the socioeconomic and political reality of the country, the lack of resources available, and competing priorities that prevent the appropriate implementation of several plans. Due to these challenges posed, it is

³¹ Ibid., 5

³² Inter-American Development Bank. Strengthening of the PIC's environmental, health and safety capacity. (HA-T1209). Accessed October 7th, 2015 <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=39687389>

³³ American Institute of Architects. Cap-Haitien-Ouanaminthe Development Corridor. *Regional Comprehensive Plan - Volume 1*. By Erica Rioux Gees. (December 10, 2012). pg 19-24.

³⁴ Inter-American Development Bank. Haiti Social Impact Assessment. February 10, 2012.

³⁵ Inter-American Development Bank. ESS-Productive Infrastructure Program IV (HA-L1101).

³⁶ Ibid., 6.

³⁷ Inter-American Development Bank. Haiti Social Impact Assessment. February 10, 2012.

required an adequate placement of measures that are effective to manage the consequential environmental and social impacts.

Mitigation strategies cover EHS impacts caused by the construction and operation of infrastructure and buildings, generated solid wastes, and they also provide measures to ensure that the adequate management of occupational health and safety is put in place. An important mitigation plan is the establishment of the Three Bays National Park (also referred as Parc National des Trois Baies - PN3B) as a national protected area in order to protect Caracol Bay.³⁸ Social impacts are also incorporated into the mitigation strategies, overseeing both the construction and operations phases of this project. These strategies ensure the provision of workers' transportation and affordable meal options, and compliance with labor standards and gender equity policies. Social mitigation strategies also involve the closure of involuntary resettlements cases from the previous phases of the project, the provision of grievance mechanisms for workers and communities, stakeholder engagement, and the introduction of new management structures such as the PIC manager and the EHS department.³⁹

As part of the initiatives to make PIC sustainable, control measures have been put in plans, including close environmental monitoring plans involving wastewater treatment, water quality and biodiversity. Additionally, analyses of water resources in the region are necessary to make better use of the resource as demand grows. Some limitations are present and need to be overcome such as the absence of a facility for solid waste disposal in the industrial park.⁴⁰ Similarly, gender equality and child care measures that encourage women of childbearing age are part of the IDB's efforts to improve labor practices in the PIC.⁴¹ Finally, citizen security and housing are part of sustainable measures to provide better quality of life to the population in the PIC, thus boosting the capacity for human capital to further drive economic growth.⁴²

This analysis examines the PIC as an infrastructure project which promotes sustainable socioeconomic development for the local population. The initiative is composed of several components that support the park's construction and operation in a context of scarcity and limited resources. These components will be addressed during the analysis in corresponding to specific aspects evaluated to measure the overall sustainability of the PIC.

³⁸ Inter-American Development Bank. ESS-Productive Infrastructure Program IV (HA-L1101).

³⁹ Ibid., 8.

⁴⁰ Ibid., 13.

⁴¹ Ibid., 15.

⁴² Ibid., 16.

2. APPLICATION OF THE ENVISION RATING SYSTEM

Caracol Industrial Park (Parc Industriel de Caracol - PIC)

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 Caracol Industrial Park (Parc Industriel de Caracol - PIC).

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 ISI⁴³ and Zofnass Program⁴⁴ websites.

3. QUALITY OF LIFE CATEGORY

Envision’s first category, Quality of Life, pertains to potential project impacts on surrounding communities and their respective wellbeing. More specifically, it distinguishes infrastructure projects that are in line with community goals, clearly established as parts of existing community networks, as well as consider the long-term community benefits and aspirations.

⁴³ www.sustainableinfrastructure.org

⁴⁴ www.zofnass.org

Quality of Life incorporates guidance related to community capacity building and promotes infrastructure users and local members as important stakeholders in the decision making process. The category is further divided into three sub-categories: Purpose, Wellbeing, and Community.

Purpose

The purpose subcategory addresses and examines general improvements to the quality of life for the local community, specifically with regards to the project's impacts on growth, development, and job creation. In relation to these aspects, the PIC has a mix of achievements, scoring highly in relation to stimulating sustainable growth and development, and increasing productivity of the northern region of the country. Nonetheless, a challenge to achieving better performance is in expanding the skills and capacities of the community workforce by including training and educational programs.

Community needs have been considered by the PIC since the beginning of the project as part of the economic development plan for the northern region of Haiti, but the implementation of this plan poses major challenges, considering the country's context of poverty and lack of resources. At the same time, the resettlement of a small number of families who were directly affected by the construction of the PIC was made following IDB's guidelines, however the overall engagement of the communities indirectly affected by the project has been limited, without any evidence of satisfaction or endorsement. As a result of all of the different needs brought up by all of the stakeholders, the IDB and the interested parties established priorities, including training plans, provision of transportation, a formal banking system, and access to childcare, but it is unclear how these improvements will be implemented, with the exception of transportation. Given all of the challenging tasks presented in this project, keeping records that attest community acceptance, and the work done in tandem between key decision-makers and community leaders is vital to improving performance.

The PIC's main strength relies on the creation of jobs throughout its design, construction, and operation. The number of PIC jobs has grown from 1,200 jobs in 2012 to 6,201 in 2015.⁴⁵ Also, other small and micro-businesses have been attracted by the growth and development presented in the area, contributing to the opening of about 700 businesses in 2014. Furthermore, measures taken to provide transportation to employees, as required by Haiti's law, supports employees from the surrounding areas of Limonade, Caracol, Trou du Nord, Terriere Rouge, and EKAM. In order to provide an alternative way of access to employees, the

⁴⁵ Sonapi. PIC Quarterly Report Final. 2015 Q1 PIC REPORT. 2015. Pg 8.

PIC is planning to make infrastructure improvements, including a bicycle lane that will connect Caracol with the PIC, and the paving of several streets in the surrounding areas. These works are part of several initiatives to bring better conditions not only to the PIC's employees, but also to the entire community. However, the PIC's limited implementation in the completion of the works poses a difficulty that needs to be overcome in order to make improvements. For this reason, the PIC can advance its achievements by shifting its projects to a more community-centered focus that allows for creating jobs based on improved capacity, competitiveness, and attractiveness, and also by investing in community assets that represent a historical or cultural value to the community.

Considering that the main purpose of the PIC is to promote economic development, the project provided new employment opportunities to local communities, but it is unclear how capacities and skills will be expanded and developed amongst the park's workforce. For example, there are initiatives for technical cooperation to reinforce organizational management and resource management capabilities that will create a skilled workforce, but no training programs are considered in order to fill these positions with local employees. Therefore, there is room for improvement, and several types of initiative can be taken in order to make sure the PIC will contribute to long-term community competitiveness, such as providing explanations of proposed education and training programs that will be developed, and record their implementation in order to obtain a higher community level of performance.

Wellbeing

In the Wellbeing subcategory, individual components aim to ensure individual comfort, health, and mobility. This subcategory examines the physical safety of workers, alternative modes of transportation, and the project's incorporation into a wider community network of mobility. As a result of identifying several needs, the PIC has considered important initiatives in the design to improve community mobility and access. The encouragement of non-motorized means of transportation aims to bring several benefits to the community. At the same time, the PIC also leaves room for improvement by implementing several proposed programs and taking actions in order to: meet normal health and safety requirements, minimize noise and vibration, and light pollution.

While the PIC's risk assessment in construction and operation phases have been identified, the enforcement of safety protocols through implemented programs or methodologies remain limited. During the construction and operation of the PIC, the only new technology that was used was the macrophytes in a wastewater treatment plant. There was little need to

implement special security measures because the wastewater treatment plant did not show any visible health risk. Additionally, the PIC is in the process of creating an environmental health and safety team with qualified personnel to implement general policies. In the context of extreme poverty, lack of resources and limited institutional capacity can undermine implementation of any plan. Nonetheless, in implementing new materials, technologies, or methodologies, it is important to ensure enforcement of health and safety protocols in the PIC.

Regarding arising acoustic nuisance, there was no evidence of actions taken to minimize noise and vibration caused by the construction or operation of the PIC. Although communities do not live close to the Park, their community life can still be affected by the transportation of materials. However, there was not any evidence of measurements to establish a baseline for measurement. The absence of these measurements and initiatives creates an opportunity for the PIC not only to perform studies to determine the baseline of the existing noise and vibration, but to go beyond the standards and document the implementation of all the initiatives taken to create quieter communities. Besides, no evidence of initiatives make sure that lighting meets minimum standards for safety; nor is there any assessment of the lighting needs. The PIC could enhance its performance by working closely with experts that can assess the lighting needs, and incorporate components that reduce lighting energy requirements.

It should be noted that the PIC's consideration for community mobility and the regional promotion of sustainable economic growth in the northern area has benefited employees by ensuring the transportation provision of transportation, mandated by Haiti's law. The provision of transportation has improved commute time and user safety. Several initiatives of future programs already acknowledge possible long term scenarios. As the PIC expands, the implementation of environmental health and safety management system becomes vital because addresses needs for circulation and mobility in the PIC. Even though the plans performed by the PIC are comprehensive and identify needs in short and long term, Haiti poses a challenging context of undeveloped transportation systems, expensive transportation, and limited regulations.

Among the PIC's actions to encourage alternative modes of transportation include: the construction of a bike path, which connects the city of Caracol with the PIC, and the provision of bike stations, a strength to this project. This initiative not only motivates people to use a non-motorized vehicle, but it displays mobility and health benefits by encouraging physical activity. Even though an economic incentive for bike users is mentioned, provision of extensive information to understand exactly how the plan aims to be implemented or the level of community engagement would improve performance.

The PIC has considered the needs for physical safety in the surrounding areas, and also the risks brought by crime and vandalism. There are several plans that involve the application of safety measures during construction and operation of works; however, little evidence determines their effectivity. The development of transportation and security management plans are initiatives that will allow the PIC to implement mechanisms to improve user accessibility and safety. Nonetheless, the restricted presence of the police in the area provides a challenge for safety and the appropriate enforcement of security for employees, investors, and operations.

Community

In the community subcategory, it is analyzed how the project respects, maintains, or improves the surrounding communities through the assessment of the impacts on visual and functional aspects. Depending on the type of project, some impacts are considered in the design and they include measures as preserving views or incorporating the local character of the community. The PIC has acknowledged through its design the presence of valuable historic sites and the importance of public space with scarce efforts to preserve view and the local character of the community. Besides, the implementation of several measures and ideas are constrained by contextual factors.

The PIC has identified some historic sites that could represent a touristic potential in the future. Even though, the project does not have any construction or operation affecting these areas, it is important to state the the PIC is considering these sites in the planning of their operations because of their potential for sustainable economic growth in the region. Besides, the PIC worked with the community to build a new church in an effort to preserve heritage sites. Another key point is the limitation that the Government of Haiti has to ensure the preservation of cultural or historic sites due to lack of resources, and this is why this would be an opportunity for the PIC to collaborate by providing a plan that identifies and guides the restoration of these valuable resources.

There was no evidence to identify the efforts taken to maintain the local character of the community and how to minimize or eliminate the possible negative impacts caused by the project. Therefore, the PIC could achieve higher levels of achievement by developing programs that help preserving the local landscape, ensuring the incorporation of the community in the project.

The PIC recognizes the importance of enhancing public space in the design of the project and as part of the regional comprehensive plan, to help the sustainable economic growth of northern

Haiti. Nonetheless, the plans are not yet implemented, therefore there is a great opportunity for the PIC to ensure the implementation of the new public spaces by providing funding and responsibilities for future maintenance and including the community in the process, so they can take ownership of these spaces.

Vulnerable groups

In the gender and diversity subcategory, the initiatives taken to improve the quality of life of women and diverse groups are examined. In this subcategory, it is important to identify how the project affects the gender and social inequalities and ensure that appropriate measures are taken to consider the needs from different groups. The PIC has identified women's needs, however the implementation of measures to guarantee the potential impacts are reduced is not completed yet.

The PIC has established the major needs of women and they are especially related to children care and maternity needs. The PIC has developed an environmental, social, and health and safety management plan that aligns with the IDB's policies on Gender and Equality and also with Haiti's labor code. However, the evidence that enforcement of these policies have been done is limited and the implementation of the plan mentioned above is not completed. Additionally, the IDB is providing labor training to tenants on how to improve gender aspects focused on best practices. Considering that these measures are part of the design and implementation is limited, the PIC can achieve better performance by providing not only documentation that guarantees the implementation of gender and social equality plans but also showing the level of satisfaction once these plans are put into place.

The PIC has promoted the economic empowerment of women by creating jobs in compliance with Haiti's law and IDB's gender and equality policies. Even though the PIC has to adhere to these policies, there is limited evidence that the mechanisms will ensure that future jobs are equally distributed. Around 65% of employees are women and these jobs are part of the industry nature-textiles. The fact that future job growth will take place in the PIC pose the challenge to ensure higher levels of achievement. One way to improve performance is maintain proof of enforcement of job creation targeted to women along with education programs to improve women's skills.

The PIC has a strong mobility design but there is limited understanding of the various patterns and needs of mobility of different social groups (i.e. women and children). Additionally, the transportation provided by the park does not cover rural areas posing a safety risk for women. These restricted considerations towards women and children in the design is the main area to

improve performance by identifying those needs, reporting the efforts made, and presenting the changes achieved and adaptations that benefit those diverse groups.

4. LEADERSHIP CATEGORY

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

Collaboration

In the collaboration subcategory, the project is examined to establish the level of involvement of several stakeholders and to successfully identify opportunities of collaboration, but in order to accomplish this, there must be committed leadership that will bring new ways of managing the process and good communication established within all the parties. Effective communication will contribute new ideas and perspectives. The IDB, working along with the PIC, has provided effective leadership and commitment, established a sustainable management system, and foster collaboration and engagement among stakeholders. Nonetheless, implementation on related programs and plans is severely limited by financial resources and available capacities to ensure the long-term sustainability of the park.

The IDB has made efforts to provide effective leadership and commitment by engaging with the park's management organism, SONAPI. The bank is providing technical cooperation, strengthening the Environmental Health and Safety (EHS) team for the long-term sustainable management of the park, and providing guidelines that the PIC have to follow in order to comply with bank policies, Haiti's regulations and law, and also to provide a long-term committed plan. The creation of several plans such as the EHS management system are evidence of the advances made by the committed leadership, however, the successful execution of these initiatives can be limited once the IDB completes the work and transfers all the management responsibilities to SONAPI. Even though the efforts presented are extensive, addressing sustainability as the core value of the institution, performance will be demonstrated with their full implementation, which should consider, capacity building and funding for maintenance.

In order to seek improved sustainable performance, the IDB has established the EHS management system and there is a clear identification of the several parties involved including agencies, parties administering the PIC, management roles, tenants, contractors and subcontractors. Also the ongoing Proposal for Operation Development (POD) will address several environmental, economic and societal priorities. Although the system contains important elements of the park to address sustainability issues, concerns are posed by lack of government enforcement, technical capability, resources, and unknown robustness of the system. The PIC may improve by implementing these systems to meet the park's sustainability goals providing sufficient mechanisms to manage changing conditions or unexpected events.

The PIC is a component of a larger effort to bring sustainable economic growth to northern Haiti, and the park recognizes the importance of addressing infrastructure projects in the context of the entire community and the surrounding cities infrastructure. The PIC must comply with environmental, social, health, financial and reputational risks that share with the IDB and contractors and subcontractors should align with IDB's policies, but is not clear how this efforts are enforced. Multiple stakeholders are part of the collaborative management process established by the PIC, such as UTE, SONAPI, INCATEMA, and Ingenieria Estrella. Although a systems view is important to optimize the overall performance of the infrastructure, in the case of the PIC, it should be considered that the conclusion of the initiatives planned are vital to improve sustainable performance.

The leadership provided by the IDB have identified meaningful issues that have been prioritized by stakeholders. The subsequent creation of programs to address those issues have included the active engagement that needs to ensure the completion of the stakeholder management plan. Nonetheless, there is no evidence that these engagements expand to a wider community, or that there is a process that incorporates fairness and equity in project decisions. Furthermore, the communication with the community did not follow any specific plan during the design phase and there is no evidence to show their involvement. In order to build a strong community relationship, the grievance mechanisms and stakeholder engagement plans must be put in place to demonstrate significant changes based on feedback. However, their appropriate completion may be limited by the challenges posed by the Haitian context.

Management

In the management subcategory, the project examines if there is an understanding of how the project has identified opportunities to pursue by-product synergies to use unwanted by-products or discarded materials and resources from nearby operations or with a larger

infrastructure systems. The PIC has not conducted a search of by-products or unwanted materials from nearby facilities. However, as in other aspects analyzed, the major constraint to evaluate the performance of the park is the lack of implementation of the programs proposed and the uncertainty that is posed by how effective they will be considering the future growth of the park and the surrounding population.

The PIC's efforts to find by-product synergy opportunities were limited and little work was done to assess the potential use of unwanted by-products or discarded materials from nearby operations. Also, there is no evidence of a comprehensive assessment of the availability of resources. In the future, a proactive plan to identify facilities and possibilities to assess the potential of by-products synergy opportunities, could reduce operational costs and waste.

One of the goals of the of the PIC, given the context in Haiti of undeveloped infrastructure, has been the build institutional capacity through the target of several agencies, government entities, civil society, among other relevant groups. The creation of new capacities indirectly promotes a better integration with larger systems of infrastructure, especially considering that the strengthening of planning agencies ensures a better coordinated future development. As part of a larger project to bring sustainable economic growth in northern Haiti, the PIC recognizes the importance of improving infrastructure to a fully integrated system to achieve a better level of performance, but the limitations already identified cause delays in completion of projects.

Overall, the PIC has made efforts to create a wide integration with the main elements constituent of community infrastructure, however, relevant factors for future development, such as the rapid population growth was not considered, which poses a risk to implement necessary mitigation measures on time.

Planning

In the planning subcategory, the long-term view of the project is examined. This includes the assessment of plans for long-term maintenance and monitoring, studies about regulations and policies connected with sustainability, and also how the project is designed to extend its useful life. The efforts were limited by the PIC to extend the useful life of the constructed works and to address conflicting regulations that may hinder sustainability goals. However, the PIC has identified the need for long-term monitoring and by completing a working plan.

The long-term monitoring and maintenance plans and associated resources ensure, to the extent practical, that ecological protection, mitigation, and enhancement measures are

incorporated into the project and can be carried out. The PIC has incorporated the need for monitoring plans through the EHS management system, which is an effort to comply with operational policies established by the bank, however it needs to be implemented. This system is accompanied by two other efforts, the environmental social management report and a technical cooperation program to strengthen SONAPI's capabilities. Towards future implementation, the personnel to make the EHS management system have been clearly identified and there is an initiative to ensure that new contractor and subcontractor align to the park's policies, but there is no evidence regarding maintenance plans.

The PIC has not completed any assessments to identify regulations that may unintentionally create barriers to the implementation of sustainable performance goals. In Haiti's context is important to note that the regulatory and political environment is undeveloped, with weak enforcement due to the lack of resources. The relationship between the PIC and several other agencies is characterized by the mutual interest, and the building of institutional capacity, to promote a sustainable growth in northern Haiti and they all provide important assessments that will help the decision making process in the future.

Efforts to incorporate components that makes constructions easy to refurbish and reconfigure, and extend their useful life are examined. Including these components is important to minimize the need of replace, repair or rebuild constructions within the project. However, the PIC did not consider adding such components. Looking into the future, the PIC can create a plan that incorporates those components and complementing it with the identification of key areas to invest in extending useful life that would have reasonable paybacks in the long-term.

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

In the materials subcategory, several components are examined to assess the reduction of amount of natural resources that were extracted and processed. Also, other components are reviewed such as the sourcing of sustainable or locally produced materials, the use of recyclable materials and their diversion from landfills, and how materials can be used at the end of the park's useful life. The PIC demonstrated efforts taken to reduce the amounts of excavated materials taken off site, however, there are areas with room for improvement, especially the following two: the implementation of plans related to locally procurement and waste management, and the integration of considerations about materials and sustainability in the construction of new buildings that will belong to the future stages of development of the industrial park.

Conserve energy by reducing the net embodied energy of project materials contributes to reduce gas emissions, congestion, and environmental pollution and degradation. The PIC made limited efforts to reduce energy associated with the extraction, processing, manufacturing and processing of materials and components. Towards the future, the completion of a life cycle assessment (LCA) to assess the embodied energy of key materials is recommended.

The sources of materials matters in order to minimize the total amount of natural resources consumed. Therefore, support sustainable procurement practices by obtaining materials and equipment from suppliers that implement sustainable practices is recommend for future constructions in the PIC. Additionally, the use of recycled materials and regionally sourced materials will also contribute to minimize impacts to the environment by reducing the use of virgin materials and impacts related to transportation. The information is limited to demonstrate that the PIC used reclaimed or recycled materials, however, one of the main materials utilized in construction, concrete, was extracted from a local quarry. Nonetheless, information is limited to establish a reliable percentage of materials locally sourced.

In relation to the waste generated during the project's operations, a waste management plan should ensure that waste is minimized and that opportunities for recycling and reuse are maximized. The PIC is completing a comprehensive solid waste management plan to comply with Haiti's law and address the current inadequate management. Also, it is important to address that the Environmental Social Health and Safety Management Plan contains a waste management section without guidelines on reusables and recyclables, and these plans have not been implemented yet. There is a potential to make use of recyclable materials due to the fact that separation is being performed at the park. Nonetheless, the plan must be implemented to increase reductions in waste generation and diversion of waste from landfills. In addition, its is

recommended to detect opportunities to reuse on site any excavated materials from construction works, eliminating soil transportation and environmental degradation.

Finally, the PIC avoided the transportation of excavated materials off site by storing soils and other materials, and making use of topsoils for works inside and outside of the park. This effort should continue to maintain the environmental impact caused by transportation of materials off site as low as possible. Furthermore, considerations for deconstruction and disassembly so that the materials and equipments could be reused and upcycled after the end of the project useful life should be considered in the design phase. Overall, in the PIC no considerations related to the end-of-life of the project constructions were made, therefore, for future constructions, it is recommended to expand the scope and include more life-cycle elements beyond construction, moving outside typical owner considerations of functionality.

Energy

In the energy subcategory, initiatives to reduce overall energy use and efficiency are addressed. This subcategory examines the efforts taken to reduce energy consumption, minimize the use of fossil fuels, and implementing monitoring systems that ensures the efficiency throughout the life of the project. The PIC has made limited efforts to address concerns regarding the efficient use of energy and the use of renewable sources to meet the industrial park's energy needs.

Energy generation is the primary source of greenhouse gas emissions and numerous pollutants harmful to the environment and human health, therefore conserve energy and reduce overall consumption is important. In the case of the PIC, there is not a formal assessment to identify and analyze options for reducing energy consumption in the operation and maintenance of constructed works. As part of a collaborative project, USAID funded and built the diesel fueled power plant that provides electricity to tenants and around 9,000 households in the communities surrounding the PIC. Looking into the future, the population will grow causing a higher demand for energy. Due to this reason, it is vital for the PIC's sustainable economic growth to implement plans to conserve energy and present clear reduction targets. For the future it is recommended to conduct feasibility and cost analysis to determine effective methods for energy reduction that could be integrate to the PIC. As first target goal, at least 10% of operational energy reductions when compared to industry norms is recommended.

In relation to the use of renewable sources, due to the fact that Haiti's generation of electricity is undeveloped; the use of renewable energy was dismissed due to a greater cost of installation and the timeframe to install a renewable energy system. The diesel fueled power plant was funded and implemented by USAID. A progressive inclusion of regenerable energy to meet the

PIC's energy needs could improve sustainability performance. An initial goal of obtaining 10% of the project's annual energy consumption from renewable energy could be set to reduce the present need for fossil fuel in the USAID energy power plant.

In order to insure a reliable energy performance of the industrial park over time during operations, an initial commissioning to evaluate the project's energy systems and efforts to integrate long-term monitoring of electrical and mechanical equipment are recommended. This will ensure that systems are functioning as intended and avoid degradation over time during operations.

Water

In the water subcategory, critical components related to water availability, quality, and monitoring are examined. Several factors such as the expansion of operations, population growth and climate change pose uncertainty, therefore, addressing concerns through the implementation of advanced water systems in the industrial park is necessary to ensure sustainable growth. The PIC made efforts to assess the availability of water and the implementation of plans to address water management are considered; however, limited efforts were made to replenish water extracted from the aquifer and to reduce overall potable water consumption.

The PIC conducted comprehensive assessments to determine the availability of water in the region, and the amount of water used from each phase of the industrial park. For example, phase I, use of water represented less than 5% of the water from the aquifer. However, it is important to consider that water demand will increase with a growing population and the expansion of the PIC's activities. Therefore, it should be considered an updated revision of quantities of groundwater available and strategies to replenish freshwater resources.

The PIC's potable water is being supplied with bottled water due to the fact that water quality is bacteriologically compromised by the presence of coliforms caused by fecal contamination. The adequate treatment of water has been restrained by mechanical problems and chemical supplies limitations. There are several limitations with the water system because of leaks causing water losses, lack of monitoring, and uncertainty provided by the lack of progress in obtaining potable water from previous operations. Additionally, the PIC has not considered the integration of design strategies to make use of reuse or recycle of non-potable water to meet water needs and reduce overall potable water consumption once is potable water is attained. A water efficient system will contribute to alleviate water needs and resolve the problems on water supply that the PIC is confronting.

The programs to monitor performance of water systems at the PIC and their impact has been assessed by an independent entity. This assessment has found several limitations in the system that need to be addressed. Water losses, unmetered flows, and lack of estimations were found by the independent review. Also, the systems are not fully operational and there are constraints posed by chemical supplies. There was no evidence of implementation of long-term monitoring strategies. However, the IDB has completed a Technical Cooperation Program to address water management issues, and the PIC has compromised to hire a water manager to develop a water management plan. The expected implementation is overshadowed by the lack of progress presented in previous operations to supply potable water. The PIC can achieve higher levels of performance by incorporating a monitoring program to improve the operational efficiency of the industrial park.

6. NATURAL WORLD CATEGORY

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

Siting

In the siting subcategory, the PIC's direct and indirect impacts on important ecological areas are examined along with the mitigation measures that have been completed and implemented by the project to offset the effects caused. The PIC has collaborated in efforts to prevent the degradation of lands with a high ecological value in the Caracol bay, accompanied with actions to protect wetlands and waterbodies and preventing groundwater contamination. Besides, efforts to preserve floodplain functions were included by assessing flooding prone areas. However, the PIC's limited efforts to promote strategies to prevent erosion can represent an opportunity, specially in the areas close to the river Trou du Nord. Additionally, the PIC could implement further sustainable actions by preserving surrounding greenfields and recovering degraded occupied land, and conducting studies to preserve farmland for future generations threatened by the influx of population seeking for job opportunities generated by the industrial park.

The siting of a sustainable project examines strategies to avoid development on land with a high ecological value. The PIC has taken initiatives to offset the impacts caused on prime habitat by creating the Three Bays National Park (PN3B) in October 2013⁴⁶ to acts as buffer zone for mangroves, wetlands and surface water. Additionally, an integrated water resource management plan is being currently completed and it will be implemented. It is recommended to further sustainability, to implement restoration plans, with the assistance of a qualified natural resource professional, to restore prime habitat either on the project site or near areas.

The efforts that the PIC took to minimize floodplain impacts consisted on an assessment to determine the areas prompt to flooding, but no evidence of strategies to ensure appropriate floodplain functions were presented. An emergency response plan has been completed but its implementation has been constrained by the limited capacity of SONAPI's personnel.⁴⁷ In order to maintain a high sustainability performance, the PIC should continue the efforts to implement the emergency response plan, and include vegetation and soil protection zones to enhance floodplain infiltration capacities.

The PIC did not take any considerations to avoid construction on hillsides or steep slopes, greenfields, or prime farmland, because the PIC siting was a decision made by the Government of Haiti to decentralize and promote development. Nonetheless, an assessment of the risks posed by adverse geologic formations and guaranteeing the preservation of aquifers and groundwater resources should be considered as part of the siting of any project. The PIC included earthquake resistant designs and elevated buildings to avoid flooding.⁴⁸ It is important to note that the implementation of procedures to prevent damage and contamination of groundwater resources would result in a more sustainable project.

Land & water

In the **land and water** subcategory, the impact of the project on hydrologic and nutrient cycles are examined. The PIC has made limited efforts to minimize the impact of infrastructure on stormwater runoff, and to create a preventive plan to restrain the use of pesticides, herbicides, and insecticides in the park. On the other hand, the PIC has incorporated measures to prevent pollutants from contaminating surface and groundwater.

⁴⁶ Inter-American Development Bank. Environmental and Social Management Report (ESMR). *Haiti Productive Infrastructure Program IV*. By Serge-Henri Troch et al. (September, 2015). pg 39.

⁴⁷ Ibid., 38.

⁴⁸ Serge-Henri Troch. Interview by Johan Arango. Phone Interview. Chelsea, MA. October 7th, 2015.

The construction of an industrial park can cause changes to the natural flow of stormwater runoff. For instance, building impervious surfaces decreases the amount of water that infiltrate to the ground. In order to minimize this type of disruption, a sustainable project developed on a greenfield, as the PIC, should maintain 100% of the water storage capacity. Nevertheless the information is limited to determine the percentage of final post development water storage capacity. The PIC's efforts focus on channeling stormwater to a basin, to subsequently discharge it into the river. Low-impact measures that could be considered in the design to increase infiltration, evapotranspiration and harvesting include: impervious surface disconnection, permeable pavers, buffers and strips or vegetated swales, among others.

The use of pesticides, herbicides, and fertilizers should be reduced or eliminated because they are a significant non-point source pollutants. There is no evidence of plans to reduce and prevent their use. For this purpose, the PIC could incorporate the use of plant species that do not require these chemical inputs, increase the use of composting, and encourage the use of integrated pest management practices.

Protecting aquatic ecosystems requires maintaining a set of water conditions unaltered. In order to preserve surface and groundwater resources, a sustainable project must prevent pollutants from contaminating these resources. The PIC has focused on maintaining the quality of the water that is being discharged in the river and the wastewater treatment plant. Other measures that will be executed in the future contain the implementation of grease traps to avoid contamination⁴⁹, and an inventory of surface water and groundwater⁵⁰ in order to provide better data to set up refined management plans. The PIC has completed an Environmental Health and Safety management system that addresses wastewater treatment procedures and the standards to be met to prevent the risks caused by pollutants that are typical from a textile industry. The implementation of these programs may be constrained by resources and limited personnel capacity of SONAPI. Regarding opportunities for improvement, the PIC could invest in the long-term and recycle wastewater effluents instead of discharging them directly to the Trou du Nord river.

Biodiversity

In the **biodiversity** subcategory, efforts to minimize impacts on natural species and their habitats near the development site are examined. The PIC made efforts to preserve habitats

⁴⁹ Serge-Henri Troch. Interview by Johan Arango. Phone Interview. Chelsea, MA. October 7th, 2015.

⁵⁰ Inter-American Development Bank. Water availability, quality and integrated water resources management in northern Haiti.(HA-T1179). (n.d.). pg 1.

were focused in the contribution of the National Park Three Bays (PN3B) that will protect mangroves and coral reefs. However, the efforts planned are still uncompleted in relation to prevent the introduction of invasive species and soils restoration. Therefore, the PIC can improve their sustainability goals by implementing a management plan for the PN3B, and also by creating a strategy to reuse and restore soils disturbed during construction. On the other hand, the PIC has taken initiatives to maintain surface water functions by enhancing the habitat in the surrounding area, as well as, maintaining water quality and hydrologic connections.

The construction of the PIC can fragment and decrease the total quantity of available habitat. As mentioned, the PIC has made efforts by contributing to the creation of the PN3B. This initiative will protect ecosystems important for many ecological functions and habitat of several species. Currently, a study to determine the biological and aquatic baseline of the PN3B is an ongoing effort that is also highly recommended to complement this initiative by establishing an appropriate management plan.

Besides, a preventive plan to avoid the introduction of non native species is important to avoid ecological disruptions. The PIC has not completed any plans of this sort. Nevertheless, the PIC will take invasive species into consideration when the construction of green spaces starts. It is recommended to complete and implement a comprehensive management plan addressing the control of invasive species that could change the functions of the ecosystem.

During the construction of an infrastructure project, soils are disturbed and their capability to hold water, nutrients, or carbon dioxide is affected. Therefore, restoring disturbed soils is vital to maintain the soil's ecological functions and the ability to retain water that bring benefits such as preventing floods. The PIC's Environmental Impact Assessment identified the need to store topsoil until ready to use for reforestation to avoid erosion of sloping surfaces, and recommended to carry out excavation activities when rainfall is low. Accordingly, the PIC is storing all the soils and other materials excavated, and reusing topsoil for landscaping to fill sunken areas within the park and replant some areas. However, the PIC could improve their impact on soils by providing documentation and calculations to establish if 100% of disturbed soils during construction have been restored.

Aquatic ecosystems are prompt to impacts caused by infrastructure and related development. Currently, the PIC is protecting hydrologic connections, implementing a water quality monitoring plan and by preserving mangroves and coral reefs with the creation of PN3B. Nonetheless, the PIC has limited evidence to establish if sediment transport is being maintained or enhanced. The completion of a study that demonstrates that natural in-waterway sediment transport is not disrupted by the project would benefit the long term sustainability of the ecosystem.

7. CLIMATE & RISK CATEGORY

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

Emissions

In the emissions subcategory, sustainable projects take action to reduce greenhouse gas emissions and maintaining or enhancing air quality by controlling air pollutant emissions. The greenhouse gases emitted by a project can exacerbate the effects caused by climate change. Also, pollutant emission may cause damage to human health, environment, and infrastructure. The PIC provided scant efforts to evaluate greenhouse gas emissions and to control air pollutants.

The PIC has not considered a life-cycle carbon assessment for key materials to be used in the project, neither reduction targets have been established. This analysis should include the estimation of carbon emissions caused by material extraction, processing, transportation, and project maintenance and operation, including vehicle traffic. Nevertheless, an estimation of greenhouse gas emissions was completed in order to comply with an operation policy established by the IDB to infrastructure projects that are expected to produce significant amount of greenhouse gases. In order to comply with IDB's compliance policy, a calculation of predevelopment greenhouse gas emissions was completed including construction components such as paved roads, sidewalks, sewage systems, connection to public lighting systems, among others. Nonetheless, the PIC could consider a comprehensive life-cycle carbon assessment and integrate this analysis in the design of future phases of the industrial park, so that carbon emissions are reduced in relation to future constructions and during the overall life-cycle of the project.

Regarding air pollutant emissions, every country has local air quality standards and meeting these minimum standards should be attained by sustainable projects. However, in Haiti, the undeveloped context with lack of regulations, enforcement and technical capabilities pose a limitation for the appropriate control of pollutants. The PIC acknowledges the need to address a management system to control air pollution adhering to the Environmental Health and Safety (EHS) Management System. The air pollution section in the EHS Management System is based on guidelines provided by the International Finance Corporation (IFC) for textile industries. Nonetheless, this EHS management system to control air pollutant emissions is currently not

being executed. Moreover, the PIC could adhere to other international standards such as the Clear Air Act Quality Standards set by the U.S. Environmental Protection Agency (U.S. EPA).

Resilience

The resilience subcategory examines the ability to withstand short-term risks and adapt to changing long-term conditions, such as weather patterns, sea level rise, or changes in climate. Short-term risks include flooding, hurricanes or fires, and long-term risks comprise sea-level rise or changes in climate. The PIC presents considerable efforts to assess climate threats as well as, avoid traps and vulnerabilities that could create high long-term risks. In terms of long-term adaptability and short term risks, both are addressed in the plans presented by the PIC. Nonetheless, actions to minimize the heat islands effect produced by new hard surfaces and urbanization are not considered.

Sustainable projects must assess vulnerability risk, and adaptation actions to lessen effects from climate change. The PIC is currently completing a Disaster Risk Assessment (DRA) that incorporates risks posed by climate change as sea level rise. Moreover, it is already planned to implement a Disaster Risk Management (DRM) and a Climate Change Adaptation plans once the DRA is completed. Besides, a changing world presents long-term challenges such as resources becoming scarce and expensive, economic changes extreme weather events or natural disasters. The PIC considers action to avoid configuration highly vulnerable to extreme weather events and natural disasters by placing, designing and constructing the buildings to ensure resistance to flooding, hurricanes and earthquakes. Nonetheless, these actions are targeted to specific aspects and they are limited in considerations for water, energy, materials supplies, and do not incorporate a systematic assessment on potential traps and vulnerabilities.

Short-term hazards include natural occurring hazards such as earthquakes, flooding, and fires; and it also covers human-induced ones such as epidemics, terrorists attacks, material spills, so on. The DRA, currently under completion, incorporates also risks posed by short-term hazards, including hurricanes, excessive rain, inland and coastal flooding. Also, all buildings have been designed and built to be seismic resistant and elevated to avoid flooding.. Moreover, the DRA will establish design disaster prevention and mitigation measures, contingency plans, estimated costs, implementation and evaluation plan, and a monitoring program. Besides, a disaster risk management plan is also in preparation, that will include proposals that will reduce the risk of disaster.

It is recommended to ensure the completion and implementation of DRA, DRM, Climate Change Adaptation plans and disaster risk management plan as well as the incorporation of the

proposed mitigation action. Also, it is recommended to the PIC's project team to conduct a complete survey of possible resources, constraints and vulnerabilities that the community could face in future in order to avoid high long-term costs and risks for the affected communities.

In addition, when a project create hard surfaces and pavements, the management of the heat island effect related to those actions should be considered. These surfaces can absorb a large percentage of the incident solar radiation, heating the surfaces and the surrounding air. The amount of heat alters microclimate and can impact local vegetation, wildlife, and community comfort. The PIC did not consider strategies to reduce or manage the heat island effects. The use of materials with high solar reflectance index (SRI) or increment of vegetation to provide cooling via evapotranspiration and increased shade can help to manage the heat island effects. Therefore, for future phases of construction of the PIC it is recommended to consider this actions for implementation.