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EXPANSION AND UPGRADE PROJECT
INTERNATIONAL (ECOLOGICAL) AIRPORT IN GALAPAGOS- ECUADOR

Figure 01: Ecological airport, platform view. \ Source: Environmental Impact Assessment, page 38, figure 3-4

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1. PROJECT INTRODUCTION

This case study outlines the evaluation of the proposed expansion of and upgrades to the International Airport of the Galápagos Islands, off the coast of Ecuador. Specifically, the project is located on Baltra Island, which is within the jurisdiction of Parish Santa Rosa, Canton of Santa Cruz, Galápagos Province.

Due to the expected increase in tourism to the ecologically valuable Galápagos archipelago, more space and better infrastructure will be required to handle the demand. Baltra is one of the main entry points for tourists visiting the Galápagos Islands and is home to the Galapagos international Airport (formerly known as Seymor Airport), which is one of only two airports within the archipelago. Tourists arrive at the airport and are transported to different locations by bus and boat. In the past few years, due to the increase of tourism in the area, the Government of the Republic of Ecuador has decided to expand and modernize the existing airport.

In July 2008, the Ecuadorian Government launched an international bidding process for the construction, operation and management of Baltra Airport. The contract was awarded to Corporación América, an Argentine Holding Company that manages about 50 airports in the world.[1] The budget for this project is around US $35 million and construction will be divided into three different phases. Phase one consists of the construction of the new terminal building, control tower and technical block, and should be completed within a period not exceeding 12 months. Phase two involves demolition of the previous terminal, extension of the aircraft platform, remodeling of the Fire Service building, and relocation of existing hangars and the cargo terminal; it is anticipated to take 6 months. The final phase involves reconstruction of the runway and is expected to be executed within 12 months. The first phase began in July 2011; phase two is currently being implemented.

The main goal of the project is to integrate bioclimatic and natural conditioning strategies within the design of the new terminal in order to enhance environmental quality and reduce energy consumption. To this end, Corporación América (CA) is seeking gold certification under the standards of LEED[2] (Leadership in Energy and Environmental Design) developed by the United States Green Building Council (USGBC).[3]The implementation of LEED standards has resulted in a 40% reduction in energy consumption based on a building of the same area and occupation. Water savings are estimated at around 40% as well. According to recent measurements taken in October 2013, renewable energy sources will generate 40% of the total energy demand of the airport. This percentage is expected to increase to 100% once the wind farm next to

[1] http://www.ecogal.com.ec/web/index.php/about-us

[2] **The LEED Green Building Rating System (LEED):** is a voluntary, consensus-based, market-driven program that provides third-party verification of green buildings. The LEED rating systems address both a wide variety of buildings types, including commercial buildings, homes, neighborhoods, retail, healthcare and schools; as well as every phase of the building lifecycle; including design, construction, operations and maintenance. Projects may earn one of four levels of LEED certification (Certified, Silver, Gold or Platinum) by achieving a given number of point-based credits within the rating system. . (http://en.wikipedia.org/wiki/U.S._Green_Building_Council)

[3] **U.S. Green Building Council (USGBC)**: Membership-based non-profit organization that promotes sustainability in how buildings are designed, built, and operated. USGBC is best known for its development of the Leadership in Energy and Environmental Design (LEED) green building rating systems. (http://en.wikipedia.org/wiki/U.S._Green_Building_Council)

the passenger terminal is operational. It is worth mentioning that in terms of materials reuse, 75% of the materials from the old terminal are slotted for reuse by the new building.[4]

2. PROJECT DESCRIPTION & LOCATION

The Galápagos Islands form an archipelago in the Pacific Ocean that is comprised of 13 large volcanic islands, 6 smaller islands and 107 rocks and islets. Located 972 kilometers from the Ecuadorian mainland, the Galápagos Islands are at the confluence of three ocean currents and as such are a 'melting pot' of marine species. Due to volcanic and seismic activity combined with a long period of isolation, an unusually high amount of biodiversity was able to develop in the area.

The Galápagos Islands are characterized by their high ecological value, and are considered part of the National System of Protected Areas of Ecuador. In 1978, the Galápagos Islands were granted the UNESCO World Heritage designation; in 1985, UNESCO further designated the islands as a Biosphere Reserve. In 1986, UNESCO declared the sea around the Galápagos a Marine Reserve, and in 2001, this area received distinction as a Whale Sanctuary, Biosphere Reserve and RASMAR site for the protection of wetlands.[5]

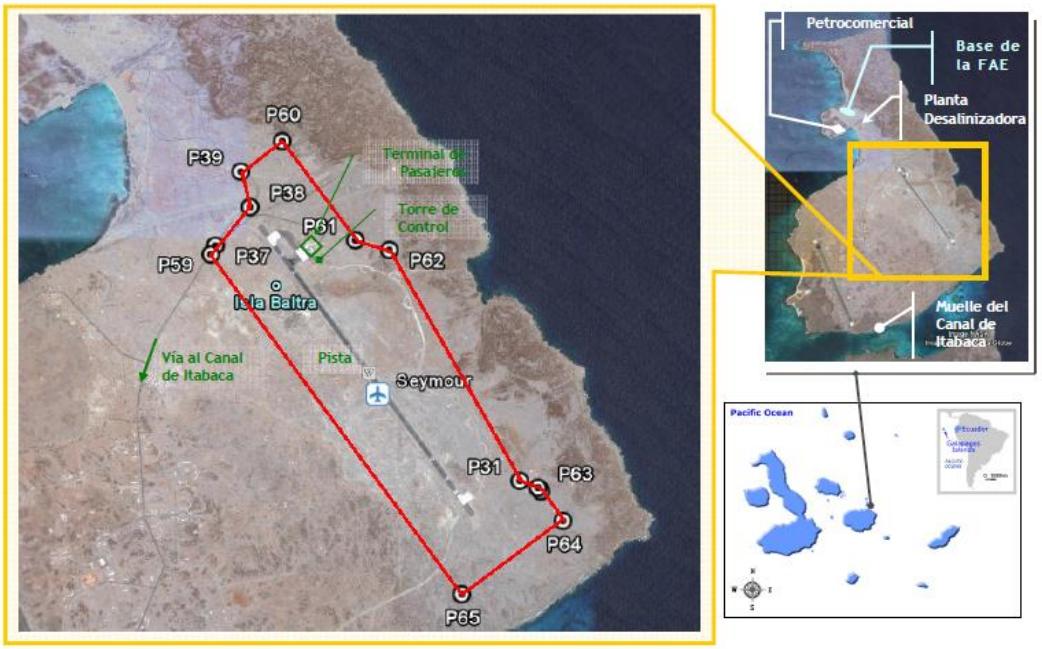


Figure 02: General map of the location of the project/ Source: Environmental Impact Assessment_ Figure 1.1_page 26.

Baltra Island is located in the center of the archipelago and comprises a land area of 21 square kilometers. It is generally flat with a maximum elevation of 100 meters. Baltra was relatively unknown until the 1930s, when the US government decided to establish an airbase on the island due to its strategic location proximate to the Panama Canal. Construction of the airbase, and other infrastructure to accommodate a

[4] Energy usage data Baltra - October 2013. Excel file
[5] Official web page of ecological airport Galapagos. http://www.ecogal.aero

1,000-soldier US military presence, began in 1941. In 1948,[6] after the end of World War II, the base was turned over to the Ecuadorian government. In 1963, the airport and base facilities began to be used for commercial aviation purposes; today, northwestern parts of the island are used by both the Ecuadorian Navy and Air Force, and by PETROCOMERCIAL terminal fuels.

The Ecuadorian government has recently decided to upgrade and modernize the airport in order to respond to the growing tourist activity in the area, and to adapt the existing facilities. The new facilities will be located in the vicinity of the existing facilities. Due to the need for space, the new terminal will double the airport's area, from around 2,500m^2 to 6,000m^2. Currently, there are 12 flights per day that handle about 530 passengers. Over the course of a year, these figures total to approximately 4,450 flights and 193,500 passengers.

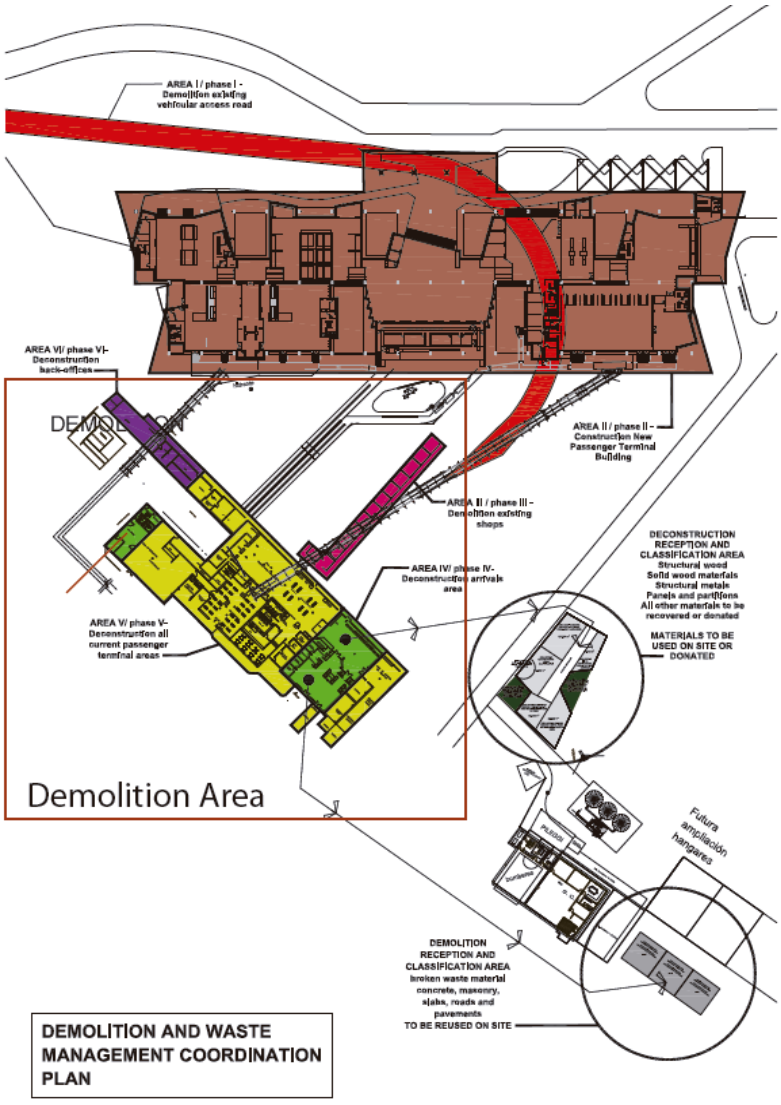


Figure 03: Different phases of the project,/Sources: Materials and resources, page, LEED-19.6; credit MR- 3., 3-2

[6] Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 72.

3. APPLICATION OF THE ENVISION RATING SYSTEM[7]

The *Envision* rating system is a set of criteria that assess and evaluate any specific piece of infrastructure. In this case the infrastructure to be assessed is the expansion and upgrades project for the construction of an ecological airport in Galapagos. The main intent of this rating is to evaluate the entire project divided in the three different phases previously mentioned.

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 has been met for a particular credit. In each of the five categories there is a specific credit called "Innovative or exceed credit requirements". This is an open window to reward exceptional performance or the application of innovative methods.

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 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 positive impact for the given credit criteria. The *Envision* system weighs the relative value of each credit and level of achievement by assigning points. Credit criteria are documented in the *Envision Guidance Manual,* which is available to the public on the ISI[8] and Zofnass Program[9] websites.

Appendix C provides a table with the detailed project assessment, specifications for each of the credits, and recommendations for the ecological airport project.

[7] Anthony Kane, Zofnass program research director, and Salmaan Khan, research assistant, wrote most parts of this section.
[8] www.sustainableinfrastructure.org
[9] www.zofnass.org

4. EVALUATION CATEGORIES

4.1. QUALITY OF LIFE

The first category of the *Envision* rating system is Quality of Life. The assessment here mainly refers to the impact of the project on the surrounding communities and their well-being. As stated in the Envision manual, *"Quality of Life particularly focuses on assessing whether infrastructure projects are in line with community goals, incorporated into existing community networks, and will benefit the community long-term."*[10] It also determines if the project is aligned with the community needs.

This category is divided into 3 subcategories and 12 credits: Purpose (QL 1.1, QL 1.2, QL 1.3, and QL 1.4), Community (QL 2.1, QL 2.2, QL 2.3, QL 2.4, QL 2.5, and QL 2.6) and Well-Being (QL 3.1, QL 3.2, and QL 3.3).

CREDIT SCORING

				IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve community quality of life	2	5	10	20	25
2			QL1.2 Stimulate sustainable growth and development	1	2	5	13	16
3			QL1.3 Develop local skills and capabilities	1	2	5	12	15
4		COMMUNITY	QL2.1 Enhance public health and safety	2			16	
5			QL2.2 Minimize noise and vibration	1			8	11
6			QL2.3 Minimize light pollution	1	2	4	8	11
7			QL2.4 Improve community mobility and access	1	4	7	14	
8			QL2.5 Encourage alternative modes of transportation	1	3	6	12	15
9			QL2.6 Improve site accessibility, safety and wayfinding		3	6	12	15
10		WELLBEING	QL3.1 Preserve historic and cultural resources	1		7	13	16
11			QL3.2 Preserve views and local character	1	3	6	11	14
12			QL3.3 Enhance public space	1	3	6	11	13
						Maximum points possible:		181

Figure 04: Quality of Life category, credits distribution.

4.1.1. Purpose:

In the **Purpose subcategory**, the Ecological Airport of Galapagos has a good performance, with all three credits evaluated as Superior (QL 1.1 Improve Community Quality of Life, QL 1.2 Stimulate Sustainable Growth and Development and QL 1.3 Develop Local Skills and Capabilities).

In terms of community impacts, it has been specified that there are no settlements near the airport or on Baltra Island; the island is only used for the airport, ancillary infrastructure and military facilities. However, while the project is located in a relatively remote area, it has many implications for the inhabitants of Santa Cruz, a nearby island. Thus, the socioeconomic aspects considered in this assessment refer to the Canton Santa Cruz in Galapagos Province, whose main population center is the town of Puerto Ayora (EIA page 129). The expansion and improvement of the Ecological Airport will also have social and economic impacts on tourists, visitors and residents of the Archipelago. Vehicular traffic on Baltra Island is expected to double, and the Environmental Impact Assessment (EIA) states that "*Galapagos Ecological Airport will benefit the development of tourism on the islands by handling 100% of passenger demand, and will especially benefit Santa Cruz County by directly and indirectly generating jobs*" (EIA page 276).

[10] *Envision* Guidance Manual, p.30

Due to the importance of the Ecological Airport for the local economy, a Tourism Development Program is expected to be created to focus on community development. The EIA also stated that several educational and environmental training programs for local people who are interested in working on the project would start in May 2009 on a quarterly basis. However, no information has been provided regarding this initiative.

One of the positive impacts of the project is the generation of labor demand for all activities involved in the construction phase, including civil works, metalworking, and electrical and plumbing work. "*According to the project sponsor, the work, from inception to completion, will create between 150 and 200 jobs*." The project will impact several different sectors through the demand for construction supplies and materials of national origin. "*For the closing phase, the generation of employment in dismantling the facilities will create the greatest positive impact*" (EIA page 234).

4.1.2 Community:

In the **Community subcategory**, out of six credits, four were evaluated as Conserving (QL 2.2 Minimize Noise and Vibration, QL 2.3 Minimize Light Pollution, QL 2.5 Encourage Alternative Modes of Transportation and QL 2.6 Improve Site Accessibility, Safety & Wayfinding), one was evaluated as Enhanced (QL 2.4 Improve Community Mobility and Access), and one was evaluated as No Score (QL2.1 Enhance Public Health and Safety).

In terms of noise generation, detailed methodology[11] has been applied for the analysis of noise impacts. The EIA determined that the impact of aircraft noise is not significant, mainly due to the small scale of operations that take place in the Ecological Airport facilities. Different noise exposure levels have been determined in order to plan land use in the area.[12]

Descriptor	Día de Medición						
	Lunes 12	Martes 13	Miércoles 14	Jueves 15	Viernes 16	Sábado 17	Domingo 18
Nivel Día-Noche (DNL)	50,9	53,7	52,0	54,3	59,7	54,0	54,3
Nivel Sonoro Equivalente 06h00-20h00 (Leq diurno)	51,7	55,7	54,1	55,4	61,0	55,6	55,2
Nivel Sonoro Equivalente 20h00-06h00 (Leq nocturno)	38,9	38,3	32,6	38,7	37,5	40,7	42,0
Nivel de Polución Sonora (NPL)	64,5	66,7	66,5	66,8	72,0	73,9	68,2
Nivel Máximo (L_{Amax})	86,0	97,1	91,2	95,8	102,8	94,4	94,2
Nivel Sonoro Equivalente 24 horas (Leq 24 horas)	50,6	53,4	51,8	54,2	59,7	53,4	53,4

Elaboración: Ecolcitos, 2009.

Figure :05 Table 4-3. Summary of results for noise levels measure. Based on the north area of the American base. 12 to 18 January 2009 /Source: Environmental Impact Assessment, page 84

Fuente: Ecolcitos, 2009.

Figure 06: Table 4-4. Sonometer used and noise measurement site / Source: EIA page 81

[11] The methodology used for this purpose is recommended by the environmental regulations, specifically Annex 9: Statement of Airport Noise, Book VI of Texto Unificado de Legislación Secundaria del Ministerio del Ambiente (TULSMA).

[12] "*According to the provisions of the standard, and as seen in Table 5-2, all land use is considered consistent if the noise levels day-night annual average DNL are under 65 dBA. For areas where noise contours determined by INM exceed 65 dBA, it may not be necessary to establish the compatibility with the use of assigned floor" [...] " According to the provisions of the standard, and as seen in Table 5-2, all land use is considered consistent if the noise levels day-night annual average DNL are under 65 dBA"(*EIA page 178). Standard used: Integrated Noise Model (INM)

Regarding light pollution,[13] the airport operating hours are from 7am to 4pm, during which there will be no exterior, facade or landscape lighting. All interior lighting is controlled by daylight and occupancy sensors that dim and turn off lights as required when sufficient daylight is available. There is no reference to the illumination of other areas within the airport.

Figure 07: Lighting of the terminal building and surroundings/ Source: LEED documentation. Credit SS-08, plan L-14.1

Figure 08: Signage on the construction site and construction area/ Source: Pictures submitted by the project owner.

In terms of access and transportation to the airport, the project will maintain the existing road infrastructure and will address several gaps in the safety of site access. As a result of the road improvements, dust is reduced, and mobility and site access are improved; several pictures of the construction signage have been provided. The existing transportation system is directly related to airport operations and is timed to be available upon arrival or departure of aircraft. Some airlines have buses that can transport passengers to and from the terminal at Itabaca Canal. Boats are required for transit through Itabaca Canal, while buses and light vehicles carry passengers from Santa Cruz to Puerto Ayora city. Thus, all the transportation within the island is considered public transit. In terms of accessibility, the old terminal had several issues such as: insufficient apron width for aircraft maneuverability; limited parking areas for aircraft; and an insufficient distance between the runway and the old terminal building. The expansion of the airport solved some of these problems and thus resulted in an improvement to overall safety conditions.

Credit QL 2.1 Enhance Public Health and Safety has been evaluated as No Score. This credit seeks to identify additional risks associated with new or innovative materials, technologies or methodologies. No documents have been provided that reference of special risks taken into account or additional efforts to exceed normal health and safety requirements.

[13] Credit SS 8: Light Pollution Reduction, for LEED certification.

4.1.3 Wellbeing:

In the **Wellbeing subcategory**, out of three credits, one was evaluated as Improved (QL 3.1 Preserve Historic Character and Cultural Resources), one credit was Superior (QL 3.2 Preserve Views and Local Character), and one was Conserving (QL 3.3 Enhance Public Space).

The Ecological Airport is considered the main entrance to the Galapagos archipelago. As a result, a very detailed analysis of the landscape surrounding the airport has been developed. Considering that the current project constitutes a modification and expansion of a previous airbase, "*the current facilities of the Galapagos Ecological Airport do not represent significant changes to the natural landscape of the project area.*"[14] The project team tried to integrate sustainability principles and interrelationships between flora, fauna and landscape into the project design. *"The project uses native plants and respects the topography of the site, [...]. No exogenous materials are being introduced to the ecological system of the islands*" (LEED project page 34). It is important to mention that this specific island, Baltra, does not have outstanding natural landscape elements such as forests, lakes or rivers that can be interrupted by the project. The biggest impact of the project will occur during the construction phase, due to the increase in vehicles and materials on the island. This disruption will cease once construction is completed. The project achieves alignment between the design, existing infrastructure, and preservation of the surrounding character. Local materials have been used, and existing connection routes improved. Views and landscape alteration have been analyzed in terms of possible long-term impacts.

Construction of the new terminal has solved some of the existing capacity issues, such as the lack of common spaces like ground transportation waiting areas and small shopping areas around the terminal. These improvements have also created safer and more comfortable areas. In terms of historic and cultural resources, there is some evidence of archeological findings on certain islands around the Galapagos. "*It was in 1952 that Galapagos archaeology was taken into account, due to the interest shown by Norwegian Thor Heyerdahl.*"[15] However, after these studies, no further analyses have been developed.

Figure 09: View of previous area for ground transportation/ Source: LEED project document page 19

Figure 10: View of the crowd on the old terminal building / Source: LEED project document page 16

[14] Corporación América. 2009. Estudio de Impacto Ambiental y Plan de Manejo Ambiental. Proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda. Page 93.

[15] Idem Page 166,167.

Figure 11: Sketch of the new terminal facade / Source: LEED project document. Page 90

4.1.4 Summary of results for the Quality of Life Category.

The table below shows the distribution of credits as well as the level of achievement reached in each credit (figure 12).

			ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR	PT.	Performance	% Total	max.
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life	10	Superior	40.0%	25
2			QL1.2 Stimulate Sustainable Growth & Development	5	Superior	31.3%	16
3			QL1.3 Develop Local Skills And Capabilities	5	Superior	33.3%	15
4		COMMUNITY	QL2.1 Enhance Public Health And Safety	0	No score	0.0%	16
5			QL2.2 Minimize Noise And Vibration	8	Conserving	72.7%	11
6			QL2.3 Minimize Light Pollution	8	Conserving	72.7%	11
7			QL2.4 Improve Community Mobility And Access	4	Enhanced	28.6%	14
8			QL2.5 Encourage Alternative Modes of Transportation	12	Conserving	80.0%	15
9			QL2.6 Improve Site Accessibility, Safety & Wayfinding	12	Conserving	80.0%	15
10		WELLBEING	QL3.1 Preserve Historic And Cultural Resources	1	Improved	6.3%	16
11			QL3.2 Preserve Views And Local Character	6	Superior	42.9%	14
12			QL3.3 Enhance Public Space	11	Conserving	84.6%	13
			QL0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			QL	82		45.3%	181

Figure 12: Summary of results in Quality of life category

The biggest opportunities for improvement in the Quality of Life (QL) category are the preservation of historical and cultural resources through further analyses, and a consideration of possible risks associated with new technologies or procedures. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 45%, or 82 points out of 181.

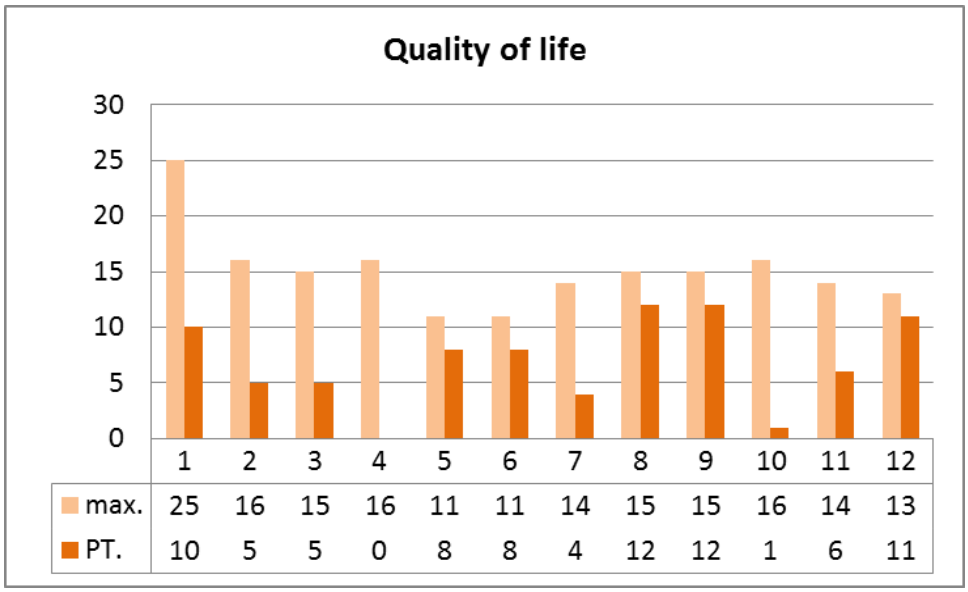


Figure 13: Summary of results in Quality of life category

4.2 LEADERSHIP

Envision's Leadership category evaluates the collaboration, management and planning of the project's team, as well as its stakeholders. *Envision* states that *"communicate and collaborate early on, involve a wide variety of people in creating ideas for the project, and understand the long-term, holistic view of the project and its life cycle."*[16]

The 12 credits in this category are: collaboration (LD 1.1, LD 1.2, LD 1.3 and LD 1.4), management (LD 2.1, LD 2.2) and planning (LD 3.1, LD 3.2, LD 3.3).

CREDIT SCORING

				IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
13	LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	2	4	9	17	
14			LD1.2 Establish a sustainability management system	1	4	7	14	
15			LD1.3 Foster collaboration and teamwork	1	4	8	15	
16			LD1.4 Provide for stakeholder involvement	1	5	9	14	
17		MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	1	3	6	12	15
18			LD2.2 Improve infrastructure integration	1	3	7	13	16
19		PLANNING	LD3.1 Plan for long-term monitoring and maintenance	1	3		10	
20			LD3.2 Address conflicting regulations and policies	1	2	4	8	
21			LD3.3 Extend useful life	1	3	6	12	
							Maximum points possible:	121

Figure 14: Leadership category, credits distribution.

[16] *Envision* Guidance Manual, p.60

4.2.1 Collaboration

In the **Collaboration subcategory**, one credit is Conserving (LD 1.1 Provide Effective Leadership and Commitment), one is Improved (LD 1.2 Establish a Sustainability Management System), one is Enhanced (LD 1.3 Foster Collaboration and Teamwork), and one is Superior (LD 1.4 Provide for Stakeholder Involvement).

The documentation provided indicates that sustainability is a core value of the project owner and the organization itself. Considering the unique location of the project within the Galapagos Islands, which have the UNESCO World Heritage designation, some standards and regulations applied to this project are demanding. The new terminal building has been designed according to the Leadership in Energy and Environmental Design (LEED) standards of the US Green Building Council (USGBC). In addition, the project team offers educational programs regarding sustainable practices to impart knowledge about environmental issues to the people interested in working on the project. Several management procedures[17] have been described for both the construction and operation phases to ensure that systems are working properly.

To promote collaboration and involvement of the stakeholders, several public meetings and programs for dissemination of project information have been conducted. These programs are specifically targeted at the community and authorities of the Canton of Santa Cruz, Galapagos Province, as well as directors and officers of government agencies.[18] In terms of the parties involved in the actual project, in April 2011, the Ecuadorian government signed a contract with Corporación America (CA) for the construction and 15 year operation of the Ecological Airport. ECOGAL S.A., a company belonging to Corporación America (CA), will be in charge of the project.

4.2.2 Management:

In the **Management subcategory**, one credit achieved No Score (LD 2.1 Pursue By-product Synergy Opportunities), and one achieved Conserving (LD 2.2 Improve Infrastructure Integration).

The concept of by-product synergy opportunities refers to "*the identification and cost-effective use of unwanted materials located near the project.*"[19] No information has been provided regarding the use of unwanted byproduct materials from nearby sites.

In terms of improving Infrastructure integration, the project is closely aligned to existing infrastructure systems. The expansion of the airport was designed to take into account the existing base and other community functions. This integration has resulted in a larger terminal building as well as improvements to the parking area and existing roads. As specified within the EIA, an agreement has been signed between Corporación America (CA) and the Provincial Council of Galapagos to improve the road infrastructure from

[17] In construction phase: Erosion and sedimentation best practices, wastewater, site and wildlife management, spill prevention and control. During the operation phase: Management Program Petroleum Hydrocarbons and Chemicals; Waste Management Program; Monitoring Program, Registration and Monitoring, Noise Compatibility Program.

[18] Corporación América. 2009. Estudio de Impacto Ambiental y Plan de Manejo Ambiental. Proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda. Page 278.

[19] Envision Guidance Manual, p.70

the airport to Itabaca Canal.[20.] The airport design is also integrated with the physical infrastructure around it, increasing the efficiency and effectiveness of the project.

4.2.3 Planning:

In the results of **Planning subcategory**, two credits were evaluated as Improved (LD 3.1 Plan for Long-term Monitoring and Maintenance and LD 3.3 Extend Useful Life), and one was considered No Score (LD 3.2 Address Conflicting Regulations and Policies).

The contract signed between Dirección General de Aviación Civil (DGAC) and Corporación América (CA) identifies long-term monitoring and maintenance within the scope of the agreement. "*Throughout the Airport Concession Term, maintain and preserve the functional fitness of the terminals, equipment and related structures so that the security, comfort and operation are optimized and in accordance with ICAO standards and applicable IATA standards, and the provisions of this Agreement*" (Contract DGAC-CA). The documentation provided specifies that an Annual Maintenance Program should be submitted within 180 days after the conclusion of phase one. This maintenance program should be updated every 12 months and delivered to the Administrator in October each year starting in 2011 (Contract DGAC-CA). Due to the early stage of construction, the personnel and resources for monitoring and maintenance were not yet identified. The lifetime of the project is between 20 and 30 years.

Through a better and more sustainable design of the airport, a more durable project is expected. The lifetime of the project I expected to be 20 to 30 years. No specific use has been defined after this (EIA page 305). Due to a likely rise in tourism to the Galapagos Islands, the expansion of the airport increases the current capacity to accommodate more flights. As specified by the concessionaire, the installations are designed to support growth up to 100% of current demand (EIA page 221). No specific considerations have been given to future expansion or configuration of the airport, but the current expansion represents flexible planning regarding long-term expectations. The project team has not provided very detailed information regarding construction specifics beyond the terminal building, and more detail is needed regarding intersection between the platform and the runway. In addition, the project team has not provided information regarding coordination with public officials in addressing laws and regulations that create a barrier to sustainable infrastructure

[20] Corporación América. 2009. Estudio de Impacto Ambiental y Plan de Manejo Ambiental. Proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda. Page 276.

4.2.4 Summary of results, Leadership Category.

The table below shows the distribution of credits as well as the level of achievement reached in each credit (figure 15).

	ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR			PT.	Performance	% Total	max.
13	LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	17	Conserving	100.0%	17
14			LD1.2 Establish A Sustainability Management System	1	Improved	7.1%	14
15			LD1.3 Foster Collaboration And Teamwork	4	Enhanced	26.7%	15
16			LD1.4 Provide For Stakeholder Involvement	9	Superior	64.3%	14
17		MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	0	No Score	0.0%	15
18			LD2.2 Improve Infrastructure Integration	13	Conserving	81.3%	16
19		PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	1	Improved	10.0%	10
20			LD3.2 Address Conflicting Regulations & Policies	0	No Score	0.0%	8
21			LD3.3 Extend Useful Life	1	Improved	8.3%	12
			LD0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			LD	46		38.0%	121

Figure 15: Summary of results in Leadership category

The biggest opportunities for improvement in the Leadership (LD) category are the establishment of a more detailed Sustainability Management System and a long-term monitoring program that specifies the roles of all parties involved in the process as well as the overall size and responsibilities of the organization. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 38%, or 46 points out of 121.

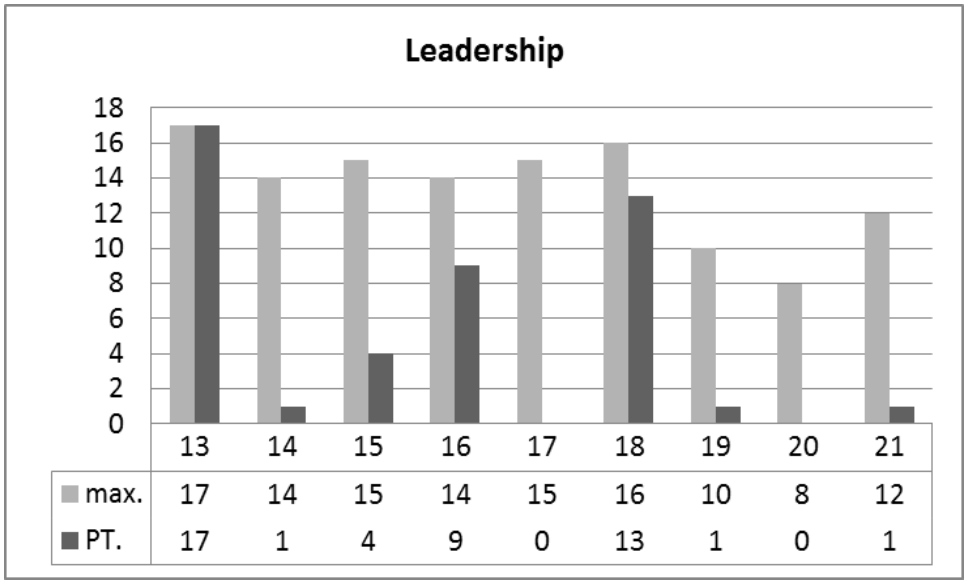


Figure 16: Summary of results in Leadership category

4.3 RESOURCE ALLOCATION

The Resource Allocation (RA) category deals with the quality and source of the materials used in the project during its construction and operation phases. Use and allocation of materials and other resources has a great impact on the overall sustainability of the project. The RA category is divided into 13 credits: materials (RA 1.1, RA 1.2, RA 1.3, RA 1.4, RA 1.5, RA 1.6 and RA 1.7), energy (RA 2.1, RA 2.2, RA 2.3) and water (RA 3.1, RA 3.2, RA 3.3).

CREDIT SCORING

				IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce net embodied energy	2	6	12	18	
23			RA1.2 Support sustainable procurement practices	2	3	6	9	
24			RA1.3 Use recycled materials	2	5	11	14	
25			RA1.4 Use regional materials	3	6	9	10	
26			RA1.5 Divert waste from landfills	3	6	8	11	
27			RA1.6 Reduce excavated materials taken off site	2	4	5	6	
28			RA1.7 Provide for deconstruction and recycling	1	4	8	12	
29		ENERGY	RA2.1 Reduce energy consumption	3	7	12	18	
30			RA2.2 Use renewable energy	4	6	13	16	20
31			RA2.3 Commission and monitor energy systems		3		11	
32		WATER	RA3.1 Protect fresh water availability	2	4	9	17	21
33			RA3.2 Reduce potable water consumption	4	9	13	17	21
34			RA3.3 Monitor water systems	1	3	6	11	
							Maximum points possible:	182

Figure 17: Resource Allocation category, credits distribution.

4.3.1 Materials:

In the **Materials subcategory**, out of seven credits, three were assessed as Improved (RA 1.3 Use Recycled Materials, RA 1.4 Use Regional Materials, and RA 1.6 Reduce Excavated Materials Taken Off Site), one credit was assessed as Superior (RA 1.5 Divert Waste from Landfills), and three credits received No Score (RA 1.1 Reduce Net Embodied Energy, RA 1.2 Support Sustainable Procurement Practices, and RA 1.7 Provide for Deconstruction and Recycling).

A detailed inventory of potential reused materials from the old terminal has been provided. Certain materials such as natural soil, deconstruction debris, and structural elements such as beams and posts have been reused, as noted in the documentation provided.[21] The amount of reused material represents 15.34% of the total material cost. Due to toxic content or degradation, certain materials such as asphalt from the demolition of the runway have been classified as non-recyclable. The Waste Management Plan for Construction and Demolition (C&DWM) identifies several strategies for the reuse of existing materials in order to divert waste from landfills. Some of these strategies include storage of excavated soil/rock in piles; and storage of concrete waste, masonry, wood and packing materials for future reuse. Hazardous waste should be separated from other materials to avoid contamination. The project will be developed in six different phases and in each of them a detailed analysis of waste material has been conducted. For all

[21] "steel structures from commercial shops and kiosks, on-site deconstruction salvaged structural steel beams and posts 100% [...]; recovered wood columns and beams for interior pergolas, on-site deconstruction salvaged structural wood beams and posts 100% [...]; recovered wood beams and rangers for PV panel supports, on-site deconstruction salvaged structural wood beams and posts 100% [...]; recovered wood for paneling, wood siding and wood partitions for commercial and retail shops, on-site deconstruction salvaged wood slats 100%."

phases combined, the tonnage of material sent to landfills was 1,434 out of a total of 5,981.7 tons, which represents around 23.97%. The remaining 4,547.3 tons, or 76.03% of materials, were reused or recycled.[22]

Figure 18: Savage Material, metal and wood form the old terminal/ Source: Materials and resources, page, L-01 and L-19; credit MR- 3.1, 3-2

A very detailed inventory of the percentage and cost of regional materials used has been provided. The inventory includes information about the manufacturer, the distance between the project and the provider, the distance between the project and the source of extraction, the product cost, and the percentage and value of regionally-extracted materials. The primary regional materials used are natural soil and deconstruction debris for filling roads, walkways and buildings and the sub-base pavement layer.[23] The transportation distances for the materials vary depending on what side of the airport they are going to.[24]

Figure 19: Use of local material s and areas of excavation to extracts stone and gravel./ Source: Materials and resources, page, L-20-2; credit MR- 5.1, 5-2

[22] ECOGAL, waste Reporting, excel sheet by area.

[23] Corporación América. 2009. Estudio de Impacto Ambiental y Plan de Manejo Ambiental. Proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda. Chapter III 1.2.2, Page 43.

[24] Idem, page 145. "*It is emphasized that the operating areas will be located near the construction site, with a maximum distance of approximately 1,000 meters to the current terminal (considering the defined operating areas to the northeast of the terminal). The quarry location will likely minimize the environmental impact of powder emissions, which tends to be moderately significant. Moreover, the Petrocomercial Fuels dock will be the main dock used for transport of goods from the mainland, which is approximately 1,900 meters from the terminal construction site*."

Excavated material is derived from within the vicinity of the construction site, and therefore does not require lengthy transportation. "*The close proximity of and easy access to material sources enhances the site suitability for the project*" (EIA page 89).

Very little information has been provided about the Life Cycle Assessment of the materials used in the construction of the airport, or the reliability of evidence that proves that materials and equipment required for construction were from companies with sustainable practices. In terms of deconstruction of the existing building for later recycling, no specific percentages of potentially recyclable material have been provided. Some of the materials transferred from the old terminal to the new terminal may be expected to be reused again. However, plans and arrangements need to be made to identify and track prefabricated components that have been designed for disassembly and/or deconstruction.

4.3.2 Energy:

In the **Energy subcategory**, out of three credits, two were assessed as Enhanced (RA 2.1 Reduce Energy Consumption and RA 2.3 Commission and Monitor Energy Systems), and one was evaluated as Conserving (RA 2.2 Use renewable energy).

One of the goals of the international project LEED certification is to minimize the environmental impact of energy use. According to the calculations provided, and using the energy consumption of a building with similar characteristics and occupancy but without saving energy methods as a baseline, the reduction in energy consumption for the airport is around 40%. Several measures have been proposed to reduce energy consumption. Most of the rooms within the terminal building do not have air conditioning. Comfort conditions are maintained through a bioclimatic design. Natural ventilation as well as the orientation of the new terminal will have great importance in reducing the energy required to operate the building. Another strategy used is the optimization of natural light to minimize power consumption. However, most of the information provided regarding the reduction of energy consumption is based on the new terminal and very little information has been made available regarding the other construction projects taking place within the airport apart from the terminal building.

Figure 20: Use solar panels to shade some of the external paths/ Source: Energy and Atmosphere, page, L-13-3; credit SS- 7.1 , EA-2

One of the goals of the project is to promote the use of clean energy while reducing the use of fossil fuels. As shown within the information provided, the project will take advantage of several sources of renewable energy such as solar panels and wind turbines. According to the measurements taken last October 2013, around 47% of the total power used by the airport was provided by renewable sources. This percentage is

expected to increase once the installation of the solar panels near the passenger terminal is complete. At that point, almost 100% of the energy required will be provided by renewable sources.

Figure 21: Wind turbine /Source: LEED Wind Turbines L-17.3_EA6

Figure 22: Wind turbine /Source: LEED Wind Turbines L-17.3_EA6

As a prerequisite for the project (EAP1), a commissioning process to monitor the performance of energy systems was established. The commissioning process will include measurements to verify that the electrical and mechanical installations are running as expected. Nevertheless, information about the monitoring process, its frequency, and the equipment required to enable more efficient operations, is not very detailed.

4.3.3 Water:

In the **Water subcategory**, out of three credits, one was evaluated as Superior (RA 3.3 Monitor Water Systems), one was evaluated as Conserving (RA 3.1 Protect Fresh Water Availability), and one was evaluated as Improved (RA 3.2 Reduce Potable Water Consumption).

The documentation provided indicates that a desalination plant will be built to provide water during the construction process. According to LEED documentation *"100% of the wastewater generated will be treated on-site, of which 48% will be reused for flush fixtures and the remaining 52% will be piped to a collector used for extraction and desalination of seawater"*[25]. As specified by the project owners, drinking water used on-site is still bottled. The system is intended to be a close circle replenishing the water at the source.
One of the goals for the construction of the new building is the implementation of efficient water devices within the building and landscape. As specified in LEED-WE-3, some of the measures to be taken are the installation of low water consumption appliances, green spaces that do not require irrigation, and water storage areas (LEED project point 4 page 8). *"Flow fixtures to be installed in the project include ultra-low-flow push operated lavatories, regulated to less than 0.5gpf and low-flow push operated shower heads regulated to less than 1.8gpf."*[26] Additionally, all greywater from lavatories, showers, and kitchen sinks is treated on-site and reused within the building's toilets and urinals. The total treated water used estimated by year is around 507,702 gallons, of which 194,012 g/y will be used for flush fixtures. Using these numbers, it can be determined that a 38% reduction in water consumption will occur. *"All wastewater generated from the use of potable water within the building will then be collected, cleaned through grease*

[25] LEED-NC 2.2 Submittal Template. WE Credit 2: Innovative Wastewater Technologies. Page 5 out of 6.
[26] LEED-NC 2.2 Submittal Template. WE Credit 3: Water Use Reduction. Page 5 out of 6.

traps and sand filters, and sent to the treatment plant. Once treated, the recovered greywater will be redistributed to flush fixture installations."[27] During the construction process, the water used for dust control will be recycled water that has been transported from the desalination plant. No information has been provided regarding the procedures and program for monitoring water system performance during the operation phase, and whether and how this will impact receiving waters.

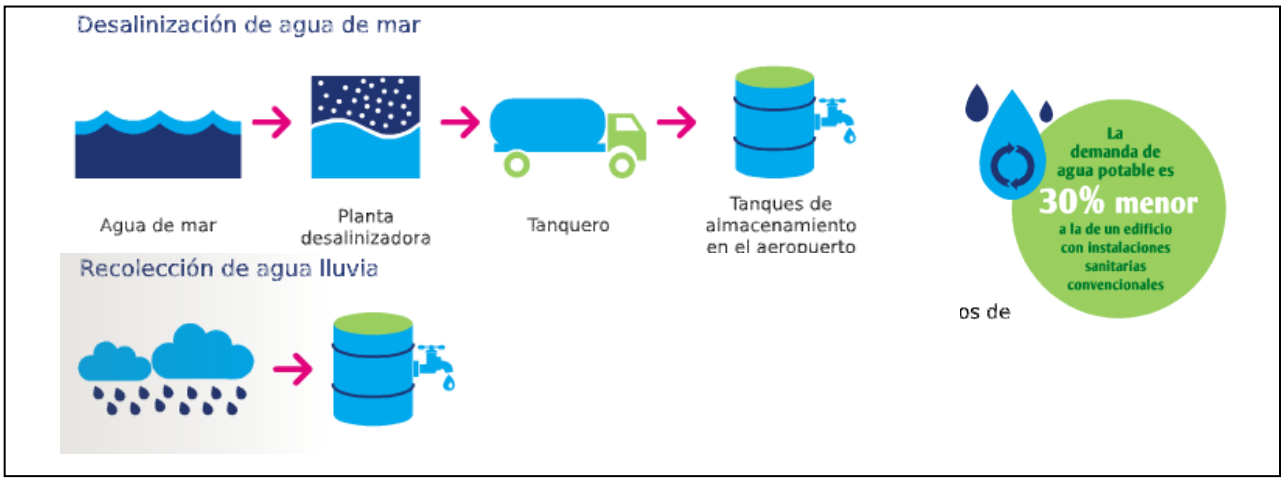


Figure 23: Informational Brochure on website. http://www.ecogal.aero

4.3.4 Summary of results, Resource Allocation category.

The table below shows the distribution of credits as well as the level of achievement reached in each credit (**figure 24**).

			ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR	PT.	Performance	% Total	max.
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	No score	0.0%	18
23			RA1.2 Support Sustainable Procurement Practices	0	No Score	0.0%	9
24			RA1.3 Used Recycled Materials	2	Improved	14.3%	14
25			RA1.4 Use Regional Materials	3	Improved	30.0%	10
26			RA1.5 Divert Waste From Landfills	8	Superior	72.7%	11
27			RA1.6 Reduce Excavated Materials Taken Off Site	4	Improved	66.7%	6
28			RA1.7 Provide for Deconstruction & Recycling	0	No score	0.0%	12
29		ENERGY	RA2.1 Reduce Energy Consumption	7	Enhanced	38.9%	18
30			RA2.2 Use Renewable Energy	16	Conserving	80.0%	20
31			RA2.3 Commission & Monitor Energy Systems	3	Enhanced	27.3%	11
32		WATER	RA3.1 Protect Fresh Water Availability	17	Conserving	81.0%	21
33			RA3.2 Reduce Potable Water Consumption	4	Improved	19.0%	21
34			RA3.3 Monitor Water Systems	6	Superior	54.5%	11
			RA0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			RA	**70**		**38.15%**	**182**

Figure 24 : Summary of results in Resource Allocation category

The biggest opportunities for improvement in the Resource Allocation (RA) category are in reducing net embodied energy, supporting sustainable procurements and practices, and long-term planning for

[27] LEED-NC 2.2 Submittal Template. WE Credit 3: Water Use Reduction. Page 5 out of 6.

demolition and recycling. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 34.1%, or 56 points out of 182.

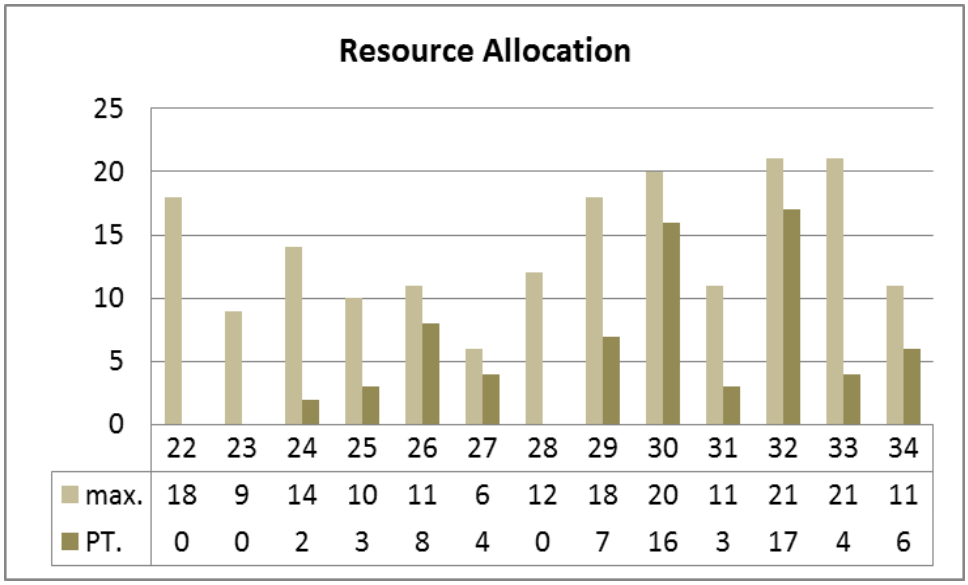


Figure 25 : Summary of results in Resource Allocation category

4.4 NATURAL WORLD

The Natural World category addresses "*how to understand and minimize negative impacts while considering ways in which the infrastructure can interact with natural systems in a synergistic, positive way.*"[28] The NW category is divided into 14 credits related to project siting (NW 1.1, NW 1.2, NW 1.3, NW 1.4, NW 1.5, NW 1.6, and NW 1.7), impacts on land and water (NW 2.1, NW 2.2, NW 2.3) and biodiversity (NW 3.1, NW 3.2, NW 3.3, NW 3.4).

CREDIT SCORING

				IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
35	NATURAL WORLD	SITING	NW1.1 Preserve prime habitat			9	14	18
36			NW1.2 Protect wetlands and surface water	1	4	9	14	18
37			NW1.3 Preserve prime farmland			6	12	15
38			NW1.4 Avoid adverse geology	1	2	3	5	
39			NW1.5 Preserve floodplain functions	2	5	8	14	
40			NW1.6 Avoid unsuitable development on steep slopes	1		4	6	
41			NW1.7 Preserve greenfields	3	6	10	15	23
42		LAND & WATER	NW2.1 Manage stormwater		4	9	17	21
43			NW2.2 Reduce pesticide and fertilizer impacts	1	2	5	9	
44			NW2.3 Prevent surface and groundwater contamination	1	4	9	14	18
45		BIODIVERSITY	NW3.1 Preserve species biodiversity	2			13	16
46			NW3.2 Control invasive species			5	9	11
47			NW3.3 Restore disturbed soils				8	10
48			NW3.4 Maintain wetland and surface water functions	3	6	9	15	19
							Maximum points possible:	203

Figure 26: Natural World credit distribution

4.4.1 Siting:

In the **Siting subcategory**, one credit performed as Enhanced (NW 1.4 Avoid Adverse Geology), two credits as Superior (NW 1.1 Preserve Prime Habitat and NW 1.7 Preserve Greenfields), two credits scored Conserving (NW 1.3 Preserve Prime Farmland, and NW 1.6 Avoid Unsuitable Developments on Steep Slopes), and two credits received No Score (NW 1.2 Protect Wetlands and Surface Waters and NW 1.5 Preserve Floodplain Functions).

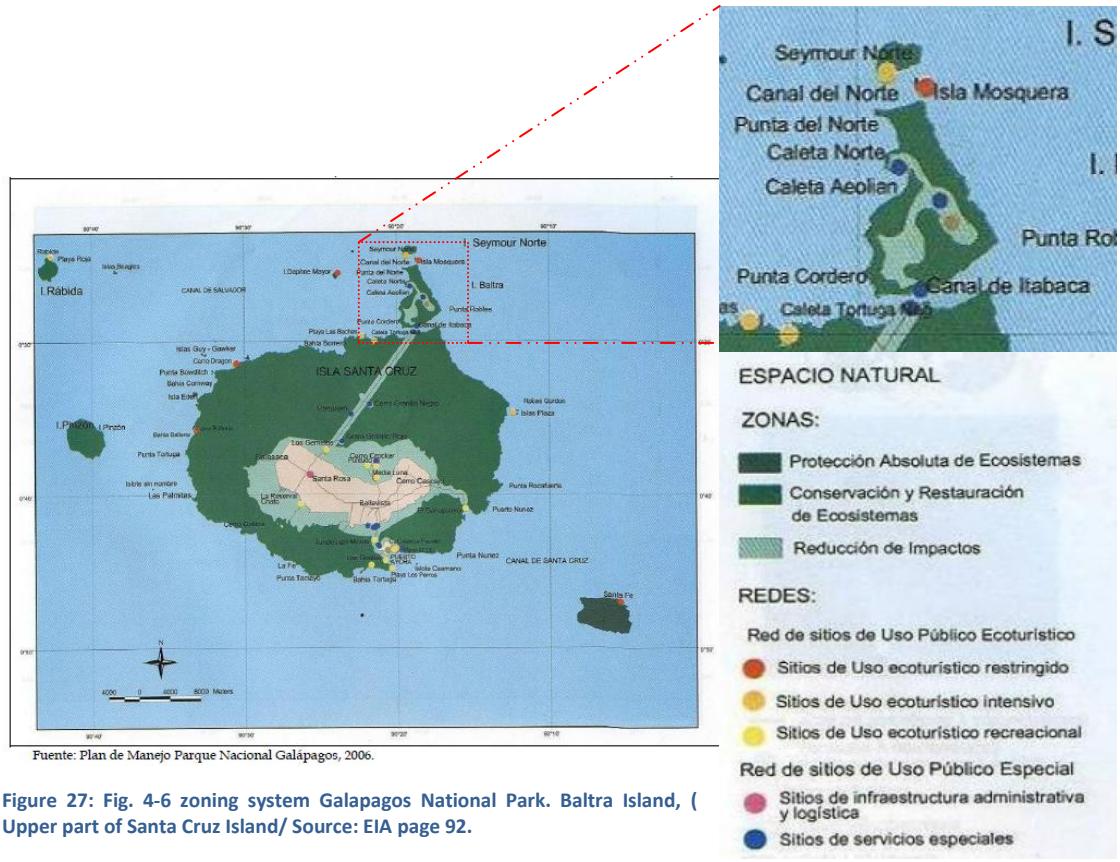
The expansion of and upgrades to the Seymour Airport will occur within the current boundaries of the existing airport. As specified in the Environmental Impact Assessment (EIA), the location of the airport is considered significantly altered and has been categorized as a "Reduced Impact Zone" (see figure 27). This zone has been significantly altered and is not considered a greenfield. However, the Environmental License describes an intersection between the runway and Galapagos Park, which may be considered a greenfield. There is no information about how this intersection area has been classified.

Due to the volcanic origin of the Galapagos archipelago, an extensive analysis has been done to determine the geology, geomorphology, ground soil characteristics, hydrogeology and seismicity of the site. Nevertheless, due to this volcanic origin, it has been determined that there is no place without the potential for adverse impact. "*The last volcanic activity on the islands was Galapagos Fernandina in 2005. Prior to this eruption, the Galapagos Cerro Azul volcano on Isabela Island erupted in 1998. The seismic activity, fumaroles and occasional steam expulsions of some Galapagos volcanoes are signs of continuous*

[28] Envision Guidance Manual, p.116

volcanic processes in the Islands" (EIA page 89). No specific information has been provided on the degree to which this can affect aquifers or high quality groundwater resources.

Excavations performed were critical to the geophysical research, and results revealed that the groundwater level and aquifer are well below the surface (EIA, Chapter IV.2.7 page 89). Test pits have been performed and samples have been taken to analyze and understand the soil composition and presence of water in the project area. The test pits were done to a maximum depth of 25 m and no groundwater was detected near the surface or inside cavities. As no water has been identified, the project team has not designated a buffer area to protect wetlands or surface water bodies.



Fuente: Plan de Manejo Parque Nacional Galápagos, 2006.

Figure 27: Fig. 4-6 zoning system Galapagos National Park. Baltra Island, (Upper part of Santa Cruz Island/ Source: EIA page 92.

It is worth mentioning that several documents note the flat topography of Baltra Island; as a result the project design and operations do not have to contend with any hillsides or steep slopes. Nevertheless In order to maintain natural channels and mitigate soil erosion, special attention should be paid to the maintenance of different drainage features. In areas where materials are extracted and quarried, there are specific measures to prevent erosion of slopes from rain events (EIA page 248).

4.4.2 Land and Water:

In the **Land and Water subcategory**, out of three credits, two were assessed as Enhanced (NW 2.1 Manage Stormwater and NW 2.3 Prevent Surface and Groundwater Contamination), and one was considered Superior (NW 2.2 Reduce Pesticide and Fertilizer Impacts).

According to the information provided, some methodologies such as rainwater collection have been considered for the management of stormwater. However, no specific information about the total storage capacity has been provided. Rainwater from the roof of the terminal building will be collected and reused in the kitchen and bathrooms. The environmental impact of stormwater runoff has also been considered. Specific measures to control stormwater flow and erosion will be implemented in areas surrounding the construction site and inside the project boundaries. One measure is the provision of adequate side channels to divert torrents of rainwater away from the construction area. Again, specific information about the total storage capacity has not been provided.

To prevent surface and groundwater contamination several hydrocarbon-containing products and chemicals have been identified. Programs have been implemented to reduce the potential for environmental impacts from the mishandling of fuels. Storage and fueling areas have been designated for specific uses, and no fueling of commercial aircraft carriers will take place at the airport. Currently, there is a small tank at the Galapagos National Park (GNP) which is used to fuel small aircraft. The program implemented to manage hazardous substances focuses on detection of certain abnormalities in the storage areas, as well as registration of spill events in the storage area, and registration of product leak cleanup.

As specified in the documentation provided, one of the major issues impacting flora on Baltra Island has been the introduction of invasive species over the past few years. When a species has become a pest, there are several methods to control it, both manually and chemically. There are certain herbicides with low toxicity that are allowed to be used on the Galapagos Islands. A report on the control and eradication of invasive plants, drafted in January and February 2013, documents certain species that need to be eradicated.[29]

4.4.3 Biodiversity:

The project performs well in the **Biodiversity subcategory**. Of the four credits, two were evaluated as Conserving (NW 3.3 Restore Disturbed Soils and NW 3.4 Maintain Wetland and Surface Water Functions), one was assessed as Improved (NW 3.1 Preserve Species Biodiversity), and one credit received No Score (NW 3.2 Control Invasive Species).

Extensive information has been provided regarding the biodiversity of the area. The specific location of the airport has been described as completely degraded.[30] Currently the trees are scarce, and are located on the perimeter of the island. Project implementation may have an impact on the existing vegetation, which

[29] Some examples are: Flor de Cáliz (Hilocereus undatus), sábila (Aloe barbadensis), chabelas (Catharantus roseus), higuerilla (Ricinus communis), and Cactu introducido (Euphorbia láctea)..

[30] Corporación América. 2009. Estudio de Impacto Ambiental y Plan de Manejo Ambiental. Proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda Page 72.

plays several important roles within the natural ecosystem. As such, a great effort has been made to relocate certain species. During January and March 2013, a total of 119 plants were transplanted, including both tree species and shrubs, along the perimeter of the airport.

As identified in the documentation provided, one of the major risks to the island is the introduction of exotic species that impact native species. Though the existing flora is not very significant aesthetically, it has a really important role within the biological cycle of the island species. Currently, the Charles Darwin Foundation is carrying out a program to repopulate land iguanas. In the recent past, the population of land iguanas decreased significantly. In addition, there is a new initiative to reduce the impact of airport activities on biodiversity. The Galapagos National Park Authorities have indicated the need for a protective perimeter around the airport; this has been specified as an easy way to prevent the entry of natural fauna into the airport site. Periodic analyses are expected to be done during the operation phase to guarantee that the airport has the least possible impact on biodiversity in the area.

Figure 28: Protected species on the construction site/ Source: Ecogal newsletter, Number 8_2012.

Figure 29 and 30: Protected species on the construction site/ Source: Ecogal newsletter, Number 6_2012.

Several reports identify the different invasive species in the area, as well as appropriate measures to eradicate them. Methodology to remove them has traditionally included the use of small tools. More recently, the collection of seeds of native species for future planting and germination has been considered. To apply this methodology, the project team will be required to come to an agreement with the Galapagos National Park (PNG) to initiate a reforestation program. However, such an agreement is not within the current project scope.

Overall, the project attempts to interrupt natural areas as little as possible in order to prevent the problems of undermining and impacts of stormwater runoff on soil erosion. In terms of wetland and surface water functions, several tests have been done that have determined that no water exists on or near the site.

4.4.4 Summary of results, Natural World category:

The table below shows the distribution of credits as well as the level of achievement reached in each credit (**figure 31).**

			ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR	PT.	Performance	% Total	max.
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	9	Superior	50.0%	18
36			NW1.2 Preserve Wetlands and Surface Water	0	No score	0.0%	18
37			NW1.3 Preserve Prime Farmland	12	Conserving	80.0%	15
38			NW1.4 Avoid Adverse Geology	2	Enhanced	40.0%	5
39			NW1.5 Preserve Floodplain Functions	0	No score	0.0%	14
40			NW1.6 Avoid Unsuitable Development on Steep Slopes	6	Conserving	100.0%	6
41			NW1.7 Preserve Greenfields	10	Superior	43.5%	23
42		L & W	NW2.1 Manage Stormwater	4	Enhanced	19.0%	21
43			NW2.2 Reduce Pesticides and Fertilizer Impacts	5	Superior	55.6%	9
44			NW2.3 Prevent Surface and Groundwater Contamination	4	Enhanced	22.2%	18
45		BIODIVERSITY	NW3.1 Preserve Species Biodiversity	16	Restorative	100.0%	16
46			NW3.2 Control Invasive Species	11	Restorative	100.0%	11
47			NW3.3 Restore Disturbed Soils	8	Conserving	80.0%	10
48			NW3.4 Maintain Wetland and Surface Water Functions	3	Improve	15.8%	19
			NW0.0 Innovate or Exceed Credit Requirements	0	N/A		
			NW	90		44.3%	203

Figure 31 : Summary of results in Natural World category

Generally speaking, the project has performed well in the Natural World (NW) category. The biggest opportunity for improvement is to provide more details in terms of water storage capacity. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 44.3%, or 90 points out of 203.

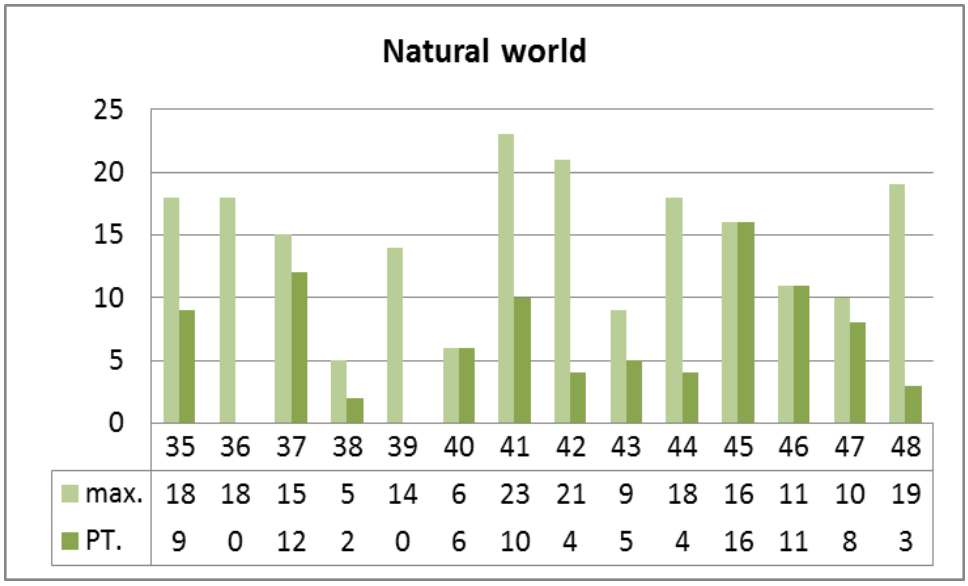


Figure 32: Summary of results in Natural World category

4.5 CLIMATE AND RISK

Envision's Climate and Risk category is divided into two main sub-categories, emissions and resilience. The main goals of the category are to *"minimize emissions that may contribute to increased short and long-term risks"* and *"to ensure infrastructure projects are resilient to short-term hazards or long-term altered future conditions."*[31] The credits are distributed as: Emissions (CR 1.1, CR 1.2), and Resilience (CR 2.1, CR 2.2, CR 2.3, CR 2.4, CR 2.5).

CREDIT SCORING

				IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
49	CLIMATE & RISK	EMISSIONS	CR1.1 Reduce greenhouse gas emissions	4	7	13	18	25
50			CR1.2 Reduce air pollutant emissions	2	6		12	15
51		RESILIENCE	CR2.1 Assess climate threat				15	
52			CR2.2 Avoid traps and vulnerabilities	2	6	12	16	20
53			CR2.3 Prepare for long-term adaptability				16	20
54			CR2.4 Prepare for short-term hazards	3		10	17	21
55			CR2.5 Manage heat islands effects	1	2	4	6	
						Maximum points possible:		116

Figure 33: Climate and Risk credit distribution.

4.5.1 Emissions

In the **Emissions subcategory**, out of two credits, one was assessed as No Score (CR 1.1 Reduce Greenhouse Gas Emissions), and one as Enhanced (CR 1.2 Reduce Air Pollutant Emissions).

The project utilizes several sources of renewable energy, such as solar panels and wind turbines, which provide a portion of the electricity required to operate the terminal building. The use of renewable energy systems will result in an overall reduction in greenhouse gas emissions; however, no information has been provided that proves the percentage reduction achieved or describes a life cycle carbon assessment. In terms of pollutant emissions, a very comprehensive Air Quality Analysis has been developed for the construction and operation phases.[32] This analysis outputs data on CO, HC, NOx, SOx based on aircraft operations - including takeoff and landing, as well as stationary combustion sources (EIA page 77).

In terms of pollutant emissions, the results obtained are compared with Ecuadorian environmental regulations. The model predicts the annual average maximum concentrations over 24-hour and 3-hour periods. The analysis for the operation phase has been done for a 5-year period, assuming an expected operating capacity that is equivalent to twice the activities recorded currently.[33] In addition, a detailed analysis of particle pollution has been developed that indicates environmental impacts from the blending of concrete at preparation plants. During the construction phase, the largest amount of gas emissions will

[31] *Envision* Guidance Manual, p.150

[32] This analysis was based on the Emissions and Dispersion Modeling System software Version 5.1 (EDMS) released by the U.S. Federal Aviation Administration (U.S. FAA) and recommended for emissions inventories and air quality modeling at airports

[33] Corporación América. 2009. Estudio de Impacto Ambiental y Plan de Manejo Ambiental. Proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda. Page 200.

be created by internal combustion engines from generators, machinery and vehicles. As specified in the EIA, "*The impact on emissions and air quality by the project is considered to be insignificant*"(EIA page 202).

CATEGORÍA	EMISIONES (TONELADAS/AÑO)				
	CO	THC	NO_x	SO_x	PARTÍCULAS (PM_{10})
Aeronaves	15,69	1,12	20,09	1,37	0,160
GSE	27,38	N/A	0,93	0,186	0,110
APU	0,741	0,046	0,53	0,076	0,078
Fuentes estacionarias (Generadores)	35,56	N/A	164,33	10,91	11,71
TOTAL	79,37	1,16	185,88	12,54	12,05

Fuente: Modelo EDMS V5.1, US FAA, 2008.
Notas:
HC: Hidrocarburos Totales
Elaboración: *Efficácitas*, 2009.

TABLA 5-6
INVENTARIO DE EMISIONES MEDIANTE MODELO EDMS
ESCENARIO FUTURO A 5 AÑOS

Figure 34: Table 5-6 **Inventory of emissions based on the model EDMS. Future scenario to five years/ Source: EIA page 200**

4.5.2 Resilience

The **Resilience subcategory** offers several opportunities for improvement and suffers from a lack of documentation. Out of five credits, one was assessed as Improved (CR 2.4 Prepare for Short Term Hazards), one was Superior (CR 2.5 Manage Heat Island Effects), and three received No Score (CR 2.1 Assess Climate Threat, CR 2.2 Avoid Traps and Vulnerabilities, and CR 2.3 Prepare for Long-Term Adaptability).

The Ecological Airport is located in a volcanic area described as *"an active volcano at rest,"*[34] and as a result the risks from exposure to volcanic eruptions have been considered. Some other man-made hazards such as spills, leaks, and use of chemical products have been considered. As a result, several procedures for transportation, transfer and fuel storage have been implemented.

No climate impact assessment/adaptation plan that identifies risks of climate change and possible responses has been provided. Such a plan should assess the risks and possible changes in operating conditions required due to changes in atmospheric conditions. No possible traps or vulnerabilities[35] affecting the surrounding communities have been identified. Furthermore, the documentation provided does not contain information regarding special measures for enhancing the resiliency of infrastructure systems vis-à-vis the consequences of long-term climate change.

Management of heat island effects has been one of the design criteria for the terminal building, and as a result a very comprehensive study has been conducted. Some of the measures implemented include an

[34] Corporación América. 2009. Estudio de Impacto Ambiental y Plan de Manejo Ambiental. Proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda. Page 90.

[35] According to Envision manual the traps that should be considered are described as: "Resources traps: infrastructure projects that increase community dependence on resources that could become very scarce and expensive [...]; Configuration traps: infrastructure projects that create configurations highly vulnerable to extreme weather events, natural disasters, economic conditions and/or actions by others [...]; Standards traps: infrastructure projects delivered according to design standards and methodologies that are not in alignment with changing environmental or operating conditions or other concerns."

increase in vegetation on exterior surfaces (floors, ceilings, walls), and the use of reflective materials for roofing. In addition, certain paths throughout the airport site have been shaded with solar panels. This has the dual purpose of reducing the heat island effect while supplying new sources of renewable energy.

4.5.3 Summary of results, Climate and Risk category:

The table below shows the distribution of credits as well as the level of achievement reached in each credit (**figure 35).**

ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR				PT.	Performance	% Total	max.
49	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	0	No score	0.0%	25
50			CR1.2 Reduce Air Pollutant Emissions	6	Enhanced	40.0%	15
51		RESILENCE	CR2.1 Assess Climate Threat	0	No score	0.0%	15
52			CR2.2 Avoid Traps And Vulnerabilities	0	No score	0.0%	20
53			CR2.3 Prepare For Long-Term Adaptability	0	No score	0.0%	20
54			CR2.4 Prepare For Short-Term Hazards	3	Improved	14.3%	21
55			CR2.5 Manage Heat Island Effects	4	Superior	66.7%	6
			CR0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			CR	13		10.7%	122

Figure 35 : Summary of results in Climate and Risk category

The biggest opportunities for improvement in the Climate and Risk (CR) category are based on measuring greenhouse gas emissions and undergoing life cycle carbon assessments. It is also very important that the project team evaluates the possible impacts of climate change on the airport's infrastructure. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 10.7%, or 13 points out of 122.

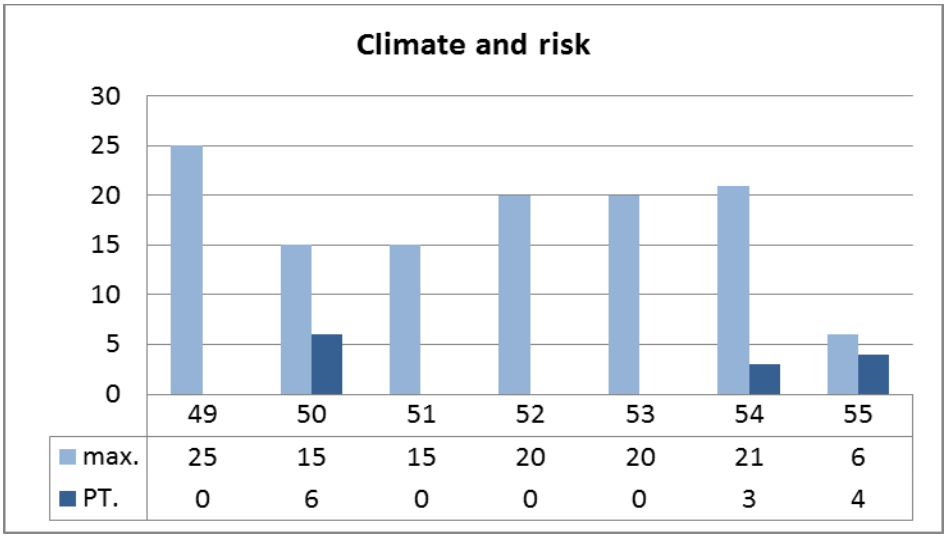


Figure 36 : Summary of results in Climate and Risk category

5. RESULTS AND CONCLUSION

The Ecological Airport is considered the main entrance to the Galapagos archipelago. In 2011, the Ecuadorian government decided to upgrade and modernize the airport in order to respond to growing tourist activity in the area. The project involves adapting the airports existing facilities, and is anticipated to have a social and economic impact on the residents of the archipelago. Considering the unique location of the project within the Galapagos Islands, which are considered a UNESCO World Heritage Site, the project team designed the new terminal based on standards of sustainability such as the Leadership in Energy and Environmental Design (LEED) criteria of the US Green Building Council (USGBC). A more detailed analysis of each of the five *Envision* rating system categories can be seen below.

In the **Quality of Life category**, the project scored 82 out of 181 points, or 45.3%, which was the project's best performance in any of the five categories of *Envision's* rating system. However, it is important to note that there are no settlements near the airport or on Baltra Island; the island is mainly used for the airport services. Nevertheless, the project has an impact on the inhabitants of Santa Cruz, a nearby island. Several programs for community development as well as environmental training are being implemented. It is estimated that during the construction phase between 150 and 200 jobs[36] will be created.

Several studies analyzing noise generation, light pollution and visual impacts have been developed. According to the results of these studies, and the small scale of operations at the airport, it has been determined that impacts from aircraft noise will not be significant. The airport operating hours are from 7am to 4pm, this reducing opportunities for light pollution in the surrounding area. No exterior facade or landscape lighting is anticipated, and light levels are considered to be within the acceptable range. Due to the fact that an airport already exists on site, and that the access routes will be maintained, any visual impacts from the airport expansion are expected to be minimal. In addition, views and landscape alteration have been analyzed in terms of possible long-term impacts. The biggest opportunities for improvement in the Quality of Life (QL) category are the preservation of historical and cultural resources through further analyses that go beyond the one conducted several decades ago, and the consideration of possible risks associated with new technologies or procedures.

In the **Leadership category**, the project scored 46 out of 121 points, or 38%, which was the project's second lowest best performance in the *Envision* categories. The documentation provided clearly shows that sustainability is a core value of the project and the organization itself. This commitment to following sustainable practices is clear as LEED standards have been applied to the construction of the terminal building. The project team also offers educational programs regarding sustainable practices to spread knowledge about environmental issues to the people interested in working on the project. Several public meetings have been conducted among stakeholders to disseminate project information.

With this improved and more sustainable design, the airport is expected to be more durable and resilient. The lifetime of the project is between 20 to 30 years, and the current expansion represents flexible planning regarding long-term expectations. However, no specific considerations were given to future

[36] Corporación América. 2009. Estudio de Impacto Ambiental y Plan de Manejo Ambiental. Proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda. Page 234..

expansion or configuration of the airport. Due to the early stage of the project at the time of this evaluation, personnel and resources for monitoring and maintenance of the project had not yet been identified. It is also important to mention that most of the documentation available describes the terminal building and does not include much information about the other areas of the airport. The biggest opportunities for improvement in the Leadership (LD) category are the establishment of a more detailed Sustainability Management System. A long-term monitoring program that specifies the roles of all parties involved in the process as well as the overall size and responsibilities of the organization is also recommended.

In the **Resource Allocation category**, the project scored 70 out of 182 points, or 38.15%, which was the third best performance out of the five categories. Very detailed analyses have been done to identify materials that can potentially been used in the construction of the new terminal. After the demolition of the old terminal, 75% of materials will be reused or recycled. This amount represents around 15% of the total material required for the construction of the new building.[37] Other strategies, such as storage of excavated soil, have been implemented to reduce the amount of waste sent to landfills. In order to minimize air pollution associated with the transport of construction materials, an effort has been undertaken to promote the use of regional materials. However, this effort has been challenging due to the limited availability of materials on the island. The primary regional materials used are natural soil and deconstruction debris for filling roads, walkways and buildings, and for use within the sub-base pavement layer.

The Ecological Airport has implemented strategies to reduce the amount of energy consumed and change the type of energy used within its facilities. Based on a building of similar sized and capacity, the airport will reduce energy consumption by about 40%. The airport also incorporates the use of renewable energy into its design. According to the last measures taken in October 2013, 40% of the energy used is from renewable sources. This percentage is expected to increase once the installation of the solar panels near the passenger terminal is complete. At that point, almost 100% of the energy required for airport operations will be provided by renewable sources.[38]

In addition, a very efficient water system has been implemented to optimize the water comsumption. All of the water used in the kitchen and restrooms will come from the desalination plant, and "*100% of the wastewater will be treated on-site*, *of which 48% will be reused for flush fixtures and the remaining 52% will be piped to a collector used for extraction and desalination of seawater."* The biggest opportunities for improvement in the Resource Allocation (RA) category are in reducing net embodied energy,[39] and documenting the practices of the subcontractors working in the project

In the **Natural World category**, the project scored 90 out of 203 points, or 44.3%, which was the project's second best performance in any category. As previously mentioned, expansion of the airport will take place within the existing boundaries of the airport site. This area is very flat and has been significantly altered, and is categorized as a "Reduced Impact Zone". As the Galapagos archipelago has volcanic origins, an

[37] LEED-NC 2.2 submittal Template. WE Credit 3: Water Use Reduction.
[38] Energy usage data Baltra - October 2013. Excel file
[39] The embodied energy of a material or product is the sum of energy that was used in the production of the material or product, including raw material extraction, transport, manufacture, and all the undertaken processes until the material or product is completed and ready.

extensive analysis has been done to determine the geology, geomorphology, ground soil characteristics, hydrogeology and seismicity of the site. As such, it has been determined that no place on the island is without potential for adverse impacts. Several test pits were performed to determine soil composition and the presence of water; results obtained indicate that no water resources are close to the site. Nevertheless, several actions have been implemented to prevent soil and surface water contamination from hydrocarbons.

Due to the location of the project, one of the most important concerns is maintaining the biodiversity in the area. Though the specific location of the airport has been described as completely degraded, one of the major risks to the island is the introduction of exotic species that impact native species. Though the existing flora is not very significant aesthetically, it has a really important role within the biological cycle of the island species. Currently, the Charles Darwin Foundation is carrying out a program to repopulate land iguanas. In the recent past, the population of land iguanas decreased significantly. In addition, a new initiative has been started to reduce the impact of airport activities on biodiversity. Overall, the project attempts to interrupt natural areas as little as possible in order to prevent the problems of undermining and impacts of stormwater runoff on soil erosion. The biggest opportunity for improvement is to provide more details in terms of water storage capacity and impacts to surface waters.

In the **Climate and Risk category**, the project scored 13 out of 122 points, or 10.7%, which was the project's worst performance according to the *Envision* rating system. Despite this, the project team did provide information regarding some of the credits in this category. A very comprehensive Air Quality Analysis has been developed for the construction and operation phases which outputs data on CO, HC, NOx, SOx based on aircraft operations - including takeoff and landing, as well as stationary combustion sources. Certain short-term risks such as volcanic eruptions or man-made hazards have also been evaluated. A very detailed analysis of heat island effects has been developed, as well as measures to reduce its effects. However, as no measures for reduction of greenhouse gas emissions have been considered, the CR category represents a big opportunity for project improvement. The project team should prepare a Climate Impact Assessment and Adaptation Plan that identifies risks to the airport related to climate change.

The graphs below demonstrate the project's performance under the three Infrastructure 360^{o} Awards. The **People and Leadership Award** (figure 37) represents the QL and LD categories from the Envision™ Rating System. The project received a score of 128 points out of a total of 302 combined points within these categories, which equates to a 42.4% level of achievement. The **Climate and Environment Award** (figure 38) represents the RA, NW and CR categories within the Envision™ Rating System. The project received a score of 173 points out of a total of 507 combined points within these categories, which equates to a 34.1% level of achievement. Thus, the overall achievement of the International (Ecological) Airport in Galapagos project under the **Infrastructure 360 Award** (figure 39) is 301 out of 809 points, or 37.2% of the total score.

This report evaluates the sustainability performance of the International (Ecological) Airport in Galapagos 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.

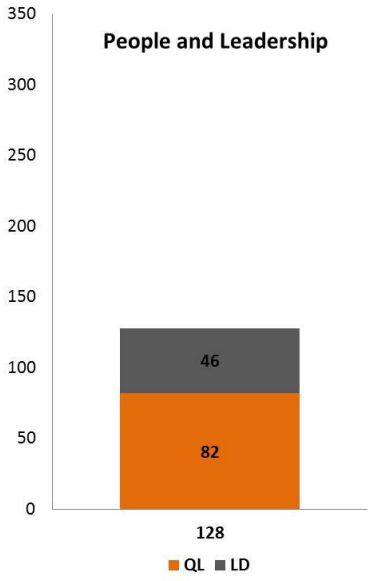


Figure 37:People and Leadership.

Score distribution

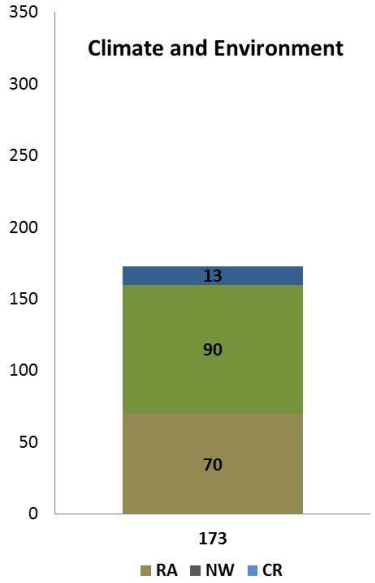


Figure 38:Climate and Environmental.

Score distribution

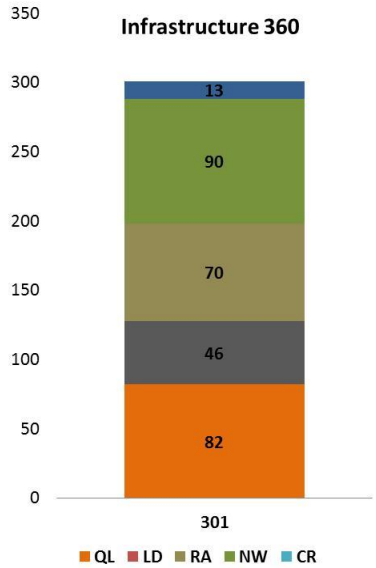


Figure 39:Infrastructure 360.

Score distribution

APPENDIX A: PROJECT PICTURES AND DRAWINGS


Figure 40 and 41 : Paving Materials Architectural Shading LEED L-12-2 SS-7.1.


Figure 42 and 43 : Landscape surrounding the airport. LEED L-11-3 SS-5.1.


Figure 44 and 45 : Landscape surrounding the airport. LEED L-11-3 SS-5.1.

Figure 46 and 47 : Endemic Plants Approved by Galapagos National Park LEED L-11-4, SS-5.1, SS-5.2, WE-1.2.

International (Ecological) Airport in Galapagos, Ecuador

Figure 48 and 49 : Sustainable Sites LEED L-15.7 WE-2. Discharge of water once treated.

Figure 50 and 51 : Demolition process LEED L-19.7 MR-3.1; MR-3.3; MR-5.1; MR-5.2.

Figure 52 and 53 : Materials and resources. LEED L-20.2 MR-5.1; MR-5.2. Reuse of material from the old terminal.

Figure 54 and 55 : Materials and resources. LEED L-20.3 MR-5.1; MR-5.2. Use of regional materials.

APPENDIX B: *ENVISION* POINTS TABLE

CREDIT SCORING

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

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

APPENDIX C: CREDIT DETAILS

CATEGORY I, PEOPLE AND LEADERSHIP (PL)			
SUB CATEGORY: QUALITY OF LIFE			
	ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR		**RECOMMENDATIONS**
PL1.1 Improve Community Quality of Life	**10**	**Superior** There are no settlements near the airport or on Baltra Island; the island is only used for the airport, ancillary infrastructure and military facilities. However, while the project is located in a relatively remote area, it has many implications for the inhabitants of Santa Cruz, a nearby island. Thus, the socioeconomic aspects considered in this assessment refer to the Canton Santa Cruz in Galapagos Province, whose main population center is the town of Puerto Ayora.(EIA page 129). One of the requirements specified on the environmental license is that the project must consider and incorporate criteria and observations of citizens, especially within the affected population. Several measures have been identified to promote community engagement as well as improve the capacity of the project to respond to identified needs. These measures include "Meetings, if possible, in the homes of individuals, during which material is distributed that includes project information, and potential positive and negative impacts that will be generated in the region." This measure was expected to be implemented quarterly beginning in September 2009, but there is no evidence that any meetings were held. Another strategy to facilitate communication between the community and the project leaders is the development of a "response strategy for complaints or claims by the immediate community during construction or operation of the Ecological Airport in the Galapagos. Such claims will be attended to by specifically trained personnel." (EIA page 341 Source : Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, Table 7-3, Schedule for implementing environmental management measures, freshwater green airport operation phase. Page 341)	*Increasingly detailed review and assessment of the community's goals, plans, needs. *Strong evidence of community acceptance. Shift from no seriously adverse impacts to minimal/no adverse impacts on the host and affected communities.

PL1.2 Stimulate Sustainable Growth & Development	**5**	**Superior** The expansion and improvement of the Ecological Airport in Galapagos will have social and economic impacts on tourists, visitors and residents of the Archipelago. Vehicular traffic on Baltra Island is expected to double, and the EIA specifically states that "Galapagos Ecological Airport will benefit the development of tourism on the islands by handling 100% of passenger demand, and will especially benefit Santa Cruz County by directly and indirectly generating jobs." (EIA page 276) Due to the importance of the Ecological Airport for the local economy, a Tourism Development Program is expected to be created to focus on community development. The design and implementation of this program should be initiated during construction of the project (EIA page 276). The EIA also stated that several educational and environmental training programs for local people interested in working on the project would start in May 2009 on a quarterly basis. However, no information has been provided regarding this initiative Source: -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, Table 7-3, Schedule for implementing environmental management measures, freshwater green airport operation phase. Chapter V 2.8 Page 220, Chapter VII.3.8.4 page 276, Table 7-3, Schedule for implementing environmental management measures, freshwater green airport operation phase. Page 341, Chapter V.1.12 Employment Generation, page 162)	*Improvements in cultural and recreational assets that make communities more livable. *Restoration of natural and cultural resource
PL1.3 Develop Local Skills and Capabilities	**5**	**Superior** One of the positive impacts of the project is the generation of labor demand for all activities involved in the construction phase, including civil works, metalworking, electrical and plumbing, among others. "According to the project sponsor, the work, from inception to completion, will create between 150 and 200 jobs." The project will impact several different sectors through the demand for construction supplies and materials of national origin. "For the closing phase, the generation of employment in the dismantling of the facilities would generate the greatest positive impact".(EIA page 234) As previously mentioned, several educational and environmental training programs for local people interested in working on the project were supposed to be conducted; however, no documentation has been provided in support of this initiative. Another suggested program was for waste management "Copies of the Project C&D Waste Management Plan will be made available to all relevant personnel on site. All site personnel and sub-contractors will be instructed about the objectives of the Project C&D Waste Management Plan and informed of the responsibilities which fall upon them as a consequence of its provisions" (C&DWMP,page 13)	*Identification of how will the project contribute to long-term community competitiveness, by hiring and educational. Do these programs emphasis shifts from local capacity development to community competitiveness

		Source: Waste Management Plan for Aeropuerto Ecologico de Galapagos Baltra. Project Construction and Demolition Waste Management Plan (C&DWMP page 13) -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, Table 7-3, Schedule for implementing environmental management measures, freshwater green airport operation phase. Chapter V 2.8 Page 220, Chapter VII.3.8.4 page 276, Table 7-3, Schedule for implementing environmental management measures, freshwater green airport operation phase. Page 341, Chapter V.1.12 Employment Generation, page 162)	
PL2.1 Enhance Public Health And Safety	**0**	**No score** This credit analysis makes reference to additional risks associated with new or innovative materials, technologies or methodologies. No potential risks have been taken into account, and no additional efforts have been made to exceed normal health and safety requirements. Given the goal of certifying sustainability, recommendations have been made for the use of materials responsive to the environment that minimize possible health impacts. “The renovation and expansion will be done with the airport in operation, which implies a strict work plan that includes the impact on the environment and health of people: construction workers, airport staff, island residents, visitors and transit passengers” (LEED project page 48). Within the different contracts signed with the subcontractors is a statement that all work performed on the site should follow industrial safety regulations. Source: Contract with MExul SA, Consturcción de la planta desalinizadora -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 48.	Systematic identification and assessment of any new or non-standard technologies, materials and methodologies used by the project. -Show how the changes in methodologies and protocols to deal with these new risks are to be passed onto the construction contractor.

PL2.2 Minimize Noise And Vibration	**8**	**Conserving** One of the most important aspects in terms of noise generation is landing and takeoff of aircraft. A detailed analysis of noise impact has been developed. The methodology used for this purpose is recommended by the environmental regulations, specifically Annex 9: Statement of Airport Noise, Book VI of Texto Unificado de Legislación Secundaria del Ministerio del Ambiente (TULSMA). In addition the impacts on local wildlife produced by air traffic noise have been taken into consideration. The Environmental Impact Assessment (EIA) determined that the impact of aircraft noise is not significant, mainly due to the small scale of operations that take place in the Airport Ecological Galapagos facilities. Base on the Integrated Noise Model (INM), several noise exposure maps have been created. Different noise exposure levels have been determined in order to plan land use in the area. "According to the provisions of the standard, and as seen in Table 5-2, all land use is considered consistent if the noise levels day-night annual average DNL are under 65 dBA. For areas where noise contours determined by INM exceed 65 dBA, it may not be necessary to establish the compatibility with the use of assigned floor" [...] " According to the provisions of the standard, and as seen in Table 5-2, all land use is considered consistent if the noise levels day-night annual average DNL are under 65 dBA"(EIA page 1) One of the measures considered for noise control is the use of specific aircraft (Etapa 3) for flights to the island territory. Another recommended measure is for authorities to know the results of the noise impact assessment while planning for future land uses. These studies will include helpful noise contour maps generated by the Integrated Noise Model - INM. Complementing this is the advice of CORPORACION AMERICA to limit noise-sensitive land uses such as residential, hospital, church and school uses in the area of the airport Source : -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1,page 178, 338; Table 4-3, Resumen de Mediciones Niveles de Ruido cabecera norte- Base de la fuerza aerea Ecuatoriana del 12 al 18 de enero del 2009; Figure 4-4 sonómetro empleado y sitio de medición del ruido. -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 9.	*Analysis and documentation of estimates of ambient noise and vibration level and comparisons before and after the development of the project

PL2.3 Minimize Light Pollution	**8**	**Conserving** Most of the information available refers to the Credit SS 8: Light Pollution Reduction, for LEED certification. "The project is located within the Galapagos National Park. The airport operating hours are from 7am to 4pm, with no exterior, facade or landscape lighting. After 4pm the site is closed to all access. The interior lighting system is in operation from 7am to 4pm only. All interior lighting is controlled by daylight and occupancy sensors that dim and turn off lights as required when sufficient daylight is available. Baltra Island is home to only the airport and the Baltra military base. All lighting in the building is turned off after 4pm. Only in case of an emergency, such as a complete evacuation of the island, will the lighting systems operate after 4pm". Plans of the terminal building have been provided, but do not refer to the illumination in other areas within the airport. Source: LEED-NC 2.2 Submittal Template.Credit SS Credit 8: Light Pollution Reduction. -Exhibit: Lighting plans with roof projection and overhang, L-14.pdf -Exhibit:Photographic evidence of terminal building at night, L-14.1.pdf -Exhibit:Interior lighting plans ground floor level, L-14.2.pdf -Exhibit:Interior lighting plans mezzanine level, L-14.3.pdf -Exhibit:Interior lighting plans with location of daylight and occupancy sensors ground floor, L-14.4.pdf -Exhibit:Interior lighting plans with location of daylight and occupancy sensors mezzanine floor, L-14.4.1.pdf -Exhibit:Photographic evidence interior lighting fixtures, L-14.5 INTERIOR LIGHTING.pdf	*Information of the type of lighting if so, out of the terminal building
PL2.4 Improve Community Mobility And Access	**4**	**Enhanced** The project will maintain the existing road infrastructure and will address several gaps in the safety of site access. As stated in the documentation provided, "Vehicle access presents clear dangers for pedestrian access. The new project involves a clear distinction between pedestrian and vehicular access that is simplified, safer and more orderly" (LEED project, page 19). A paved area approximately 6.5 km in length connects the passenger terminal with a dock located in the Itabaca channel; maintenance of such roads is described in the documentation provided. As a result of the road improvements, mobility and site access are improved and dust is reduced. An additional section of road that is approximately 3.1 km in length connects to the offices of the Ecuadorian Air Force, Navy of Ecuador, and PETROCOMERCIAL Fuels Terminal. Construction of entrances and exits for emergency vehicle access to the runways has been considered in the project as well. (EIA page 8) Given that the project is located on an island, and that there are inherent limitations on transportation, the access routes are still considered satisfactory: "Currently, passengers are transferred from the airport terminal to Puerto Ayora city on Santa Cruz Island via boat down the Itabaca Channel. Once passengers arrive on Santa Cruz Island, there is a paved road that runs through the territory from the Canal City Itabaca to Puerto Ayora, for an approximate length of 34 kilometers." (EIA page 137)	*Extent to which alternative modes of access were considered. *Alternative modes of transportation during the construction phase, if necessary.

		Source: -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 19. -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1,page 137,8,234. -Naranjo, S. Muñoz,E. March,21,2013. Informe de Mejoramiento de vias. Baltra: 2.	
PL2.5 Encourage Alternative Modes of Transportation	**12**	**Conserving** As previously mentioned, no settlements exist near the airport or on Baltra Island. Current activity in the region is based on tourism, specifically on Santa Cruz island. Consequently, the transportation system is directly related to airport operations and "is available upon arrival or departure of aircraft." Some airlines such as Tame or Aerogal operate buses that can transport approximately 54 passengers to and from Terminal Itabaca Canal. Boats are required for transit through Itabaca Canal, while buses and light vehicles carry passengers from Santa Cruz to Puerto Ayora city. However, such transportation is only available during the operating hours of the airport, and the last bus to Puerto Ayora (EIA page 137) corresponds with the last flight. Due to the increase in tourists associated with the airport expansion, it is expected that the number of buses and boats connecting Baltra island to Puerto Ayora city will also increase. Thus, all the transportation within the island is considered "public transit". Non- motorized vehicle modes have not been considered due to the limitations presented by the airport's location on an island and the need for tourists to get from one island to another. Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1,page 137,166,220) -Naranjo, S. Muñoz,E. May 01,2013. Informe de vehículos de operación. Baltra: -Naranjo, S. Muñoz,E. June 01,2013. Informe de vehículos de operación. Baltra: -Naranjo, S. Muñoz,E. July 01,2013. Informe de vehículos de operación. Baltra:	*Convenience in quality, accessibility and safety of the interconnection among the different transport modes. *Availability of appropriate facilities and infrastructures for public transit.

PL2.6 Improve Site Accessibility, Safety & Wayfinding	**12**	**Conserving** Certain improvements have been made in terms of access to the terminal and parking area; these improvements extend to aircraft parking and safety requirements. The old terminal had several issues such as: insufficient width in the "apron" for maneuvering aircraft on the ground; limited parking area for aircraft; and insufficient distance between the runway and the old terminal building. The expansion of the airport solved some of these problems and thus resulted in an improvement to overall safety conditions. Several pictures have been provided of the signage used to protect sensitive areas in the vicinity, as well as to access surrounding areas. The signage is specifically placed at construction site entrances and exits, emergency entrances and exits, and on runway ends. There are several reports describing the typology of signaling used and the main goals that can be achieved, which are: "Establish a signaling system to control the speed of vehicles and machinery that circulate through the access routes to the airport"; "Protect plant species found within the project construction area"; and "Post signs to inform airport users of the construction process" (Informe de Señalización operación enero 2013). Certain reports indicate a program to improve roads surrounding the airport because an increase in traffic volume is expected during the construction phase: "The construction phase of the project will generate growth in vehicular traffic on Baltra Island, related to the transport of construction materials and workers to the site." (EIA 162) For this reason, the concessionaire is trying to form an agreement with the Provincial Council of Galapagos as joining efforts between the two institutions will represent a benefit for the users of the road. (EIA 276) Source: -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1,page 162,276) -Power point presentation "Señalización de obra". -Power point presentation "DELIMITACION DE AREAS PROTEGIDAS,Mallado y Señalética" -Naranjo, S. Muñoz,E. January 22,2013. Informe de Señalización operación. Baltra: -Naranjo, S. Muñoz,E. February 22,2013. Informe de Señalización operación. Baltra: -Naranjo, S. Muñoz,E.March 01,2013. Informe de Señalización operación. Baltra: -Naranjo, S. Muñoz,E. April 01,2013. Informe de Señalización operación. Baltra: -Naranjo, S. Muñoz,E.May 01,2013. Informe de Señalización operación. Baltra: -Naranjo, S. Muñoz,E. June,01,2013. Informe de Señalización operación. Baltra: -Naranjo, S. Muñoz,E. July,22,2013. Informe de Señalización operación. Baltra: -Naranjo, S. Muñoz,E.March 01,2013. Informe de Señalización operación. Baltra: -Naranjo, S. Muñoz,E.March 01,2013. Informe de Mejoramiento de Vias. Baltra: -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 84.	Plans showing how the project has restored safety and access in the adjacent n

PL3.1 Preserve Historic And Cultural Resources	**1**	**Improved** There is some evidence of archeological findings on certain islands around the Galapagos. It is believed that the first findings were made by sailors who arrived in the area: "It was from 1952 that the Galapagos Archaeology was taken into account, from the interest shown by Norwegian Thor Heyerdahl [...] From some fragments that were in the laboratories of the Charles Darwin Research Station in Puerto Ayora, Santa Cruz, has been proposed that although much of the material comes from the sixteenth century, many have great similarities with pottery Bay (0-600 AD) of our shores [...] In 1988, were identified as part of the collection of the Research Station Charles Darwin 66 pieces from pre-Hispanic Black Cove (Isabela) and Cabo Colorado (Santa Cruz)" (EIA page 166, 167).After these studies, no further analyses have been developed. It is worth mentioning that the island was heavily modified when the airbase was constructed. There is an initiative for cultural dissemination which will "incorporate into the landscape the presence of the ancient cultures of the Ecuadorian coast (Valdivia, Huancavilca Mantilla and others)." The main goal is to share with both national and international visitors the cultural richness of the islands. Source: -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1,page 166,279)	Increasing efforts to preserve and protect historical and cultural heritage sites. Provide information demonstrating that the site avoids impact any cultural resource. -Documentation proven that work has done in collaboration with historic and cultural preservationists, to ensure restoration. -Qualifications of historic/cultural preservationists judged on experience with similar sites.
PL3.2 Preserve Views And Local Character	**6**	**Superior** Views and landscape alteration have been analyzed in terms of possible long-term impacts. The ecological airport is considered the main entrance to the Galapagos archipelago. As a result, a very detailed analysis of the landscape surrounding the airport has been developed. The project team tried to integrate sustainability principles and interrelationships between flora, fauna and landscape into the project design. "The project uses native plants and respects the topography of the site, [...]. no exogenous materials are being introduced to the ecological system of the islands. This island is practically deserted." (LEED project page 34) Considering that the current project constitutes a modification and expansion of a previous airbase, "the current facilities of the Galapagos Ecological Airport do not represent significant changes to the natural landscape of the project area" (EIA page 93). It is important to mention that this specific island, Baltra, does not have outstanding natural landscape elements such as forests, lakes or rivers, that can be interrupted by the project. The biggest impact of the project will be during the construction phase, due to the increase in vehicles and materials on the island. This disruption will cease once construction is completed. The project achieves alignment between the design, existing infrastructure, and the preservation of surrounding character.	Documented evidence of any efforts to aid local communities in developing more comprehensive policies and regulations regarding views that fit with local conditions

		Source: -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 34. -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda.,	
PL3.3 Enhance Public Space	**11**	**Conserving** During the LEED certification for the project, it was determined that the waiting areas lacked proper conditions and presented safety concerns. The construction of a new terminal building will enhance existing public spaces and create a more comfortable atmosphere for users. Passenger waiting areas for ground transportation and the shops around the airport have also been improved for safety and comfort. In addition, there is an initiative to use some space to raise awareness of the ancient cultures of the Ecuadorian coast such as Valdivia, Huancavilca or Mantilla; however, detailed information about how this will be implemented has not been provided. Source: -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 16. -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1,page 164, 93)	More detailed explanation about how the initiative for cultural dissemination is going to be applied.
PL0.0 Innovate Or Exceed Credit Requirements	**0**	*N/A*	
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SUB CATEGORY:LEADERSHIP			
	ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR		**RECOMMENDATIONS**
LD1.1 Provide Effective Leadership And Commitment	**17**	**Conserving** The documentation provided indicates that sustainability is a core value of the project owner and organization. Considering the unique location of the project within the Galapagos Islands, which have the UNESCO World Heritage designation; standards applied to this project have been high. The new terminal building has been designed according to the Leadership in Energy and Environmental Design (LEED) standards of the US Green Building Council (USGBC) with the "aim to achieve better environmental quality with minimal energy dependence, to support the implementation of natural conditioning bioclimatic strategies and the use of renewable energy." (LEED project, page 6) In addition to this commitment, the project team offers educational programs regarding sustainable practices and performance such as: "training courses and workshops to impart knowledge about identified environmental issues, operational controls and documentation of environmental management, responses to emergency situations, and environmental audit processes." (EIA 274) *Source: -S*chiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 6. -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1,page 43)	Provide a written commitment by the project owner and the project team to address the economic, environmental and social aspects of the project not just during construction, but also during operation
LD1.2 Establish A Sustainability Management System	**1**	**Improved** The project team has specified management procedures during both the construction and operation phases. For the construction phase, the procedures taken into consideration are: erosion and sedimentation best practices; wastewater, site and wildlife management; and spill prevention and control. For the operation phase, the following management programs have been described: a Management Petroleum Hydrocarbons and Chemicals Program; a Waste Management Program; a Monitoring and Registration Program; and a Noise Compatibility Program. However, the information provided is not very specific in terms of roles and responsibilities within the project team. *Source: C*orporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1,)	Organizational charts and documentation showing the persons responsible for project sustainability issues, their position in the project organization, and their authority to make project decisions and affect change. -Completeness of the project's sustainability management policy document. -Documentation on the project's business processes and management control in the form of procedures, flowcharts, checklists and other documented control measures

LD1.3 Foster Collaboration And Teamwork	**4**	**Enhanced** In April 2011, the Ecuadorian government signed a contract with Corporación America (CA) for the construction and 15 years of operation of the ecological airport. The contractees are on the one side Dirección General de Aviación Civil (DGAC) as "Supervisor", and on the other side Aeropuertos Ecológicos de Galapagos S.A. and (ECOGAL) as a "Concessionaire". ECOGAL S.A. is a company that belongs to Corporación America (CA). CA has also been in charge of designing the terminal project according to LEED standards. The main contractor is HELPORT; this company signed a turnkey agreement with ECOGAL for construction of the project. Considering that both construction and operation are being undertaken by the same company, the project team approaches the project as a set of interconnected systems. It has been indicated that a collaborative approach, and to a certain extent a risk/ reward sharing strategy among the different parties, will take place, but no evidence about this has been provided. *Source* Contrato de Concesión Servicio Aeroportuario– Isla Baltra – Aeropuerto Seymour – Santa Cruz – Galápagos	Documentation of the multi-disciplinary project team's business processes and management controls, in the form of procedures, flowcharts, checklists and other documented control measures. Existence of risk and reward sharing terms in project contract documents.
LD1.4 Provide For Stakeholder Involvement	**9**	**Superior** As noted in the Environmental Impact Assessment, there have been several public meetings and programs for dissemination of project information. The main goals of these programs are to: inform the community and government authorities about the purpose, methodology and results of the project; maintain the expectations and understand the needs of the community; comply with the Sistema Único de Manejo Ambiental and public participation mandate of the environmental license; ensure community participation by all different groups; highlight the importance of an internationally-standardized airport to the community, the region and the country; and follow sustainability criteria to minimize the environmental impact. These programs are specifically targeted at the community and authorities of the Canton of Santa Cruz, Galapagos Province as well as directors and officers of government agencies in the region -the Galapagos National Park, Municipal Government of Santa Cross, Ministry of Environment, Ministry of Tourism, Ministry of Works Public, among others. (EIA 278) If possible, meetings with the community are conducted close to their homes and attempt to address specific allegations or claims by the community. A similar strategy for immediate response to claims should be implemented during construction and operation. The project is expected to create a tourism development program that will be realized through implementation of a series of activities working jointly with the community. "The active participation of the community in formulating the program will be crucial for the implementation Plan effectively."(EIA 277) *Source:* Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., EIA page 274, 277,278)	Provide evidence of a planned or implemented stakeholder involvement program for the project. Provide documentation of stakeholder input and resulting project desition

LD2.1 Pursue By-Product Synergy Opportunities	**0**	**No Score** No information has been providing regarding the use of unwanted byproduct material from nearby site *Source:* Envision, a Rating System for Sustainable Infrastructure.	Provide records of byproduct synergy opportunities that have been identified, assessed and pursued at nearby sites. Provide the results of any pursuits and documentation that these sites and facilities exist.
LD2.2 Improve Infrastructure Integration	**13**	**Conserving** The project is closely aligned to existing infrastructure systems. The expansion of the airport was designed to take into account the existing base and other community functions. This integration has resulted in a larger terminal building as well as improvements to the parking area and existing roads. “CORPORACION AMERICA (CA) sponsors a program to improve road infrastructure leading airport users to the dock at Itabaca Canal. Thus, CA tries to maintain an agreement with the Provincial Council of Galapagos in order to join the efforts of the two institutions in road maintenance that benefits users of both”. (EIA 276). The airport design is also integrated with the physical infrastructure around it, increasing the efficiency and effectiveness of the project. “The current access will be maintained.” (LEED project page 82) At the same time, there is a process to restore and integrate the existing infrastructure into the project des *Source:* -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., EIA page 276) -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 82/Exhibit page 84.	Document the extent to which the project design incorporates other planned and installed infrastructure. Document the project plans to restore existing infrastructure and integrate it into the project design.
LD3.1 Plan For Long-Term Monitoring & Maintenance	**1**	**Improved** The contract signed between Dirección General de Aviación Civil (DGAC) and Corporación América (CA) identifies long-term monitoring and maintenance within the scope of the agreement. “Throughout the Airport Concession Term, maintain and preserve the functional fitness of the terminals, equipment and related structures so that the security, comfort and operation are optimized and in accordance with ICAO standards and applicable IATA standards, and the provisions of this Agreement”. (Contract between DGAC-CA). The documentation provided specifies that an Annual Maintenance Program should be submitted within 180 days after the conclusion of phase one. This maintenance program should be updated every 12 months and delivered to the Administrator in October each year starting in 2011(Contract between DGAC-CA). Due to the early stage of construction, the personnel and resources for monitoring and maintenance were not yet identified. *Source:* Contrato de Concesión Servicio Aeroportuario– Isla Baltra – Aeropuerto Seymour – Santa Cruz – Galápago	Plans for long-term monitoring and maintenance of the constructed work, including the requisite access to the completed and operating works. -Monitoring and maintenance plans including assessments that the completed work is functioning as designed and that environmental impacts are within the design parameters. -Explanation of how funding will be allocated, set aside and maintained at sufficient levels to fund the necessary monitoring and maintenance.

LD3.2 Address Conflicting Regulations & Policies	**0**	**No Score** The project team has not provided information regarding coordination with public officials in addressing laws and regulations that create a barrier to sustainable infrastructure. In the LEED credit regarding "Heat island effect: Roof", it states that due to the uniqueness of the project location, a green roof is not authorized by the existing regulations. "The Park authorizes only the use of native species on site, which equate to a small number of shrubs and cactuses, and does not include any alternatives such as grass or other small green plants that could be considered for a vegetated roof, thus making it ineasible to incorporate a green roof strategy" (LEED-NC 2.2 Submittal Template. SS Credit 7.2, page 4). This information is cited as an example of a conflict between different approaches, but nevertheless is not counter to sustainability goals as it preserves native species. *Source:* LEED-NC 2.2 Submittal Template. SS Credit 7.2: Heat Island Effect: Roof, page 4.	If necessary, work to change laws and regulations that restrict sustainable practices.
LD3.3 Extend Useful Life	**1**	**Improved** Through a better and more sustainable design of the airport, a more durable project is expected. "Though the lifetime of the system is 20 to 30 years, the present time is not defined to be granted using the site, after stoppage" (EIA page 305). Due to a likely rise in tourism to the Galapagos Islands, the expansion of the airport increases the current capacity to accommodate more flights. As specified by the concessionaire, the installations are designed to support growth up to 100% of current demand (EIA page 221). Even though specific considerations have not been made for future expansion or configuration of the airport, the current expansion represents flexible planning regarding long-term expectations. The project team has not provided very detailed information regarding construction specifics beyond the terminal building, platform and runway. *Source:* Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., EIA page 221,305)	Provide documentation of how the overall design will allow for expansion, reconfiguration or multiple uses. Provide documentation of elements intended to add durability, flexibility and resilience throughout the useful life of the project that were incorporated into the design.
LD0.0 Innovate Or Exceed Credit Requirements	**0**	*N/A*	
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CATEGORY II: CLIMATE AND ENVIRONMENT (CE)			
RESOURCE ALLOCATION			
	ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR		**RECOMMENDATIONS**
RA1.1 Reduce Net Embodied Energy	**0**	**No score** One of the objectives identified for the construction of the terminal is to "Promote low-impact building materials from the extraction of raw materials to deconstruction; Use selected materials based on energy content, GHG emissions and environmental impact." Due to the sustainable certification, is recommended the usage of materials responsible to the environment and minimize the impact to the health of people, throughout their lifecycle. This impacts should be considered from procurement of raw material, during transport and subsequent transfers and manufacturing processes, it being necessary to maintain the quality in use, careful reaction to chemical and biological agents (LEED project page 54) Very little information has been provided about the Life Cycle Electricity Use, Life Cycle Fuel Use and Life Cycle Energy Use of the terminal building. Furthermore, there is no evidence of an environmental life cycle assessment that includes the rest of the facilities that comprise the proj Source: Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 8 point 4.; page 54 conclusion. - EA Prerequisite 2: Minimum energy performance." Revit Conceptual Energy Analysis Compare Results" page 1 of 6.	Develop an Environmental Cycle assessment to estimate the net embodied energy of projects materials from extraction, transportation, refinement, manufacture and undertake process until the material is ready to be transported to the construction site. This assessment should include the materials used for the construction as well as the rest of the airport
RA1.2 Support Sustainable Procurement Practices	**0**	**No Score** There is no specific evidence to prove that the supply of materials and the equipment required for construction come from companies with sustainable practices. Several contracts were provided between different subcontractors and HELPORT ECUADOR SL, the project's legal representative, but none specifically mentioned that sustainable practices within the company are required. Source: Contrato de Ingeniería, Provisión y Construcción Integral, bajo la modalidad de "llave en mano", de las fases I,II y III de obras en el aeropuerto Seymour, Isla Baltra. Signed HELPORT ECUADOR SL -ECOGAL S.A	Provide evidence of policies and criteria for the selection and identification of the different supplies working on the project. Provide inventory of materials being tracked for sustainable procurements and practices, including description of the material and its manufacture. Evidence of certification of materials and suppliers.

RA1.3 Used Recycled Materials	**2**	**Improved** A detailed inventory of potential recycled material has been provided. Certain materials such as natural soil, deconstruction debris, and structural elements such as beams and posts have been reused, as noted in the documentation provided: "steel structures from commercial shops and kiosks, on-site deconstruction salvaged structural steel beams and posts 100% [...]; recovered wood columns and beams for interior pergolas, on-site deconstruction salvaged structural wood beams and posts 100% [...]; recovered wood beams and rangers for PV panel supports, on-site deconstruction salvaged structural wood beams and posts 100% [...]; recovered wood for paneling, wood siding and wood partitions for commercial and retail shops, on-site deconstruction salvaged wood slats 100%." This amount represents 15.34% of the total material cost (Baltra Airport CSI Master Format Construction cost Reused materials. Certain materials have not been recycled, such as the asphalt from the demolition of the runway. "Given the toxic content of this material, together with its degradation by aging and exposure to weather, is not recommended for reuse or recycling, [asphalt from the runways] will be disposed under the conditions outlined for wood and paints" (LEED project page 53). <u>Source:</u> Baltra new passenger terminal building-Galapagos, material reuse. -Baltra Airport CSI Master Format Construction cost Reused materials -Baltra Airport MRc3 Materials Reuse Table 1 -Exhibit: Plan:Materials and resources, page, LEED-19; credit MR- 3., 3-2 -Exhibit: Plan:Materials and resources, page, LEED-19.1; credit MR-2 -Exhibit: Plan:Materials and resources, page, LEED-19.2; credit MR-3.1 - 3.2 \5.2 - 5.1 -Exhibit: Plan:Reused materials_interior pergolas, LEED-19.3; credit MR-3.1 - 3.2 \5.2 - 5.1 -Exhibit: Plan:Transportation and assembly, LEED-19.4; credit MR-3.1 - 3.2 \5.2 - 5.1 -Exhibit: Plan:Materials and resources, page,L -01; credit MR-2-3.1 - 3.2 \5.2 - 5. -Exhibit: Plan:Materials and resources, page,L -01´; credit MR-2-3.1 - 3.2 \5.2 - 5.1 -Documentation LEED NC V2.2 MR credit Project CSI Master FOrmat section 2-10. -Waste Management Plan for Aeropuerto Ecologico de Galapagos Baltra. Project Construction and Demolition Waste Management Plan (C&DWMP)	Very detailed explanation of the reuse of different material. recommended unify all existing information in a single document

RA1.4 Use Regional Materials	**3**	**Improved** A very detailed inventory of the percentage and cost of regional materials used has been provided. The inventory includes information about the manufacturer, the distance between the project and the provider, the distance between the project and the source of extraction, the product cost, and the percentage and value of regionally-extracted materials. The primary regional materials used are as follows: natural soil and deconstruction debris for filling roads, walkways and buildings; water used by the desalination plant for dust control; natural stone material utilized for the subbase pavement layer, soil preparation and ornamental fencing. According to the EIA, all the stone required for construction has been locally sourced: ”The common source of materials for all previous construction on the island were local stones”. (EIA chapter III 1.2.2 page 43). The transportation distances for the materials vary depending on what side of the airport is being considered. “It is emphasized that the operating areas will be located near the construction site, with a maximum distance of approximately 1,000 meters to the current terminal (considering the defined operating areas to the northeast of the terminal). The quarry location will likely minimize the environmental impact of powder emissions, which tends to be moderately significant. Moreover, the Petrocomercial Fuels dock will be the main dock used for transport of goods from the mainland, which is approximately 1,900 meters from the terminal construction site.” (EIA pag 145). This area is very appropriate for the location of the airport due to the proximity of the materials use Source: LEED NC V2.2 MR credits Project CSI Master format sections 2-10 -Exhibit: Plan:Materials and resources, page,L -20.2; credit MR-5.1 - 5.2 -Exhibit: Plan:Exterior coating. Section A-A´; I-I´, page,L -20.1; credit MR-5.1 - 5.2 -Exhibit: Plan:Materials and resources, page,L -20.3; credit MR-5.1 - 5.2 -Exhibit: Plan: Land side Materials, page,L -20.4; credit MR-5.1 - 5.2 -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 43,89,145) --Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 48, 49, 50.	

RA1.5 Divert Waste From Landfills	**8**	**Superior** A detailed Waste Manage Plan for Construction and Demolition (C&DWM) has been developed and includes guidelines "designed to promote sustainable development, environmental protection and optimum use of resources" (C&DWM page 1). In this Plan, strategies have been developed for the reuse of existing materials in order to divert waste from landfills, such as: storage of excavated soil/rock in piles; and storage of concrete waste, masonry, wood and packing materials for future reuse. Hazardous waste should be separated from other materials to avoid contamination. "Posters will be designed showing disposal methods and routes of transport of material from the site to Controlled Disposal Sites" (C&DWMP, page 13) The project will be implemented in six phases. Phase 1 involves the demolition of 2,100 m2 of current vehicular access roads to the existing terminal building. Phase 2 includes the development and construction of a 10,000 m2 new passenger terminal building and service areas. Phase 3 comprises the demolition of 200 m2 of current shops adjacent to the existing passenger terminal building. Phases 4, 5 and 6 each involve the demolition of 500 m2 of current terminal building areas. For all these phases combined, the tonnage of material sent to landfills was 1,434 out of a total of 5,981,7 tons, which represents around 23.97%. The remaining 4,547,7 tons, or 76.03% of materials, were reused or recycled (ECOGAL, waste Reporting) All the parties involved on the construction and demolition process, are on board with the Waste Manage Plan and its requirements. "Thus it is imperative that ALL CONTRACTORS AND SUBCONTRACTORS are informed of their obligations and on the need to comply with conditions and requirements established in this document" (C&DWMP, page 1) <u>Source:</u> Waste Management Plan for Aeropuerto Ecologico de Galapagos Baltra. Project Construction and Demolition Waste Management Plan (C&DWMP) page 13 -Exhibit: Waste Management -18.1; credit MRp	
RA1.6 Reduce Excavated Materials Taken Off Site	**4**	**Improved** Reuse of excavated material has been considered in each project phase; however the project team has not provided many details. Excavated material and deconstruction debris has been primarily reused for filling and compacting of natural soil, and for filling roads and walkways. Excavated material is derived from within the vicinity of the construction site, and therefore does not require lengthy transportation. "The close proximity of and easy access to material sources enhances the site suitability for the project." (EIA page 89)	Design documents demonstrating how the project was designed to balance cut and filled. During planning and design, the project team should identify opportunities to minimize grading, retain all soil on-site, and/or eliminate the need to transport additional soil to the site.

		Source: Baltra new passenger terminal building-Galapagos, material reuse. -Baltra Airport CSI Master Format Construction cost Reused materials -Baltra Airport MRc3 Materials Reuse Table 1 -Exhibit: Plan: Land side Materials, page,L -20.4; credit MR-5.1 - 5.2-Waste Management Plan for -Aeropuerto -Ecologico de Galapagos Baltra. Project Construction and Demolition Waste Management Plan (C&DWMP) (....) -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 89)	Applicant should provide estimations of the excavated material to be taken off site and excavated material beneficially reused on site.
RA1.7 Provide for Deconstruction & Recycling	**0**	**No score** It is expected that the lifetime of the project will last between 20 to 30 years; however, there is no specific plan for the end of its useful life. "The phase of abandoning the project will mainly consist of the dismantling, removal and retirement of structures - sheds, water desalination plant, control tower, building, fire service, system waste water treatment, among others". The waste materials from the deconstruction phase will mainly consist of civil structures (walls, paved areas, hangars and tower structures, etc.). "Waste from demolition of structures shall be removed from the site or used as fill material." (EIA page 306) No specific percentages for reconstruction or reuse of material after the lifetime of the project have been provided. Some of the materials transferred from the old terminal to the new one may be expected to be reused again. However, plans and arrangements need to be made to identify and track prefabricated components that have been designed for disassembly and/or deconstruction. Source: Baltra new passenger terminal building-Galapagos, material reuse. -Baltra Airport CSI Master Format Construction cost Reused materials -Baltra Airport MRc3 Materials Reuse Table 1 -Exhibit: Plan:Materials and resources, page, LEED-19; credit MR- 3., 3-2 -Exhibit: Plan:Materials and resources, page, LEED-19.1; credit MR-2 -Exhibit: Plan:Materials and resources, page, LEED-19.2; credit MR-3.1 - 3.2 \5.2 - 5.1 -Exhibit: Plan:Reused materials_interior pergolas, LEED-19.3; credit MR-3.1 - 3.2 \5.2 - 5.1 -Exhibit: Plan:Transportation and assembly, LEED-19.4; credit MR-3.1 - 3.2 \5.2 - 5.1 -Exhibit: Plan:Materials and resources, page,L -01; credit MR-2-3.1 - 3.2 \5.2 - 5. -Exhibit: Plan:Materials and resources, page,L -01´; credit MR-2-3.1 - 3.2 \5.2 - 5.1 -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 306, 307)	Inventory of materials incorporated into the design that retain some value for future use. -Provide design documents showing efforts to minimize adhering recyclable material to non-recyclable materials or materials that will contaminate the waste stream and limit recyclability. . -Provide design documents showing efforts to detail connections that will ease disassembly and encourage reuse or recycling.

RA2.1 Reduce Energy Consumption	**7**	**Enhanced** One of the goals of the international project LEED certification is to minimize the environmental impact of energy use. According to the calculations provided, and using the energy consumption of a building with similar characteristics and occupancy but without saving energy methods as a baseline, the reduction in energy consumption for the airport is around 40%. Several measures have been proposed to reduce energy consumption. Most of the rooms within the terminal building do not have air conditioning. Comfort conditions are maintained through a bioclimatic design. Natural ventilation as well as the orientation of the new terminal will have great importance in reducing the energy required to operate the building. Another strategy used is the optimization of natural light to minimize power consumption. However, most of the information provided regarding the reduction of energy consumption is based on the new terminal and very little information has been made available regarding the other construction projects taking place within the airport apart from the terminal building. <u>Source:</u> -Energy usage data Baltra - October 2013. Excel file -Solar module certification: EN 61000-6-1: 2007/ EN 61000-6-3: 2007 -Certification as a Solar Module Manufacturers of [Hengji PV-Tech Energy Co (HJ Solar)] by British Photovoltaic Association. - Photovoltaic panel data sheet HJM230 -Exhibit: Energy and Atmosphere, page,L-13.3; credit SS-7.1´; EA-2 [Installation of the solar panels(electricity generation)] -Exhibit: Solar water heaters,page,L-17.1; credit: EA-2 [Installation of the solar panels (water heating)] -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 8, point 2 and 3.	Provide a calculation of the alternatives showing the energy saved for each option. All the different construction projects that comprise the overall project should be taken into consideration. Use industry norms as a benchmark. Submit a calculation of the project's estimated annual energy consumption over the life of the project.
RA2.2 Use Renewable Energy	**16**	**Conserving** One of the goals of the project is to promote the use of clean energy while reducing the use of fossil fuels. As shown within the information provided, the project will take advantage of several sources of renewable energy such as solar panels and wind turbines. "For the hot water supply, the project Ecological Airport Galapagos includes a solar-operated system, which includes four (4) systems located in the sector required". (EIA page 56) Within the boundaries of the airport are paths that have been shaded by solar panels. These panels have the dual purpose of reducing the heat island effect while providing new sources of renewable energy. According to the measures taken last October 2013, 40% of the total power used by the airport was provided by renewable sources. This percentage is expected to keep increasing once the installation of the solar panels near the passenger terminal is complete. At that point, almost 100% of the energy required will be provided by renewable sources.	Provide documentation of the project's anticipated annual operational energy consumption broken down by source type. Include total energy consumption, not just that used by the terminal. Provide documentation of the anticipated annual output of all renewable sources and the overall percentage of renewable energy to total energy consumption.

		Source: -Energy usage data Baltra - October 2013. Excel file -Exhibit: Energy and Atmosphere, page,L-13.3; credit SS-7.1´; EA-2 [Installation of the solar panels(electricity generation)] -Exhibit: Solar water heaters,page,L-17.1; credit: EA-2 [Installation of the solar panels (water heating)] -Exhibit: Wind turbines,L-17.3; credit: EA-6 [Installation of the wind turbines for energy production] -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 9, point 11. -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 56)	
RA 2.3 Commissio n & Monitor Energy Systems	**3**	**Enhanced** As a prerequisite for the project, a commissioning process to monitor the performance of energy systems was established. The commissioning process will include measurements to verify that the electrical and mechanical installations are running as expected. “The energy demand of buildings and the environmental quality of the interior spaces are important aspects of the certification. It is therefore important to establish current conditions to specify and evaluate the improvements proposed by the project to transform the airport.”(LEED project point 12) However, information about the monitoring process and its frequency, and the equipment required to enable more efficient operations, is not very detailed. Source: -Manual de instalación, almacenaje y mantenimiento de los paneles- -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certification internacional LEED. 1, point 12. -Exhibit: Energy and Atmosphere, page,L-13.3; credit SS-7.1´; EA-2 [Installation of the solar panels(electricity generation)] -Exhibit: Solar water heaters,page,L-17.1; credit: EA-2 [Installation of the solar panels (water heating)] -Exhibit: Wind turbines,L-17.3; credit: EA-6 [Installation of the wind turbines for energy production] -Solar module certification: EN 61000-6-1: 2007/ EN 61000-6-3: 2007	Documentation providing the necessary information to train operations and maintenance workers on the requirements for monitoring energy systems. -Rationale as to how the monitoring equipment may enable more efficient operations over the industry norm.

RA3.1 Protect Fresh Water Availability	**17**	**Conserving** The two types of precipitation identified on the island are direct rain and indirect or passive dews and moisture on the ground. The documentation provided indicates that there are two desalination plants with 19 m3 and 52 m3 respectively. The desalinated water will be combined with rainwater, and used for lavatories, showers and kitchen sinks. "All wastewater generated from the use of potable water within the building will be collected, cleaned through grease traps and sand filters, and sent to the treatment plant. Once treated, the recovered greywater will be redistributed to flush fixture installations" (LEED-WE-3). Based on LEED quantification one used and after been treated, the water will be send to the ocean, no creating impacts on the water supply volumes. As a result this methodology is considered a close circle replenished at the source: "100% of the wastewater generated will be treated on-site" As specified by the project owners, drinking water used on-site is still bottled. "For the construction phase of the project, the drinking water needed for different tasks will be brought from Guayaquil using Armed Ecuador tankers" (EIA page 54). Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 54,56) -LEED-NC 2.2 Submittal Template. WE Credit 3: Water Use Reduction. -LEED-NC 2.2 Submittal Template. WE Credit 3: Water Use Reduction. -LEED-NC 2.2 Submittal Template. WE Credit 3: Water Use Reduction -Exhibit: Water system plan, L-15.pdf -Exhibit: Water systems installation plan - food court restrooms and kitchen areas, L-15.1, L-15.1.pdf -Exhibit: Water systems installation plan - migration hall restrooms, L-15.2, L-15.2.pdf -Exhibit: Grey water system, L-15.3, L-15.3.pdf -Exhibit: Grey water system partial view 1 - treatment plant, L-15.4, L-15.4.pdf -Exhibit: Grey water system partial view 2, L-15.5, L-15.5.pdf -Exhibit: Grey water system partial view 3 - restroom detail, L-15.6, L-15.6.pdf -Exhibit: Photographic evidence of desalinization plant, L-15.7, L-15.7 INNOVATIVE WASTE WATER TECH.pdf -Exhibit: Restroom low consumption water faucets, Signal push faucet Kohler.pdf -Exhibit: Kitchen low consumption water faucets, DELTA KITCHEN FAUCET K-21984LF.pdf -Exhibit: Waterless urinals, Eco Waterless Urinal.pdf -Exhibit: low-flow flushmeter, Kohler flushmeter 13517.pdf	Provide a rationale as to how the integrated systems of the project will work together to mitigate overall negative impacts or achieve net positive recharge. -Provide calculations of the volume of fresh water discharged after use. -Indicate the location of discharge and impact of discharge on receiving water quality and quantity, including temperature and salinity. - Provide design documents indicating the location, type, quantity, rate of recharge and quality of water resources available to the project.

RA3.2 Reduce Potable Water Consumption	**4**	**Improved** One of the goals for the construction of the new building is the implementation of efficient water devices within the building and landscape. As specified in LEED-WE-3, some of the measures to be taken are the installation of low water consumption appliances, green spaces that do not require irrigation, and water storage areas. (LEED project point 4 page 8). "Flow fixtures to be installed in the project include ultra low-flow push operated lavatories, regulated to less than 0.5gpf and low-flow push operated shower heads regulated to less than 1.8gpf." Additionally, all greywater from lavatories, showers, kitchen sinks, toilets and urinals is treated on-site for reuse and recirculation within the building's toilets and urinals. The total treated water used estimated by year is around 507,702 gallons, of which 194,012 g/y will be used for flush fixtures. Using these numbers, it can be determined that a 38% reduction in water consumption will occur. "All wastewater generated from the use of potable water within the building will then be collected, cleaned through grease traps and sand filters, and sent to the treatment plant. Once treated, the recovered greywater will be redistributed to flush fixture installations". During the construction process, the water used for dust control will be recycled water transported from the desalination plant <u>Source:</u> -Baltra new passenger terminal building-Galapagos, material reuse. -Baltra Airport CSI Master Format Construction cost Reused materials -Baltra Airport MRc3 Materials Reuse Table 1 -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 9 point 10. -Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 56) -LEED-NC 2.2 Submittal Template. WE Credit 3: Water Use Reduction -Exhibit: Water system plan, L-15.pdf -Exhibit: Water systems installation plan - food court restrooms and kitchen areas, L-15.1, L-15.1.pdf -Exhibit: Water systems installation plan - migration hall restrooms, L-15.2, L-15.2.pdf -Exhibit: Grey water system, L-15.3, L-15.3.pdf -Exhibit: Grey water system partial view 1 - treatment plant, L-15.4, L-15.4.pdf -Exhibit: Grey water system partial view 2, L-15.5, L-15.5.pdf -Exhibit: Grey water system partial view 3 - restroom detail, L-15.6, L-15.6.pdf -Exhibit: Photographic evidence of desalinization plant, L-15.7, L-15.7 INNOVATIVE WASTE WATER TECH.pdf -Exhibit: Restroom low consumption water faucets, Signal push faucet Kohler.pdf -Exhibit: Kitchen low consumption water faucets, DELTA KITCHEN FAUCET K-21984LF.pdf -Exhibit: Waterless urinals, Eco Waterless Urinal.pdf -Exhibit: low-flow flushmeter, Kohler flushmeter 13517.pdf	

RA3.3 Monitor Water Systems	**6**	**Superior** A very efficient system for water usage has been designed. Water will be supply to the terminal through the desalination plant, and greywater will be reused. Plans and pictures of the desalination plant, the treatment process and the discharge of water to the ocean have been provided. There is specific daily data collection and water monitoring according to: Consumption on the terminal building and water treatment plant (m3), fire protection consumption, and gardens maintenance as well as water production on the desalination plants and working hours. On the pictures provided it is easy to distinguish the facilities used for this water monitoring and maintenance properly labeled. <u>Source:</u> Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 54) -LEED-NC 2.2 Submittal Template. WE Credit 3: Water Use Reduction -Exhibit: Water system plan, L-15.pdf -Exhibit: Water systems installation plan - food court restrooms and kitchen areas, L-15.1, L-15.1.pdf -Exhibit: Water systems installation plan - migration hall restrooms, L-15.2, L-15.2.pdf -Exhibit: Grey water system, L-15.3, L-15.3.pdf -Exhibit: Grey water system partial view 1 - treatment plant, L-15.4, L-15.4.pdf -Exhibit: Grey water system partial view 2, L-15.5, L-15.5.pdf -Exhibit: Grey water system partial view 3 - restroom detail, L-15.6, L-15.6.pdf -Exhibit: Photographic evidence of desalinization plant, L-15.7, L-15.7 INNOVATIVE WASTE WATER TECH.pdf -Consumo y Produccion-Agua y energia Noviembre 2013	Provide design documents and specifications identifying the installation of leak detection systems when appropriate, and water quality collection points. · Provide documentation of commissioning by a monitoring authority within the contract documents. This should demonstrate either that the monitoring authority is independent of both the design and construction teams, or that collected data is periodically checked by an independent authority.
RA0.0 Innovate Or Exceed Credit Requirements	**0**	*N/A*	
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NATURAL WORLD			
	ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR		**RECOMMENDATIONS**
NW1.1 Preserve Prime Habitat	**9**	**Superior** The expansion of and upgrades to the Seymour Airport will occur within the current boundaries of the existing airport. As specified in the Environmental Impact Assessment (EIA), the location of the airport is considered significantly altered and has been categorized as "Reduced impact zone". The degree of alteration may vary depending on the location's proximity to urban or rural areas (EIA, Chapter IV.2.9 page 90). Outside of the concession area, the locations of future quarries and landfills in existing natural areas will cause other impacts to the environment based on changes in the topography due to the extraction of material. As specified within the EIA "natural areas to be used as a quarry will involve a change in land use. The same is expected for areas that will be used as dumps. The impact on land use will be significant if the quarries and dumps infringe on land use zones specified for "Conservation and Restoration of Ecosystems" (EIA, Chapter V.1.10 page 162). Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 90,162)	Before redefine the areas, for quarries and landfills, it will be appropriate to determine other sources to get the materials required.
NW1.2 Preserve Wetlands and Surface Water	**0**	**No score** Test pits have been performed and samples have been taken to analyses and understand the soil composition and presence of water in the project area. The test pits were done to a maximum depth of 25 m and no groundwater was detected near the surface or inside cavities. As no water has been identified, the project team has not designated a buffer area to protect wetlands and surface water. This credit is not applicable to the project. Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda a., 1, page 89,155, 328, 329)	It is recommended to provide more information according to the waterbody location as well as the vegetation and soil protection zones (VSPZ) in the a
NW1.3 Preserve Prime Farmland	**12**	**Conserving** The expansion and upgrade project will be occur mainly within the current boundaries of the existing airport . As a result, no soils characteristic of prime farmland will be disturbed for the project.	

		Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda 1, page 43)	
NW1.4 Avoid Adverse Geology	**2**	**Enhanced** An extensive analysis has been done to determine the geology, geomorphology, ground soil characteristics, hydrogeology and seismicity of the site. Excavations were critical to the geophysical research, and results show that the groundwater level and aquifer are well below the surface. There are no underground or internal cavities (EIA, Chapter IV.2.7 page 89). Nevertheless, the Galapagos islands have volcanic origins, and as a result there is no place without the potential for adverse impact. "The last volcanic activity on the islands was Galapagos Fernandina in 2005. Prior to this eruption, the Galapagos Cerro Azul volcano on Isabela Island erupted in 1998. The seismic activity, fumaroles and occasional steam expulsions of some Galapagos volcanoes are signs of continuous volcanic processes in the Islands". (EIA pag 89). No specific information has been provided on the degree to which this can affect aquifers or high quality groundwater resources. Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda 1, page 85-91	Provide documentation of project designs that illustrate strategies used to avoid damage to sensitive geology or damage from adverse geology, such as operating plans or monitoring plans.
NW1.5 Preserve Floodplain Functions	**0**	**No score** Not floodplains has been identified on the surroundings of the airport. The footprint of the existing airport is around 2,600 m2, while the footprint of the new terminal is expected to be 6,000 m2 plus the outbuildings. There are no specific measure to minimize the impact on the possible water bodies due to the increase of impervious surface. Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 35	Provide documentation of a flood emergency management plan to address the operation and/or evacuation plan for all infrastructure in the floodplain.
NW1.6 Avoid Unsuitable Development on Steep Slopes	**6**	**Conserving** Several documents note the flat topography of Baltra Island; as a result the project design and operations do not have to contend with any hillsides or steep slopes. "The island has relatively flat topography, with low coastal cliffs and a maximum height of about 60 m above sea level (Google Earth, 2008). This directly influences levels of rainfall." (International certification LEED, April 2008) In order to maintain natural channels and mitigate soil erosion, special attention should be paid to the maintenance of different drainage points. In the areas where materials extracted and quarried, there are specific measures to prevent erosion of slopes from rain events (EIA page 248).	

		Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 249. Ecogal, Aeropuertos Ecológicos Galápagos S.A, March to November 2012,Mantenimiento de canales y puntos de drenaje de aguas lluvias para canales naturales como sitios de descarga de agua y evitar el asentamiento de maquinarias o materiales o el campamento en canales naturales. Para evitar la erosión y sedimentación de estos sitios.Baltra. Schiller,E and associates & CASA Green Management Department, April 2008, El Primer "Green Airport" Baltra, Galapagos, page 56.	
NW1.7 Preserve Greenfields	**10**	**Superior** The project is located on the site of the previous terminal, in an area defined as "Reduction Zone Impacts". This zone has been significantly altered and is not considered a greenfield. However, the Environmental Licence describes an intersection between the runway and Galapagos park, which may be considered a greenfield. There is no information about how this area has been classified. Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 90)	Develop compensation strategies related to the occupation of existing greyfields, if possible. Provide documentation showing the percentage of the developed area of the site that was formerly developed and may be classified as a greyfield.
NW2.1 Manage Stormwater	**4**	**Enhanced** According to the information provided, some methodologies such as rainwater collection have been considered for the management of stormwater. The rainwater from the roof of the terminal building will be collected and reused for several purposes. The environmental impact of stormwater runoff has been taken into consideration. Some activities that may have a significant impact on runoff quality are: vegetation clearing, earthworks, the removal of construction waste, and management of chemicals from cement, paints, additives and hydrocarbons from diesel, oils, etc. (EIA page 149) Specific measures to control stormwater flow and erosion will be implemented in areas surrounding the construction site and inside the project boundaries. One measures is the provision of adequate side channels to divert torrents of rain water away from the construction area. "This measure shall be implemented according to the topography and flow patterns of runoff, so that it can be captured and diverted from the construction area. As such, channels will be installed at lower levels of the site, adjacent to the construction area, and should have an adequate slope to facilitate the evacuation of water without causing stagnation." (EIA page 246) Specific information about the total storage capacity has not been provided; however, the project team has indicated that the water will be reused in toilets and kitchens within the terminal building. Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 65,149,205,246)	Documentation of the initial, final post-development, and target water storage, infiltration, evaporation, water harvesting and/or cistern storage capacities using TR-55 CNs or other continuous simulation modeling methods to describe site conditions

NW2.2 Reduce Pesticides and Fertilizer Impacts	**5**	**Superior** As specified in the documentation provided, one of the major issues impacting flora on Baltra island has been the introduction of invasive species over the past few years. When a species has become a pest, there are several methods to control it, both manually and chemically. There are certain herbicides with low toxicity that are allowed to be used on the Galapagos Islands. A report on the control and eradication of invasive plants, drafted in January and February 2013, documents certain species that need to be eradicated. Some examples are: Flor de Cáliz (Hilocereus undatus), sábila (Aloe barbadensis), chabelas (Catharantus roseus), higuerilla (Ricinus communis), and Cactu introducido (Euphorbia láctea). The methodology used to eliminate them was manual; where possible some small mechanical utensils were used. <u>Source:</u> Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 271, 272) // Table 7-2 Cronograma de implementación de medidas de manejo ambiental aeropuerto ecológico de Galápagos, fase de construcción,page 322// Naranjo, S. Muñoz,E. February,27,2013. Informe de control y erradicación de plantas introducidas. Baltra: 2 Naranjo.S. January,10, 2013. Informe de control y erradicación de plantas introducidas. Baltra: 1	Minimize the amount of pesticides used in the area. Provide specific information about the pesticides used.
NW2.3 Prevent Surface and Groundwater Contamination	**4**	**Enhanced** Some of the products identified as hazardous contain hydrocarbons and chemicals. Specific programs have been implemented to safely manage these kinds of substances as potential environmental impacts from mishandling of fuels are significant. Thus, storage and fueling areas have been designated for specific uses. It is important to note that no fueling of commercial aircraft carriers will take place at this airport. Galapagos National Park (GNP) owns a fuel tank which is used to supply small aircrafts. The program implemented to manage hazardous substances mainly focuses on prevention and detection so that an adequate response can be provided in case of a spill or leak. Information collected through this program would include the detection of certain abnormalities in the storage areas, as well as the registration of spill events in the storage area, or the registration of product leak cleanup. Certain measures have been established to intercept hydrocarbons and minimize the risk of spills. Potential risks associated with surface and groundwater quality have also been addressed. “In cases of fuel spills (Diesel and AV-GAS) there is potential risk of impacts to soil quality; and in case of rain, the risks extend to the closest body of water, which in this case is the Pacific Ocean. In addition, the leakage of fuel into water bodies leads to deterioration of the quality of aquatic flora and fauna, impacts the health of citizens and erodes the industrial landscape.” (EIA page 215) <u>Source:</u> Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, pages 157,214,269,287)	

NW3.1 Preserve Species Biodiversity	**16**	**Restorative** Extensive information has been provided regarding the biodiversity of the area. ”Since the first scientific guide of the flora of the archipelago developed by Hooker in 1846 and based mainly on specimens collected by Darwin, much field research and collections have been gathered, which have enabled the development of more comprehensive listings of Galapagos plants.”(EIA, page 94). The specific location of the airport has been described as completely degraded. Baltra was leased to the United States during World War II, at which time they set up a military base. As a result, the island vegetation disappeared to a big extent. Currently the trees are scarce, and are located on the perimeter of the island. Project implementation may have an impact on the existing vegetation that plays several important roles within the natural ecosystem. As such, a great effort has been made to relocate certain species. During January and March 2013, a total of 119 plants were transplanted, including both tree species and shrubs, along the perimeter of the airport. The main purpose of this was to repair the aesthetics and enhance the area’s ecological interest, but it also is a way of linking, upgrading and protecting existing habitats. As identified in the documentation provided, one of the major risks to the island is the introduction of exotic species that impact native species. As previously described, the existing flora is not very significant aesthetically; however, it has a really important role within the biological cycle of the species that inhabit the island. Currently, the Charles Darwin Foundation is carrying out a program to repopulate land iguanas. In the recent past, the population of land iguanas decreased significantly. It is important to remember that the plant system is vital to retaining moisture levels and shade, and that plants are an essential food resource along with insects, which are a staple of the iguanas diet. As a measure to reduce the impact of the airport activities on biodiversity, the Galapagos National Park Authorities have indicated the need for a protective perimeter around the airport. The main justification is that it is an easy way to prevent the entry of natural fauna into the airport site. Periodic analyses should be done during the operation phase to guarantee that the airport has the least possible impact on biodiversity in the area. Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 18, 95,96,272,300)/ Naranjo,S. Muñoz,E. Burgos,F. March, 01,2013. Informe de reubicación de plantas. Baltra: 2 -Naranjo, S. Muñoz,E. February, 2, 2013. Informe de rehubicación de plantas. Baltra: 1 -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 20,33).	Periodic analyses should be done during the operation phase to guarantee the success of the transplanted species and that the project has a minimal impact on biodiversity in the area.

NW 3.2 Control Invasive Species	**11**	**Restorative** An extensive study of invasive species has been developed. Several species such as higuerilla (Ricinus communis), and ornamental cactus (Euphorbia lactea a.k.a. aloe vera) have been recognized as invasive. The ornamental cactus has been colonizing the area adjacent to the solid waste dump. Table 4-5 lists all of the invasive species (EIA page 104). There are several reports identifying the different invasive species in the area, and appropriate measures to follow to eradicate them. Methodology to remove them has traditionally included the use of small tools. More recently, the collection of seeds of native species for future planting and germination has been considered. To apply this methodology, the project team will be required to come to an agreement with the National Park Galapagos (PNG), to initiate a reforestation program. Such an agreement is not within the current project scope. Identification of different species should be performed by an expert. Once identified, decisions will be made on which ones to eliminate. (EIA 272) "Until the end of 2006, 490 species of insects and 53 species of other invertebrates (as spiders, snails and slugs) introduced to the Galapagos were recorded. Out of all of them, six are known as invasive species (species that have significant impacts on Galapagos ecosystems): fire ants and auropunctata Wasmannia Solenopsis geminata, Brachygastra lecheguana and wasps Polistes versicolor, purchase Icerya cottony cushion scale, and fly parasitic on birds Philornis downsi." (EIA page 115). Refer to Table 4-11 for more information about "invertebrate species introduced that have equal or more potential for impact within the Galapagos islands." Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 115, 271, 272). Naranjo, S. Muñoz,E. February,27,2013. Informe de control y erradicación de plantas introducidas. Baltra: 2. Naranjo.S. January,10, 2013. Informe de control y erradicación de plantas introducidas. Baltra: 1	
NW3.3 Restore Disturbed Soils	**8**	**Conserving** Several measures have been taken to prevent the problems of undermining and the effects of soil erosion due to stormwater flow. One of these measures is to avoid, if possible, intervening in natural areas. By reducing the impact on these areas, it will be easier to maintain their natural conditions. Soil disturbance shall be limited to the construction perimeter; once construction is completed, soil should be restored and stabilized to its original condition (EIA page 245). There are two specific actions to stabilize soils exposed to erosion: stabilization measures for temporary use, and stabilization measures for permanent use. "Overall, the construction phase should consider including measures directed towards stabilization of soils, in areas that the latter is exposed to erosion". (EIA, 247) Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, pages 245, 247)	Calculations showing that 100% of disturbed soils have been restored and documentation of soil reuse.

NW3.4 Maintain wetland and surface water functions.	**3**	**Improve** As previously specified in credit NW 1.2, several test pits and samples have been taken to analyze and understand the soil composition and presence of water in the project area. The result of these samples identified no water in the area. Due to the lack of a sewage system on Baltra Island, the project cannot discharge any wastewater, and thus all wastewater from the project will be treated on site. As such, the project does not alter water quality. All water used comes from the existing desalinization plant. Once the water has been used and treated, it is emptied back into the zone where it originated. Several measures such as stabilization of the ground have been proposed to avoid erosion, especially during the construction phase where more materials are exposed to stormwater. In terms of enhancement of the habitat, species are not considered aquatic or riparian since there are no surface water bodies close to the new airport site. Source: Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 65,149,205,246)	
	0	*N/A*	
	90		

CLIMATE AND RISK			
	ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR		**RECOMMENDATIONS**
CR1.1 Reduce Greenhouse Gas Emissions	**0**	**No score** It was mentioned in previous credits that the project utilizes several sources of renewable energy. These sources are mainly solar panels and wind turbines, which provide a portion of the electricity required to operate the terminal building. Other systems such as air navigation track lighting, are provided by diesel electric motor generators. (EIA page 77) While it is likely that the use of renewable energy systems will result in an overall reduction in greenhouse gas emissions, no information has been provided that proves the percentage reduction achieved. Moreover, no life cycle carbon assessment has been provided. *Source:-*Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 56) -Schiller, E y asociados & CASA Green. Abril, 2008. Baltra. el primer "green airport". certificación internacional LEED. 1, page 9, point 11.	Provide an assessment related to materials includes the carbon emissions generated for the key materials to be used in the project, including extraction, refinement and manufacture and distance transported Carbon emissions released in use after incorporation in the constructed works

CR1.2 Reduce Air Pollutant Emissions	**6**	**Enhanced** A very comprehensive Air Quality Analysis has been developed for the construction and operation phases. This analysis was based on the Emissions and Dispersion Modeling System software Version 5.1 (EDMS) released by the U.S. Federal Aviation Administration (U.S. FAA) and recommended for emissions inventories and air quality modeling at airports. The EDMS software models aircraft input data, and puts values on emissions of CO, HC, NOx, SOx based on aircraft operations - including takeoff and landing, as well as stationary combustion sources.(EIA page 77) The resulting concentrations of pollutants that are obtained are compared with Ecuadorian environmental regulations. The model predicts the annual average maximum concentrations over 24-hour and 3-hour periods, which is required for the modeling and evaluation of the environmental impact of gas emissions. No maps or graphical information (what about the chart below?) showing the distribution of the abovementioned contaminants have been provided. The analysis for the operation phase has been done for a 5-year period, assuming an expected operating capacity that is equivalent to twice the activities recorded currently (EIA-200). In addition, a detailed analysis of particle pollution has been developed that indicates anticipated environmental impacts from the blending of concrete at preparation plants, the transit of trucks over unpaved roads, and the extraction of materials from the quarry (EIA p 143). During the construction phase, the largest amount of gas emissions will be created by internal combustion engines from generators, machinery and vehicles. Expected gas emissions include carbon monoxide (CO), sulfur dioxide (SO2), nitrogen oxides (NOx), volatile organic compounds (VOC's) and unburned hydrocarbons. Gas discharge will be in open areas, so dispersion is anticipated to be good and therefore the related environmental impact has been classified as not significant (EIA p 145) As specified in the EIA, "the future operation of the Ecological Airport in the Galapagos will generate ambient air conditions and particle concentrations that are in compliance with the maximum permissible limits stipulated in current environmental regulations. The impact on emissions and air quality by the project is considered to be not significant"(EIA page 202). *Source:* Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 15, 16, 77, 142, 143, 145, 197, 200, 202)	Calculations of expected emissions according to SCAQM, and strategies implemented to reduce air pollutants to required levels.
CR2.1 Assess Climate Threat	**0**	**No score** No information has been provided regarding a climate impact assessment or adaptation plan that identifies risks of climate change and possible responses. Such a plan should assess the risks and possible changes in operating conditions that will be needed to handle higher ambient temperatures, increased frequency and intensity of storms, extended flooding, etc. The plan should also address the recovery from extreme events. A plan like this could lengthen the life of the project. *Source:*	Documentation that prove that a Climate Impact Assessment and Adaptation Plan has been completed. Acquire input from local emergency management departments.

CR2.2 Avoid Traps And Vulnerabilities	**0**	**No score** Within the documentation provided there is no reference to the evaluation of possible vulnerabilities that the community could face in the future due to climate change or other causes. According to Envision manual the traps that should be considered are described as: "Resources traps: infrastructure projects that increase community dependence on resources that could become very scarce and expensive [...]; Configuration traps: infrastructure projects that create configurations highly vulnerable to extreme weather events, natural disasters, economic conditions and/or actions by others [...]; Standards traps: infrastructure projects delivered according to design standards and methodologies that are not in alignment with changing environmental or operating conditions or other concerns." *Source:* Envision, a Rating System for Sustainable Infrastructure. Version 2.0 page 158	Assess the effect of the project according to the previous traps
CR2.3 Prepare For Long-Term Adaptability	**0**	**No score** The documentation provided does not contain information regarding special measures for infrastructure systems to be resilient to the consequences of long-term climate change. *Source:*	Implementation of plans and designs prepare for long-term climate change. Evidence of design criteria for a likely increased intensity and frequency of extreme weather events, water scarcity, sea level rise, extended droughts and increased ambient temperature.
CR2.4 Prepare For Short-Term Hazards	**3**	**Improved** The Baltra airport is located in a volcanic area and as a result the risks from exposure to volcanic eruptions have been considered. "Santa Cruz, and therefore, Baltra and Seymour should be regarded as an active volcano at rest (sleeping), but by its distance from the hot spot ("hot spot" or "plume") generated by volcanic activity in the area of the Archipelago Galapagos, this volcano tends toward extinction as is the case of Isla San Cristobal. Furthermore, there is no historical evidence of the development of earthquakes or volcanic eruption or Seymour, Baltra and Santa Cruz".[…] "The last activity of one of the Galapagos volcanoes on the island Fernandina happened in 2005" (EIA page 9) Some of the likely man-made hazards considered within the Environmental Impact Assessment are the risk of spills and leaks, and use of chemical products. As a result, several procedures for transportation, transfer and fuel storage have been implemented: "supply of fuel to the sites where generating equipment is located could have a potential environmental impact if necessary preventative measures are not taken. The Environmental Management Plan considers such measures so as to mitigate environmental impacts related to fuel management".(EIA page 345) *Source:* Corporación América. 2009. Estudio de impacto ambiental y plan de manejo ambiental. proyecto para la ampliación y mejoras del aeropuerto ecológico de galápagos. Guayaquil, Ecuador: Eficiencia Energética y Ambiental Efficacitas Consultora Cía. Ltda., 1, page 9,345)	Prove of the explanation of the strategies included in the project to cope with each event and how they surpass existing codes and regulations. Implementation of strategies to minimize the risk of future hazards using environmental restoration

CR2.5 Manage Heat Island Effects	**4**	**Superior** One of the design criteria for the new terminal building was to reduce the heat island effect. As a result, comprehensive analyses of shading and the types of materials used have been developed. Some of the measures implemented include an increase in vegetation on exterior surfaces (floors, ceilings, walls) and the use of reflective material for roofing (around 60%). "Baltra is a desert landscape island that is part of the Galapagos National Park. The Park authorizes only the use of native species on site, but does not include any alternative species such as grass or small green plants needed for a vegetated roof, thus making development of a green roof infeasible. Instead, the project focuses on the use of a metal/insulation sandwich panel which will reflect most of the radiation that hits the roof's surface. In addition, natural ventilation methods and reduced temperatures surrounding the building will help maintain a range of thermal comfort within the building. The roof panel material consists of Zincalume steel with an inner 5cm layer of insulating material. The assembly also consists of Galvalume steel in a Kynar paint system natural white finish, which has a reflectance of 0.70 and an emittance of 0.84, resulting in an SRI of 79".(LEED-NC 2.2 Submittal TemplateSS Credit 7.2: Heat Island Effect: Roof In addition, certain paths throughout the airport site have been shaded with solar panels. This has the double effect of reduce the heat island effect while supplying new sources of renewable energy. Another methodology followed is the analysis of impacts from artificial conditioning facilities in order to promote alternatives that reduce thermal impacts. A measure of heat island effect should be taken on the site, before and after project execution.	
CR0.0 Innovate Or Exceed Credit Requirements	**0**	*N/A*	
	13		

OVERALL:	**293**	**ECOLOGIC AIRPORT IN GALAPAGOS, ECUADOR**

APPENDIX D: SOURCES

DOCUMENTATION PROVIDED
GENERAL INFORMATION
-Waste Management Plan For Aeropuerto Ecologico De Galapagos Baltra. Project Construction And Demolition Waste Management Plan (C&DWMP)
Corporación América. 2009. Estudio De Impacto Ambiental Y Plan De Manejo Ambiental. Proyecto Para La Ampliación Y Mejoras Del Aeropuerto Ecológico De Galápagos. Guayaquil, Ecuador: Eficiencia Energética Y Ambiental Efficacitas Consultora Cía. Ltda., 1,
Schiller, E Y Asociados & CASA Green. Abril, 2008. *Baltra. El Primer "Green Airport". Certificación Internacional LEED*
Contrato De Ingeniería, Provisión Y Construucción Integral, Bajo La Modalidad De “Llave En Mano”, De Las Fases I,II Y III De Obras En El Aeropuerto Seymour, Isla Baltra. Signed HELPORT ECUADOR SL - ECOGAL S.A
Desarmado Aeropuerto Antiguo Febrero 2013
DIPLOMA CALIFICADORA DE RIESGO
Estabilización De Suelo Operación Marzo 2103
Estabilizacion De Vias (Polvo)Operación Enero 2013
Consumo Y Produccion-Agua Y Energia Noviembre 2013
Informe diario de materiales a utilizar (2)
Informe vehiculos operación mayo 2013
Informe vehiculos operación junio-2013
Informe vehiculos operación julio 2013
Informes Tráfico Construcción
Licencia Ambiental Aeropuerto Baltra
Manejo De Agua Escorrentía-Construcción
Materiales A Reutilizarse En Terminal Nuevo
Mejoramiento De Vías Al Terminal
Minuta_contrato_baltra_final
Reuso De Materiales En El Terminal Nuevo
Señalizacion Construcción
Señalización Proteger Sitios Sensibles
Informe Control Ratas Marzo 2013
Control De Ratas Mayo 213
Control De Ratas Junio 2013
Control De Ratas Julio
Control De Ratas Abril 2013
Ecogal Newsletter 3
Ecogal Newsletter 4
Ecogal Newsletter 5

Ecogal Newsletter 6
Ecogal Newsletter 8
Ecogal Newsletter 9
Ecogal Newsletter 10
Ecogal Newsletter 11
Ecogal Newsletter 12
Ecogal Newsletter 15
Estabilización De Suelos, Temporales, Permanentes De Áreas De Construcción, Vías Y Pilas De Material Pétreo. Marzo 2013
Informe de estabilización del suelo en la via de ingreso al aeropuerto antiguo de. Febrero 13
Informe de estabilización del suelo en la via de ingreso al aeropuerto antiguo de la isla baltra. Abril 13
Informe de estabilización del suelo en la via de ingreso al aeropuerto antiguo de la isla baltra. Mayo 13
Informe de estabilización del suelo en la via de ingreso al aeropuerto antiguo de la isla baltra. Junio 13
Informe de estabilización del suelo en la via de ingreso al aeropuerto antiguo de la isla baltra. Julio 13
Informe de intensidad de ruido no 01. January 2013
Informe de intensidad de ruido no 02. February 2013
Informe de intensidad de ruido fase de operacion. Marzo 2013
Informe de intensidad de ruido fase de operacion. Abril 2013
Informe de intensidad de ruido fase de operacion. Mayo 2013
Informe de intensidad de ruido fase de operacion. Junio 2013
Informe de intensidad de ruido fase de operacion. Julio 2013
Control Plantas Invasoras Enero 2013
Control Plantas Invasoras Febrero 2013
Reubicación De Plantas Enero 2013
REUBICACION DE PLANTAS MARZO 2013
Informe De Señalización Enero 2013
Informe De Señalización Febrero 2013
Informe De Señalización Marzo 2013
Informe De Señalización Abril 2013
Informe De Señalización Mayo 2013
Informe De Señalización Junio 2013
Informe De Señalización Julio 2013
Informe Tecnico 04, Marzo 2013
Informe Tecnico 05, Abril 2013
Informe Tecnico 06, Mayo 2013
Informe Tecnico 07, Junio 2013
Informe Tecnico 08, Julio 2013

CONTRACTS WIH SUBCONSTRUCTORS
Ba0001-2012 Novacero
Ba0002-2012 Mutualista pichincha
Ba002-2012 Juancarlos quevedo burnham
Ba0003-2012 Mexul s.a.
Ba0004-2012 Ingenieria y servicios ambientales s.a.
Ba0005-2012 Soluciones tecnicas integrales enerpro ltda.
Ba0006-2012 Pileggi construccion
Ba0007-2012 Mauricio martinez
Ba0008-2012 Imerval
Ba0009-2012 Dolca s.a.
Ba0010-2012 Juancarlos quevedo burnham
Ba0017-2012 Mexul s.a.
Ba0018-2012 Energyplam
Ba0020-2012 Pileggi
Ba0022-2012 Faiquito
Ba0023-2012 Contrato santiago raul herrera barrera
Ba0026-2012 Persianas y cortinas del ecuador s.a.
Ba0028-2012 Luis Alberto Gomez Cedeño
Ba0030-2012 Mauricio Martinez
Ba0032-2012 Sedemi
Ba0033-2012 Italio mauricio martinez gonzalez
Ba0034-2012 Constructora del pacifico imerval cia ltda.
Ba0035-2012 Imerval
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