ZOFNASS PROGRAM
FOR SUSTAINABLE INFRASTRUCTURE
Graduate School of Design
Harvard University

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Graduate School of Design
Harvard University
George Gund Hall
48 Quincy Street
Cambridge, MA 02138

HIGHWAY FROM KANTUNIL-CANCUN AND EL CEDRAL-TINAL-PLAYA DEL CARMEN, YUCATAN PENÍNSULA, MEXICO

Figure 01: General Situation Plan of the project / Map source: CE 6.5 Anexo 1 MIA.

Emmanuel Torres Reyes ENV-SP/PV prepared this case study under the supervision of Zofnass Program Research Associate Cristina Contreras ENV-SP. This research was directed by Dr. Andreas Georgoulias, Director of Research of the Zofnass Program. The authors would like to thank Ana Paula Fernandez del Castillo Quintana, Dulce Maria Santana de la Torre, and Luis Marquezi from ICA for their continuous support in developing this case.

1. PROJECT INTRODUCTION

This case study outlines the evaluation of the ICA-MayaB concession for the operation of the Kantunil-Cancún highway and the construction of a new branch of the highway that will span the communities of El Cedral-Tintal-Playa del Carmen. This project is a result of the *Plan Estatal de Desarrollo de Quintana Roo*, and its supporting initiatives *El Programa Estatal de Ordenamiento Territorial de Quintana Roo* and *Programa Sectorial De Infraestructura, Comunicaciones Y Transportes Roo 2005-2011 De Quintana Roo.* These initiatives are part of an integral strategy plan for the modernization of infrastructure to promote communication and consolidate touristic corridors in the Yucatan Peninsula.[1]

The owner of the project is the Secretaría de Comunicaciones y Transporte, public agency of the Mexico. The agency has endorsed a concession agreement with Consorcio del Mayab, S.A. de C.V.[2] The company is based in Merida, Mexico. As of March 24, 2008, Autopista Del Mayab operates as a subsidiary of Empresas ICA, S.A.B. de C.V. The concession agreement is divided in two phases. The first phase is the site preparation and construction. This phase that began on December 2011 will last 17 months. This phase can be expanded by official request. The second phase is the operation and maintenance phase. It is schedule to last 25 years, and is set to begin after May 15, 2013.[3] The contracted cost of the concession is $422.95 Million and will cover CPOS amortization, new construction, Creation of funds and reserves, and the costs of financing.

2. PROJECT DESCRIPTION & LOCATION

The rapidly recovering tourist activity in the states of Yucatán and Quintana Roo have exposed the obsolescent situation of the road systems of the two Mexican States. The project has become a mean to integrate local land use and development to regional Initiatives that stimulate productive and commercial activity between the State Service Centers. The main goal of the Concession is to physically Link the tourist zones of the regions of Caribe Norte, Maya, Cancún-Isla Mujeres de Quintana Roo with the regions of the east and northeast of the State of Yucatán. The span of the project also consolidates the Cancún-Chetumal Corridor by providing new access to Playa del Carmen and a modernized westward connection to Merida. By the time that construction ends, The ICA-MayaB Highway Concession will become a driver for socio-economic growth of the region.

The project will span across the characteristic plains of the two states over a diverse semi-arid landscape that is rich in biological, cultural, and historical resources. The site is distinguished for its extensive aquifer system and limestone bed. The brush and limestone landscapes often meet at the major

[1] Anonymous. CE 6.5 Anexo 1 MIA. Pages 17-20

[2] Company Overview of Consorcio del Mayab, S.A. de C.V. http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=34412736 Retrieved: January 27, 2014 2:49 PM ET

[3] Anonymous, 2010. Anexo 4: Programa Financiero-Cedral a Tintal y Tintal a Playa del Carmen. and Anonymous, 2011. Primer Informe de Cumplimiento de Terminos y Condicionantes del Oficio Resolutivo. Pg. 23

channels of water the feed the underground basins or over *Cenotes*. Cenotes is the local word to describe sinkholes, or collapse caves that expose the underground water system. They are very abundant in the area and have posed a great challenge for the project team. Most of the Sustainability initiatives will address the protection of freshwater, wetlands, and the subterranean basins. The design and construction of the project was planned so it would not be immersed directly in any of the fragile ecosystem that compose the region.[4]

The Concession will modernize and operate the existing 180 highway that spans 250 km from the Kantunil vicinity in Yucatan. This starting point is located around 68.7 Km southeast of Merida. This highway sees its end in Cancun's International Airport Exchange. Another component of the concession will be the new construction. This portion of the projects is composed of two segments: The Cedral-Tintal Highway Branch which will span 9.959 km and the Tintal-Playa del Carmen Branch which will span 51.241 km. The total length of new construction is 61.2 Km in a southeast orientation towards Playa del Carmen.[5]

The project is an innovative infrastructure project in a sense that it incorporates sustainable designs into large scale infrastructure projects in the region. The sustainability aspects of these designs cross social, environmental, and conservation activities. The project team has created several initiatives like ICA Ayuda that address the social components of sustainability and awareness to preserve the rich underground system. As means to achieve the modern and more efficient infrastructure project and design goals the team has established an "Online Environmental Supervision." This is made possible by a special server and database that monitors both the project and environmental management and performance. These state of the art technologies are called Magi-CIsega, where Magi is the server and CIsega is the Portal-Interface. This type of supervision is possible by the installation of Environmental Performance Indicators and on-line monitoring through the CIsega webpage.

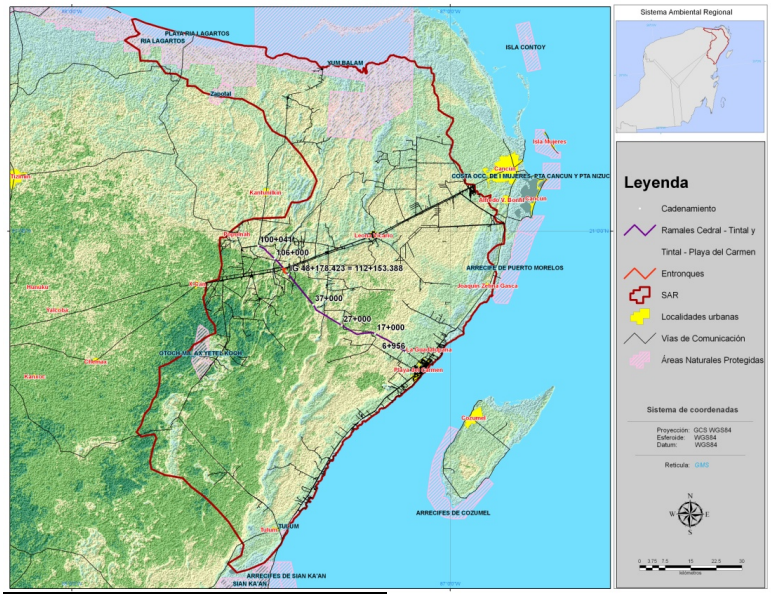


Figure 02: Project location in relation to urban and ecologically protected areas.
Map source: CE 6.5 Anexo 1 MIA.

[4] Anonymous. CE 6.5 Anexo 1 MIA. Page 61
[5] Anonymous, 2011. Primer Informe de Cumplimiento de Terminos y Condicionantes del Oficio Resolutivo. Pg. 12-14

3. APPLICATION OF THE ENVISION RATING SYSTEM[6]

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 highway from Kantunil-Cancun and el Cedral-Tinal-Playa del Carmen, Yucatan Península, México. The main intent of this rating is to evaluate the project design, construction, and operation, in order to provide recommendations for improvement in the future.

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[7] and Zofnass Program[8] websites.

Appendix C provides a table with the detailed project assessment, specifications for each of the credits, and recommendations for the highway from Kantunil-Cancun and el Cedral-Tinal-Playa del Carmen, Yucatan Península, México.

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*

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

community goals, incorporated into existing community networks, and will benefit the community long-term."[9] 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, 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 03: Quality of life category, credits distribution.

4.1.1. Purpose:

In the **Purpose subcategory**, ICA-Mayab Highway performed well. One Credit was evaluated as superior (QL 1.1 Improve Community Quality of Life). One credit was evaluated as enhanced (QL 1.2 Stimulate Sustainable Growth and Development). One credit was evaluated as conserving (QL 1.3 Develop Local Skills and Capabilities).

The Superior and conserving assessments are a result of the projects socio-economic initiatives. The project team has established three programs: Adopt a school, ICA AYUDA, and engage a school. They have different set of criteria and involvement but they are focused raising awareness on sustainability topics and on creating a beneficial space for the children and the community at large. Some of the actions taken as part of these initiatives is donating recycling and compost bins, sustainability roundtables and workshops, and providing INEA in the community (adult alphabetization and education) sessions. In addition to this, team offers Conferences and seminars addressed at the community needs and how to instill more sustainable practices. The initiatives have also created an education program tailored to the specific needs of the employees and educating them on sustainability practices at the workplace. This has a direct impact because they are mostly employed from within the communities adjacent to the project. Results of the education and conference programs are evidenced in individual worker assessments that log the educational units and credit hours that they have achieved. In addition to this the logs document previous education, the level attained,

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

and employee eligibility for other courses. This correlates with the institutional development scheme for each type of employee and the practice they have within the project.

4.1.2. Community:

In the **Community subcategory**, ICA-Mayab Highway assessment rendered mixed results. One credit was evaluated as Conserving (QL 2.1 Enhance Public Health and Safety). Another Two credits were evaluated as Enhanced (QL2.3 Minimize Light Pollution and QL2.4 Improve Community Mobility and Access). One credit was evaluated as Improved (QL2.2 Minimize Noise and Vibration), and one credit evaluated as Superior (QL2.6 Improve Site Accessibility, Safety & Wayfinding). One credit was assessed as having no score (QL 2.5 Encourage Alternative Modes of Transportation).

The superior and conserving assessments were a result of a strong move towards public safety in combination with sustainability practices. The project team has modified certain segments of the highway to avoid floodable areas. In addition to this, risks are identified and listed, including mitigation strategies to eliminate hazards to the health of the community and workers. The team has also established a system for Education and worker self-protection along with education and risk management in the work place that can arise from handling heavy machinery, petroleum derivatives and other chemicals. There has been several classes designed to address these issues; however, courses CN15-CT05 are specialized in safety and techniques required for the installation of the concrete bases. In addition to these courses two courses prepare the staff to deal with new technologies for handling, installing, and monitoring pavements. These Courses total 140 hours of training and are titled *“Diplomado de pavimentos asfalticos y Conservación”* y *“Control de Vías Terrestres.”*The Project team has also devised a workplace emergency plan and has an integrated Civil Protection Plan in the case that non-employees are the subject of an accident, or an emergency arises.

Building upon credit 2.1, the team has implemented a clear system to prevent and handle emergencies. They have created documentation that is addressed to different education levels and is clear enough for each group. As far as community outreach programs are concerned, they have distributed electronic and physical brochures that incorporate icons, symbols and cartoons so that the general public can understand the safety signage. These brochures also inform the public of the highway protection plan in case they have an accident or emergency within the highway. Thus, the team has been successful at developing and implementing a public safety plan and at making it accessible to every sector of the socioeconomic spectrum of the Yucatan and Quintana Roo. The project also has an online catalog so that users can get acquainted with the signage and their meanings. It is important to note that all the way finding and safety elements that can be recycled are diverted from the waste stream.

Figure 04: Online signage and way finding guide, note the categories.Source: Señaletica. Autovía Mexicana. Web, March 15, 2014.

4.1.3. Wellbeing:

In the **Wellbeing subcategory**, ICA-Mayab Highway assessment performed very well. One was credit evaluated as Conserving (QL 3.2 Preserve Views and Local Character). Another was evaluated as Superior (QL 3.1 Preserve Historic and Cultural Resources). One credit was assessed as having no score (QL 3.3 Enhance Public Space).

To achieve this assessments, the project team has taken steps to promote and preserve local artisans and cultural resources. They do so by hosting artisanal exposition that exhibit these talents and at the same time promote the economic growth of the region by creating a feasible market for the artisans. The Chichen Itza Cultural center is situated a few kilometers southwest of the existing highway. The Project team has entered in an agreement with INAH, *Instituto Nacional de Antropología e Historia*, which requires the contractors to inform and preserve any archeological findings related to the ancient cultures of the site. The project team has identified that deterioration of the natural landscape, by affecting the topography and biodiversity is the way that the project negatively impacts its surroundings. To mitigate this impact, the team has designed low lying highway that closely aligns with the natural slope of the geomorphology in the site. In addition, to preserve the natural views of the site and the local character of the landscape, the team has come up with a plan to rescue lost habitat and restore landscapes that the project adversely impacts. The team has a strong stand on the latter because the landscape of the region not only has a visual importance but also characterized the local culture and character.

4.1.4. Summary of results, Quality of Life Category:

The table below (figure 05) shows the distribution of credits as well as the level of performance achieved in each credit:

			highway from Kantunil-Cancun and el Cedral-Tinal-Playa del Carmen, Yucatan Península, México	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	2	Enhanced	12.5%	16
3			QL1.3 Develop Local Skills And Capabilities	12	Conserving	80.0%	15
4		COMMUNITY	QL2.1 Enhance Public Health And Safety	16	Conserving	100.0%	16
5			QL2.2 Minimize Noise And Vibration	1	Improved	9.1%	11
6			QL2.3 Minimize Light Pollution	2	Enhanced	18.2%	11
7			QL2.4 Improve Community Mobility And Access	1	Enhanced	7.1%	14
8			QL2.5 Encourage Alternative Modes of Transportation	0	No score	0.0%	15
9			QL2.6 Improve Site Accessibility, Safety & Wayfinding	6	Superior	40.0%	15
10		WELLBEING	QL3.1 Preserve Historic And Cultural Resources	7	Superior	43.8%	16
11			QL3.2 Preserve Views And Local Character	11	Conserving	78.6%	14
12			QL3.3 Enhance Public Space	0	No score	0.0%	13
			QL0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			QL	68		37.6%	181

Figure 05: Summary of results in the Quality of Life category

In the **Quality of Life category**, the biggest opportunities for project improvement are in the Community and Wellbeing subcategories. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 37.6%, or 68 points out of 181.

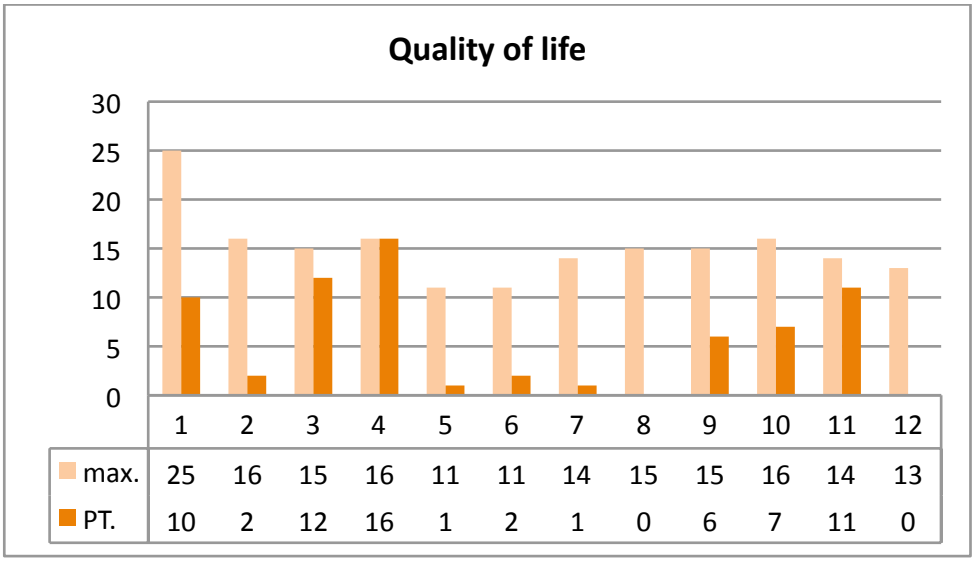


Figure 06: Summary of results in the Quality of Life category

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."*[10]

The 12 credits in this category are: Collaboration (LD 1.1, LD 1.2, LD 1.3, 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 07: Leadership category, credits distribution.

4.2.1. Collaboration:

In the **Collaboration subcategory**, ICA-Mayab Highway performed well. One credit was evaluated as Conserving (LD 1.1 Provide Effective Leadership and Commitment). One credit was evaluated as Superior (LD 1.2 Establish a Sustainability Management System). Another credit was evaluated as enhanced (LD 1.3 Foster Collaboration and Teamwork). One was evaluated as improved (LD 1.4 Provide for Stakeholder Involvement).

The project team has taken significant steps towards achieving a more sustainable practice. For example, the implementation of recycling and community outreach program, the reduction of energy consumption, and the use of renewable energy sources. The latter are part of annual reports that aim to create a precedent for better sustainable performance. In addition to these initiatives, the team has recognized the issues and problems with sustainability in a non-sustainable environment. For example, they have noted that no matter how efficient a highway is planned it

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

will, for the majority of time, serve as a barrier in terms of ecology and habitat. Thus, additional efforts were taken to encourage connectivity and avoid interrupting natural flows. Another, issue that arose is that to create a more sustainable highway, old obsolete material had to be removed. The project team addressed this by donating plastics and other asphaltic material to local communities to create low-impact, low-traffic volume infrastructures. Documents providing evidence of these dichotomies and the impacts and mitigation efforts have also been provided. In addition to this, training is provide to assess the sustainable market chain and implement sustainability practices in the workspace and courses that teach team-building techniques are taught to managers and supervisors.

The project's sustainability policy focuses on monitoring and low impact to the ecosystem. To achieve this they have developed three environmental initiatives that focus of reforestation and vegetation rescue, soil rescue, and reestablishing migratory connections of the fauna, especially the Jaguar. Sustainability manuals and procedures for environmental and workplace actions have been published. The team has created a robust system of procedures that integrate elements of sustainability and management. There is a clear line of sustainability goals and evidence that goals are being worked on or achieved. To succeed at this, lines of authority are clear and a system to address possible scenarios is implemented. The project ensures that management and employees transitioning to a sustainable lifestyle by offering at least 8 hours of training. Other specialized training per specialized sector exists and focuses on sustainability management and operation. The team has also devised a series of visual aids and workshops to ensure a successful implementation in the broader community.

The project team has established three programs to address social concerns and link the project to the community. In addition, the project managers have created an environment that encourages the residents and local authorities to be part of the process. This is evidenced by correspondence

that resulted in the donation of materials to both local authorities and school, including a request for a 10km long path to be built. Additionally, during 2010, the project team realized a comprehensive community assessment that included interviews and visits to communities affected by the project.

4.2.2. Management:

In the **Management subcategory**, one credit was evaluated as No Score (LD 2.1 Pursue By-Product Synergy Opportunities), and one credit was evaluated as Enhanced (LD 2.2 Improve Infrastructure Integration).

The project's typology follows a closed highway system model. The nature of the typology focuses of developing the economic growth and accessibility of its focus: Cancun and Playa del Carmen. Ultimately it becomes an economic driver by consolidating and linking commercial and touristic corridors in the states of Yucatán and Quintana Roo. It has an internal systems focus that emphasizes ecological connectivity and low impact on the regional habitat system. The design documents do not show any evidence of multimodal interchange hubs or any other type of connection that could improve urban growth along the path of the community or local infrastructure integration.

4.2.3. Planning:

In the **Planning subcategory**, the project had a mixed assessment. One credit was evaluated as conserving (LD 3.1 Plan for Long-Term Monitoring & Maintenance). Another Credit was evaluated as Improved (LD 3.2 Address Conflicting Regulations & Policies). One credit was evaluated as having no score (LD 3.3 Extend Useful Life).

The assessment of conserving was produced because the team has established an online monitoring system that will capture evidence from wildlife and other sensing data placed along the site. In addition to this, the team has established a management plan that will address the drainage systems no less than two times per year. The team has to submit overall operation reports annually or by governmental request. The project's final design responds to monitoring previous to construction and during the early stages of the process. To achieve all the operation and maintenance goals the team has created an annual professional growth schedule that consists on training and other educational tools. The team has allocated a budget for the continued education, maintenance, and monitoring.

The project team has supplied the regulations and policies with which they are required to abide. In the project documents, each law affecting the particular elements of the project is described in a first preamble, in a legal framework, or in a general statement. However, there is no evidence that the project team has worked with city/state officials regarding any conflicts between regulations and sustainability practices.

4.2.4. Summary of results, Leadership category:

The table below (figure 12) shows the distribution of credits as well as the level of performance achieved in each credit:

			highway from Kantunil-Cancun and el Cedral-Tinal-Playa del Carmen, Yucatan Península, México	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	7	Superior	50.0%	14
15			LD1.3 Foster Collaboration And Teamwork	4	Enhanced	26.7%	15
16			LD1.4 Provide For Stakeholder Involvement	5	Improved	35.7%	14
17		MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	0	No score	0.0%	15
18			LD2.2 Improve Infrastructure Integration	3	Enhanced	18.8%	16
19		PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	10	Conserving	100.0%	10
20			LD3.2 Address Conflicting Regulations & Policies	1	Improved	12.5%	8
21			LD3.3 Extend Useful Life	0	No score	0.0%	12
			LD0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			LD	47		38.8%	121

Figure 12: Summary of findings in the Leadership category

In the **Leadership category**, the biggest opportunities for project improvement are within the Management and Planning subcategory. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 48.8%, or 47 points out of 121.

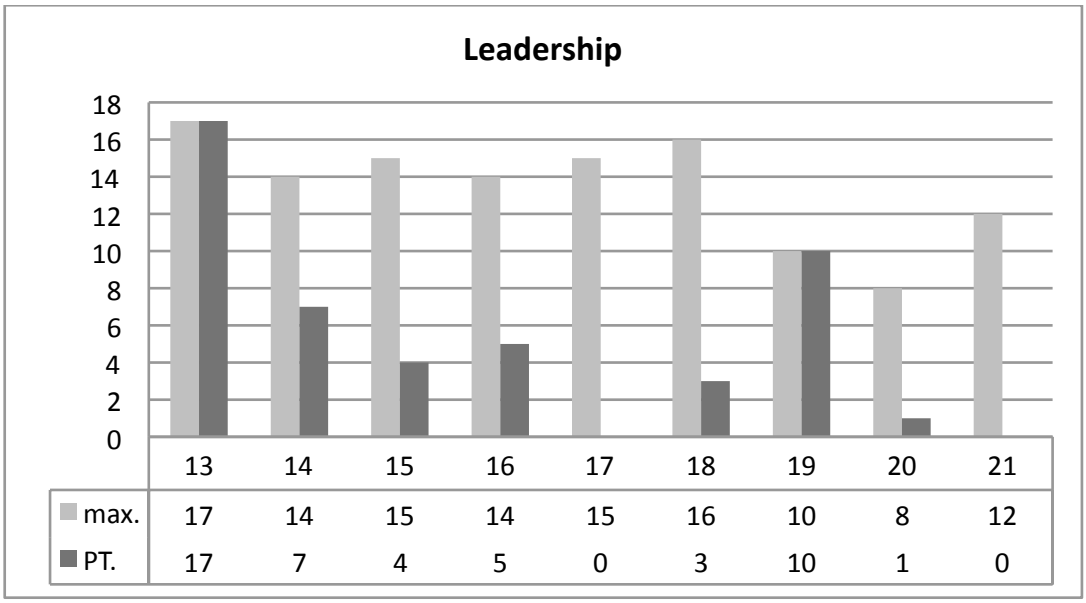


Figure 13: Summary of results in the Leadership category

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, 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 14: Resource Allocation category, credits distribution.

4.3.1. Materials:

In the **Materials subcategory**, the project had a mixed assessment. Out of seven credits, two were evaluated as Conserving (RA1.3 Used Recycled Materials and RA1.6 Reduce Excavated Materials Taken off Site). One was evaluated as Enhanced (RA1.4 Use Regional Materials). Three were evaluated as Improved (RA1.2 Support Sustainable Procurement Practices, RA1.5 Divert Waste from Landfills, and RA1.7 Provide for Deconstruction & Recycling). One credit was evaluated as having no score (RA1.1 Reduce Net Embodied Energy).

The Conserving assessment was resulted because the concession for this project will maintain and operate 250 Km or existing highway. The new construction in this project is of 61.2. This means that 80.3% of the total project operates with the use of recycled bases that exists as support of the highway. In addition, methods have been implemented to protect the life of the existing highway but most importantly they ensure an extended life and structural soundness of the new construction. Also, the asphalt that is taken from the existing highway is being donated to communities who request it for their own infrastructure works. Other materials like signs and barriers are also being reused. There another initiative in the project to use organic matter from the Valladolid toll plaza as compost to be used for the landscaping of the highways. Additionally, the project has a soil rescue program that seeks to limit the impact of the project on the site. The major soil types are Leptosol and Rendzina, which are common and characteristic of regions composed of limestone. All the soil (or at least 95% percent) will be banked to the right of the lanes, in nurseries, or in areas lacking vegetation and that have very little slope. This will occur in the preparation stages of the site. In addition, at least 60% of it will be covered with organic matter product of the preparation stage to nourish biological processes and prevent erosion. Some of these soils will be transported to the Agua Azul community to the flora rescue nursery to be part of the program itself and service the site.

The project team has identified the use of regional materials as a positive impact on the region. Included within the description is the explosion of local markets due to the scale and magnitude of the project. Of the 127 materials used, 83 are sourced locally. These figures show that 65% of the materials are sourced locally.

4.3.2. Energy:

In the **Energy subcategory**, out of three credits, one was evaluated as Enhanced (RA 2.3 Commission & Monitor Energy Systems), and two received No Score (RA 2.1 Reduce Energy Consumption, and RA 2.2 Use Renewable Energy).

Energy monitoring is implemented by means of a current monitor in the Valladolid Service Island and another for operation and maintenance exclusively. The team has specified that all of the offices and toll plazas are equipped with high efficiency lamps and go through a quarterly maintenance cycle. In addition to this, the lamps post in the highway have been equipped with individual PV cells. This has resulted in a 2.91% reduction in energy consumption.

4.3.3. Water:

In the **Water subcategory**, out of three credits, one was evaluated as enhanced (RA 3.3 Monitor Water Systems). The other two credits were evaluated as having no score (RA 3.2 Reduce Potable Water Consumption and RA 3.1 Protect Fresh Water Availability).

Because the project is located in the karstic region of the peninsula, there is an annual plan to monitor the quality of the water, especially after the end of the rainy season. Water monitoring will be heightened at any moment that a negative impact (spill, leak, etc.) is recorded. In addition to this, a drainage system monitoring/cleaning procedure has been established and this will happen, at the least, two times per year.

4.3.4. Summary of results, Resource Allocation category:

The table below (figure 15) shows the distribution of credits as well as the level of performance achieved in each credit:

highway from Kantunil-Cancun and el Cedral-Tinal-Playa del Carmen, Yucatan Península, México				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	2	Improved	22.2%	9
24			RA1.3 Used Recycled Materials	14	Conserving	100.0%	14
25			RA1.4 Use Regional Materials	6	Enhanced	60.0%	10
26			RA1.5 Divert Waste From Landfills	3	Improved	27.3%	11
27			RA1.6 Reduce Excavated Materials Taken Off Site	6	Conserving	100.0%	6
28			RA1.7 Provide for Deconstruction & Recycling	1	Improved	8.3%	12
29		ENERGY	RA2.1 Reduce Energy Consumption	0	No score	0.0%	18
30			RA2.2 Use Renewable Energy	0	No score	0.0%	20
31			RA2.3 Commission & Monitor Energy Systems	3	Enhanced	27.3%	11
32		WATER	RA3.1 Protect Fresh Water Availability	0	No score	0.0%	21
33			RA3.2 Reduce Potable Water Consumption	0	No score	0.0%	21
34			RA3.3 Monitor Water Systems	3	Enhanced	27.3%	11
			RA0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			RA	**38**		**20.9%**	**182**

Figure 15: Summary of findings in the Resource Allocation category

The **Resource Allocation category** presents biggest opportunities for project improvement in all subcategories. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 20.9%, or 38 points out of 182.

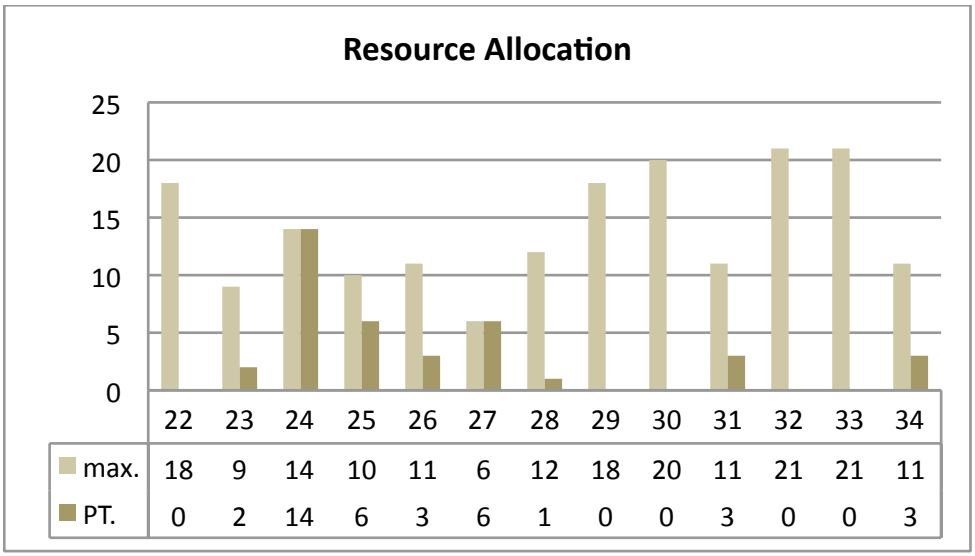


Figure 16: Summary of results in the Resource Allocation category

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.*"[11] 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 17: Natural World category, credits distribution.

[11] Envision Guidance Manual, p.116

4.4.1. Siting:

In the **Siting subcategory**, ICA-Mayab Highway assessment rendered a very good performance. One credit was assessed as Restorative (NW1.1 Preserve Prime Habitat). Three credits were evaluated as Conserving (NW 1.2 Preserve Wetlands and Surface Water, NW1.4 Avoid Adverse Geology, and NW1.6 Avoid Unsuitable Development on Steep Slopes). One credit was evaluated as Superior (NW 1.5 Preserve Floodplain Functions) and two credits were evaluated as having No Score (NW 1.3 Preserve Prime Farmland and NW 1.7 Preserve Greenfields).

The highway project creates a buffer of 380m from aquifers in order to protect the *cenotes* and other important feature of the subterranean aquifer ecosystem. The project has a rescue and reforestation initiative. There are maps that delineate the location of the new plants, nurseries, and other components of the initiative. The team has provided several lists of native flora to be used in the project as a mean to promote the sustainability of both the rescue and reforestation programs and site landscaping. The project has a soil rescue program that will and a policy that disturbed soils will be reutilized in the site to remediate areas suffering from desertification due to the loss of nutrients or topsoil. The project diagrams and maps natural corridors for different species and create underpasses so that they are not affected by the highway system. This way it increases the area of prime habitat and creates non-existing or disturbed connections between existing, restored, and natural prime habitat. Major efforts are undertaken to promote a healthy population of endangered species and a higher degree of biodiversity.

In an attempt to protect the wetlands and the waters that permeate through the limestone, the Project makes a conscious effort to avoid "*humedales*" (PSF From km 106+220 to 106+300) or wetlands or raises the structures that will be affected by these zones. In fact, project design was changed to avoid the wetlands for both environmental and structural reasons. In addition, Measures have been taken to limit the impact on surface water, its flows, and the natural filtration properties of the karst region, which is the main rock type of the area. Also, the project tries to create a buffer of at least 380 m from aquifers, supply channels, or sinkholes.

The project team identifies the main geological faults and their NE-SW orientation. A diagram showing this is presented. However, the project does not sit immediately in an area where danger is presented or areas of extreme altitudes prone to sliding. Light fractures occur at depths below 6m, but due to the property of the site and the ground cover and temperatures the ground is stable and does not represent a hazard to the construction. To achieve this conclusion a 12 evaluation stations were set up where the soil tests were to be conducted. These tests were made using a tetraelectric Dipole-Dipole Siscal Pro device from Iris Instruments. The interpretation method was Prosys II and Res2D inv. This geophysics studies show that the physical geography of the site are plains with light rolling hills. The project does not situate itself on any steep slope. Whenever the project does encounter a change of topography it will create a buffer zone to avoid the creation of a steep slope

that promotes erosion. This buffer zone is planted with regional flora to protect sites from excess heaving of sediments.

To preserve Floodplain functions the structures are used as filtration devices. These structures contain a thin layer of geotextiles that prevent debris and other small particles to wash out. It also avoids using any soil or developing areas were the natural filtration qualities of the sites are compromised. The Type of paving surface was modified to accommodate a higher performance and existing highways were covered with a "microcarpeta" or top layer to make sure that it complies with the Friction, International Roughness Index (IRI) and road standards. Some structures in floodplains have been relocated to higher ground, other structures that are not affected by seasonal floods have been raised higher, and drainage systems have been installed to connect flood basins. These drainage systems can be used by the many amphibian species and other aquatic fauna to travel from one habitat to another.

4.4.2. Land and Water:

In the **Land and Water subcategory**, ICA-Mayab Highway assessment resulted in a very good performance. Two credits were evaluated as Conserving (NW 2.2 Reduce Pesticides and Fertilizer Impacts and NW 2.3 Prevent Surface and Groundwater Contamination). One credit was evaluated as having no score (NW 2.1 Manage Storm Water).

A conserving assessment was possible because the project has adopted zero pesticide and fertilizer policy. This is feasible because the project's reforestation and landscaping uses a majority of plants that are indigenous to the area and do not require special needs of protection or nourishment. Refer to species list in the Reforestation Program. Nonetheless, the project adapts to long term risks. The team has identified that if a plague emerges or severe nourishment issues with the soil occurs, the use of pesticides and fertilizers might be contemplated. If that were the case the team has expressed that a water treatment plant is installed to filter the runoffs.

The project has limited impact on surface and groundwater ecosystems because the low stress design. The highway allows the water to flow with limited exposure to pollution. In addition it serves as a path of least resistance because the slope of the throughway responds to the natural slope of the terrain. To further protect the hydrological ecosystem the highway will be coated with ABtotal, a polymer which absorbs hydrocarbons and oils and makes them inert. The project team mentions that additional preventative actions have been taken to eliminate risks of contaminating ground and surface water. These measures include:

- Prohibit the dumping of liquid and solid residues in the river and surrounding areas. Specific Areas has been designated for dangerous materials special areas for washing the trucks handling concretes have been established.
- Install appropriate drainage systems following industry standards
- Minimize interference of the flows of surface and groundwater
- Refueling machinery outside of specified areas is not approved. If refueling is in situ, then the site for refueling has to be prepared. A response plan has been established in order to protect the aquifers and structural soundness of both the rock and built form.

4.4.3. Biodiversity:

In the **Biodiversity subcategory**, the project has achieved above average performance. One credit was evaluated as Restorative (NW3.1 Preserve Species Biodiversity). Another two credits were evaluated as Conserving (NW3.3 Restore Disturbed Soils and NW3.4 Maintain Wetland and Surface Water Functions) and one credit was evaluated as Improved (NW3.2 Control Invasive Species).

The project team has identified that the main threat is by the barrier and border effects that the highway has in the prime habitats, including deforestation due to construction. To address these issues the Project team has installed surveillance and monitoring devices to identify areas of species concentration. This allowed them to identify Illegal hunting grounds, places of feline activity concentration and catalog an index of species and quantity of animals run-over. As a response, the team identified migration patterns and natural connections and created a series of underpasses that would reinforce these trends. This installation of underpasses and open drainage systems in wetlands mitigates the effects of the barrier and border effects that highways usually have on ecosystems. As an added benefit, the number of trampled fauna decreases. Monitoring population numbers and illegal fur traffic and hunting has allowed the team to take a proactive stance and promote education and policing that would see an end to these activities and eliminate another threat related to development. To ensure that the loss of flora during site assembly does not affect the diversity of animals and plants, the project team has delineated a habit and forest rescue plan. It calls for a habitat restoration in a proportion of 3:1 reforestation. In other words, 3 trees should be put in place for every one that is cut down. The species planted should be endemic to the Central American regions that match the semi-arid conditions of the peninsula as to ensure resistance and at least an 85% survival rate with minimum intervention. This detailed reforestation and rescue plan has several benefits. First it ensures that plants can survive and endure low soil fertility and dry seasons. Because a detailed list of species, their individual description, fruit, habitat, and health requirements have been provided, the process is not ad hoc and is very controlled. Finally, it is helpful because it controls invasive species. All these factors together yield new living quarters for a growing population of protected animals and limited exposure of the hydrological ecosystem to chemicals related to protecting or nourishing these new reforested areas.

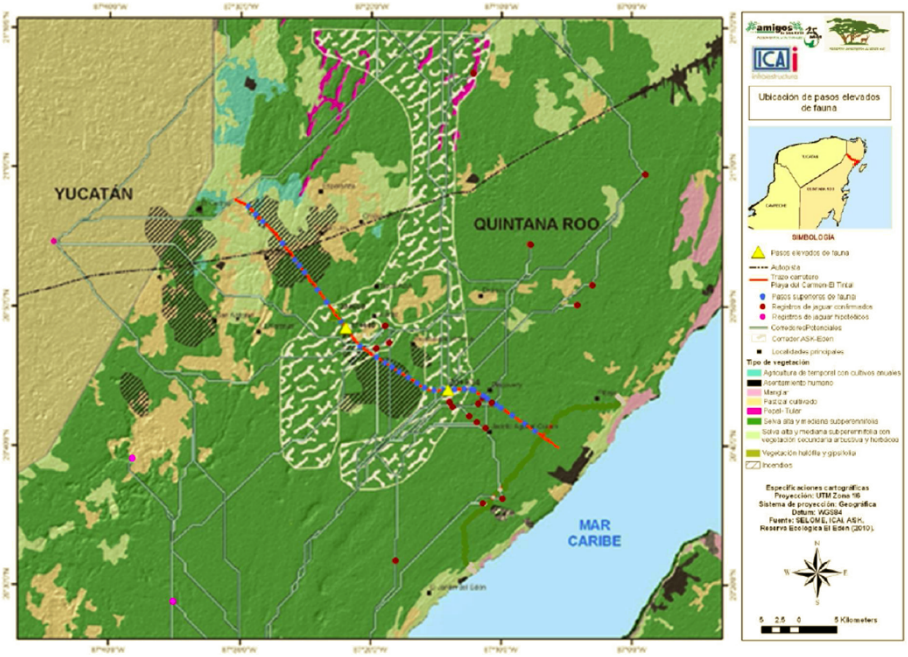


Figure 18: Location of Overpasses to allow habitat connections. These locations have to be restored or rescued once construction has finalized.

Map source: CE 6.5 Anexo 1 MIA.

In addition to the rescue and reforestation initiative, there is an initiative to rescue and restore all the soils as part of habitat restoration programs. Processes and plans for the excavation of these soils have been delineated. For example, soils will be banked to the right of the lane during site preparation. To prevent compaction, erosion, and nutrient deterioration they will be covered with organic matter. This will start biological processes that will infuse the soil with bacteria, organisms and nutrients that could have been lost in the process of site preparation. These soils will then be transported to temporary nurseries, experimental nurseries in the communities, to areas that have suffered desertification, or placed on the sides of the road to promote vegetation growth and prevent the erosion of highway structure.

Figure 19-21: Flora and Soil Rescue and Conservation manuals. Jaguar rescue and monitoring Manual

4.4.5. Summary of results, Natural World category:

The table below (figure 22) shows the distribution of credits as well as the level of performance achieved in each credit:

highway from Kantunil-Cancun and el Cedral-Tinal-Playa del Carmen, Yucatan Península, México				PT.	Performance	% Total	max.
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	18	Restorative	100.0%	18
36			NW1.2 Preserve Wetlands and Surface Water	14	Conserving	77.8%	18
37			NW1.3 Preserve Prime Farmland	0	No score	0.0%	15
38			NW1.4 Avoid Adverse Geology	5	Conserving	100.0%	5
39			NW1.5 Preserve Floodplain Functions	8	Superior	57.1%	14
40			NW1.6 Avoid Unsuitable Development on Steep Slopes	6	Conserving	100.0%	6

41			NW1.7 Preserve Greenfields	0	No-Score	0.0%	23
42		L & W	NW2.1 Manage Stormwater	0	No score	0.0%	21
43			NW2.2 Reduce Pesticides and Fertilizer Impacts	9	Conserving	100.0%	9
44			NW2.3 Prevent Surface and Groundwater Contamination	14	Conserving	77.8%	18
45		BIODIVERSITY	NW3.1 Preserve Species Biodiversity	16	Restorative	100.0%	16
46			NW3.2 Control Invasive Species	5	Improved	45.5%	11
47			NW3.3 Restore Disturbed Soils	8	Conserving	80.0%	10
48			NW3.4 Maintain Wetland and Surface Water Functions	9	Conserving	47.4%	19
			NW0.0 Innovate or Exceed Credit Requirements	0	N/A		
			NW	112		55.2%	203

Figure 22: Summary of results in the Natural World category

The project performs very well in the **Natural World category**, but there are opportunities for project improvement in the Siting and Land & Water subcategories. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 55.2%, or 112 points out of 203.

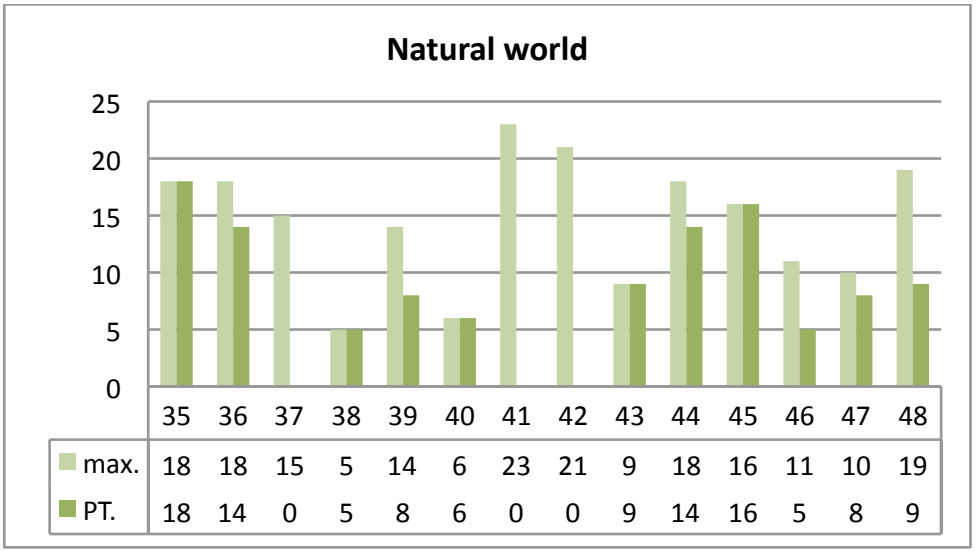


Figure 36: Summary of results in the Natural World category

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."[12] 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 23: Natural World category, credits distribution.

4.5.1 Emissions

In the **Emissions subcategory**, both credits were evaluated as having no score (CR 1.1 Reduce Greenhouse Gas Emissions and CR 1.2 Reduce Air Pollutant Emissions).

The project team submitted documents that evidenced that vehicles were inspected and were compliant with local laws. However, the credit performance was poor because metric evidence, carbon cycle analyses, and comparison to industry norms were not provided. This is a growth opportunity for the project team if they are able to provide the necessary documents.

4.5.2 Resilience

In the **Resilience subcategory**, out of five credits, one was evaluated as Conserving (CR2.1 Assess Climate Threat). Another two credits were evaluated as Improved (CR 2.2 Avoid Traps and Vulnerabilities and CR2.4 Prepare for Short-Term Hazards) and the remaining two credits were evaluated as having no score (CR 2.3 Prepare for Long-Term Adaptability, and CR 2.5 Manage Heat Island Effects).

The project design takes into consideration the climate threats, and designs around them and to prevent them. For example, to eliminate the risk of structures failing under constant flooding and protect the ecosystem from traffic, one segment of the highway was redesigned to avoid wetlands and floodable areas. To prevent the extensive erosion, heat islands, and heat waves, the project team has adopted a 3:1 reforestation ratio, is planting the slopes that the bases of the roads create, and is planting the service islands with native plants. As evident in previous credits, there has been a robust community outreach program that accompanies this project to educate and promote more sustainable lifestyles.

To avoid traps and vulnerabilities, the project team has delineated several strategies to limit impact on the karst region, the underground basins, and open-air basins. Impacts have been assessed and mitigation strategies proposed in the event either of the ecosystems is compromised. The team has

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

understood that the cost of the vulnerabilities is not only monetary, but has implication both in the health of the ecosystem and communities that live off the water supply.

The short term hazards of loss of habitat and erosion are addressed by creating nursery and reforestation programs. The team has also identified that a measure for short-term preparedness is the storage of water. The project clearly delineates man-made hazards during the construction and operation phases and catalogs them according to their risk magnitude and impact intensity. In addition to this the project responds to both long/short-term hazards by taking into consideration flooding and other man-made hazards that could amplify flooding after rain events due to hurricanes. Earthquakes and topographical hazards are not present in the area, so there is no evidence of planning for these.

4.5.3 Summary of results Climate and Risk category.

The table below (figure 24) shows the distribution of credits as well as the level of performance achieved in each credit:

highway from Kantunil-Cancun and el Cedral-Tinal-Playa del Carmen, Yucatan Península, México				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	0	No score	0.0%	15
51		RESILENCE	CR2.1 Assess Climate Threat	15	Conserving	100.0%	15
52			CR2.2 Avoid Traps And Vulnerabilities	2	Improved	10.0%	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	0	No score	0.0%	6
			CR0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			CR	20		16.4%	122

Figure 24: Summary of findings in the Cimate & Risk category

In the **Climate and Risk category**, the biggest opportunities for project improvement are in the both the emissions and Resilience subcategories. Considering all credits and the maximum possible values for each indicator, the percentage of achievement equates to 16.4%, or 20 points out of 122.

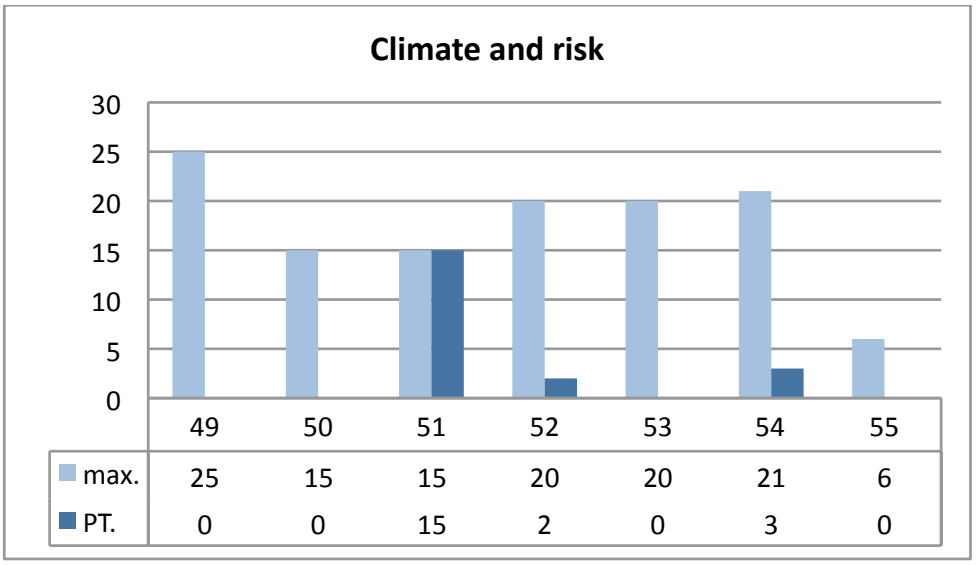


Figure 25: Summary of results in the Climate & Risk category

5. RESULTS AND CONCLUSION

The evaluation of the ICA-Mayab Highway from Kantunil-Cancun and El Cedral-Tinal-Playa del Carmen is an opportunity to analyze a sustainable infrastructure project that contributes to the overall development of the economy of the Yucatán and Quintana Roo States in México. The analysis recognizes both the strengths and vulnerabilities of the project and points out recommendations that could be used to achieve better standards in the future stages of the highway operation or further expansions.

In the **Quality of Life category**, the project obtained 68 out of 181 points, or 37.6%. This is the third best performance by the ICA-Mayab Highway from Kantunil-Cancun and El Cedral-Tinal-Playa del Carmen out of the five categories of the *Envision* rating system. The project improved quality of life through the generation of employment and targeted investments in regionally sourced materials for the communities located among the length of the project's area of influence. In addition, emphasis was placed on hiring local individuals on providing the necessary training to comply with the legal and technical requirements to meet the project's high standards set for human and environmental resource management and technology application.

A comprehensive Social Management Plan composed of three programs was implemented. The three programs have two school components and a social relief component. The team has prioritized sustainability as a lifestyle and have identified that influencing the younger generations is the best starting point. Additionally, it invests in hiring and training local manpower or providing adult alphabetization and education in conjunction with INEA. Each new hire to the project goes through at least eight hours of training on sustainability practices, after areas of specialty are define they will

undergo further training. Policies and procedures were established to maintain safe and healthy work environments, and to minimize the risks to which workers are exposed. To this end the project team has institutionalized a set of courses that teaches the workers how to employ safety measures when installing new technologies.

In the **Leadership category**, the project obtained 47 out of 121 points, or 38.8%, which was the second best performance for the project out of the five categories. The project team takes a radical approach to project development. This approach requires the phases of the project to be managed through collaborations of a highly technological multidisciplinary team to ensure that the sustainable values that arise from the contradictions in the project model are preserved. This team has to ensure that highway functions in an alternate artificial nature to its own. In other words, they have to ensure its programmatic efficiency without creating a nuisance in the ecosystem. Thus, constant monitoring and coordination was necessary.

With regard to long-term monitoring, different plans have been established that include objectives, actions, and schedule. To guarantee implementation, funds and responsibilities have been assigned and specific tasks.

In the **Resource Allocation category**, the project obtained 38 of 182 points, or 20.9%. This performance ranked fourth among the five categories for the project performance in the *Envision* rating system, and was largely due to a lack of information. While there is a contractor and supplier evaluation form, no specific data was provided about supplier performance regarding materials and sustainable procurements, or any legal stipulation to which each would have to bind. During the project's operation and construction, a Comprehensive Waste Management Plan will be implemented that includes a waste classification system, disposition and management of all the solid residues including organic matter and in-situ composting. Additionally the project has diverted waste from landfill by reutilizing signage and other materials and by entering in direct contact with local agencies and organizations and donating over 40 kg of PET, 350 m^3 of asphalt millings to build path to facilitate community mobility, 64 wheels of different varieties, and recycling over 407 kg of solid waste.

The project includes internal monitoring of the energy systems and quarterly maintenance. It has reduced energy overall consumption by 2.91%. Energy originated from renewable sources represents around 2%. Reduction of energy consumption and implementing renewable energy sources could be part of future improvements to the highway system. Regarding water consumption, there is no clear water management plan which reflects adversely in the amount of water consumed and the reduction of non-replenishable potable water uses.

In the **Natural World category**, the project obtained 112 out of 203 points. This represents 55.2%, and is the project's best performance within any of the five categories of the *Envision* rating system. The project is located in an area assessed as not being of high ecological value, but is surrounded by a valuable natural fragile ecosystem of underground water systems, wetlands, and semi-arid brush forests that house a plethora of species. The project is keen on not only protecting wildlife, but also on rescuing

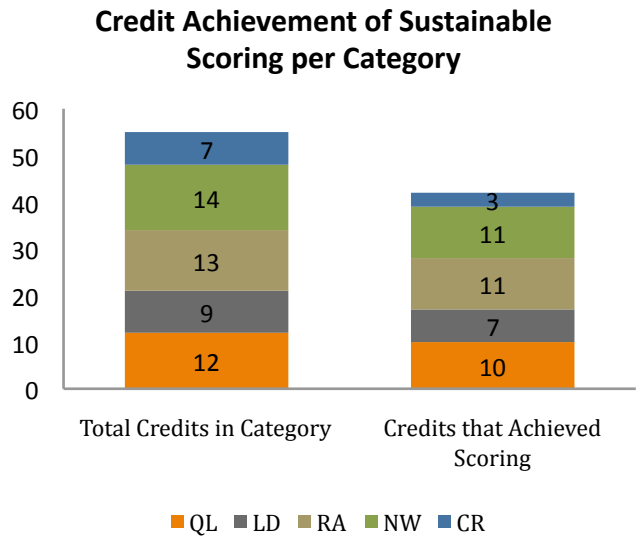
and restoring habitats and habitat functions that have been lost due to the presences of the existing highway. This ensures the regeneration and vitality for the future.

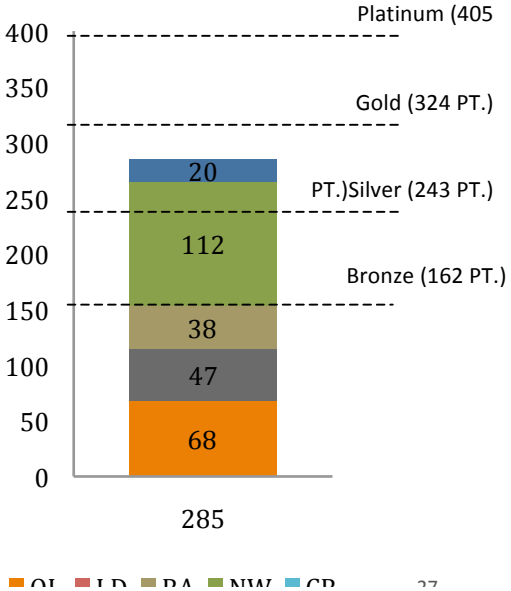
Furthermore, the project includes a 380 m buffer area to prevent impacts generated by project activities existing subterranean water bodies and the channels and sinkholes that feed the aquifer system. To maintain and enhance biodiversity, the project implements constant monitoring of the wildlife and has constructed under and over passes to restore the connectivity of the ecosystem. Rather than disturbing the surface water flows and functions of the floodplain, the project follows the natural slope of the site. In addition it has been coated with special polymers that absorb and neutralize petroleum products. This way the fresh water supplies are protected. As an added benefit, the project has also instituted a series of drainages that not only promote sediment transportation but also serve as aquatic connectors between wetland habitats.

In the **Climate and Risk category**, the project obtained 20 out of 122 points, or 16.4%, which was the worst performance the NQIA had in any category.

The project has properly assessed the climate threats and the design has reacted correspondingly by avoiding areas of extensive flooding or by raising the bases. This ensures that the life of the project is extended and the safety of the users during prolonged rainy episodes is not compromised. The project team contemplates the mitigation of both carbon emissions and heat island effects by rescuing deserted areas, planting service islands, and establishing nurseries that will respond to deforestation; thus, increasing the tree canopy and with it the efficiency of the project to absorb carbon emissions and heat.

The **overall performance** reflects the quality and quantity of the documents that were provided to assess the project. In the Quality of life category, 10 of the 12 of the credits achieved scoring, which represents an 83%. In the Leadership category, 7 out of 9 credits achieved scoring, which represents a 78%. In the Resource Allocation category, 11 of 13 credits achieved scoring, which represents a total of 85%. In the Natural World category, 11 out of 14 credits achieved scoring, which represents a total of 79%. Finally, in the Climate and Risk Category, only 3 out of 7 achieved scoring, which represents a total of 43%.The total scores per category sum up to 285 out 809 points. This represents a total performance of 35.2%. This level of performance qualifies the ICA-Mayab Highway from Kantunil-Cancun and El Cedral-Tinal-Playa del Carmen Project for a **Silver level of achievement**.





APPENDIX A: PROJECT PICTURES AND DRAWINGS

Figure 28: View of the existing high way. Source: Project Team Submittal

Figure 29: View of one type of open air water basin

Source: Project Team Submittal

Figure 30: View of one type of *Cenote*, or sinkhole

Source:






Figures 31-36: Sequence showing the removal of banked soil that is reused in the nurseries. Note the online motoring system watermark on the pictures.

a) Cubeta van Dorn para la toma de muestras a media gua y en fondo

b) Vaciado de la cubeta van Dorn y toma de muestras

c) Empaquetado y sellado de muestras

Figure 37-45: Sequence showing water monitoring activities in the bodies of water on the site to ensure there is no impact.

All Images Sourced from: Anonymous.2012. CSCE4.7 anexo1 Programa de restauración de suelos.

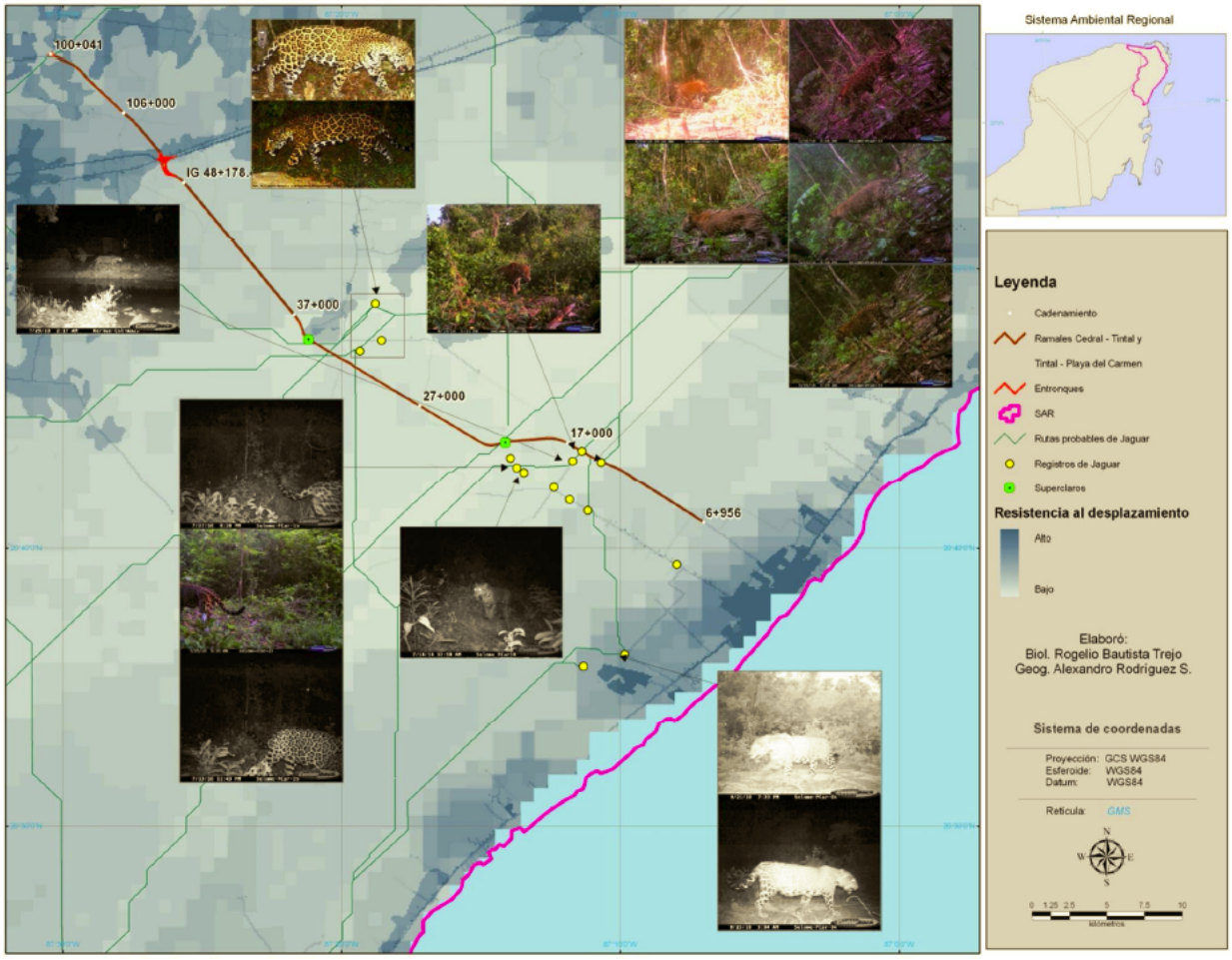


Figure 46: Location for large fauna underpasses in relation to Jaguar sightings.

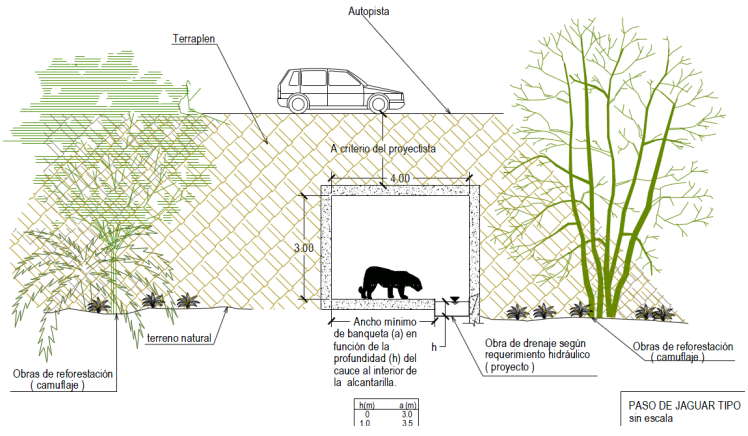


Figure 47 (Left): Some of the registered Large Animals

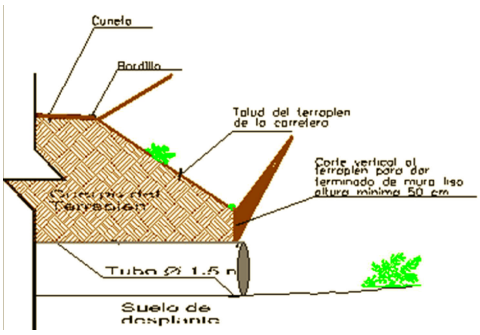
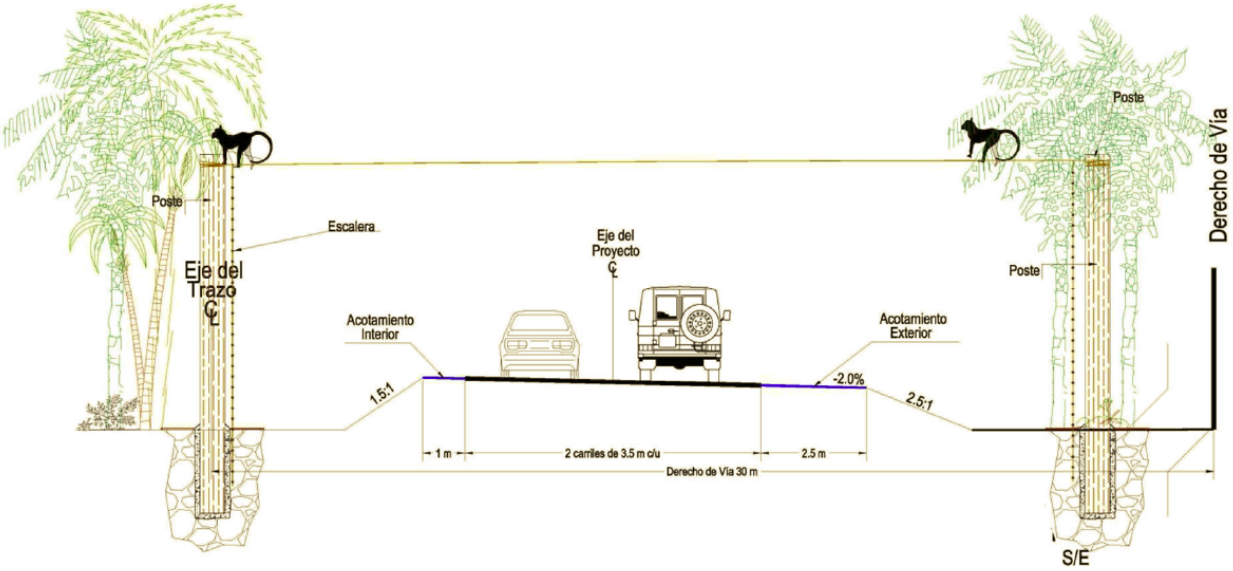


Figure 48 (Top): Large Fauna Underpass including drainage that connects floodable areas and wetlands in order for amphibious and aquatic species to be mobile within the different ecosystems.



All Images sourced from :Anonymous. PL 2.2- Anexo 1 Capitulo V & VI MIA.

Figure 50: Under pass for small fauna

Figure 51: Small fauna using underpass

Figure 52: Over pass for monkeys and other tree canopy dwellers

Figure 53: Monitoring Illegal Hunting. The green patches show areas of hunting.

Figure 55: Community engagement: Interviewing school director.

Figure 54: Street Light Post with PV Cells

Images sourced from :Anonymous. PL 2.2 Anexo 1 Capitulo V & VI MIA.

Figure 56: Donating Trash cans and recycling bins to the communities.

Source:

Figures 57-59: Adult Alphabetization and employee training.

Source: R.H. PL 1.3 anexo 1 Reporte de INEA y Reporte de capacitación

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**	

*The five innovation credits are bonus points

APPENDIX C: CREDIT DETAILS

highway from Kantunil-Cancun and el Cedral-Tinal-Playa del Carmen, Yucatan Península, México: CREDIT SPREADSHEET WITH DETAILS			
CATEGORY I, PEOPLE AND LEADERSHIP (PL)			
SUB CATEGORY: QUALITY OF LIFE			
	ICA-MayaB Concesion Autopistas Kantunil-Cancun y Cedral-Tintal-Playa del Carmen		**RECOMMENDATIONS**
PL1.1 Improve Community Quality of Life	**10**	**Superior** The project team has engaged the municipalities and communities in the project. For this, the project team has established three programs: Adopt a school, ICA AYUDA, and engage a school. The three programs have different set of criteria and involvement but they are focused on creating a beneficial space for the children and community at large. In addition to this, Steps have been taken to accommodate the requests of the communities in terms of supplying the needs and requests that the neighbors have made via written letters. For example, the neighbors requested a 10km path to be created so that the farmers could get to their crops and of those 10km, 7km would be to create a tourist destination and a local cave system. The team donated PET and Asphalt trimming. This diverted waste from the landfills, created local infrastructure, and impacted positively quality of life. Sources: Anonymous. R.H. PL 1.1Presentación Comisión Social. Anonymous. R.H. PL 1.2 anexo 2 Reporte de responsabilidad social. Anonymous. R.H. PL 1.2 anexo 3 Reporte de Responsabilidad social.	If the previous level of information is available, the next step would be to provide reports and documents of meeting results, design charrettes, and other activities conducted with representatives of the affected communities. There should be evidence of the processes for collecting, evaluating and incorporating community input into the project design. The project team should demonstrate the thoroughness such evaluation and incorporation into the design. If the above criteria are met, the team should provide acknowledgement and endorsements by the community that the design participation process was helpful and that their input was appropriately assessed and incorporated into the project, as well as evidence of community satisfaction.
PL1.2 Stimulate Sustainable Growth & Development	**2**	**Enhanced** The Project team has provided details on some initiatives and steps taken towards achieving sustainable growth and development. However, the metrics of impact were not provided. Some of these activities are addressed at improving local cultural capacity and access and has created the following 1. Generate job opportunities and give priority to regional residents for job openings within ICA/MayaB and its service and material providers. 2. Provide socio-economic opportunities by doing fairs to expose local talent	Initially, the project team should be able to offer an analysis of the jobs that will be created in/out of the contracts for the design portion of the project. Once this is done, the team should provide reports showing how the delivered work expands the capacity or increases the quality of operating, recreational, or cultural capacity. The results should be verified against the references to official community plans, goals, needs assessments, minutes of meetings, or

		Sources: Anonymous. R.H. PL 1.2 anexo 2 Reporte de responsabilidad social. Anonymous. "Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional" in MIA regional. Pg. 98	letters from community leaders and decision makers. This verification process should be provided in a detailed checklist manner. This verification should be able to render analyses on how the delivered work has affected local productivity, for example: Reduced traffic congestion, improved pedestrian traffic, lower operation costs, increased operating capacity, increased efficiency, and operating alternatives. Another level of information that could be included is: 1. reports or documents that show how the project improves community attractiveness for compatible businesses and industries, improves recreational opportunities, and generally improves socio-economic conditions in the community. 2. Evidence showing how the project will improve the overall business environment, for example: increases in productivity, improved access to facilities and infrastructure, increased use of alternative resources, facilities and infrastructure. 3. Evidence of new employment opportunities that will be created and will expand the skill base of the citizens. 4. Analyses showing how the project will improve community prospects for sustainable economic growth and development. 5. Evidence of efforts by the project team to work with the community in identifying community infrastructure assets, needs for improvement, prospects and plans for growth and development.
PL1.3 Develop	**12**	**Conserving**	Provide Documentation of the extent

Local Skills and Capabilities	**12**	**Conserving** By means of ICA Ayuda, one of the three programs mentioned in QL 1.1, the team offers Conferences and seminars addressed at the community needs. This program has also created an education program tailored to the specific needs of the community. This can be seen in the assessments and education services provided to the workers. Minimum education requirements to achieve an acceptable level of education for the positions are offered. Numbers of alphabetization, primary, and secondary students are provided along with photos of the onsite classrooms. Sources: Anonymous. 2012-2013. R.H. PL 1.3 anexo 2 Plan anual de capacitación Anonymous. 2012R.H. PL 1.3 anexo 1 Reporte de INEA y Reporte de capacitación. Anonymous. R.H. PL 1.1Presentación Comisión Social.	and skill-level of work planned for local firms and the skill mix of local project hires in relation to overall project hires should be made available. Finally, a statement of the ratio of proposed local hires to overall hires should be provided.
PL2.1 Enhance Public Health And Safety	**16**	**Conserving** The project team has modified certain segments of the highway to avoid floodable areas. In addition to this, risks are identified and listed, including mitigation strategies to eliminate hazards to the health of the community and workers. The team has also established a system for Education and worker self-protection along with education and risk management in the work place that can arise from handling heavy machinery, petroleum derivatives and other chemicals. There has been several classes designed to address these issues; however, courses CN15-CT05 are specialized in safety and techniques required for the installation of the concrete bases. In addition to these courses Two courses Prepare the staff to deal with new technologies for handling, nstalling ,and monitoring pavements. These Courses total 140 hours of training and are titled “Diplomado de pavimentos asfalticos y Conservación” y “Control de Vías Terrestres.”The Project team has also devised a workplace emergency plan and has an integrated Civil Protection Plan in the case that non-employees are the subject of an accident, or an emergency arises.	Provide evidence of approval and sign-off by the appropriate public health and safety officials.

		Sources: Abarca de la Cruz, Ing. Agenor.2013. C PL2.1-Anexo 3 plan de seguridad del proyecto. Anonymous. 2012. A PL 2.1 anexo 1 y 2 F-GGC-80_Mantenimiento_Mayab. Identificación de Peligros y Evaluación de Riesgos Laborales. Anonymous. 2012. A PL 2.1 anexo 1 y 2F-GGC-80 Traslado Centros de Trabajo: Identificación Anonymous. 2012. A PL 2.1 anexo 1 y 2F-GGC-80_Oficina_OM: Identificación de Peligros y Evaluación de Riesgos Laborales. Anonymous. 2012. A PL 2.1 ANEXI 1 Y 2F-GGC-80_Operacion_Plazas_Cobro: Identificación de Peligros y Evaluación de Riesgos Laborales. Anonymous. 2011. A CE 3.1 Anexo 1 Identificacion Aspectos. Bueda, Dra. Cristina Maria. C PL2.1-Anexo 3 Programas de capacitación continua sobre salud y seguridad en el trabajo. Horcasitas Nava, Ing. Alberto. 2012. C CE 4.4 ANEXO 1 y 2 modificacion de proyecto de areas humedas. Anonymous. "Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional" in MIA regional. Pg. 20-22, Pg. 73	
PL2.2 Minimize Noise And Vibration	**1**	**Improved** The project team has not provided sufficient information regarding baseline studies of existing noise and vibration. The study does give baseline data for the species that are mostly affected by the project, location of major threat of noise and vibration pollution, but does not show actual project data. The baseline Data provided calls for noise that does not exceed 42-48 decibels in bird species, Mentions the effect of vehicular transportation in amphibian communication and reproduction patterns, and provides a plan that suggests how the fauna will situate itself along the new construction of the project. Sources: Anonymous. "Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional" in MIA regional. Pg. 20-22, Pg. 71-73	Provide noise and vibration studies and field monitoring by individuals with acceptable credentials and qualifications that provide adequate baseline information and predictions of ambient noise and vibration levels during construction and operation. These baseline measures should be accompanied by submitted proposals for ambient noise and vibration mitigation and monitoring. Common best practices are not acceptable to satisfy this credit's requirements. Instead, comprehensive proposals that show information of coverage, detail and the dissemination of requirements to construction contractors should be provided. Analyses and documentation of estimates of ambient noise and vibration levels and efforts to reduce them to meet the community's needs and goals for livability will be considered for higher credit.
PL2.3 Minimize	**2**	**Enhanced**	Provide documentation on lighting

Light Pollution	**2**	**Enhanced** A detailed study of lighting conditions within the office environments is provided. These studies provide metrics, type of light, and recommendations. To minimize Light pollution in areas not categorized as urban areas the use of billboard (spectacular) is not allowed. This type of billboard is only allowed in areas that are no more that 200 M from an urban area. **Sources:** Anonymous. 2012. A PL 2.3 anexo 1 y 2Condiciones de iluminación en los centros de trabajo Merida. Anonymous. 2012. A PL 2.3 anexo 1 y 2Condiciones de iluminación en los centros de trabajo(Chichen). Anonymous. 2012. A PL 2.3 anexo 1 y 2 Condiciones de iluminación en los centros de trabajo(Valladolid). Anonymous. 2012. A PL 2.3 anexo 1 y 2Condiciones de iluminación en los centros de trabajo(Xcan). Anonymous. "Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional" in MIA regional. Pg. 102	assessments conducted for the project and the development and design of light zone levels according to appropriate needs of the project. Also, demonstrate that signage for the constructed work will meet the following standards for digital signs, digital billboards, electronic message boards or displays, electronic messages centers, marquees and other digital/electronic display systems: at all times there shall be no display such as twirls, swirls, blinking, videoclips or any other form of animation. Sign copies cannot change more than once per hour. During daylight times, during sunrise and sunset, luminance shall not be more than 2000 candelas per square meter. During all other times, before sunrise and after sunset, luminance shall not exceed 250 candelas per square meter. Plans, drawings, and specifications that show the use of energy-efficient lighting, removal of existing but unneeded lighting, use of automatic turnoff systems, and application of non-lighting alternatives will be necessary for higher credit analysis. In addition, plans, drawings, and specifications should show reductions in lighting intensity and the use of: high barriers planted trees and shrubs Full cut-off lenses
QL2.4 Improve Community Mobility And Access	**1**	**Enhanced** The Project is a closed highway typology. In other words, it is a high speed project with limited entry/exit points. It is not design to create urban growth along its route but rather to benefit the touristic centers of Cancún and playa del Carmen. There is no evidence of intermodal transportation initiatives, interchange hubs, or pedestrian connections. Nonetheless, it creates higher visibility and access for the communities mentioned and increases tourist and commercial traffic to them.	Provide complete studies and reports addressing the effects of the project on access and mobility. These studies should show the extent to which the project improves community transportation efficiency, walkability, and livability. Reports, memoranda, and minutes of

		Sources: Anonymous. "Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional" in MIA regional. Pg. 101	meetings with managers, operators, and community leaders that discuss access to adjacent facilities, amenities, and transportation should be provided. Records of decisions made based on these meetings should be documented as well. These decisions should directly translate into specifications of requirements for the contractors and should contemplate alternative construction methods. Most importantly, information about the existence and comprehensiveness of programs within the affected communities should be submitted as well.
QL2.5 Encourage Alternative Modes of Transportation	**0**	**No score** The goal of the project is to construct, operate, and maintain a highway with transportation elements that ease the access of a higher volume of private vehicles to and from Merida-Playa del Carmen-Cancún. There is no evidence on how the project improves walkability through the construction of pedestrian bridges or other amenities. No metrics have been provided on projected increased use of alternative modes of transportation or initiatives taken to encourage their use. Moreover, no data regarding the projected volume of use of the bridges or alternate modes of transportation has been provided. Source	Document the extent of convenience that the pedestrian bridges offer to the communities, for example, distance and time to bridges and multimodal facilities. If parking is provided near or around the project, the location should be depicted; parking around the toll plazas and under highway passes is highly desirable. These parking areas should be proportional to the need and shall not exceed it as promoting the use of automobiles rather than alternative methods is not desirable. Design documents for bus stops, tram stops, and other shelters for alternative transportation methods should be provided. Before and after projections will be very helpful in understanding where topography and natural elements enrich the design. If any alternate transportation infrastructure is revitalized as part of this project, the design drawings should be provided for such. In addition, all the plans and construction drawings, including renderings, of community oriented planning and design, should be submitted.
QL2.6 Improve	**6**	**Superior**	Provide evidence of how the project

Site Accessibility, Safety & Wayfinding	**6**	**Superior** Building upon credit 2.1, the team has implemented a clear system to prevent and handle emergencies. They have created documentation that is addressed to different education levels and is clear enough for each group. As far as community outreach programs are concerned, they have distributed electronic and physical brochures that incorporate icons, symbols and cartoons so that the general public can understand the safety signage. These brochures also inform the public of the highway protection plan in case they have an accident or emergency within the highway. Thus, the team has been successful at developing and implementing a public safety plan and at making it accessible to every sector of the socioeconomic spectrum of Lima. The project also has an online catalog so that users can get acquainted with the signages and their meanings. In an effort to promote sustainability, the project team has established a recycling initiatives with all the signage and wayfinding equipment. The equipment that are still usable will be recycled. Sources: Anonymous. 2012. "Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional" in MIA regional. Pg. 5, Pg. 92-93 Anonymous. 2012. M CE 1.2 ANEXO 1 SEÑALAMIENTO VERTICAL. Anonymous. 2000. C PL2.6-Anexo 1 Señalamiento y dispositivos para proteccion de obras	promotes substantial restoration of safety and access to adjacent neighborhoods by providing design documents and other illustrative materials. Also, provide design documents that show how the project integrates with the local community, environmental and cultural resources.
QL3.1 Preserve Historic And Cultural Resources	**7**	**Superior** The project team has taken steps to promote and preserve local artisans and cultural resources by hosting artisanals exposition that exhibit these talents and at the same time promote the economic growth of the region by creating a feasible market for the artisans. The Chichen Itza Cultural center is situated a few kilometers southwest of the existing highway. For this reason the Project team has entered in an agreement with INAH, Instituto Nacional de Antropología e Historia, which requires the contractors to inform and preserve any findings related to the ancient cultures of the site.	Provide reports, memoranda, and minutes of meetings with the community and required regulatory and resource agencies to identify historic and cultural resources. These inputs should translate into a feasibility analysis that documents how conflicts with community efforts to consolidate and reduce the cost of maintaining excess infrastructure have been addressed.

		Sources: Velázquez, Adriana. 2011. CSPL3.1 ANEXO 1 Y 2 RESOLUTIVO INAH. Anonymous. 2012. CSPL4.4 ANEXO3 ACCIONES NECESARIAS PARA LA ADMINISTRACION DEL PROYECTO. González Neri, Irma y Valtier Hernández, Ariel. 2010. CS PL 1.1 ANEXO 1, 2 y 3,CS PL 3.3 anexo 1,CS PL 4.2 anexo 3Diagnostico situacional afectación comunidades. Anonymous. R.H. PL 3.3 anexo 1 Reporte de Responsabilidad Social. Anonymous. R.H. PL 1.2 anexo 2 Reporte de Responsabilidad social. Anonymous. R.H. PL 1.2 anexo 3 Reporte de Responsabilidad social.	Location and design drawings that demonstrate that the site avoids impacts to cultural resources, or makes efforts to mitigate negative impacts, should be provided. Drawings and plans of mitigation efforts included in the design should be provided as well. If the project positively affects any resources, documentation of such efforts to enhance or restore existing historic and cultural resources should be provided. Also, any evidence that the project construction was done in collaboration with historic or cultural preservationists to ensure minimal damage to the quality of existing historic/cultural resources should be presented.
QL3.2 Preserve Views And Local Character	**11**	**conserving** In the case of the operation and construction of the highways, the team has identified that deterioration of the natural landscape is the way that the project negatively impacts its surroundings. To mitigate this impact, the team has designed low lying highway that closely aligns with the natural slope of the geomorphology in the site. In addition, to preserve the natural views of the site and the local character of the landscape, the team has come up with a plan to rescue lost habitat and restore landscapes that the project adversely impacts. The team has a strong stand on the latter because the landscape of the region not only has a visual importance but also characterized the local culture and character. Sources: Anonymous. 2012. “Identificación,descripción, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional” in MIA regional. Pg. 6, Pg. 92-93 Garcia Bert, Leonides Emilio. 2012. CSCE 4.4 Anexo 2 Estudio de Geofísica.	All landscape features and views to be protected should be inventoried and a plan for addressing public views should be incorporated into the project design. The plan should include: identification and location of the areas to be protected, identification of compatible land uses, development standards and establishment of policies for inappropriate development and land use. These should all translate into design guidelines written specifically for the project to preserve public views, important natural landscape features and local character traits. Provide reports, memoranda, or meeting minutes that show involvement of decision-makers and local officials in the development of the design. Also, evidence of programs for monitoring and enforcing protective measures should be provided, including a schedule of penalties for acts of non-compliance with the programs.
QL3.3 Enhance Public Space	**0**	**No score** The project team has not submitted any design documents or information on how the project enhances public spaces. For this reason, the credit is considered to be No score. Source	Provide the following information: 1. Studies and assessments of the impact the project has on existing public space. 2. Design documents describing any new public space developed as part of the project. 3. Determination of benefits, improvements, and negative impacts.

			4. Determination of risks to public health and safety. 5. Evidence that the above documents were accepted by the appropriate public agencies. 6. Evidence of stakeholder satisfaction 7. Plans and drawings showing the scope and extent of any restoration efforts to be made on the public space.
QL0.0 Innovate Or Exceed Credit Requirements	**0**	*N/A*	
	68		

SUB CATEGORY:LEADERSHIP			
	ICA-MayaB Concesion Autopistas Kantunil-Cancun y Cedral-Tintal-Playa del Carmen		**RECOMMENDATIONS**
LD1.1 Provide Effective Leadership And Commitment	**17**	**Conserving** The project team has taken significant steps towards achieving a more sustainable practice. For example, the implementation of recycling and community outreach, the reduction of energy consumption, and the use of renewable energy sources. The latter are part of annual reports that aim to create a precedent for better sustainable performance. In addition to these initiatives, the team has recognized the issues and problems with sustainability in a non-sustainable environment.For example, no matter how efficient a highway is planned it will, for the majority of time, serve as a barrier in terms of ecology and habitat. Thus, additional efforts were taken to encourage connectivity and avoid interrupting natural flows. Another, issue that arose is that to create a more sustainable highway, old obsolete material had to be removed. The project team addressed this by donating plastics and other asphaltic material to local communities to create low-impact, low-frequency infrastructures. Documents providing evidence of these dichotomies and the impacts and mitigation efforts have also been provided. in addition to this, training is provide to assess the sustainable market chain and implement sustainability practices in the workspace. Sources: Anonymous. 2013. O. CE 2.1 anexo 1 y 2 Reducción del consumo de energía eléctrica. Anonymous. 2012. OPL 2.3 anexo 1 Acciones Sustentables. Anonymous. OPL 1.1 anexo 1,CS PL 4.1 anexo 2 La Misión y Visión.	When the sustainability reports become available, compare them against past or projected reports to reveal important measures that can improve sustainable performance.
LD1.2 Establish	**7**	**Superior**	Provide evidence that there is

A Sustainability Management System	**7**	**Superior** The project team has set forth both a clear sustainability policy that focuses on monitoring and low impact to the ecosystem. To achieve this they have developed three environmental initiatives that focus of reforestation and vegetation rescue, soil rescue, and reestablishing migratory connections of the fauna, especially the Jaguar. Sustainability manuals and procedures for environmental and workplace actions have been published. The team has created a robust system of procedures that integrate elements of sustainability and management. There is a clear line of sustainability goals and evidence that goals are being worked on or achieved. To succeed at this, lines of authority are clear and a system to address possible scenarios is implemented. The project ensures that management and employees transitioning to a sustainable lifestyle by offering at least 8 hours of training. Other specialized training per specialized sector exists and focuses on sustainability management and operation. The team has also devised a series of visual aids and workshops to ensure a successful implementation in the broader community. Sources: Anonymous. 2012. OPL 2.3 anexo 1 Acciones Sustentables. Torres-Talamante, Olmo. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg. 90-92 González Neri, Irma y Valtier Hernández, Ariel. 2010. CS PL 1.1 ANEXO 1, 2 y 3,CS PL 3.3 anexo 1,CS PL 4.2 anexo 3Diagnostico situacional afectación comunidades.	contingency for addressing potential changes in averages, variances, and plausible extremes in key design variables. Documentation of the business processes and management controls, in the form of procedures, flowcharts, checklists and other control measures.
LD1.3 Foster Collaboration And Teamwork	**4**	**Enhanced** The project owner and project team recognize the importance of working together to achieve high levels of sustainable performance. To this end the project team has provided information of collaboration between the communities, the local and federal authorities and the project in the form of documents that evidence this collaboration, a matrix of responsibilities, and a matrix of communication, responsibilities, and actions between the concessionary, the operator, contractors and the risk/rewards are noted for the owner, contractors, employees. The project team is involved in the design process and thus is able to have input in the decision process, thus foreseeing the added cost that could arise from maintenance or other expendables if the project is not design to maximum efficiency and safety. Sources: Anonymous. CSPL4.4 ANEXO 1 PROGRAMA DE REUNIONES Y MATRIZ DE COMUNICACION Y ENTREGABLES DEL PROYECTO MAYAB. Torres-Talamante, Olmo. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg. 91	Incorporate terminology about risk and reward sharing into project contracts and other official documents. Provide evidence of the extent to which the sharing of risk/reward is important to the owner, and how much of it the owner is willing to share.
LD1.4 Provide	**5**	**Improved**	Provide evidence of planned or

For Stakeholder Involvement	**5**	**Improved** The project team has established three programs to address social concerns and link the project to the community. In addition, the project managers have created an environment that encourages the residents and local authorities to be part of the process. This is evidenced by correspondence that resulted in the donation of materials to both local authorities and school. In addition, during 2010, the project team realized a comprehensive community assessment that included interviews and visits to communities affected by the project. Show evidence of the design interventions including and final location of the 10km path that the communities asked for. Sources: González Neri, Irma y Valtier Hernández, Ariel. 2010. CS PL 1.1 ANEXO 1, 2 y 3,CS PL 3.3 anexo 1,CS PL 4.2 anexo 3Diagnostico situacional afectación comunidades. Alcocer García, C Roger David. 2013. M PL 1.1 anexo 2 Solicitudes de las comunidades. Anonymous. R.H. PL 3.3 anexo 1 Reporte de Responsabilidad Social. Anonymous. R.H. PL 1.2 anexo 2 Reporte de Responsabilidad social. Anonymous. R.H. PL 1.2 anexo 3 Reporte de Responsabilidad social.	implemented stakeholder involvement programs as well as results of the input of stakeholders on modifications to the project design.
LD2.1 Pursue By-Product Synergy Opportunities	**0**	**No score** Although the project team has a strategy for recycling and reducing waste, it has not provided enough information regarding the use of unwanted byproducts or discarded materials and resources from nearby facilities. *Source*	Provide evidence of at least initial research into nearby byproducts, records of contacts and inquiries made to nearby facilities, and comparisons of these to the total number of potential opportunities. Also, identify the scope of the assessment process and records of any byproduct synergy opportunities identified, assessed, and pursued. An even higher level of achievement would include evidence of successful byproduct synergy opportunities captured and applied.
LD2.2 Improve Infrastructure Integration	**3**	**Enhanced** The project's typology follows a closed highway system. The nature of the typology focuses of developing the economic growth and accessibility of its focus: Cancún and Playa del Carmen. It has an internal systems focus that emphasizes ecological connectivity and low impact on the regional habitat system. The design documents do not show any evidence of multimodal interchange hubs or any other type of connection that could improve urban growth along the path of the community or local infrastructure integration. Sources: Anonymous. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg. 102	Provide Clearer drawings of the connections, perhaps in color, and diagrams showing the relations.
LD3.1 Plan For	**10**	**Conserving**	Create a more detailed resource

Long-Term Monitoring & Maintenance	**10**	**Conserving** The project team has established an online monitoring system that will capture evidence from wildlife and other sensing data placed along the site. In addition to this, the team has established a management plan that will address the drainage systems no less than two times per year. The team has to submit overall operation reports annually or by governmental request. The project's final design responds to monitoring previous to construction and during the early stages of the process. To achieve all the operation and maintenance goals the team has created an annual professional growth schedule that consists on training and other educational tools. **Sources:** Anoynmous. 2012. A PL 2.1 anexo 1 y 2 F-GGC-80_Mantenimiento_Mayab. Anonymous. 2011. PL 3.4 anexo 1 seguimiento Anonymous. 2011. PL 3.4 anexo 1 Seguimiento_Requisitos_Legales_SST Torres-Talamante, Olmo. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg. 22 Anonymous. 2011. PL2.1-Anexo 3 Programa de Inspecciones, Capacitación Específica y Programa de Platicas de Seguridad	allocation plan where designations of the persons or organizations assigned to monitor and maintain the constructed works are evident. Explain with this designation how funding will be allocated, set aside and maintained at sufficient levels to fund necessary monitoring and maintenance. Although it is clear that funding will be available for service and maintenance after the delivery of the project, make sure that there is a narrative that incorporates the three elements of this credit.
LD3.2 Address Conflicting Regulations & Policies	**1**	**Improved** The project team has supplied the regulations and policies with which they are required to abide. In the project documents, each law affecting the particular elements of the project is described in a first preamble, in a legal framework, or in a general statement. However, there is no evidence that the project team has worked with city/state officials regarding any conflicts between regulations and sustainability practices. Sources: Anonymous. 2011. A PL 3.4 anexo 1 Seguimiento_Requisitos_Legales_SST. Anoynmous. 2013. CE 6.5 Anexo 1 MIA	Provide documentation of any applicable laws, standards, regulations or policies that conflict with the goals and objectives of the project. Provide evidence of efforts taken to identify them and to assess their impact on the project's sustainability performance. Provide memoranda, letters, and minutes of meetings with regulatory agencies to identify and resolve issues, and the results achieved by these efforts.
LD3.3 Extend Useful Life	**0**	**No score** The project team has not provided sufficient information on how the design and operation of the highway promote a more durable, flexible, and resilient project. The concession will last for 30 years, but other than contracts and maintenance/operation plans, there is no clear documentation of elements and designs that extend the useful life of the project. For this reason, this credit is considered to be not scoring.	Provide documentation of any elements intended to add durability, flexibility, and resilience throughout the useful life of the project that were incorporated into the design, and submit specifications of durable materials to show how they improve upon industry norms. Provide documentation on how the

		Sources:	implementation of such elements was incorporated into construction contracts and operation and maintenance procedures. Another level of information that could be provided includes diagrams, plans and other documentation that shows that the project design allows for expansion, reconfiguration, or multiple uses. Submit any feasibility studies conducted to identify key areas for investment in extending the useful life of the project with a reasonable payback period.
LD0.0 Innovate Or Exceed Credit Requirements	**0**	*N/A*	
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CATEGORY II: CLIMATE AND ENVIRONMENT (CE)			
RESOURCE ALLOCATION			
	ICA-MayaB Concesion Autopistas Kantunil-Cancun y Cedral-Tintal-Playa del Carmen		**RECOMMENDATIONS**
RA1.1 Reduce Net Embodied Energy	**0**	**No score** Although Energy consumption has been documented to have been less by year, there is no available information regarding any calculation or reduction in the net embodied energy of the materials. For this reason, the credit is considered to be not scoring.	Provide Documentation on the results of the life cycle energy assessment. Provide evidence that this assessment was realized in accordance to recognized and accepted methodologies, data sources, and

		Source:	software. Also, provide a report on the selection of the life cycle energy assessment model used and/or databases referenced. This should include a narrative describing how strategies to reduce net embodied energy will not increase operational or maintenance energy of the project and will not shorten the lifespan of the project. Because of the relative newness of this assessment and the scarcity of information covering embodied energy, the scope of this objective is limited to the materials used in significant quantities and make the majority portion of the constructed works. Another level of information required would be design documents for elements that will reduce the net embodied energy of the project and the rationale of why they were chosen. In addition, calculations showing the overall reduction of net embodied energy over industry norms.
RA1.2 Support Sustainable Procurement Practices	**2**	**Improved** The project team has supplied one receipt from a provider. In addition, the project team has supplied a form used to identify materials that have a higher performance and their suppliers. This same form has a section that suggest that suppliers and contractors are evaluated in terms of sustainable practices. The credit could be awarded a higher score; However, there is no narrative of sustainable procurement practices or a quantity of materials acquired from suppliers who have adopted a sustainability standpoint.. **Sources:** Anonymous. O. CE 1.2 ANEXO 1, 2 Y 3Apoyo de adquisición de prácticas sostenibles Anonymous. A CE 1.1 Anexo 1 Reporte Indicadores. Anonymous. OPL 2.3 anexo 1 Acciones Sustentables.	Provide information on the criteria for selection and its breadth of coverage of the triple bottom line. This should include documentation of the total weight or volume of materials. The sustainability management team should include a list of all materials being tracked for sustainable procurement practices including a description of the material and the manufacturer or supplier. Another level of information that could be provided is documentation from manufacturers or suppliers to demonstrate that sustainable practices are employed for a percentage of purchased products. Other documents to be submitted include: certifications of materials and supplies, and evidence of efforts to identify any unresolved worker health or environmental violations by the manufacturers or suppliers.
RA1.3 Used	**14**	**Conserving**	Provide or project the weight and

Recycled Materials	**14**	**Conserving** The concession for this project will maintain and operate 250 Km or existing highway. The new construction in this project is of 61.2. This means that 80.3% of the total project operates with the use of recycled bases that exists as support of the highway. In addition, methods have been implemented to protect the life of the existing highway but most importantly they ensure an extended life and structural soundness of the new construction. Also, the asphalt that is taken from the existing highway is being donated to communities who request it for their own infrastructure works. Other materials like signs and barriers are also being reused. There another initiative in the project to use organic matter from the Valladolid toll plaza as compost to be used for the landscaping of the highways. **Source:** Anonymous. 2013. **M CE 1.7 ANEXO 1 Materiales Reutilizados.** Anonymous. 2013. **C CE 1.5 ANEXO 1 Manejo de Residuos.**	volume of materials to be reused or recycled and an inventory of specifications for materials seeking inclusion as containing recycled content. Provide documentation that all materials meet the necessary quality and performance criteria required for the intended application.
RA1.4 Use Regional Materials	**6**	**Enhanced** The team has identified the use of regional materials as a positive impact on the region. Included within the description is the explosion of local markets due to the scale and magnitude of the project. Of the 127 materials used, 83 are sourced locally. These figures show that 65% of the materials are sourced locally. Source: Anonymous. 2013. M CE 1.4 ANEXO 1 Materiales Regionales. Anonymous. 2013. M CE 1.4 ANEXO 2 listado de Materiales. Anonymous. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg. 17 and Pg. 98	Provide documentation on the total cost of materials and an inventory of materials including plants, aggregates, and soils sourced near the site of construction. Provide calculations of percentages of total project materials by cost that are sourced locally. Reused materials, and materials harvested on-site count toward this credit requirement criteria.”.
RA1.5 Divert Waste From Landfills	**3**	**Improved** The project team has devised strategies to minimize waste production on site, the result of this initiative was that from September to November 2011 a total of 407 Kg were taken to a recycling facility. For example, It has donated 40 Kg of PET to a local school to instill the importance of environmental awareness in the children that attend it. In addition to the PET, it has diverted from the landscape and landfill 350 m/c of pavement milling by donating it to a local municipality.Also, it has recycled 47 automobile wheels and 17 truck wheels, thus avoiding mosquito infestation and unnecessary burning. However it has not provided the metrics that quantify this decrease in waste production. In addition to that, the project team has offered evidenced that it will make use of public landfills and is not using a private waste company. Source: Anonymous. O. CE 1.5 ANEXO 1,2 Y3 Desviar los residuos de los vertederos 1. Anonymous. 2013. C PL 5.1 Anexo 2 Donación de llantas. Horcasitas Nava, Ing. Alberto. 2013. C PL 5.1 Anexo 2 Dona PET.	Waste Management plans document the volume of anticipated waste generation and reduction. Provide considerations for the quantity of waste being generated, the recyclability of that waste stream and its toxicity. Documentation that contractors, subcontractors, and operators are aware of waste sorting requirements and committed to achieving the target levels of reduction.

RA1.6 Reduce Excavated Materials Taken Off Site	**6**	**Conserving** The project has a soil rescue program that seeks to limit the impact of the project on the site. The major soil types are Leptosol and Rendzina, which are common and characteristic of karstic areas. All the soil (or at least 95% percent) will be banked to the right of the lanes, in nurseries, or in areas lacking vegetation and that have very little slope. This will occur in the preparation stages of the site. In addition, at least 60% of It will be covered with organic matter product of the preparation stage to nourish biological processes and prevent erosion. Some of these soils will be transported to the Agua Azul community to the flora rescue nursery to be part of the program it self and service the site. Source: Anonymous. 2012. CSCE4.7 ANEXO1 PROGRAMA DE RESTAURACION DE SUELOS.	Provide design projections of volume of land to be excavated.
RA1.7 Provide for Deconstruction & Recycling	**1**	**Improved** The project team has engaged in a process with local communities that provides them with asphalt that is removed from the existing highway. This asphalt is then repurposed in the municipalities as material to make infrastructure remediation in their own communities. Nonetheless, a design that accommodates reconstruction or utilizes material from the toll plazas has not been documented. Source: Anonymous. 2012. M CE 1.7 ANEXO 1 Materiales Reutilizados. Orcacitas Nava, Ing. Alberto . 2013. C PL 5.1 Anexo 2 Donacione PET. Alcocer Garcia, Roger David. 2013.M PL 1.1 anexo 2 Solicitudes de las comunidades.	Provide design documents that demonstrate efforts to limit adherence of recyclable materials to non-recyclable materials or materials that might contaminate the waste stream or limit recyclability. Provide design documents that show connections and the way they promote ease of disassembly and enable reuse.
RA2.1 Reduce Energy Consumption	**0**	**No score** The project does not provide information on how it compares on industry norms. However, some energy reduction methods and renewable energy sources implemented. For Example, all of the offices and toll plazas are equipped with high efficiency lamps and go through a trimestral maintenance cycle. In addition to this, the lamp post in the highway have been equipped with individual PV cells. This has resulted in a 2.91% reduction in energy consumption. Source: Anonymous. 2013. O. CE 2.1 anexo 1 y 2 Reducción del consumo de energía eléctrica.	Provide reports, memoranda, or minutes of meetings regarding energy consumption reduction strategies. These documents should include an inventory of energy saving methods considered, results of feasibility studies, and design documents demonstrating the incorporation of energy saving strategies into the design. Another level of information to be provided should be the calculation of the industry norm to be used as a benchmark for comparison with the project's energy consumption. All results should be provided in BTUs. Other calculations should be project's estimated annual energy consumption over the life of the project. All results should be provided in BTUs.
RA2.2 Use Renewable Energy	**0**	**No score** The project has implemented the use of lamp posts that are self-powered by means of a solar panel. The same strategy is applied	Documentation of the project's anticipated annual operational energy consumption broken down by type of source. Provide documentation that

		mentioned that the overall volume of energy from renewable sources is 2%. Source: Anonymous. 2013. O. CE 2.2 Usar energías renovables. Anonymous. 2014. Origen de la energía y porcentaje.	details if the project incorporates renewable energy means to its design. If it does, provide calculations that show the anticipated annual output of all renewable energy sources and the overall energy consumption of the project
RA 2.3 Commission & Monitor Energy Systems	**3**	**Enhanced** Energy monitoring is implemented by means of a current monitor in the Valladolid Service Island and another for operation and maintenance exclusively. A narrative of the impact of monitoring on practices is not provided nor the nature of the monitoring taking place. Source: Anonymous. 2013. M CE 2.3 ANEXO 1 medidores de energia.	Supply a document that releases the project management from the responsibility of installing commission and energy monitoring systems. Also, include documents that demonstrate that the commission authority is independent of both the design and construction team. Document the materials provided for operations and maintenance. Provide design documents and specifications showing the location, purpose and type of monitoring equipment installed. These should be capable of monitoring, at minimum, all primary project functions accounting for at least an accumulated 80% energy use. Include a rationale as to how the monitoring equipment may enable more efficient operations over the industry norm.
RA3.1 Protect Fresh Water Availability	**0**	**No score** The project will use water supplied by a third party and limit extraction from the rivers or other water sources. Use of water from natural sources and disposal of residues into them are prohibited. The project will minimize interference with surficial waterbodies and subterranean aquifers. If extraction occurs, it should be done in a way that does not create puddles, affect turbidity, or alter the ecosystem. If any water is drawn from or released into the river, analysis and tests will be run to ensure the quality of the water. Nonetheless, there is no specific documentation regarding this process or calculations that point to protecting the existing fresh water sources. Source: Anonymous. 2012. M CE 3.2 ANEXO 1 Bitacoras de Agua. Anonymous. 2012. O. CE 3.3 anexo 1,2 y3 Monitorear los sistemas de agua.	Provide design documents for all features that are intended to reduce negative water impacts. The sustainability management team should provide an inventory of all water impacts that the project is not able to mitigate and a rationale as to how the integrated systems of the project will work together to achieve net positive recharge. Another level of information should include calculations showing that the project has a long-term, net positive impact, and does not significantly alter natural fluctuations of flow in receiving waterway ecosystems.
RA3.2 Reduce Potable Water Consumption	**0**	**No score** Water monitoring system shows that the potable water extraction increases over the period of construction from 716 m3 in the dry season to 1,144.0 m3 in the wet season. No Industry norms are provided or goals towards lowering potable water consumption.	Provide reports, memoranda, or minutes concerning water reduction strategies and documentation that shows the project's water needs. Provide an inventory of measures taken to reduce potable water

		Source: Anonymous. 2012. M CE 3.2 ANEXO 1 Bitacoras de Agua. Anonymous. 2012. O. CE 3.3 anexo 1,2 y3 Monitorear los sistemas de agua.	consumption during operation and the results of feasibility studies. If available, include design documents demonstrating the incorporation of water saving strategies. Provide calculations of estimated water consumption over the life of the project and provide a comparison with the industry norm. Evidence the volume of water that will be injected to the local ecosystem by means of irrigation or treated discharge.
RA3.3 Monitor Water Systems	**3**	**Enhanced** Because the project is located in the karstic region of the peninsula, there is a annual plan to monitor the quality of the water, especially after the end of the rainy season. Water monitoring will be heightened at any moment that a negative impact (spill, leak, etc.) is recorded. In addition to this, a drainage system monitoring/cleaning procedure has been established and this will happen, at the least, two times per year. Source: Torres-Talamante, Olmo. C C.E. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg 15-19. Anonymous. PL 2.2- Anexo 1 Capitulo VI MIA. Pg. 22	Supply a document that provides the monitoring schedule and what is the criteria for evaluation of the water quality.
RA0.0 Innovate Or Exceed Credit Requirements	**0**	*N/A*	
	38		

NATURAL WORLD			
	ICA-MayaB Concesion Autopistas Kantunil-Cancun y Cedral-Tintal-Playa del Carmen		**RECOMMENDATIONS**
NW1.1 Preserve Prime Habitat	**18**	**Restorative** The highway project creates a buffer of 380m from aquifers and the Karst region. The project has a reforestation initiative and has maps and diagrams of where the new plants will be placed, as well as a list of native and non-native flora. The project has sections of soil restoration. The project diagrams and maps natural corridors for different species and create underpasses so that they are not affected by the highway system. This way it increases the area of prime habitat and creates non-existing connections between existing, restored, and natural prime habitat. Major efforts are undertaken to promote a healthy jaguar population. Source:	All documents are present. A suggestion would be to provide examples of sensors and other mechanisms used with CIsega to monitor populations and a document or example of a document where growth in numbers within a species of plants and animal occur.

NW1.2 Preserve Wetlands and Surface Water	**14**	**Conserving**	Provide documentation that clearly shows that the developments are situated within the distances established and that shows the Vegetation and Soil Protection Zone (VSPZ).
		No information has been provided regarding design strategies used to protect and preserve wetlands and surface water bodies. For this reason, this credit is considered to be Not-Achieving.	Establish a Vegetation and Soil Protection Zone. Submit a site plan showing the final site design, the boundaries of the VSPZ, and the minimal VSPZ depth calculated as the shortest point between the VSPZ boundary and the identified body of water/wetland and coastline.
		Sources: C CE 4.4 ANEXO 1 y 2 modificacion de proyecto de areas humedas. C CE 4.5 ANEXO 1,3 y4 modificacion de proyecto de areas humedas. Pg. 4 Torres-Talamante, Olmo. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg. 10 and Pg. 13	In addition to these measures, the project should aim to restore previously degraded buffer zones to a natural state, marking them elements of the VSPZ, especially in the Ramiro Priale highway where the river runs parallel to the traffic artery. This should be accompanied by a restoration plan that outlines the efforts to restore wetlands, river banks, and shoreline. This plan should include, at a minimum, site maps outlining the location of restoration and proof that both required actions were taken. Efforts must include:
NW1.3 Preserve Prime Farmland	**0**	**No score**	· Provide documentation showing how prime farmland is protected or development is protected or development is prevented.
		Although the project team suggests that the project is not situated near any prime farmland, there is no plan or image that demonstrates this. For this reason, this credit is considered to be Not-Achieving.	· Provide documentation that no soils have been stripped from areas on the site defined as prime farmland.
		Source:	· The project should take a proactive stance in restoring farmland to a productive state or establishing prime farmland sites.
NW1.4 Avoid	**5**	**Conserving**	· Provide documentation of project

Adverse Geology	**5**	**Conserving** The project teamThe project team identifies the main geological faults and their NE-SW orientation. A diagram showing this is presented. However, the project does not sit immediately in an area where danger is presented or areas of extreme altitudes prone to sliding. Light fractures occur at depths below 6m, but due to the property of the site and the ground cover and temperatures the ground is stable and does not represent a hazard to the construction. To achieve this conclusion a 12 evaluation stations were set up where the soil tests were to be conducted. This tests were made using a tetraelectric Dipole-Dipole Siscal Pro device from Iris Instruments. The interpretation method was Prosys II and Res2D inv. identifies the main geological faults and risks related to the project construction phase. However, the project does not address this issue in the operations and maintenance phase and no plan has been provided that shows how these features relate to the existing and new construction of the project. Recommendations are provided to the right. Sources: Garcia Bert, Leonides Emilio. CSCE 4.4 Anexo 2 Estudio de Geofísica. june 2012.	design that illustrates strategies used to avoid damage to sensitive geology. For example, elements of the highway structure do not go deeper than 6 meters.
NW1.5 Preserve Floodplain Functions	**8**	**Superior** The project avoids situating itself in waterways and establishes a buffer of 380 m. This is important because the impact of floodplains is limited. Also, when possible the structures are used as filtration devices. these structures contain a thin layer of geotextiles that prevent debris and other small particles to wash out. It also avoids using any soil or developing areas were the natural filtration qualities of the sites are compromised. The Type of paving surface was modified to accommodate a higher performance and existing highways were covered with a "microcarpeta" or top layer to make sure that it complies with the Friction, International Roughness Index (IRI) and road standards. Some structures in floodplains have been relocated to higher ground, other structures that are not affected by seasonal floods have been raised higher, and drainage systems have been installed to connect flood basins. These drainage systems can be used by the many amphibian species to travel from one habitat to another. Source: Anonymous. "Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional" in MIA regional. Pg. 50-51 Anonymous. M PL 2.2 Anexo 2: Aplicación de Microcarpeta en el proceso de conservacion. November 2013. Fimbres Castillo, Jose María. C PL2.2-Anexo 2 Modificación al diseño de pavimento. May 2013. Torres-Talamante, Olmo. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg. 14	Initial documentation should include a plan showing the location of the project in regards to the 100-year or design floodplain and how project siting lowers the impact of these two situations. The documents should be able to show pre/post floodplain storage and floodplain elevations and show that the project does not increase flood elevations outside of the project easement and maintains floodplain storage. Supporting documentation should include estimates of pre-development floodplain infiltration capacity and estimates of post-development infiltration capacity using the above described strategies. For the pre-development phase, documents should include approaches to maintain the floodplain, for example: amount of impervious surface, established vegetation, and soil protection zones. Other approaches that allow for natural floodwater infiltration and filtration of pollutants are highly welcomes. Other levels of documentation include the provision of a flood emergency management plan to address the operation and/or evacuation plan for all infrastructure in the flood plain.

			Also, documentation should be provided that addresses measures to maintain or enhance aquatic habitat connectivity, fish and sediment transport, and the removal of barriers and traps.
NW1.6 Avoid Unsuitable Development on Steep Slopes	**6**	**Conserving** The project team has mentioned that they will avoid development on unsuitable steep slopes to prevent erosion and impacts to aquatic habitats that surround the project. A construction detail demonstrating this is provided on page 057 of the project document. Source:	The physical geography of the site are plains with light rolling hills. The project does not situate itself on any steep slope. Whenever the project does encounter a change of topography it will create a buffer zone to avoid the creation of a steep slope that promotes erosion. This buffer zone is planted with regional flora to protect sites from excess heaving of sediments.
NW1.7 Preserve Greenfields	**0**	**No-Score** Documentation of soil classification has not been provided. Also, documentation on that describes the existing developed area of the site that can be classified as a greyfield has not been submitted. For this reason, the credit is evaluated as not-achieving. Source:	· Provide documentation that shows how the concession is revitalizing the existing infrastructure including the remodeling of the toll plazas.
NW2.1 Manage Stormwater	**0**	**No score** No metric or data has been provided regarding the existing or projected impact of infrastructure on stormwater runoff quantity and quality. For this reason, this credit is considered to be Not-Achieving. Nonetheless, water treatment plants that collect water and filter the runoffs are present. Source:	Provide documentation of the initial, final post-development, and target water storage, infiltration, evaporation, water harvesting, and/or cistern storage capacity using TR-55 CNs or other continuous simulation modeling methods to describe site conditions.
NW2.2 Reduce Pesticides and Fertilizer Impacts	**9**	**Conserving** As per document M CE 5.2 Anex 3, the project has a zero pesticide policy. In addition to this, the project's reforestation uses a majority of plants that are indigenous to the area and do not require special needs of protection or nourishment. Refer to species list in the Reforestation Program. If a plague emerges and use of pesticides and fertilizers is needed, a water treatment plant is installed to filter the runoffs. **Sources:** Anonymous. M CE 5.2 ANEXO 3 Uso de pesticida. Anonymous. CSPL3.2 ANEXO 1 PROGRAMA REFORESTACION. Pg 17, Pg. 63	
NW2.3 Prevent	**14**	**Conserving**	

Surface and Groundwater Contamination	**14**	**Conserving** The project has limited impact on the area because the low stress quality of the project allows the water to flow without encountering pollution and because the direction of the water flow towards natural filtration follows the same course of the project. In addition to this the highway will be coated with ABtotal absorb4 polimers which absorb hydrocarbons and oils and makes them inert. The project team mentions that additional preventative actions have been taken to eliminate risks of contaminating ground and surface water. These measures include: Prohibit the dumping of liquid and solid residues in the river and surrounding areas. Specific Areas has been designated for dangerous materials special areas for washing the trucks handling concretes have been established. Install appropriate drainage systems following industry standards Minimize interference of the flows of surface and groundwater Refueiling machinery outside of specified areas is not approved. If refueling is in situ, then the site for refuelings has to be prepared. A response plan has been established in order to protect the aquifers and structural soundness of both the rock and built form. **Sources:** Anonymous. "Estrategias para la Prevención y Mitigación de los Impactos Ambientales " in MIA regional. Pg. 18 Anonymous. CE 5.3 anexo 1 Preservar la contaminación de las aguas superficiales y subterráneas. Torres-Talamante, Olmo. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Pg. 13	· Please provide plans and drawings showing the placement of material storage piles and where the handling of potentially polluting runoff occurs. · Show evidence of initiatives to reduce the use or replacement of hazardous and potentially polluting materials with non-hazardous and non-polluting equivalents. · Show plans to clean up any contaminated area and plans to prevent contamination from entering receiving waters or altering receiving water flows. · Show evidence of proposed land use controls.
NW3.1 Preserve Species Biodiversity	**16**	**Restorative** The project team has identified that the main threat is by the barrier and border effects that the highway has in the prime habitats, including deforestation due to construction. To address these issues the Project team has installed surveillance and monitoring devices to identify areas of species concentration. This allowed them to identify Illegal hunting grounds, places of feline activity concentration and catalog an index of species and quantity of animals run-over. As a response, the team identified migration patterns and natural connections and created a series of underpasses that would reinforce these trends. Monitoring population numbers and illegal fur traffic and hunting, the team is in a position to stop these activities and eliminate another threat. In addition to this, the project team has delineated a habit and forest rescue plan. It calls for a habitat restoration in a proportion of 3:1, or 3 trees should be put in place for every one that is cut down. The species should be endemic to the central american and tropics as to ensure resistance and at least 85% survival rate with minimum intervention. This in turn will offer new living quarters for a growing population of protected animals.	· The project should be able to not only protect habitats but also upgrade habitats by expanding wildlife corridors and linking existing habitats it may disturb. Maps of existing wildlife settlements outlining preservation strategies should be provided. For each species a map showing important potential and/or likely movement should be provided. The project should identify potential on-site barriers and delineate strategies to remove them. Ultimately, a descriptive narrative of both should be included.

		Sources: Anonymous. "Estrategias para la Prevención y Mitigación de los Impactos Ambientasles " in MIA regional. Pg. 18 Anonymous. CSPL3.4 ANEXO 1 MONITOREO SATELITAL DEL JAGUAR. February 2012. Anonymous. "Acciones Integrales para la conservación del Jaguar y el Resto de la Fauna: Restauración de la Conectividad en el Ecosistema" in MIA regional. Pg. 75 Anonymous. Primer Informe de Cumplimiento de Terminos y Condicionantes del Oficio Resolutivo. Anonymous. CSPL3.2 ANEXO 1 PROGRAMA REFORESTACION. Pg. 63	
NW 3.2 Control Invasive Species	**5**	**Improved** The project team has established a detailed reforestation and rescue plan that only uses native plants of the region. This ensures that plants can survive and endure low soil fertility and dry seasons. A detailed list of species, their individual description, fruit, habitat, and health requirements have been provided. Sources: Anonymous. CSPL3.2 ANEXO 1 PROGRAMA REFORESTACION. February 2012 Pg 17, Pg. 63 Anonymous. CSPL3.2 ANEXO 2 PROGRAMA DE RESCATE Y REUBICACION DE FLORA. February 2012.	· Establish a multi-year management plan to control species and a system to control noxious plants. This plan should include: o Prediction and prevention: Strategies for minimizing potential for invasive species, both plants and animals, to reappear after initial removal and/or enter the site from nearby areas. o Detection and management: Strategies that monitor and remove invasive species emerging on-site in the future. · Invasive species should actively be eliminated. In addition to the elements above the plan should consider: o Removal: Elimination of any invasive species o Rehabilitation and Restoration: Methods to restore habitats to pre-invasion state.
NW3.3 Restore Disturbed Soils	**8**	**Conserving** All the soils will be reused either on site or as part of habitat restoration programs. Processes and plans for the excavation of these soils have been delineated. For example, soils will be banked. To prevent compaction, erosion, and nutrient deterioration they will be covered with organic matter. This will start biological processes that will infuse the soil with bacteria, organisms and nutrients that could have been lost in the process of site preparation.. These soils will then be transported to temporary nurseries, experimental nurseries in the communities, to areas that have suffered desertification, or placed on the sides of the road to promote vegetation growth and prevent the erosion of highway structure. Sources: Anonymous. "Estrategias para la Prevención y Mitigación de los Impactos Ambientales " in MIA regional. Pg. 12-13 Anonymous. CSCE4.7 ANEXO1 PROGRAMA DE RESTAURACION DE SUELOS. February 2012.	The project should aim to restore disturbed soils as a result of previous highway development. The previously mentioned documents should be provided for this restorative effort.

NW3.4 Maintain wetland and surface water functions.	**9**	**Conserving** The project team has enhanced 4 of the ecosystems: Forest, Wetlands, streams, and floodplains. The project team has identified that by installing a series of drainage systems the project restores three functions of wetland ecosystem: Hydrologic connection to natural drainage systems, sediment transport across the landscape, and biological connections by allowing species to travel across the diverse wetlands without the highway acting as a barrier. In addition to the drainages, the highway has been equipped with Small geotextile features in the road structure that retain particulates and dust. This prevents the need for dredging or other sediment removal strategies. By rescuing and reforesting vegetation the team restores the function of erosion protection that the roots provide. The underpasses and overhead installation along the highway allow harm free connectivity between the forest habitats that was lost by the highway acting as a barrier. **Sources:** Anonymous. “Estrategias para la Prevención y Mitigación de los Impactos Ambientales ” in MIA regional. Pg. 12-13 Anonymous. CE 5.3 anexo 1 Preservar la contaminación de las aguas superficiales y subterráneas. Torres-Talamante, Olmo. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION.	For streams, rivers, and lakes, provide documentation showing how the waterways a Provide documentation for habitat in the following manner: A habitat survey of the waterbodies and reference areas, by a recognized professional, and a plan to maintain or enhance the habitat for aquatic and riparian species through plantings and appropriate physical modifications. This survey may include the location and proposed mitigation of existing obstructions to habitat connectivity such as: Dams, roadway structures, and other infrastructure that blocks aquatic or shoreline species migration Ideally, the project will fully restore disturbed functions. This level of achievement will require that documentation be provided by a resource professional team that outlines strategies for ecosystem functions that exist or existed, and describes a restoration plan for any disturbed ecosystem functions.re connected or proposed to be connected to the riparian floodplain at a six month to two year frequency flow rate
	0	*N/A*	
	112		

CLIMATE AND RISK			
	ICA-MayaB Concesion Autopistas Kantunil-Cancun y Cedral-Tintal-Playa del Carmen		**RECOMMENDATIONS**
CR1.1 Reduce	**0**	**No score**	Provide documentation that evidences

Greenhouse Gas Emissions	**0**	**No score** There is no available information regarding a comprehensive life cycle carbon analysis that demonstrates that the project owners are attempting to reduce the anticipated amount of net greenhouse gas emissions. Though the project owners have provided measures to monitor greenhouse gas emissions every six months, they have not provided an industry standard and self-analysis to properly assess their level of achievement. For this reason, the credit is considered to be not-achieving. *Source:*	that a life cycle carbon analysis has been made in accordance with available methodologies, data sources, and software. This assessment should include extraction, refinement, manufacture, and distance of transportation to bring materials to the site. Another level of information would be to provide documentation on the efforts to reduce carbon emission and calculations of percentage reduction as calculated with available methodologies, data, and software.
CR1.2 Reduce Air Pollutant Emissions	**0**	**No score** Although the project team has provided impact analyses and mitigation control methods for particulates and emissions, no information has been provided on standards to which the project was designed or evidence that the project meets the California Ambient Air Quality Standards (CAAQS). Moreover, there is no reference to the South Coast Air Quality Management (SCAQM) rules. *Source:*	First, perform an analysis of air pollutant emissions and provide documentation of expected emissions following CAAQS protocol. Second, implement strategies to reduce air pollution to required levels using the CAAQS standards. In addition, documentation on monitoring and control programs should be provided as well as rules and strategies for compliance. Another level of information that could be provided is documentation on expected emissions of the six criteria pollutants and strategies to reduce air pollution to required levels. These strategies must include calculations and industry standards for comparison.
CR2.1 Assess Climate Threat	**15**	**Conserving** The project design takes into consideration the climate threats, and designs around them and to prevent them. For example, to eliminate the risk of structures failing under constant flooding and protect the ecosystem from traffic, one segment of the highway was redesigned to avoid wetlands and floodable areas. To prevent the extensive erosion, heat islands, and heat waves, the project team has adopted a 3:1 reforestation ratio and is planting the service islands with native plants. As evident in previous credits, there has been a robust community outreach program that accompanies this project. The document provided by the team titled Asses Climate threat, does not provide any information regarding the plans or design that take into account the dangers posed and should be critically evaluated for effectiveness. Sources: Anonymous. 2011. O CE 8.1 Evaluar la amenaza climática. Anonymous. 2012. CSPL3.2 ANEXO 1 PROGRAMA REFORESTACION.	An additional level of documentation should evidence community outreach programs during the process and documentation of consultation with local and regional emergency management officials.
CR2.2 Avoid	**2**	**Improved**	Provide Documentation on the work

Traps And Vulnerabilities	**2**	**Improved** The project team has delineated several strategies to limit impact of the karst region, the underground basins, and open-air basins. Impacts have been assessed and mitigation strategies proposed in case the case that it is compromised. The team has understood that the cost of the vulnerabilities is not only monetary, but has implication both in the health of the ecosystem and communities that live off the water supply. Nonetheless, there is no information available regarding a plan that identifies and avoids traps and vulnerabilities that could create high, long-term costs and risks for the affected communities. For this reason, this credit is considered improved. Sources: Anonymous. 2011. O CE 8.2 Evaluar trampas y vulnerabilidades .Torres-Talamante, Olmo. C C.E. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION.	done to identify and assess possible changes in key engineering design variables or documentation and mentioned in the previous credit. Also, documentation that outlines potential traps and vulnerabilities that are associated with costs and risk, and documentation that shows the extent to which project concepts, configuration and design have taken into account the need to reduce identified significant risks, traps, and vulnerabilities with substantial costs and other negatives.
CR2.3 Prepare For Long-Term Adaptability	**0**	**No score** There is no information available regarding preparation for or resilience of the highway to the consequences of long-term climate change. For this reason, the credit is considered to be non-achieving. *Source:*	Identification of specific measures taken to address the potential consequences of long term climate change including sea-level rise, intensity and frequency of extreme weather events. Provide specific measures take to address other potential long term threats such as water and energy shortages and shortages of other critical material. Another level of information would be to provide plans, designs, and documents that show restoration and rehabilitation efforts in the case that the aforementioned threats come to happen.
CR2.4 Prepare For Short-Term Hazards	**3**	**Improved** The project clearly delineates man-made hazards during the construction and operation phases and catalogs them according to their risk magnitude and impact intensity. In addition to this the project responds to both long/short-term hazards by taking into consideration flooding and other man-made hazards. Earthquakes and topographical hazards are not present in the area. In addition to this, the short term hazards of loss of habitat and erosion are addressed by creating nursery and reforestation programs. The team has also identified that a measure for short-term preparedness is the storage of water. Source: Anonymous. O CE 8.4 Preparación de riesgos a corto plazo. Torres-Talamante, Olmo. C C.E. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION. Anonymous. 2012. CSPL3.2 ANEXO 1 PROGRAMA REFORESTACION.	Provide a list of expected natural hazards in the area and their predicted frequency and severity including, but no limited to: -Eathquakes -Tsunamis -floods An explanation of the strategies included in the project to cope with each event and how they surpass the existing codes and regulations should be provided. Subsequently, another level of information should be a documentation of strategies and how the minimize the risk of future hazards
CR2.5 Manage	**0**	**No score**	Provide drawings showing all non-roof,

Heat Island Effects	**0**	**No score** There is no information available regarding the minimization of surfaces with high reflectance indices to reduce localized heat accumulation and manage microclimates. *Source:*	non-vegetated areas of the site and its surfacing material. Drawings of roof surfaces and their materials should also be provided. Also, provide calculations demonstrating the percentage of hardscape surfaces that meet the requirements. Finally, provide documentation of all shaded areas, assumed at noon or summer solstice, and a list of species used and expected growth rates showing shading five years from the initial planting.
CR0.0 Innovate Or Exceed Credit Requirements	**0**	*N/A*	
	20		

OVERALL:	**285**	**ICA-MayaB Concesion Autopistas Kantunil-Cancun y Cedral-Tintal-Playa del Carmen**

APPENDIX D: SOURCES

DOCUMENTACION ENTREGADA. (ESPAÑOL)
Información general
Anonymous. 2012. M CE 3.2 ANEXO 1 Bitacoras de Agua.
Anonymous. 2012. O. CE 3.3 anexo 1,2 y3 Monitorear los sistemas de agua.
Anonymous. CE 5.3 anexo 1Preservar la contaminación de las aguas superficiales y subterráneas.
Anonymous. PL 2.2- Anexo 1 Capitulo VI MIA.
Anonymous. 2011. O CE 7.1 Reducir las emisiones de contaminantes de aire.
Anonymous. 2011. O CE 7.2 Reducir las emisiones de contaminantes de aire.
Anonymous. 2011. O CE 8.1 Evaluar la amenaza climática
Anonymous. 2012. CSPL3.2 ANEXO 1 PROGRAMA REFORESTACION.
Anonymous. 2011. O CE 8.2 Evaluar trampas y vulnerabilidades
Anonymous. O CE 8.4 Preparación de riesgos a corto plazo.
Anonymous. O CE 8.5 Administrar Efectos de isla de calor.
Anonymous. C CE 4.4 ANEXO 1 y 2 modificacion de proyecto de areas humedas.
Anonymous. C CE 4.5 ANEXO 1,3 y4 modificacion de proyecto de areas humedas.
Anonymous. *"Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional"* in MIA regional.
Anonymous. 2013.M PL 2.2 Anexo 2: Aplicación de Microcarpeta en el proceso de conservacion.
Anonymous.2012. CSCE4.7 ANEXO1 PROGRAMA DE RESTAURACION DE SUELOS.
Anonymous.2011. Primer Informe de Cumplimiento de Terminos y Condicionantes del Oficio Resolutivo.
Anonymous. M CE 5.2 ANEXO 3 Uso de pesticida.
Anonymous. CSPL3.2 ANEXO 1 PROGRAMA REFORESTACION.
Anonymous. 2012. CSPL3.4 ANEXO 1 MONITOREO SATELITAL DEL JAGUAR.
Anonymous. *"Acciones Integrales para la conservación del Jaguar y el Resto de la Fauna: Restauración de la Conectividad en el Ecosistema"* in MIA regional.
Anonymous.2012. CSPL3.2 ANEXO 2 PROGRAMA DE RESCATE Y REUBICACION DE FLORA.
Anonymous. 2012. CSCE4.7 ANEXO1 PROGRAMA DE RESTAURACION DE SUELOS.
Anonymous. R.H. PL 1.2 anexo 2 Reporte de responsabilidad social.
Anonymous. *"Identificación, descripcion, y Evaluación de los Impactos Ambientales en el Sistema Ambiental Regional"* in MIA regional.
Anonymous. 2012-2013. R.H. PL 1.3 anexo 2 Plan anual de capacitación
Anonymous. 2012. R.H. PL 1.3 anexo 1 Reporte de INEA y Reporte de capacitación.
Anonymous. R.H. PL 1.1Presentación Comisión Social.
Anonymous. 2012. A PL 2.1 anexo 1 y 2 F-GGC-80 Mantenimiento Mayab. Identificación de Peligros y Evaluación de Riesgos Laborales.
Anonymous. 2012. A PL 2.1 anexo 1 y 2F-GGC-80 Traslado Centros de Trabajo: Identificación de Peligros y Evaluación de Riesgos Laborales.

Anonymous. 2012. A PL 2.1 anexo 1 y 2F-GGC-80_Oficina_OM: Identificación de Peligros y Evaluación de Riesgos Laborales.
Anonymous. 2012. A PL 2.1 ANEXI 1 Y 2F-GGC-80_Operacion_Plazas_Cobro: Identificación de Peligros y Evaluación de Riesgos Laborales.
Anonymous. 2011. A CE 3.1 Anexo 1 Identificacion Aspectos.
Anonymous. 2012. A PL 2.3 anexo 1 y 2Condiciones de iluminación en los centros de trabajo Merida.
Anonymous. 2012. A PL 2.3 anexo 1 y 2Condiciones de iluminación en los centros de trabajo(Chichen).
Anonymous. 2012. *A PL 2.3 anexo 1 y 2 Condiciones de iluminación en los centros de trabajo(Valladolid).*
Anonymous. 2012. A PL 2.3 anexo 1 y 2Condiciones de iluminación en los centros de trabajo(Xcan).
Abarca de la Cruz, Ing. Agenor.2013. C PL2.1-Anexo 3 plan de seguridad del proyecto.
Bueda, Dra. Cristina Maria. C PL2.1-Anexo 3 Programas de capacitación continua sobre salud y seguridad en el trabajo.
Fimbres Castillo, Jose María. 2013.C PL2.2-Anexo 2 Modificación al diseño de pavimento.
Garcia Bert, Leonides Emilio. CSCE 4.4 Anexo 2 Estudio de Geofísica. june 2012.
Horcasitas Nava, Ing. Alberto. 2012. C CE 4.4 ANEXO 1 y 2 modificacion de proyecto de areas humedas.
Torres-Talamante, Olmo. C C.E. 6.4 Anexo1 MEDIDAS DE PREVENCION Y MITIGACION.