

## POZO ALMONTE SOLAR PHOTOVOLTAIC PLANTS – CHILE



Figure 01 : General view of the photovoltaic plant \Solar Pack. Declaración de Impacto Ambiental, Page 1

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## 1. PROJECT INTRODUCTION

This case study outlines the evaluation of the Pozo Almonte 2 & 3, two solar photovoltaic installations in Chile. Specifically, the Pozo Almonte 2 & 3 projects consist of the design, construction, operation and maintenance of two plants with a combined 25 MW of photovoltaic solar power for the provision of energy to Compañía Minera Doña Inés de Collahuasi.

Construction of the Pozo Almonte plants was scheduled to begin in January/February 2013 with operations scheduled to commence by the end of 2013. It is anticipated that the plants will generate 60,000 MWh of clean energy per year, which is equivalent to the energy consumption of 25,000 households, and will avoid the emission of 58,865 tons (45,359 tonnes) of CO<sub>2</sub> every year.

The plants were built and are owned and operated by SolarPack Corporación Tecnológica, S.L. (SolarPack), a Spanish company. In July 2012, SolarPack was awarded a 20-year power purchase agreement (PPA) by Collahuasi as the result of a tendering process for the provision of 60 GWh/year of non-conventional renewable energy (NCRE). The Pozo Almonte 2 & 3 plants were developed by SolarPack's Chilean subsidiary, SolarPack Chile, S.A. SolarPack provided all engineering, procurement and construction services, as well as the continuing operation, maintenance and asset management services for the project.<sup>1</sup> In addition, in 2012, SolarPack completed construction of and is operating a 1 MW solar photovoltaic plant to sell energy under a 21 year PPA to Codelco for its Chuquicamata mine operations.<sup>2</sup>

The estimated total cost of all three components of the project is US \$80 million, which will be funded through a combination of equity and debt. Along with loans from IDB and other banks, the project is seeking financing from the Canadian Climate Fund for the Private Sector in the Americas (C2F), a fund established by the Government of Canada and managed by IDB to catalyze increased private sector investment in climate change mitigation and adaptation.<sup>3</sup>

## 2. PROJECT DESCRIPTION & LOCATION

The two Pozo Almonte plants are located in Chile's Tarapacá region in rural northern Chile. The two projects have been built, and will be maintained and operated by the same entity, SolarPack.<sup>4</sup> Each plant differs in location and size. The Pozo Almonte 2 plant is 56 hectares, and the Pozo Almonte 3 plant is 126 hectares.

The two Pozo Almonte projects, which comprise 182 hectares, lie at an elevation of approximately 1,030 meters above sea level, roughly 2.6 km east of the city of Pozo Almonte. The greater Pozo Almonte area has a population of 10,830, including approximately 6,348 inhabitants of the city of Pozo Almonte as

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<sup>1</sup> Pozo Almonte Solar PV Project Abstract

<sup>2</sup> Pozo Almonte Solar PV Project Abstract

<sup>3</sup> Pozo Almonte Photovoltaic Plants Initial Report (05\_14\_CH-L1069)]

<sup>4</sup> Pozo Almonte Solar PV Project Abstract

well as four other small villages in the area - Mamina, Macaya, Parca, and Quipisca. The area is typically referred to as the pampas region in the Atacama Desert of northern Chile, which is known to be the driest location on the planet.<sup>5</sup>



Figure 02: The project is divided into two plants: Pozo Almonte 2, Pozo Almonte 3. Together, the project consumes 188 hectares. Source Inter-American Development Bank. Environmental and Social Management Report, Page 5-7

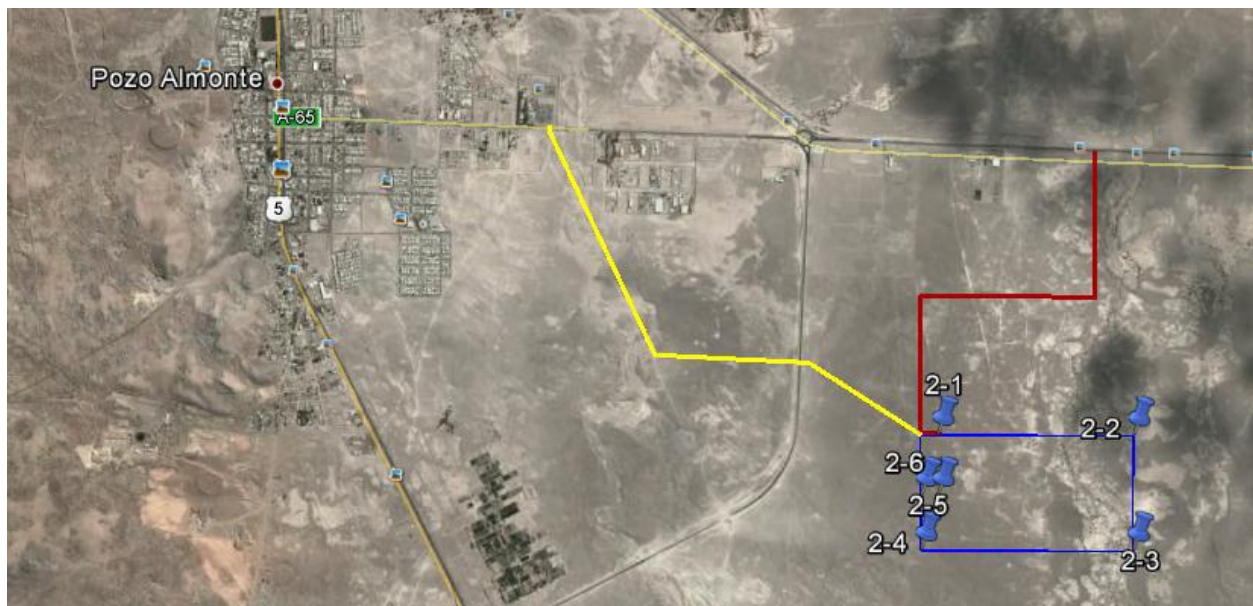


Figure 03: Location of Pozo Almonte 2/ Source: Inter-American Development Bank. Environmental and Social Management Report, Page 5-7

<sup>5</sup> Inter-American Development Bank. Environmental and Social Management Report, Section 2.10-2.11



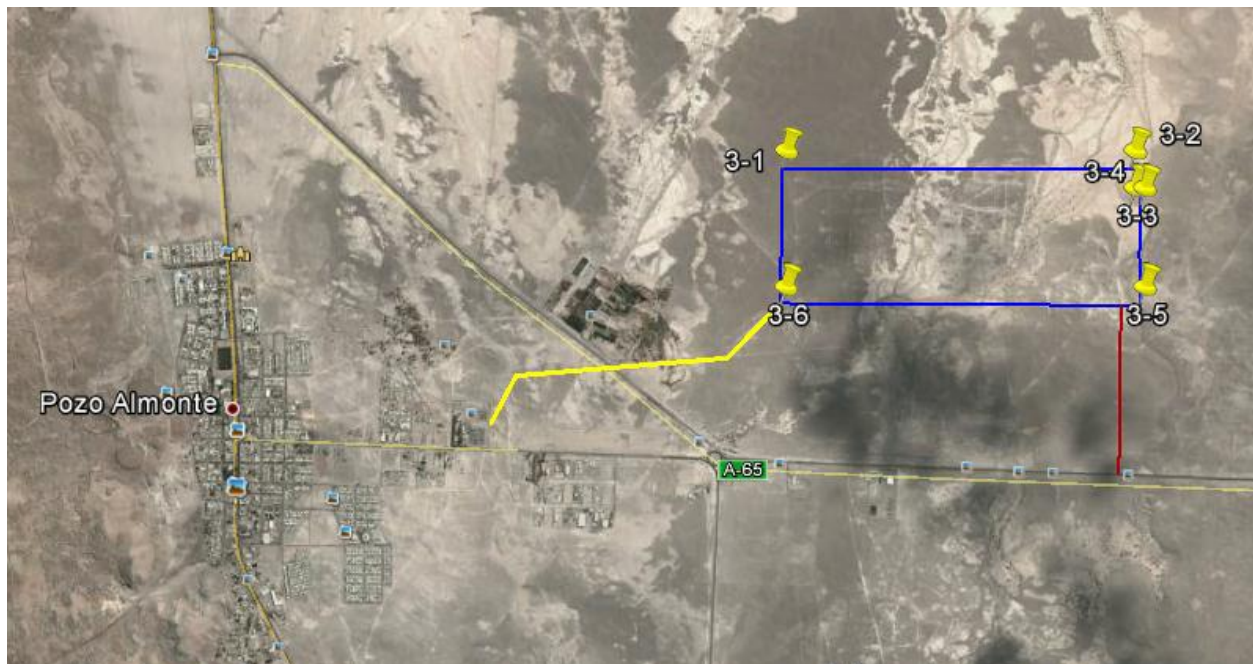


Figure 04: Location of Pozo Almonte 3 /Source Inter-American Development Bank. Environmental and Social Management Report, Page 5-7

The development of a local energy source to diversify the energy matrix in Chile is important for Chile's future. Currently, 75% of Chile's energy needs rely on imported fossil fuels. The successful implementation of this project as a renewable resource to substitute for fossil fuel generation will serve as a testament to the efficiency of renewable energy sources. This project will help meet the energy needs of the Chilean mining industry, which currently accounts for 18% of total national energy consumption. The reduction of the carbon footprint of the Collahuasi and Codelco mining operations will improve the region's ecological footprint. The clean energy generated by the project is expected to prevent the release of 58,865 tons of CO<sub>2</sub> each year.

The project team entered into negotiations with the government of Chile in order to obtain the lease agreement and contracts for land use changes from Bienes Nacionales and Servicio de Impuestos, respectively. Final contracts on these items were signed on December 17, 2012. The Pozo Almonte plants were to be constructed on government lands that were unclaimed and unused by the local population or any other third parties. The long-term (30-year) land use agreements in place establish clear rights and benefits for the involved parties and no economic displacement or resettlement of any kind will occur as a result of the project.

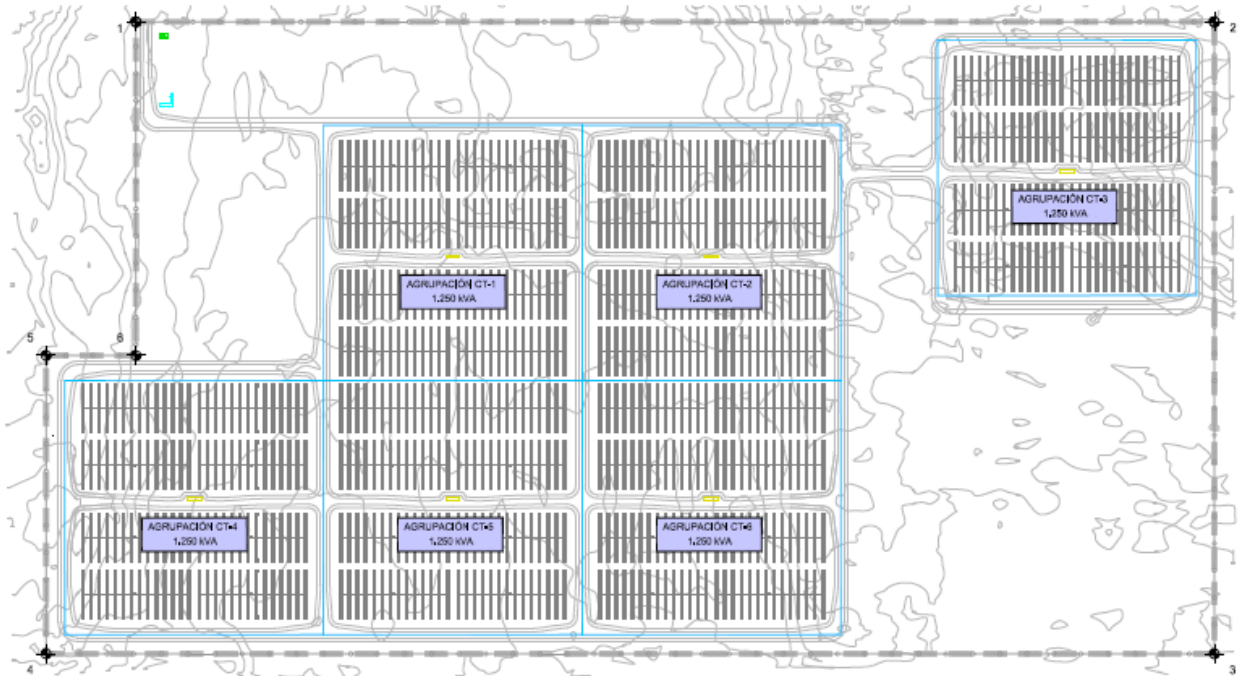


Figure 05: Pozo Almonte 2 Site Layout / Source: Inter-American Development Bank. Environmental and Social Management Report, Page 8

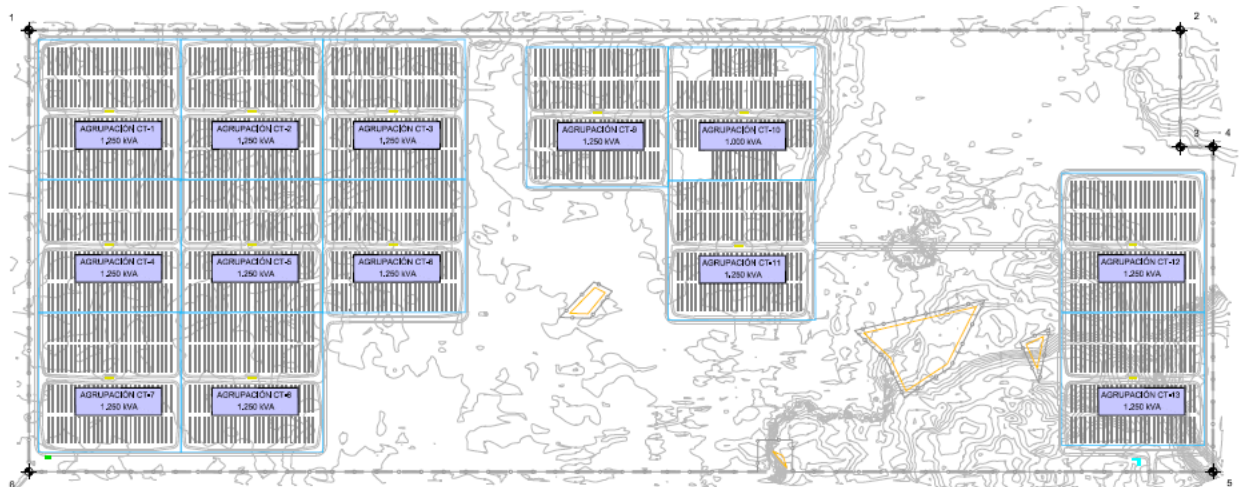


Figure 06: Pozo Almonte 3 Site Layout/ Source: Inter-American Development Bank. Environmental and Social Management Report, Page 8

### 3. APPLICATION OF THE ENVISION RATING SYSTEM<sup>6</sup>

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 Pozo Almonte Photovoltaic Plants in Chile. The main intent of this rating is to evaluate the performance of the project according to sustainability practices.

*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<sup>7</sup> and Zofnass Program<sup>8</sup> websites.

*Appendix B* provides a table with the detailed project assessment, specifications for each of the credits, and recommendations for the Pozo Almonte Photovoltaic Plants project.

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<sup>6</sup> Anthony Kane, Zofnass program research director, and Salmaan Khan, research assistant, wrote most parts of this section.

<sup>7</sup> [www.sustainableinfrastructure.org](http://www.sustainableinfrastructure.org)

<sup>8</sup> [www.zofnass.org](http://www.zofnass.org)

## 4. EVALUATION CATEGORIES

### 4.1. QUALITY OF LIFE

The first category of *Envision* rating system is Quality of Life. The assessment here mainly refers to the impact of the project on the surrounding communities and their wellbeing. As stated in the *Envision* manual, “*Quality of Life particularly focuses on assessing whether infrastructure projects are in line with community goals, incorporated into existing community networks, and will benefit the community long term.*”<sup>9</sup> 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 Wellbeing (QL 3.1, QL 3.2, QL 3.3).

#### CREDIT SCORING

EDIT 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 07: Quality of life category, credits distribution.

#### 4.1.1. Purpose

In the **Purpose subcategory**, out of three credits, two were assessed as Improved (QL 1.1 Improve Community Quality of Life, and QL 1.2 Stimulate Sustainable Growth & Development), and one was assessed as No Score (QL 1.3 Develop Local Skills and Capabilities).

The project reports that 390 jobs will be created during construction of the plant and that preference will be given to workers from local communities. The area communities, however, have a low unemployment rate, meaning attracting workers from the local communities may be a challenge. The project documents provide no evidence that relevant planning documents affecting the area communities were reviewed and report only a minimal amount of social outreach. The documents indicate that social programs benefiting children, women and Chileans of indigenous ethnicity will be given preference, however, no specific social programs were identified. The plant may also open itself up to field trips for local area schools.

The project documents do not indicate any other improvements in job growth, capacity building, productivity, business attractiveness and/or livability. A formal cumulative impacts analysis was not provided as this is not required by the Government of Chile. The project reports that efforts will be

<sup>9</sup> *Envision* Guidance Manual, p.30

made to purchase materials and goods from local providers in the Tarapacá Region; however, this does not guarantee their purchase.

#### 4.1.2. Community:

In the **Community subcategory**, out of six credits, two were assessed as Conserving (QL 2.2 Minimize Noise and Vibration, and QL 2.4 Improve Community Mobility and Access) and four were assessed as No Score (QL 2.1 Enhance Public Health and Safety, QL 2.3 Minimize Light Pollution, QL 2.5 Encourage Alternatives Modes of Transportation, and QL 2.6 Improve Site Accessibility, Safety & Wayfinding).

The project is sited in a rural location outside of the urban core, and the impacts from automobile and truck traffic will be minimal. Anticipated volumes of automobile and truck traffic meet all the requirements enforced by the government of Chile and are not expected to have adverse affects on the local roads.

The project has set noise and vibration standards, and reports that the plant will produce no significant noise or vibration. The project sets standards for day and night operations for workers and plant machinery. These include: 1. Requiring that all machinery noise levels be maintained no greater than the manufacturer's recommendations, 2. Workers will be required to use ear protection during moments of high noise (if any), 3. Machines that produce the lowest levels of noise and vibration will be given preference in the operation of the plant, and 4. Any activity that will produce audible levels of noise and/or vibration will be reported to the local community. The community will be notified of the reasons for the noise and the duration for which temporary noise and vibration levels will last.

The project does not provide an analysis of the health and safety implications of using new materials, technologies or methodologies. The project also does not provide any light pollution studies or wayfinding measures.

#### 4.1.3. Wellbeing:

In the **Wellbeing subcategory**, out of three credits, one was assessed as Improved (QL 3.2 Preserve Views and Local Character), and two were assessed as No Score (QL 3.1 Preserve Historic and Cultural Resources, and QL 3.3 Enhance Public Space).

The solar panels used in the Plant will be selected and installed to be minimally invasive to the views in the landscape. Additionally, the distribution of electrical power from the plant will not require the erection of new electrical poles. Existing utility poles will be used for distribution, which will minimize the Plant's negative effects on the landscape and views.

The project is sited in a rural, sparsely populated location and does not provide any improvements to public space. No long-term adverse effects on existing public spaces have been identified during the construction or operation phases of the project. No plans or commitments to preserve, conserve, enhance, and/or restore defining elements of public space have been reported as part of the project.

The project is located in a rural location with no identified historic and/or cultural resource provided by the project team.





Figure 08: The solar panels will be minimally invasive to views in the area /Source: SolarPack

#### 4.1.4. Summary of results for the Quality of Life Category.

The table below (Figure 10) shows the distribution of credits, as well as the level of performance achieved in each credit. Opportunities for improvement can be found in all three sub-categories (Purpose, Community, and Wellbeing). Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 14.4%, or 26 points out of a total of 181.

POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE				PT.	Performance	% Total	Max.
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life	2	Improved	8.0%	25
2			QL1.2 Stimulate Sustainable Growth & Development	1	Improved	6.3%	16
3			QL1.3 Develop Local Skills And Capabilities	0	No Score	0.0%	15
4		COMMUNITY	QL2.1 Enhance Public Health And Safety	0	No Score	0.0%	16
5			QL2.2 Minimize Noise And Vibration	8	Conserving	72.7%	11
6			QL2.3 Minimize Light Pollution	0	No Score	0.0%	11
7			QL2.4 Improve Community Mobility And Access	14	Conserving	100.0%	14
8			QL2.5 Encourage Alternative Modes of Transportation	0	No Score	0.0%	15
9			QL2.6 Improve Site Accessibility, Safety & Wayfinding	0	No Score	0.0%	15
10		WELLBEING	QL3.1 Preserve Historic And Cultural Resources	0	No Score	0.0%	16
11			QL3.2 Preserve Views And Local Character	1	Improved	7.1%	14
12			QL3.3 Enhance Public Space	0	No Score	0.0%	13
			QL0.0 Innovate Or Exceed Credit Requirements	0	N/A		
			QL	26		14.4%	181

Figure 09: Summary of results in the Quality of Life category

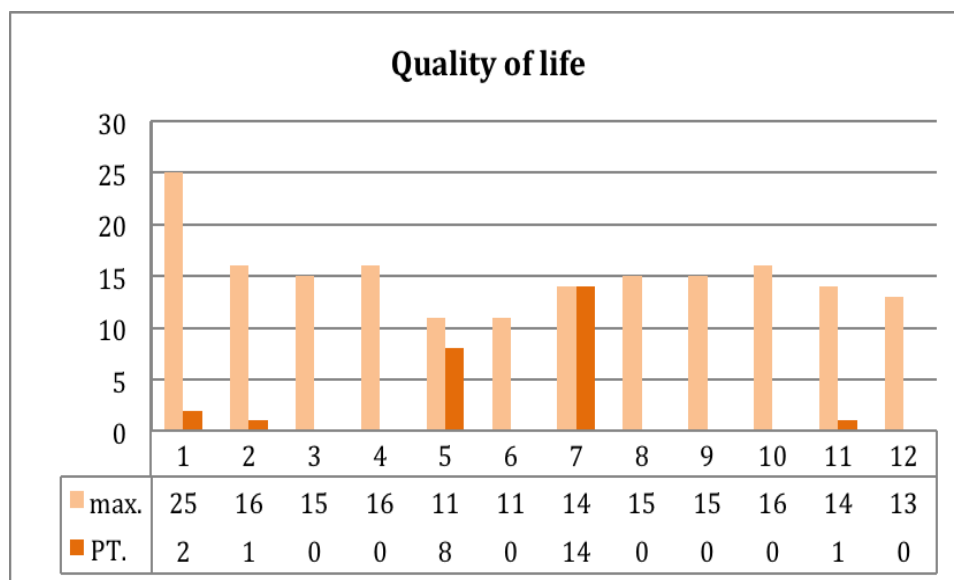


Figure 10 Summary of results in the Quality of Life category.

## 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.”<sup>10</sup>

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

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 11: Leadership category, credits distribution.

<sup>10</sup> *Envision* Guidance Manual, p.60

#### 4.2.1. Collaboration

In the **Collaboration subcategory**, out of four credits, three were assessed as Enhanced (LD 1.1 Provide Effective Leadership and Commitment, LD 1.2 Establish a Sustainability Management System, and LD 1.3 Foster Collaboration and Teamwork), and one was assessed as Improved (LD 1.4 Provide for Stakeholder Involvement).

The project's consultant and management teams worked together through the initial delivery phase. Project management is lead by the Operations Director, who is responsible for overseeing the subcontracting of the project construction, as well as the intercommunication and teamwork between departments. Under the Operations Director is a team of four principal managers- Project Manager, Construction Manager, Operations Manager, and Quality Control Manager. Under these four managers is a staff of 13 people. Together, they will all work as a team under the Operations Director during the initial construction phase, and throughout the long-term operations of the plant.

Aside from this team, there is a consultant team of four from Solar Pack. The Solar Pack team is responsible for providing the initial documentation needed for the construction and operations of the plant. The Director of Solar Pack will work directly with the Plant's Operations Manager to aid communication and coordination during the preliminary period.

The project team has provided an Integrated Plan for Environmental and Social Management. Within this plan, the project lays out its management system, scope, and policies. The plan stipulates how the project shall interact with its surroundings and workers to best protect the environment and human rights.

The project does not report any stakeholder involvement with local communities during the planning or construction phases of the Plant. The project does, however, provide various means of communication for local residents who may have complaints or concerns regarding the Plant, through a Claims Resolution process. Internally, plant workers can also file claims through this same process.

#### 4.2.2. Management:

In the **Management subcategory**, out of two credits, one was assessed as Superior (LD 2.2 Improve Infrastructure Integration), and one was assessed as "No Score" (LD 2.1 Pursue By-Product Synergy Opportunities).

As a solar photovoltaic plant, the project will address the electrical needs of the Tarapacá region of Northern Chile and help to lower the country's carbon footprint. The plant's electrical output will be integrated into the region's existing electrical power grid, thus eliminating the requirement for new infrastructure to conduct voltage. This project is expected to improve the region's electrical infrastructure.

The project team has not identified potential use of unwanted byproducts or materials from other facilities near the site.

#### 4.2.3. Planning:

In the **Planning subcategory**, out of three credits, one was assessed as Conserving (LD 3.1 Plan for Long-Term Monitoring & Maintenance), one was assessed as Enhanced (LD 3.3 Extend Useful Life), and one was assessed as “No Score” (LD 3.2 Address Conflicting Regulations & Policies).

Long-term monitoring of the project has been implemented within a central control room overseen by an operator who monitors irregularities in the Plant over the course of time. Should any repairs or maintenance be deemed necessary, the operator will notify the project's independent engineer. Within 10 days of the completion of the necessary repairs and/or work, the operator will submit a technical report to management and the independent engineer. With proper maintenance, the construction materials and panels of the plant can easily be replaced as needed during the life of the plant.

The project team has not reported collaborating with officials to identify or address laws, standards, regulations or policies that may unintentionally create barriers to the project's implementation.



Figure 12: Electrical invertors at the plants/ Source: Solar Pack.

Declaración de Impacto Ambiental, Page 20

#### 4.2.4. Summary of results for the Leadership category.

The table below (Figure 14) shows the distribution of credits, as well as the level of performance achieved in each credit. The biggest opportunities for improvement are concentrated in the Management and Planning subcategories. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 27.3%, or 33 points out of a total of 121.

POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE				PT	Performance	% Total	max
13	LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	4	Enhanced	23.5%	17
14			LD1.2 Establish A Sustainability Management System	4	Enhanced	28.6%	14
15			LD1.3 Foster Collaboration And Teamwork	4	Enhanced	26.7%	15
16			LD1.4 Provide For Stakeholder Involvement	1	Improved	7.1%	14
17		MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	0	No Score	0.0%	15
18			LD2.2 Improve Infrastructure Integration	7	Superior	43.8%	16
19		PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	10	Conserving	100.0%	10
20			LD3.2 Address Conflicting Regulations & Policies	0	No Score	0.0%	8
21			LD3.3 Extend Useful Life	3	Enhanced	25.0%	12
			LD0.0 Innovate Or Exceed Credit Requirements	0	N/A		
	LD			33		27.3%	121

Figure 13: Summary of results in the Leadership category

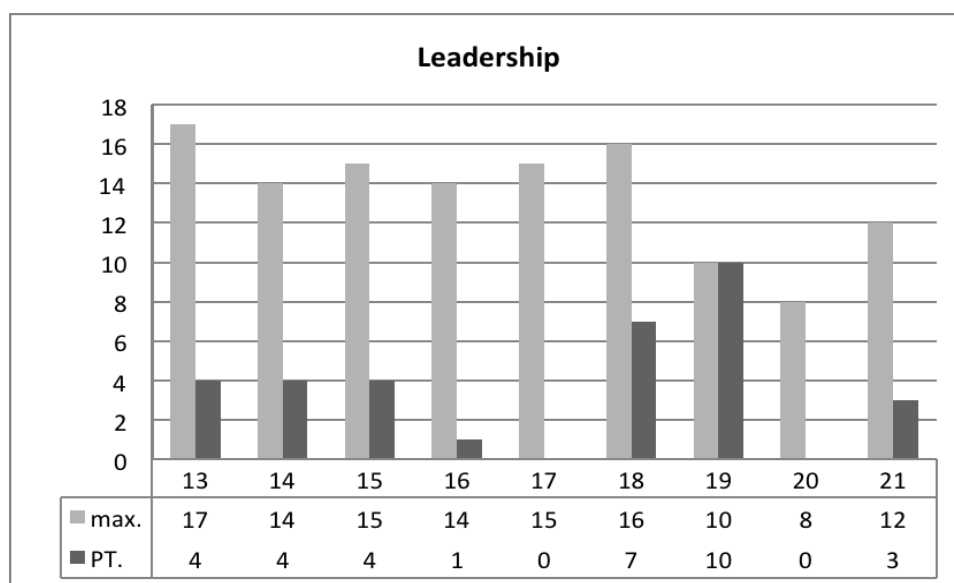


Figure 14: Summary of results in the Leadership category



### 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

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 15: Resource Allocation category, credits distribution.

#### 4.3.1. Materials:

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

The project has been designed to cause the least amount of disruption to the site as possible. During the operations of the plant, the plants will separate waste and materials, classify them, and deliver them to an authorized recycling center that complies with corresponding environmental regulations. The project also developed a waste management plan during construction and daily operations, as outlined in the *Programa de Manjeo de Residuos*, with a focus on re-utilization, recycling, and reduction whenever possible. The main goal is to reduce waste generation and find ways to recycle and reuse the waste that is already generated. Waste has been classified as hazardous and non-hazardous, and appropriate bins and management protocol has been put in place according to waste type.

All excavated soils and dirt on the site will be maintained within or near the project area. Any remaining excavated soil will be used to soften soil topography and in the creation of walkways and foundations. Soil and dirt will not be excavated near any streambeds or areas prone to flooding. Although the remaining waste and excavated material that is not able to be reused will be deposited in authorized, local landfills, the efforts on reutilization, recycling, and reduction will minimize the amount of waste taken off site.

Only 10% of project materials are from local sources. The project does not provide any documentation for the deconstruction and recycling of the project materials.

#### 4.3.2. Energy:

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

The project provides a net positive generation of renewable energy. The Pozo Almonte facility will generate 60,000 MWh of clean energy annually. This is equivalent to the energy consumption of 25,000 households. Additionally, all electrical energy needed to power the plant's operations will be produced at the facility. Therefore, no electrical infrastructure from the local electrical grid to the plant will be installed. Long-term monitoring of the project has been implemented within a central control room overseen by an operator who monitors irregularities in the plant over the course of time. Should any repairs or maintenance be deemed necessary, the operator will notify the project's independent engineer. Within 10 days of the completion of the necessary repairs and/or work, the operator will submit a technical report to management and the independent engineer.

70% of the project's energy demands will be provided by renewable energy sources. However, no documentation was provided to demonstrate any monitoring of energy consumption and reduction throughout the lifecycle of the project.

#### 4.3.3. Water:

In the **Water subcategory**, out of three credits, one was assessed as Enhanced (RA 3.3 Monitor Water Systems), one was assessed as Improved (RA 3.1 Protect Fresh Water Availability) and one was assessed as No Score (RA 3.2 Reduce Potable Water Consumption).

Approximately 100 liters of potable water are expected to be used at the site daily, as per the requirements of D.S. No. 594. The exact amount of daily potable water consumption at the plant may vary depending on the amount of workers on the site on any given day. This water will be provided to the plant by a contracted company in the Tarapacá region. This company will be required to provide a certificate of the origins and quality of the potable water.

Project provides a sanitary solution system for the plant's water consumption. This system will be installed, operated and maintained by a company authorized by SEREMI de Salud. Water in the project shall not be disposed of in canals, ditches or nearby soils. Any improper use of water or freshwater will be penalized. To provide leaks and/or water damage, the project provides a water monitoring system. If any leaks are detected, the project supervisor will be notified immediately, and the leaks will be controlled and fixed.

No information was provided on strategies for reducing potable water consumption.



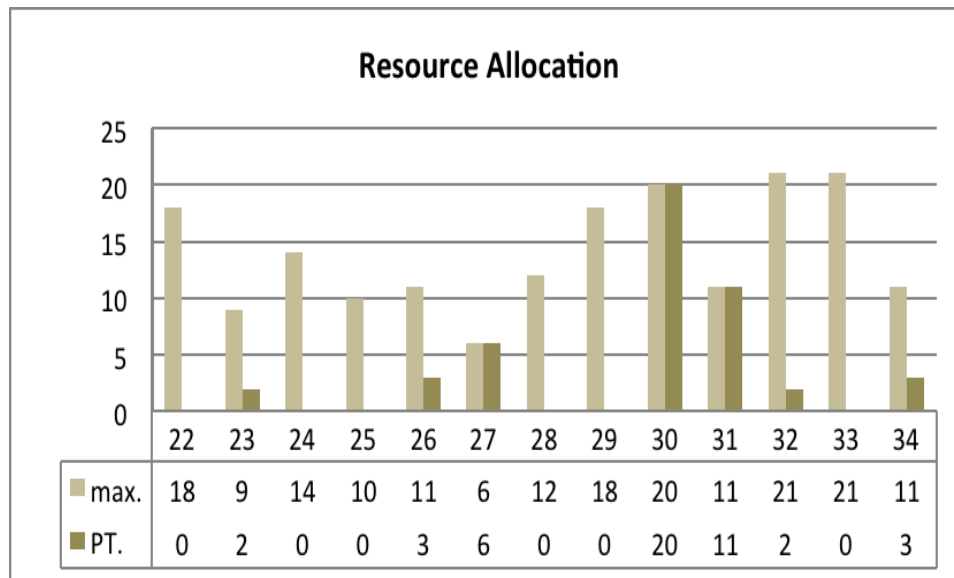
Figure 16: Storage site for toxic waste during operations/ Source: Solar Pack. Declaración de Impacto Ambiental, Page 29

#### 4.3.4. Summary of results for the Resource Allocation category.

The table below (Figure 17) shows the distribution of credits, as well as the level of performance achieved in each credit. The biggest opportunities for improvement are concentrated in the Materials subcategory. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 25.8%, or 47 points out of a total of 182.

POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE				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	0	No Score	0.0%	14
25			RA1.4 Use Regional Materials	0	No Score	0.0%	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	0	No Score	0.0%	12
29		ENERGY	RA2.1 Reduce Energy Consumption	0	No Score	0.0%	18
30			RA2.2 Reduce Pesticide and Fertilizer Impacts	20	Restorative	100.0%	20
31			RA2.3 Commission & Monitor Energy Systems	11	Conserving	100.0%	11
32		WATER	RA3.1 Protect Fresh Water Availability	2	Improved	9.5%	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		
			<b>RA</b>	<b>47</b>		<b>25.8%</b>	<b>182</b>

Figure 17: 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.”<sup>11</sup> 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

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

<sup>11</sup> Envision Guidance Manual, p.116

#### 4.4.1 Siting:

In the **Sitting subcategory**, out of seven credits, two were assessed as Conserving (NW 1.1 Preserve Prime Habitat and NW 1.3 Preserve Prime Farmland), one was assessed as Improved (NW 1.6 Avoid Unsuitable Development on Steep Slopes), and four were assessed as No Score (NW 1.2 Preserve Wetlands and Surface Water, NW 1.4 Avoid Adverse Geology, NW 1.5 Preserve Floodplain Functions, and NW 1.7 Preserve Greenfields).

The project is being built in the rural desert of the Tarapacá region of Northern Chile, just east of the town of Pozo Almonte. The location is in an area with minimal rainfall, creating an environment that hosts little to no existing flora and fauna. As such, the location is not considered prime habitat. For this same reason, the site area is undesirable to farming.

The project does not provide a 100 meter buffer around the project site. Given the site's non-prime habitat status, it does help remediate any effects it may have on the ecosystem through: 1. Maintaining natural ridges and slopes in the topography, 2. Not obstructing natural flows of water in the terrain, and 3. Prohibiting waste disposal in the surrounding areas. The project will maintain natural ridges and slopes in the topography to the maximum extent possible.

No information was provided on specific geological conditions in and around the project area beyond those stated above. Additionally, the project's effects on the entire watershed cannot be determined due to a lack of documentation identifying any potential major bodies of water in the area.

#### 4.4.2 Land and water:

In the **Land and Water subcategory**, out of three credits, one was assessed as Improved (NW 2.3 Prevent Surface and Groundwater Contamination), and two were assessed as No Score (NW 2.1 Manage Stormwater and NW 2.2 Reduce Pesticides and Fertilizer Impacts).

Project will monitor the proper disposal of toxic wastes, materials and/or liquids. The project prohibits the use of any such toxic liquids near sources of freshwater. Any observation of contaminated water will be reported and addressed immediately. The project will also provide a water quality monitoring system to assure sanitation quality.

No documentation was provided on the use of pesticides and fertilizers in the project area. The area's arid climate hosts little flora and fauna, which may reduce the demand of the use of these chemicals. Additionally, no information was provided on any potential water storage systems or runoff design elements in the project.

#### 4.4.3 Biodiversity:

In the **Biodiversity subcategory**, out of four credits, one was assessed as Improved (NW 3.1 Preserve Species Biodiversity) and three were assessed as "No Score" (NW 3.2 Control Invasive Species, NW 3.3 Restore Disturbed Soils, and NW 3.4 Maintain Wetland and Surface Water Functions).

The project site and its surroundings have been assessed as having a low diversity of flora and fauna and little to no flora or fauna life due to the region's arid desert climate. The project is not within a prime habitat area. The project, however, will help protect local biodiversity by educating its workers on local flora and fauna. Additionally, the following are all prohibited: any hunting of animals, introducing



foreign species to the site, and starting bonfires. These prohibitions will help any existing flora and fauna from negative influences of the project. If an endangered species is found in the area, a perimeter fence around the site will be installed. No documentation was provided on control or prevention measures for invasive species, restoration efforts of any potentially disturbed soils, or any maintenance or enhancements of wetland areas.



**Figure 20: Pozo Almonte 2 northern border**  
Source: Inter-American Development Bank. Environmental and Social Management Report, Page 25-28



**Figure 21: Pozo Almonte 2 southern border.**  
Source: Inter-American Development Bank. Environmental and Social Management Report, Page 25-28



**Figure 22 : Pozo Almonte 3 northeast border/** Source: Inter-American Development Bank. Environmental and Social Management Report, Page 25-28



**Figure 23 : Pozo Almonte 3 northeast border/** Source: Inter-American Development Bank. Environmental and Social Management Report, Page 25-28



**Figure 24: Pozo Almonte 3 wash area/** Source: Inter-American Development Bank. Environmental and Social Management Report, Page 25-28



**Figure 25: Flood zones shown with site area/** Source: Xterrae Geología. Estudio de Inundabilidad de Parcelas para Planta Fotovoltaica, Pozo Almonte, Región de Tarapacá, Page 94-98



Figure 26: Wind erosion in the site area / Source: Xterrae Geología. Estudio de Inundabilidad de Parcelas para Planta Fotovoltaica, Pozo Almonte, Región de Tarapacá, Page 94-98



Figure 27: Flood zone and dried sediments / Source: Xterrae Geología. Estudio de Inundabilidad de Parcelas para Planta Fotovoltaica, Pozo Almonte, Región de Tarapacá, Page 94-98

#### 4.4.4 Summary of results, Natural Word category:

The table below (Figure 29) shows the distribution of credits, as well as the level of performance achieved in each credit. Opportunities for improvement are can be found in all three sub-categories (Siting, Land and Water, and Biodiversity). Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 14.8%, or 30 points out of a total of 203.

POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE				PT	Performance	% Total	max
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	14	Conserving	77.8%	18
36			NW1.2 Preserve Wetlands and Surface Water	0	No Score	0.0%	18
37			NW1.3 Preserve Prime Farmland	12	Conserving	80.0%	15
38			NW1.4 Avoid Adverse Geology	0	No Score	0.0%	5
39			NW1.5 Preserve Floodplain Functions	0	No Score	0.0%	14
40			NW1.6 Avoid Unsuitable Development on Steep Slopes	1	Improved	16.7%	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	0	No Score	0.0%	9
44			NW2.3 Prevent Surface and Groundwater Contamination	1	Improved	5.6%	18
45		BIODIVERSITY	NW3.1 Preserve Species Biodiversity	2	Improved	12.5%	16
46			NW3.2 Control Invasive Species	0	No Score	0.0%	11
47			NW3.3 Restore Disturbed Soils	0	No Score	0.0%	10
48			NW3.4 Maintain Wetland and Surface Water Functions	0	No Score	0.0%	19
			NW0.0 Innovate or Exceed Credit Requirements	0	N/A		
			NW	30		14.8%	203

Figure 28: Summary of results in the Natural World category.

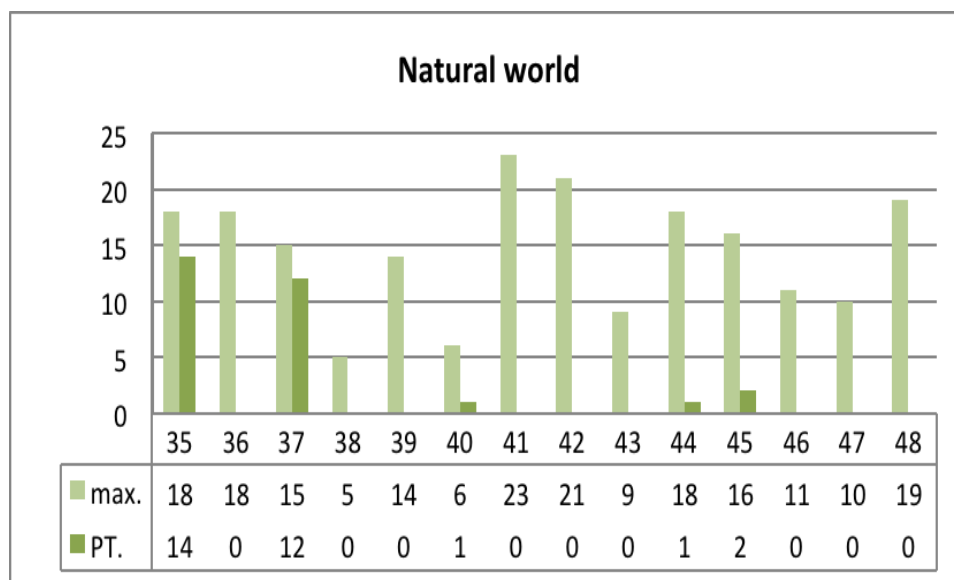


Figure 29: Summary of results in the Natural World category.

## 4.5 CLIMATE AND RISK

Envision's Climate and Risk category is divided in 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."<sup>12</sup> The credits are distributed as: Emissions (CR.1.1, CR. 1.2) Resilience (CR.2.1, CR. 2.2, CR.2.3, CR. 2.4, CR. 2.5).

### CREDIT SCORING

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			CR2.1 Assess climate threat				15							
52		RESILIENCE	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 30: Climate and Risk credit distribution.

### 4.5.1 Emissions

The project achieved an outstanding performance in the **Emissions subcategory**. Out of two credits, both were assessed as Restorative (CR 1.1 Reduce Greenhouse Gas Emissions and CR 1.2 Reduce Air Pollutant Emissions). This is the highest possible assessment rating.

The energy generated at the photovoltaic plants is projected to reduce Chile's carbon emissions by 56,000 tons of CO2 each year. A comparison to industry standards was not provided; therefore, an exact percentage of projected CO2 reductions cannot be determined. The project provides a lifecycle report in

<sup>12</sup> Envision Guidance Manual, p.150

the form of a Clean Development Mechanism (CDM). The CDM makes the project net carbon negative, and thus eligible for funding as a net carbon negative project.

#### 4.5.2 Resilience

In the **Resilience subcategory**, out of five credits, one was assessed as Superior (CR 2.4 Prepare for Short-Term Hazards), one was assessed as Improved (CR 2.2 Avoid Traps and Vulnerabilities), and the remaining three credits were assessed as No Score (CR 1.1 Assess Climate Threat, and CR 2.3 Prepare for Long-Term Adaptability, and CR 2.5 Manage Heat Island Effects).

Project has undertaken a 100-year analysis on flooding threats to the project area. This analysis resulted in a Flooding Study completed by Xterrae Geología. The hydrological models of the study found that floodwaters would not rise greater than 0.5 meters over the next 100 years. The models found that in 100 years, the flow of water in the area's streambeds would rise 0.4 meters. This coincides with ground observations by staff who have studied the area's soil. Solutions presented by the study include channelizing the flow of these streambeds to control flooding in the area.

No documentation was provided demonstrating that a comprehensive Climate Impact Assessment and Adaptation Plan identifying climate change risks and possible responses were developed to prepare the project for climate variation and natural hazards. No documentation reflected the avoidance of traps and vulnerabilities that could create high, long-term costs and risks for affected communities, any plans or designs to prepare for long-term climate change, or any information indicating the reduction of localized heat accumulation and the management of microclimates. No documentation was provided on efforts to minimize the project's heat island effects.

#### 4.5.3 Summary of results Climate and Risk category.

The table below (Figure 32) shows the distribution of credits, as well as the level of performance achieved in each credit. Overall, the project scored well in the Climate and Risk category. The biggest opportunities for improvement are concentrated in the Resilience subcategory. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 42.6%, or 52 points out of a total of 122.

POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE				PT	Performance	% Total	max
49	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	25	Restorative	100.0%	25
50			CR1.2 Reduce Air Pollutant Emissions	15	Restorative	100.0%	15
51		RESILIENCE	CR2.1 Assess Climate Threat	0	No Score	0.0%	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	10	Superior	47.6%	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	52		42.6%	122

Figure 31: Summary of results in the Climate and Risk category.

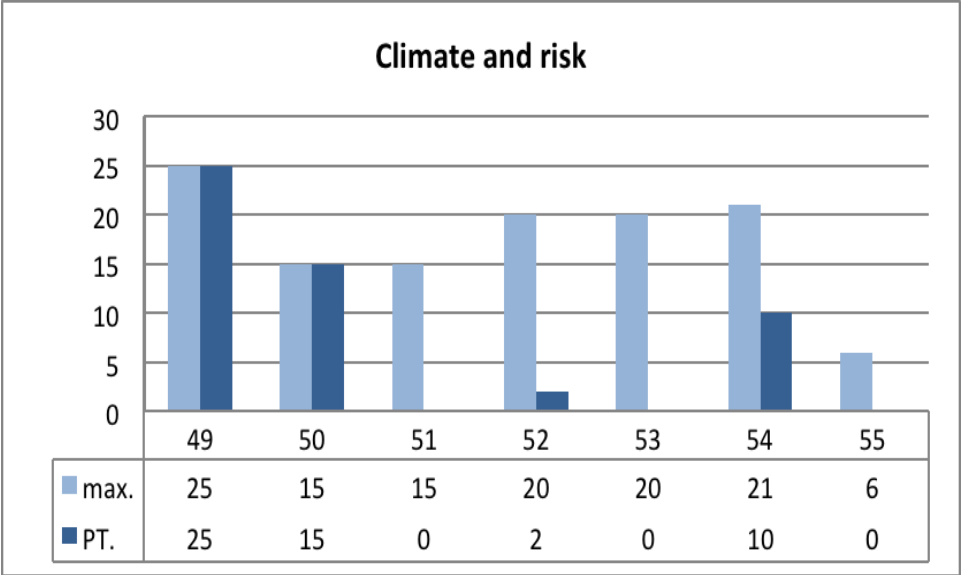


Figure 32: Summary of results in the Climate and Risk category.



## 5. RESULTS AND CONCLUSION

The Pozo Almonte Photovoltaic Plants project brings many positive changes to Chile, especially the Tarapacá and Antofagasta regions. The project scores well overall, with a total score of 188. With the production of clean, renewable solar energy, the plants are expected to reduce Chile's carbon emissions by 56,000 tons of carbon dioxide (CO<sub>2</sub>) per year. As of 2013, 75% of Chile's energy comes from imported, foreign fossil fuels. This type of investment will help reduce the country's fossil fuel dependence.

In the **Quality of Life category**, the project obtained 26 out of 181 points, or 14.4%. The project is expected to improve quality of life through the generation of clean energy. Also, the project will bring positive impacts in terms of technology transfer and creation of jobs, particularly during the construction phase. The project will provide training to employees both during the construction and operation phases. As the project is located in a rural, sparsely populated area, no known public hearings seeking public participation were held.

In the **Leadership category**, the project obtained 33 out of 121 points, or 27.3%. As a solar photovoltaic plant, the project will address the electrical needs of the Tarapacá region of northern Chile and help to lower the country's carbon footprint. The plants' electrical output will be integrated into the region's existing electrical power grid, thus eliminating the requirement for new infrastructure to conduct voltage. This project is expected to improve the region's electrical infrastructure. Long-term monitoring of the project has been implemented within a central control room overseen by an operator who monitors irregularities in the plants over the course of time.

In the **Resource Allocation category**, the project obtained 47 of 182 points, or 25.8%. The project has been designed to cause the least amount of disruption to the site as possible. During the operations of the plants, the plants will separate waste and materials, classify them, and deliver them to an authorized recycling center that complies with corresponding environmental regulations. The project also developed a waste management plan during construction and daily operations, as outlined in the *Programa de Manjeo de Residuos*, with a focus on re-utilization, recycling, and reduction whenever possible. The main goal is to reduce waste generation and find ways to recycle and reuse the waste that has already been generated. On-site waste is classified as hazardous and non-hazardous, and appropriate bins and management protocols have been put in place according to waste type.

The project provides a net positive generation of renewable energy. The Pozo Almonte facilities will generate 60,000 MWh of clean energy annually. This is equivalent to the energy consumption of 25,000 households. Additionally, all electrical energy needed to power the plants' operations will be produced by the plants themselves. Therefore, no electrical infrastructure from the local electrical grid to the plant will be installed. Long-term monitoring of the project has been implemented within a central control room overseen by an operator who monitors irregularities in the plants over the course of time.

In the **Natural World category**, the project obtained 30 out of 203 points, or 14.8%. The project is sited in the rural desert of the Tarapacá region of northern Chile, just east of the town of Pozo Almonte. The area experiences minimal rainfall, which creates an environment that hosts little to no existing flora and fauna. As such, the location is not considered prime habitat. For this same reason, the site area is undesirable for farming.

The project team will monitor the proper disposal of toxic wastes, materials and/or liquids. The project prohibits the use of any such toxic liquids near sources of freshwater. Any observation of contaminated water will be reported and addressed immediately. The project will also provide a water quality monitoring system to assure sanitation quality.

In the **Climate and Risk category**, the project obtained 52 out of 122 points, or 42.6%. The project has undertaken a 100-year analysis of flood threats to the area. This analysis resulted in a Flooding Study completed by Xterrae Geología. The hydrological models of the study found that floodwaters would not rise greater than 0.5 meters over the next 100 years. The models found that in 100 years, the flow of water in the area's streambeds would rise 0.4 meters. This coincides with ground observations by staff who have studied the area's soil. Solutions presented by the study include channelizing the flow of these streambeds to control flooding in the area. The energy generated at the photovoltaic plants is projected to reduce Chile's carbon emissions by 56,000 tons of CO<sub>2</sub> each year.

Overall, the project achieved the highest percentages of points in the Climate and Risk and Leadership categories, receiving 42.6% and 27.3% of available points respectively. This shows strong leadership by the project team, and the project owner's commitment to sustainability. The project team has evaluated the future, long-term operations of the plants, and is dedicated to maintaining their efficiency over time. This careful analysis allows the project to be successful into the future, but also shows that the project team is thinking ahead. In other categories, such as Natural World, the project scored poorly, due many times to a lack of documentation. It is possible that the project may have scored higher. Please refer to the *Envision* manual for more information on scoring and assessments.

The graphs below demonstrate the project's performance under the three Infrastructure 360° Awards. The **People and Leadership Award** (figure 33) represents the QL and LD categories from the Envision™ Rating System. The project received a score of 59 points out of a total of 302 combined points within these categories, which equates to a 19.53% level of achievement. The **Climate and Environment Award** (figure 34) represents the RA, NW and CR categories within the Envision™ Rating System. The project received a score of 129 points out of a total of 507 combined points within these categories, which equates to a 25.44% level of achievement. Thus, the overall achievement of the Pozo Almonte Photovoltaic Plants project under the **Infrastructure 360 Award** (figure 35) is 188 out of 809 points, or 23.24% of the total score.

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

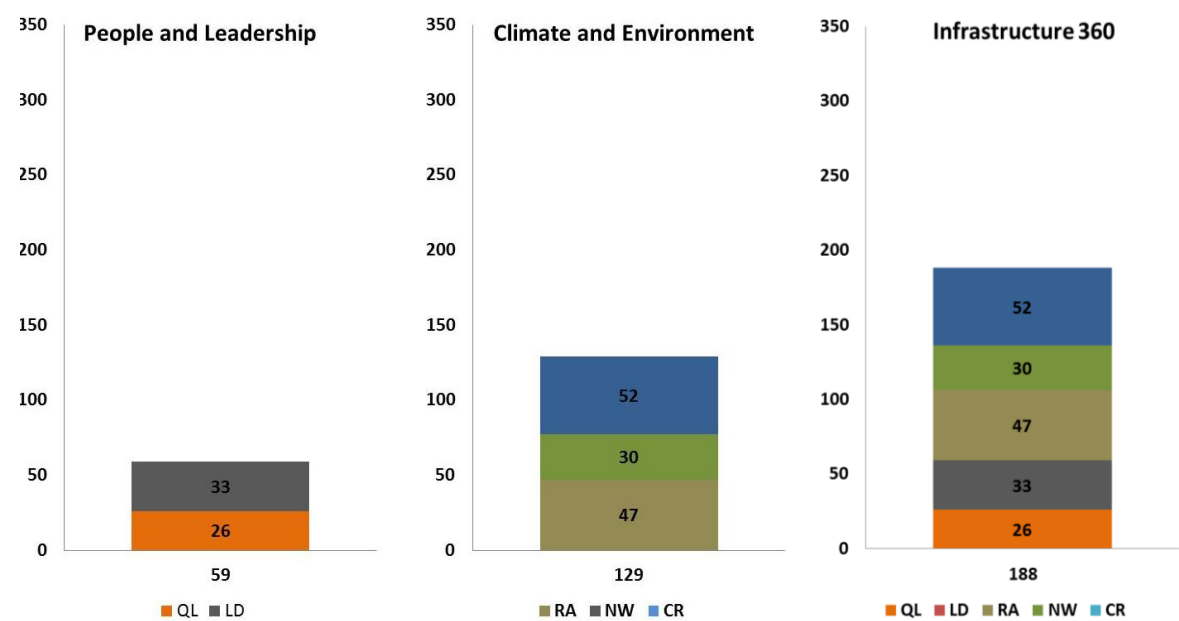


Figure 33:People and Leadership.  
Score distribution



Figure 34:Climate and Environmental.  
Score distribution



Figure 35:Infrastructure 360.  
Score distribution



## APPENDIX A: PROJECT PICTURES AND DRAWINGS



Figure 36: Pozo Almonte plant/ Source: Solar Pack. Declaración de Impacto Ambiental, Page 1



Figure 37: View of Pozo Almonte plant/ Source: SolarPack



Figure 38: Perimeter fence to be installed around plant / Source: Solar Pack. Declaración de Impacto Ambiental, Page 29



Figure 39: Panel anchors/ Source: Solar Pack. Declaración de Impacto Ambiental, Page 23



Figure 40: Fixed solar panel design/ Source: Solar Pack. Declaración de Impacto Ambiental, Page 18

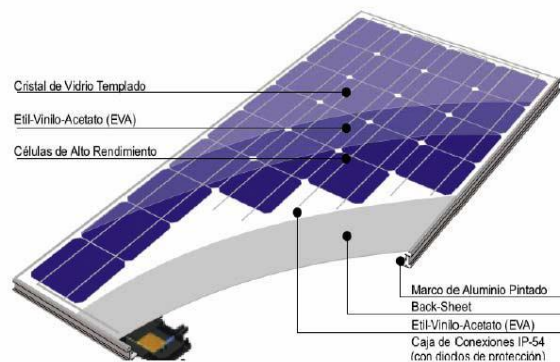


Figure 41: Solar panel materials detail / Source: Solar Pack. Declaración de Impacto Ambiental, Page 15



Figure 42: Horizontal axial solar panels/ Source: Solar Pack. Declaración de Impacto Ambiental, Page 18



Figure 43: Double axial solar panels/ Source: Solar Pack. Declaración de Impacto Ambiental, Page 19



Figure 44: Archaeological artifacts found on site / Source: SolarPack



## APPENDIX B: ENVISION POINTS TABLE

### CREDIT SCORING

EDIT 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 and not included in total point tallies							803	

## APPENDIX C: CREDIT DETAILS

CATEGORY I, PEOPLE AND LEADERSHIP (PL)		
SUB CATEGORY: QUALITY OF LIFE		
	POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE	RECOMMENDATIONS
PL1.1 Improve Community Quality of Life	2	<b>Improved</b>
		The project reports that 390 jobs will be created during construction of the plant and that preference will be given to workers from local communities. The area communities, however, have a low unemployment rate, meaning attracting workers from the local communities may be a challenge. The project documents provide no evidence that relevant planning documents affecting the area communities were reviewed and report only a minimal amount of social outreach. The documents indicate that social programs benefiting children, women and Chileans of indigenous ethnicity will be given preference; however, no specific social programs were identified. The plant may also open itself up to field trips for local area schools.
		<u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Section IV.D “Cumulative Impacts”, and IV.E, “Positive Impacts”.
PL1.2 Stimulate Sustainable Growth & Development	1	<b>Improved</b>
		The project reports that 390 jobs will be created during construction of the plant and that preference will be given to workers from local communities. The area communities, however, have a low unemployment rate, meaning attracting workers from the local communities may be a challenge. The project documents do not indicate any other improvements in job growth, capacity building, productivity, business attractiveness and/or livability. A formal cumulative impacts analysis was not provided as it is not required by the government of Chile.
		<u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Section IV.D “Cumulative Impacts”, and IV.E, “Positive Impacts”.
PL1.3 Develop Local Skills and Capabilities	0	<b>No Score</b>
		The project reports that efforts will be made to purchase materials and goods from local providers in the Tarapacá Region; however, this does not guarantee their purchase. The project also reports that construction workers from the local area will be given preference for the 390 construction jobs created by the project; however, no significant efforts to expand the knowledge, skills,

		and capacity of the community workforce have been identified.	how many local workers will be hired in comparison to the overall worker population.
		<p><u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Section IV.E, “Positive Impacts”; Solar Pack. Programa de Relaciones Comunitarias (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.2.</p>	<p>*Consider implementing an education and training program for local area workers. This can help improve the community’s competitiveness current and future, as well as improve the overall educational attainment of area workers.</p>
PL2.1 Enhance Public Health And Safety	0	<b>No Score</b>	*Provide documentation assessing exposures and risks to public health and safety.
		The project team has evaluated the project’s social impacts and risks and found no major impacts aside from effects on water use and land acquisition. Neither was considered a threat to the local area, as the project will consume minimal amounts of water and the project area is currently unused and owned by the government of Chile. The project does not provide an analysis of the health and safety implications of using new materials, technologies, or methodologies, above and beyond that which is needed to meet minimum regulatory requirements as defined by the government of Chile.	*If any exposures and/or risks are found, provide documentation of where and to what degree the project has been changed to accommodate these to better protect public health and safety.
		<u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Section IV.C “Social Impacts and Risks”.	*Provide documents of approval by the appropriate governmental environmental, public health and/or safety agencies.
PL2.2 Minimize Noise And Vibration	8	<b>Conserving</b>	<p>*Provide documentation of the exact Permissible Sound Levels produced on site during operations</p> <p>*Provide documentation and analyses of estimates of ambient noise and vibration levels and comparisons to community needs and goals for livability.</p>
		<p>The project has set noise and vibration standards, and reports that the plant will produce no significant noise or vibration. The project sets standards for day and night operations for workers and plant machinery. These include: 1. Requiring that all machinery noise levels be maintained no greater than the manufacturer’s recommendations, 2. Workers will be required to use ear protection during moments of high noise (if any), 3. Machines that produce the lowest levels of noise and vibration will be given preference in the operation of the plant, and 4. Any activity that will produce audible levels of noise and/or vibration will be reported to the local community. The community will be notified of the reasons for the noise and the duration for which temporary noise and vibration levels will last.</p> <p><u>Source:</u> Solar Pack. Programa de Medidas de Prevención y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.2.</p>	
PL2.3 Minimize Light Pollution	0	<b>No Score</b>	*Provide a lighting assessment for the project, including considerations of overall appropriate lighting
		The project does not provide any light pollution studies or report on the implementation of any light pollution reduction strategies.	

		Source: Solar Pack. Declaración de Impacto Ambiental, Section 7 (Page 73).	zone levels.  *Provide plans, drawings, and specifications showing strategies implemented to reduce lighting intensity and overall light pollution.
QL2.4 Improve Community Mobility And Access	14	<b>Conserving</b> The project is sited in a rural location outside of the urban core, and the impacts from automobile and truck traffic will be minimal. Anticipated volumes of automobile and truck traffic meet all the requirements enforced by the government of Chile and are not expected to have adverse affects on the local roads.	*Provide documentation of completed assessment studies and reports addressing the effects of the constructed works on access and mobility.
		Source: Solar Pack. Declaración de Impacto Ambiental 2, Section 6.2.6 (Page 55); Solar Pack. Declaración de Impacto Ambiental 3.	*Provide documentation of reports, memoranda, minutes of meetings with managers and operators covering access to adjacent facilities, amenities and transportation hubs.
QL2.5 Encourage Alternative Modes of Transportation	0	<b>No Score</b> The project is sited in a rural location with limited public transit options. During operation, the Plant will employ a minimal number of workers, which will reduce the Plant's transportation needs.	*Provide drawings showing proximity and accessibility to transportation and parking facilities near and on the site area.
		Source: Solar Pack. Declaración de Impacto Ambiental 2.	*Provide a diagram of the location of the project in relation to settlements to demonstrate the plant's remoteness from available public transportation alternatives.
QL2.6 Improve Site Accessibility, Safety & Wayfinding	0	<b>No Score</b> The project does not report any wayfinding or user accessibility measures on the site or in the surrounding areas.	*Consider the development of an appropriate signage standard for safety and wayfinding in and around the constructed works.
		Source: Ministerio de Obras Públicas de Chile. Resoluciones de la Dirección Regional de Vialidad.	*Provide design documents showing plans for access and egress, and plans for signage showing how the design and signage is clear and intuitive for users.  *Provide design documents showing emergency access and egress routes.  *Provide documentation showing how the project will impact public safety.
QL3.1 Preserve Historic And Cultural	0	<b>No Score</b> The project is located in a rural location with no identified historic and/or cultural resource provided by the project team.	*Consider preservation improvements to historic and cultural resources in the

Resources			nearby settlements of Pozo Almonte. Improvements made here would increase the project's levels of achievement for this category.
		Source: None	
QL3.2 Preserve Views And Local Character	1	<b>Improved</b>	*Provide plans, drawings, and reports identifying important elements of the site character including landform or levels, views, natural landscape features, materials, planting, style/detailing, and scale.
		The solar panels used in the Plant will be selected and installed to be minimally invasive to the views in the landscape. Additionally, the distribution of electrical power from the plant will not require the erection of new electrical poles. Existing utility poles will be used for distribution which will minimize the Plant's negative effects on the landscape and views.	
		Source: Solar Pack. Declaración de Impacto Ambiental 2, Section 1.1 (Page 6).	*Provide existing policies and regulations regarding public views and design guidelines relevant to the project.  *Provide an inventory of all natural views and landscape features to be protected.  *Provide documentation demonstrating how the final project design addresses each of the identified views, natural landscape features, and elements of local character.
QL3.3 Enhance Public Space	0	<b>No Score</b>	
		The project is sited in a rural, sparsely populated location and does not provide any improvements to public space. No long-term adverse effects on existing public spaces have been identified during the construction or operation phases of the project. No plans or commitments to preserve, conserve, enhance, and/or restore defining elements of public space have been reported as part of the project.  Source: Inter-American Development Bank. Environmental and Social Management Report.	*As the project is located in a sparsely populated locale, consider providing wildlife refuge improvements for local wildlife. Provide documentation of any such improvements.
QL0.0 Innovate Or Exceed Credit Requirements	0	N/A	
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SUB CATEGORY:LEADERSHIP		
	POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE	
		RECOMMENDATIONS
LD1.1 Provide Effective Leadership And Commitment	4	<b>Enhanced</b>
		The project provides various written commitments to sustainability. The project promotes sustainable development by preserving its natural resources and encouraging waste reduction. Aside from the project's benefits to the environment as a solar photovoltaic plant, the company and contractors also adhere to the overall ideals of sustainability.
		Source: Solar Pack. Programa de Relaciones Comunitarias (Plan Integral de Manejo Ambiental y Social [PIMAS]), Page 11; Solar Pack. Declaración de Impacto Ambiental.
LD1.2 Establish A Sustainability Management System	4	<b>Enhanced</b>
		The project team has provided an Integrated Plan for Environmental and Social Management. Within this plan, the project lays out its management system, scope, and policies. The plan stipulates how the project shall interact with its surroundings and workers to best protect the environment and human rights.
		Source: Solar Pack. Programa de Relaciones Comunitarias (Plan Integral de Manejo Ambiental y Social [PIMAS]), Page 6-14; Solar Pack. Programa de Relaciones Comunitarias (Plan Integral de Manejo Ambiental y Social [PIMAS]), Page 5.
LD1.3 Foster Collaboration And Teamwork	4	<b>Enhanced</b>
		The project's consultant and management teams worked together through the initial delivery phase. Project management is lead by the Operations Director, who is responsible for overseeing the subcontracting of the project construction, as well as the intercommunication and teamwork between departments. Under the Operations Director is a team of four principal managers- Project Manager, Construction Manager, Operations Manager, and Quality Control Manager. Under these four managers is a staff of 13 people. Together, they will all work as a team under the Operations Director during the initial construction phase, and throughout the long-term operations of the plant.
		Aside from this team, there is a consultant team of four from Solar Pack. The Solar Pack team is responsible for providing the initial documentation needed for the construction and operations of the plant. The Director of Solar Pack will work directly with the Plant's Operations Manager to aid communication and coordination during the preliminary period.
		Source: Solar Pack. Plan de Calidad, Version 2, Section 6.



LD1.4 Provide For Stakeholder Involvement	1	<b>Improved</b>	*Provide a list of key stakeholder groups within the general public that were consulted during the planning and construction phases of the plant. Provide documentation of this communication.
		The project does not report any stakeholder involvement with local communities during the planning or construction phases of the Plant. The project does, however, provide various means of communication for local residents who may have complaints or concerns regarding the Plant, through a Claims Resolution process. Internally, plant workers can also file claims through this same process.	
		To file a complaint, residents fill out a claims form addressed to the Plant's Project Manager. The Plant's staff will register the claim and address it. Once a resolution has been determined, the Project Manager (or his/her staff) will contact the claimant to notify him/her of the outcome. <u>Source:</u> Solar Pack. Stakeholders Table ("Tabla Stakeholders"); Solar Pack. Programa de Relaciones Comunitarias (Plan Integral de Manejo Ambiental y Social [PIMAS]), Pages 12, 18-23.	
LD2.1 Pursue By-Product Synergy Opportunities	0	<b>No Score</b>	*Consider the potential use of nearby unwanted by-products or materials in the construction of the plant to reduce waste and improve the project's sustainable performance.
		The project team has not identified potential use of unwanted byproducts or materials from other facilities near the site.	
		<u>Source:</u> Solar Pack. Programa de Manejo de Residuos (Plan Integral de Manejo Ambiental y Social [PIMAS]).	
LD2.2 Improve Infrastructure Integration	7	<b>Superior</b>	*Provide drawings or plans of the Plant's electrical infrastructure and how it will be connected to the region's existing electrical power grid.  *Provide documentation of the extent to which the project design explicitly considered other community infrastructure designs and projects.  *Provide documentation of project plans to restore existing infrastructure and integrate it into the project design.
		As a solar photovoltaic plant, the project will address the electrical needs of the Tarapacá region of Northern Chile and help to lower the country's carbon footprint. The Plant's electrical output will be integrated into the region's existing electrical power grid, thus eliminating the requirement for new infrastructure to conduct voltage. This project is expected to improve the region's electrical infrastructure.	
		<u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Article 2.3, Page 8; Centro de Despacho Económico de Carga del Sistema Interconectado del Norte Grande de Chile (CDEC-SING). Informe Proyecto Informado Nos. 2 and 3.	
LD3.1 Plan For Long-Term Monitoring & Maintenance	10	<b>Conserving</b>	*Provide documentation showing how workers in operations and maintenance will be trained to monitor the project.
		Long-term monitoring of the project has been implemented within a central control room overseen by an operator who monitors irregularities in the Plant over the course of time. Should any repairs or maintenance be deemed necessary, the operator will notify the project's independent engineer. Within 10 days of the completion of the necessary repairs and/or work, the operator will submit a technical report to management and the independent engineer.	
		<u>Source:</u> Solar Pack. Memoria Técnica, Chapter 4; Engineering Operations and Maintenance Extracts.	
LD3.2 Address Conflicting Regulations & Policies	0	<b>No Score</b>	*Provide documentation on how the project team has analyzed existing local laws and assessed whether they may hinder the
		The project team has not reported collaborating with officials to identify or address laws, standards, regulations or policies that may unintentionally create barriers to the	

		project's implementation.	project's sustainability performance.
		<u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Article 2.1, Page 5.	*Provide copies of any letters, memoranda, or minutes of meetings with regulatory agencies set up to identify and resolve issues, and the results of those efforts.
LD3.3 Extend Useful Life	3	<b>Enhanced</b>	*Provide documentation of the incorporation of elements intended to add durability, flexibility, and resilience throughout the useful life of the project into the design.
		The project team has evaluated the long-term operation of the Plant and has implemented a long-term maintenance plan. As a solar photovoltaic plant, with proper maintenance, the construction materials and panels of the plant can easily be replaced as needed.	*Provide specifications of durable materials and how they improve upon industry norms.
		<u>Source:</u> Solar Pack. Chilean International Renewable Energy Congress, Case Study: Solar PV Development in Chile, Page 8.	*Provide documentation showing how implementation measures were included in construction contracts, and operations and maintenance procedures.  *Provide documentation of how the overall design will allow for expansion, reconfiguration, or multiple uses.
LD0.0 Innovate Or Exceed Credit Requirements	0	N/A	
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CATEGORY II: CLIMATE AND ENVIRONMENT (CE)			
RESOURCE ALLOCATION			
	POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE		RECOMMENDATIONS
RA1.1 Reduce Net Embodied Energy	0	No Score	*Provide assessment documentation of the infrastructure materials' life cycle energy. Provide evidence that this assessment was realized in accordance to recognized and accepted methodologies, data, sources, and software.
		As a solar photovoltaic plant, the project is expected to reduce the amount of CO2 emissions by 56,000 tons annually. The development goal of combined reduction is 43,500 tons annually at 60 GWh of energy production. Greater energy production from the plant will result in a greater amount of CO2 reductions. 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 achieving.	*Provide design documents of elements that will reduce the net embodied energy of the project and a rationale for why they were chosen. This may involve reducing the quantity of material, selection of materials with lower embodied energy.
		Source: Inter-American Development Bank. Environmental and Social Management Report, Section V.C.	*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.
RA1.2 Support Sustainable Procurement Practices	2	Improved	*Provide documentation of a sustainable procurement program for the project.
		The manufacturer of the solar plant materials used in this project, Yingli Solar, received ISO14001 Environmental Management System certification in 2007 for its production factory. However, a sustainable procurement program is not provided as part of the project documents.	*Provide documentation showing what percentage of project materials are purchased from manufacturers and suppliers that follow sustainable practices.
		Source: Yingli Solar. Yingli Green Energy, 2013 Corporate Sustainability Report, Page 23 - "A Focus on Green Production".	
RA1.3 Used Recycled Materials	0	No Score	*Consideration should be given to the future life cycles of this project and its materials. Reclaimed and recycled materials should be considered for future structures, refurbishments or equipment pieces
		Project does not report the use of any materials made of reclaimed or recycled content.	

		<p>Source: None</p>	<p>in the project.</p> <p>*Improve efforts to specify reclaimed and recycled materials to increase their total percentage within the project.</p> <p>*Provide or project the weight and 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.</p>
RA1.4 Use Regional Materials	0	No Score	<p>*Provide documentation of inventory, origins and costs of materials used in project.</p> <p>*Increase the percentage of locally sourced materials, plants and soils.</p> <p>*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.</p>
		<p>Only 10% of project materials are from local sources. A minimum of 30% locally sourced materials is required to qualify for the lowest level of achievement, Improved. This includes any and all soils (50 miles), aggregate (50 miles), plants (250 miles), and all other materials (500 miles) within the distances specified above.</p>	
		<p>Source: Solar Pack. Programa de Relaciones Comunitarias (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.2.</p>	
RA1.5 Divert Waste From Landfills	3	Improved	<p>*Consider the implementation of a recycling program at the site. Many of the waste disposal in the Everyday "Household" Waste category could be recycled and or reused.</p>
		<p>The project incorporates the separation of waste into different bins throughout the site into the following three major categories:</p> <ol style="list-style-type: none"> <li>1. Everyday "household" waste (green bins)</li> <li>2. Safe industrial waste (yellow bins)</li> <li>3. Dangerous industrial waste (red bins).</li> </ol> <p>At least 25% of project waste will be recycled and/or reused.</p>	
		<p>Source: Solar Pack. Programa de Manejo de Residuos (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6 and Annex 1.</p>	
RA1.6 Reduce Excavated Materials Taken Off Site	6	Conserving	<p>*Provide further information on how the project was designed to balance cut and fill.</p>
		<p>All excavated soils and dirt on the site will be maintained within or near the project area. Any remaining excavated soil will be used to soften soil topography and in the creation of walkways and foundations. Soil and dirt will not be excavated near any streambeds or areas prone to flooding.</p>	
		<p>Source: Solar Pack. Programa de Manejo de Residuos (Plan Integral de Manejo Ambiental y Social [PIMAS]), Annex 2-Page 26.</p>	

RA1.7 Provide for Deconstruction & Recycling	0	No Score	*Provide documentation specifying what materials can be easily recycled and reused after the useful life of the project has ended.
		The project does not provide any documentation for the deconstruction and recycling of the project materials.	*Provide documentation showing how the design team has facilitated the future disassembly and recycling of materials.
		Source: Solar Pack. Programa de Manejo de Residuos (Plan Integral de Manejo Ambiental y Social [PIMAS]), Annex 2-Page 26.	*Expand the scope to include more life cycle elements beyond construction, moving outside normal owner considerations of functionality.
RA2.1 Reduce Energy Consumption	0	No Score	*Specify energy efficient equipment and processes.
		70% of the project's energy demands will be provided by renewable energy sources. Additionally, as a solar photovoltaic plant, the project is expected to reduce the amount of CO2 emissions by 56,000 tons annually. Documentation on consumption of energy by the project is not provided. Increased efficiency required to be eligible for scoring.	*Provide BTU calculations of industry norms to compare project with.
		Source: Inter-American Development Bank. Environmental and Social Management Report, Section V.C.; Solar Pack. Declaración de Impacto Ambiental, Section 3.9.3 (Page 36).	*Submit calculations for the project's estimated annual energy consumption over the life of the project. Document the percentage reduction over the industry norm benchmark. All energy sources should be converted into BTU.
RA2.2 Use Renewable Energy	20	Restorative	
		The project provides a net positive generation of renewable energy. The Pozo Almonte facility will generate 60,000 MWh of clean energy annually. This is equivalent to the energy consumption of 25,000 households. Additionally, all electrical energy needed to power the plant's operations will be produced at the facility. Therefore, no electrical infrastructure from the local electrical grid to the plant will be installed.	*Provide documentation of the project's anticipated annual operational energy consumption broken down by source type.
		Source: Inter-American Development Bank. Environmental and Social Management Report, Section V.C.; Solar Pack. Declaración de Impacto Ambiental, Section 3.9.3 (Page 36).	*Provide documentation of the anticipated annual output of all renewable sources, and the overall percentage of renewable energy to total energy consumption.
RA 2.3 Commission & Monitor Energy Systems	11	Conserving	
		Long-term monitoring of the project has been implemented within a central control room overseen by an operator who monitors irregularities in the plant over the course of time. Should any repairs or maintenance be deemed necessary, the operator will notify the project's independent engineer. Within 10 days of the completion of the necessary repairs and/or work, the operator will submit a technical report to management and the independent engineer.	*Provide documentation showing how workers in operations and maintenance will be trained to monitor the project.
		Source: Solar Pack. Memoria Técnica, Chapter 4; Engineering Operations and Maintenance Extracts.	

RA3.1 Protect Fresh Water Availability	2	<b>Improved</b>	<p>*Provide design documents indicating the location, type, quantity, rate of recharge and quality of water resources available to the project.</p> <p>*Increase the comprehensiveness of water availability assessment and improve water management to achieve "no net impact" conditions.</p>
		<p>Project provides documentation showing estimates of water demands during construction and long-term operations of the plant. Approximately 100 liters of potable water are expected to be used at the site daily, as per the requirements of D.S. No. 594. The exact amount of daily potable water consumption at the plant may vary depending on the amount of workers on the site on any given day. This water will be provided to the plant by a contracted company in the Tarapacá region. This company will be required to provide a certificate of the origins and quality of the potable water.</p> <p>Drinking water will be provided to the plant's workers by a purified drinking water company, most likely from distributors in Pozo Almonte.</p>	
		<p><u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Section 2.6; Solar Pack. Declaración de Impacto Ambiental, Section 3.8.2 (Page 31) and 3.9.3 (Page 36).</p>	
RA3.2 Reduce Potable Water Consumption	0	<b>No Score</b>	<p>*Strategies in the design to not only include water efficient equipment and fixtures but utilize opportunities to reuse stormwater or greywater. Reductions may be accomplished through design, construction and operational changes through conservation and/or the ability to use, treat and/or reuse non-potable water. Reductions are estimated over industry norms.</p>
		<p>According to the documentation provided, the project does not report a reduction in potable water consumption.</p>	
		<p><u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Section 4.3.</p>	
RA3.3 Monitor Water Systems	3	<b>Enhanced</b>	<p>*Expand the scope and extent of monitoring activities. Plan to incorporate monitoring data to improve the operational efficiency of the project.</p>
		<p>Project provides a sanitary solution system for the plant's water consumption. This system will be installed, operated and maintained by a company authorized by SEREMI de Salud. The project outlines water disposal policies such as: 1. Water shall not be disposed of in canals, ditches or nearby soils, and 2. Any improper use of water or freshwater will be penalized.</p> <p>The project provides a water monitoring system. If any leaks are detected, the project supervisor will be notified immediately, and the leaks will be controlled and fixed.</p>	
		<p><u>Source:</u> Solar Pack. Programa de Medidas de Prevención y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.6.1.; Ministerio de Salud de Chile. Resoluciones de la Dirección Regional de Salud.</p>	
RA0.0 Innovate Or Exceed Credit Requirements	0	N/A	
	47		



NATURAL WORLD		
	POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE	
		RECOMMENDATIONS
NW1.1 Preserve Prime Habitat	14	<b>Conserving</b>
		The project is being built in the rural desert of the Tarapacá region of Northern Chile, just east of the town of Pozo Almonte. The location is in an area with minimal rainfall, creating an environment that hosts little to no existing flora and fauna. As such, the location is not considered prime habitat.
		The project does not provide a 100 meter buffer around the project site. Given the site's non-prime habitat status, it does help remediate any effects it may have on the ecosystem through: 1. Maintaining natural ridges and slopes in the topography, 2. Not obstructing natural flows of water in the terrain, and 3. Prohibiting waste disposal in the surrounding areas.
		<u>Source:</u> Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.3 to 6.7.
NW1.2 Preserve Wetlands and Surface Water	0	<b>No Score</b>
		The project includes guidelines to avoid obstructing natural flows of water to the maximum extent possible; however, no buffer or vegetation and soil protection zone (VSPZ) has been designed around the project site. Sufficient information has not been provided to determine whether and where any water features are located on and near the site.
		<u>Source:</u> Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.3 to 6.4.
NW1.3 Preserve Prime Farmland	12	<b>Conserving</b>
		Project area is located in an arid climate that makes it an undesirable location for farmland.
		<u>Source:</u> Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.3.
NW1.4 Avoid Adverse Geology	0	<b>No Score</b>
		Sufficient information not provided - The project does not provide information on any specific geological conditions in and around the site area.
		<u>Source:</u> Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.3.
NW1.5 Preserve Floodplain Functions	0	<b>No Score</b>
		The project is located in a desert. The project documents provided do not identify major bodies of water in the area; therefore, the project's effects on the entire watershed cannot be determined.
		*Provide documentation identifying the location of major bodies of water in relation to the project site, with their 100-year flood range.

		Source: Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.3. Solar Pack. Programa de Seguridad y Prevención de Riesgos (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.4.c.	
NW1.6 Avoid Unsuitable Development on Steep Slopes	1	<b>Improved</b>	*Provide documentation of any public meetings hosted.
		Project will maintain natural ridges and slopes in the topography to the maximum extent possible.	
		Source: Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.3.	*Provide documentation of best management and design practices used, including protection of downslope buildings, facilities, and infrastructure.
NW1.7 Preserve Greenfields	0	<b>No Score</b>	
		Project will be located on a greenfield site.	
		Source: Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.3. Ministerio de Agricultura de Chile. Autorización Cambio Uso Suelo SPV2.	
NW2.1 Manage Stormwater	0	<b>No Score</b>	
		According to the documentation provided, the project does not report the use of any type of water storage system or incorporate any runoff considerations. This credit requires a drainage plan and applicable runoff reports, which were not submitted. The project is located in an arid, desert climate with minimal rainfall. Additionally, the project is located in a remote, sparsely populated area surrounded by undeveloped greenfields that allow for natural rainfall filtration into the ground.	*Provide water storage system to maximize use of the region's minimal rainfall.
		Source: Xterrae Geología. Estudio de Inundabilidad de Parcelas para Planta Fotovoltaica, Pozo Almonte, Región de Tarapacá, Section 4.2.	
NW2.2 Reduce Pesticides and Fertilizer Impacts	0	<b>No Score</b>	*Provide documentation of operational policies that will be put into place to control the application of fertilizers and pesticides.
		According to the documentation provided, the project team has not performed any studies of the impacts of pesticide and fertilizer use.	*Provide plans and drawings of any runoff controls that will be designed and installed.
		Source: None	*Provide documentation showing the mix of pesticides and fertilizers to be used on the finished project, along with measurements of their toxicity, persistence and bioavailability.
NW2.3 Prevent Surface and Groundwater Contamination	1	<b>Improved</b>	*Provide documentation showing long-term surface and groundwater quality monitoring programs.
		Project will monitor the proper disposal of toxic wastes, materials and/or liquids. The project prohibits the use of any such toxic liquids near sources of freshwater. Any observation of contaminated water will be reported and addressed immediately. The project will also provide a water quality monitoring system to assure sanitation quality.	*Provide documentation of the relationship between the plant and impact it may have on receiving

		Source: Xterrae Geología. Estudio de Inundabilidad de Parcelas para Planta Fotovoltaica, Pozo Almonte, Región de Tarapacá, Section 5.1.2. Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.6.	waters.  *Provide documentation of spill and leak prevention and response plans.
NW3.1 Preserve Species Biodiversity	2	<b>Improved</b>  Project is not within a prime habitat area. The project will help protect local biodiversity by educating its workers on local flora and fauna. Additionally, the following are all prohibited: any hunting of animals, introducing foreign species to the site, and starting bonfires. If an endangered species is found in the area, a perimeter fence around the site will be installed.	*Provide a site plan of proposed perimeter fence.  *Provide documentation of analysis process that identifies existing habitats and outlines strategies to ensure these habitats are not disturbed.
		Source: Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.4.	*Provide a monitoring plan to ensure mitigation measures are effective for preserving animal access.
NW 3.2 Control Invasive Species	0	<b>No Score</b>  The project does not provide any documentation indicating control and prevention measures for invasive species.	*Provide a list of all invasive species in the region, and map all invasive species found on or within 1000m of the site.
		Source: Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.4.	*Provide documentation that all species introduced to the site are non-invasive; include a site plan of the landscaping strategy including all vegetation species.
			*Provide documentation of collaboration with state or local agencies.
NW3.3 Restore Disturbed Soils	0	<b>No Score</b>  The project does not provide any documentation indicating efforts towards restoration of any potentially disturbed soils.	*Provide documentation of soil restoration activities, areas of disturbance, and areas restored. Provide calculations showing that 100% of disturbed soils have been restored.
		Source: None	
NW3.4 Maintain wetland and surface water functions.	0	<b>No Score</b>  The project does not provide adequate documentation showing any maintenance or enhancements of wetland areas. Sufficient information is not provided to determine which and where (if any) water features are located on and near the site. Not Achieving due to NW1.2.	*Provide documentation of any maintenance or enhancement of any hydrological connections, water quality, habitat, and/or sediment transport.
		Source: Solar Pack. Programa de Medidas y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.3 to 6.4.	
	0	N/A	
30			

CLIMATE AND RISK		
	POZO ALMONTEPHOTOVOLTAIC PLANTS, CHILE	RECOMMENDATIONS
CR1.1 Reduce Greenhouse Gas Emissions	25	<p><b>Restorative</b></p> <p>The energy generated at the photovoltaic plants is projected to reduce Chile's carbon emissions by 56,000 tons of CO2 each year. A comparison to industry standards was not provided; therefore, an exact percentage of projected CO2 reductions cannot be determined. The project provides a lifecycle report in the form of a Clean Development Mechanism (CDM). The CDM makes the project net carbon negative, and thus eligible for funding as a net carbon negative project.</p> <p><u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Section 4.10.; Solar Pack. Programa de Medidas de Prevención y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.1.</p>
		<p>*Provide a detailed assessment of CO2 produced and how it compares to industry standards.</p> <p>*Provide documentation of efforts to reduce carbon emissions and calculations of percentage reductions, as calculated with available methodologies, data sources, and software.</p>
CR1.2 Reduce Air Pollutant Emissions	15	<p><b>Restorative</b></p> <p>The project does not report measurements for reduced air pollutant emissions, however, the project provides a lifecycle report in the form of a Clean Development Mechanism (CDM). The CDM makes the project net carbon negative, and thus eligible for World Bank funding. The project will reduce demand for other sources of energy that produce air pollutant emissions.</p> <p><u>Source:</u> Inter-American Development Bank. Environmental and Social Management Report, Section 4.10.; Solar Pack. Programa de Medidas de Prevención y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.1.</p>
		<p>*Provide documentation of expected emissions of the six criteria pollutants (particulate matter, ground level ozone, carbon monoxide, sulfur oxide, nitrogen oxide, lead and noxious odors) and strategies implemented to reduce air pollution to required levels.</p>
CR2.1 Assess Climate Threat	0	<p><b>No Score</b></p> <p>Project does not provide a comprehensive Climate Impact Assessment and Adaptation Plan. The project team did, however, provide an extensive report on flood threats to the project site area over a 50-year period. Climate change was not considered in that report.</p> <p><u>Source:</u> Xterrae Geología. Estudio de Inundabilidad de Parcelas para Planta Fotovoltaica, Pozo Almonte, Región de Tarapacá, Section 4.2.; Solar Pack. Memoria Técnica, Chapter 5; Obra Civil.</p>
		<p>*Provide a plan which takes into account the impacts of a changing climate on the range of operating conditions assumed in the design of the project. These changes include: sea level rise, higher ambient temperatures, increased frequency and intensity of storms, flooding, extended droughts, and more. The plan should span the design life of the project.</p>
CR2.2 Avoid Traps And Vulnerabilities	2	<p><b>Improved</b></p> <p>Project has conducted a flood vulnerability study over a 100-year timeframe. The project has assessed local regulations and standards, but has not provided plans for potential changes and design modifications to avoid traps and vulnerabilities.</p> <p><u>Source:</u> Solar Pack. Programa de Medidas de Prevención y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]); Declaración de Impacto Ambiental; Solar Pack. Memoria Técnica, Chapter 5; Obra Civil.</p>
		<p>*Provide documentation identifying and assessing possible changes in key engineering design variables.</p> <p>*Provide documentation showing 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.</p>

CR2.3 Prepare For Long-Term Adaptability	0	<b>No Score</b>	*Provide documentation on how the project prepares for long-term climate change adaptability, resilience, and adaptation.
		Project does not report any plans or designs created or implemented to prepare for long-term climate change.  <u>Source:</u> Solar Pack. Programa de Medidas de Prevención y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]), Section 6.1.	*Identify specific measures taken to address the potential consequences of long-term climate change.
CR2.4 Prepare For Short-Term Hazards	10	<b>Superior</b>	
		Project has undertaken a 100-year analysis on flooding threats to the project area. This analysis resulted in a Flooding Study completed by Xterrae Geología. The hydrological models of the study found that flood waters would not rise greater than 0.5 meters over the next 100 years. The models found that in 100 years, the flow of water in the area's stream beds would rise 0.4 meters. This coincides with ground observations by staff who have studied the area's soil. Solutions presented by the study include channelizing the flow of these stream beds to control flooding in the area.  <u>Source:</u> Xterrae Geología. Estudio de Inundabilidad de Parcelas para Planta Fotovoltaica, Pozo Almonte, Región de Tarapacá; Solar Pack. Memoria Técnica, Chapter 5; Obra Civil.; Solar Pack. Programa de Medidas de Prevención y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS]); Solar Pack. Programa de Seguridad y Prevención de Riesgos (Plan Integral de Manejo Ambiental y Social [PIMAS]).	*Provide documentation that the team has looked at other potential natural disasters, such as: wildfires, tornadoes, hurricanes, earthquakes, tsunamis and/or man-made hazards.  *Provide documentation of the specific design strategies the project will incorporate to protect against flooding and other potential hazards.  *Provide documentation of strategies used and how they minimize the risk of future hazards using environmental restoration.
CR2.5 Manage Heat Island Effects	0	<b>No Score</b>	*A 10-30% heat-producing surface reduction would result in an Improved rating for reducing heat island effects. Consider the benefits of providing these efforts.
		Project does not report any efforts to minimize heat island effects.  <u>Source:</u> None	*Provide drawings showing all non-roof, non-vegetated areas of the site and the surface material.  *Provide documentation of roof or surface areas, surface material and corresponding SRI.
CR0.0 Innovate Or Exceed Credit Requirements	0	N/A	
52			

<b>OVERALL:</b>	188	POZO ALMONTE PHOTOVOLTAIC PLANTS, CHILE
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## APPENDIX D: SOURCE LIST

DOCUMENTATION PROVIDED	
General Information.	
1.	Centro de Despacho Económico de Carga del Sistema Interconectado del Norte Grande de Chile (CDEC-SING). Informe Proyecto Informado Nos. 2 and 3.
2.	Engineering Operations and Maintenance Extracts.
3.	Inter-American Development Bank. Environmental and Social Management Report.
4.	Ministerio de Agricultura de Chile. Autorización Cambio Uso Suelo SPV2.
5.	Ministerio de Obras Públicas de Chile. Resoluciones de la Dirección Regional de Vialidad
6.	Ministerio de Salud de Chile. Resoluciones de la Dirección Regional de Salud.
7.	Solar Pack. Chilean International Renewable Energy Congress, Case Study: Solar PV
8.	Solar Pack. Declaración de Impacto Ambiental
9.	Solar Pack. Memoria Técnica, Chapter 4
10.	Solar Pack. Plan de Calidad, Version 2
11.	Solar Pack. Programa de Manejo de Residuos (Plan Integral de Manejo Ambiental y Social [PIMAS]).
12.	Solar Pack. Programa de Medidas de Prevención y Mitigación Ambiental (Plan Integral de Manejo Ambiental y Social [PIMAS])
13.	Solar Pack. Programa de Relaciones Comunitarias (Plan Integral de Manejo Ambiental y Social [PIMAS])
14.	Solar Pack. Programa de Seguridad y Prevención de Riesgos (Plan Integral de Manejo Ambiental y Social [PIMAS])
15.	Solar Pack. Stakeholders Table (“Tabla Stakeholders”)
16.	Xterrae Geología. Estudio de Inundabilidad de Parcelas para Planta Fotovoltaica, Pozo Almonte, Región de Tarapacá
17.	Yingli Solar. Yingli Green Energy, 2013 Corporate Sustainability Report