

UCUQUER WIND FARM, PHASES I AND II
CHILE



Figure 1: Ucuquer Wind Farm, aerial view
Sources: Energías Ucuquer, SA.

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EXECUTIVE SUMMARY

The Ucuquer Wind Farm (Phases I and II) is a unique and groundbreaking project. It has transcended standard sustainability practices within its main objective of enlarging renewable energy production, fulfilling categories of the Kyoto Protocol.

The Ucuquer Wind Farm is a project of Energías Ucuquer S.A. (Ucuquer Energy), a company committed to sustainability objectives in the execution of unconventional renewable energy projects in Chile. Since 2009 one of those projects has been the Ucuquer Wind Farm, located near the Rapel River and its hydroelectric plant. The project team's leadership was outstanding, as it is an innovative project in the Chilean context.¹ This project is aligned with Chile's national energy policy, which in 2010 set a requirement that 5% of the country's electrical power must be produced through renewable resources. The Ucuquer Energy team excelled in visualizing, analyzing, and communicating the site's energy potential, as well as in introducing the technological development required. The project includes ultra-low wind speed turbines manufactured and operated by Envision Energy, China's leading wind turbine manufacturer.

Despite the strong leadership found in the project, specific mechanisms or business processes could be further improved for managing the project's sustainability issues, impacts, and opportunities. It is suggested to provide more information about leadership roles, responsibilities, and authority. Ucuquer Energy is still a small enterprise, but it is highly recommended to establish protocols, measurements, and documentation for strengthening the company's sustainability practices.

Ucuquer Wind Farm is located in a rural property in the town of Matancilla, in Litueche district in the VI Libertador General Bernardo O'Higgins Region of Chile.² The project was carried out in two phases, with a total cost of US \$36 million, and was completed in August 2015. Phase 1 began on October 17, 2011 and initiated operations on October 4, 2012, requiring US \$15 million in investment.³ It is expected to have a lifespan of 30 years of operation, though its useful lifespan might be indefinitely prolonged with appropriate maintenance and advancements in technology. The wind farm will feed energy into Chile's main alternating current power grid, the Sistema Interconectado Central. The project installed ultra-low wind speed turbines, introducing technological innovations. The project was developed in record time, leveraging economies of scale and efficiencies in logistics.

¹ Luis Ljubetic Villanueva, "Declaración de impacto ambiental Parque Eólico Ucuquer," Chile, 2011, 8.

² Ibid., 11.

³ Ibid., 15.

Being located in a rural area with no close human settlements, the project does not directly affect or interact with nearby communities. It also concentrates development inside of the project's land, which has not been designed to be inhabited but will be operated remotely. The project's challenges go beyond the community scale, largely incorporating environmental goals. It provides sustainable growth and development at a regional scale, representing an opportunity for energy growth. No specific community linkages have been found, nor major local stakeholders.

The technological innovations implemented in the project will also lead to minimizing noise and vibration generated in the wind farm's construction and operation phases. The project takes advantage of existing highway infrastructure from the Rapel Dam, attenuating environmental impacts and investment costs.

Ucuquer Energy specifies two types of interventions. One of these is associated with the installation of nine turbines, the electric substation, and the transmission line. The other type is associated with earth movements for the configuration of interior roads. The project's material sources vary from on-site earth and gravel to concrete and steel coming from regional sources and wind turbines coming from China. Excavation by-products were reused for constructing wind generator foundations and for leveling roads inside the project.

Waste management strategies have been stated in the environmental impact assessment for construction and operation phases. A specialized company will manage waste according to Chile's laws. The project team did not provide complete information about materials synergies, life cycle analysis, or net embodied energy; therefore, credits couldn't be completely evaluated for these areas. On the other hand, Ucuquer Wind Farm not only reduced energy consumption inside the project (having 0% consumption) but will also create renewable energy for the next 30 years. Monitoring and maintenance are performed remotely, reducing energy and water consumption. Moreover, the wind farm does not affect the availability, quantity, or quality of freshwater, as it does not interfere with or modify either groundwater or surface water. No potable water will be consumed or used in the wind farm. As a result the environmental impacts are considered to be low.

Ucuquer Wind farm is located in the hills of Chile's Coastal Range. The site includes numerous hills and ravines with native vegetation. Current conditions show intense agricultural activity along with zones of ravines and rivers with native vegetation.⁴ The site is located adjacent to the Rapel River, the Rapel hydroelectric plant, and lakes and streams surrounded by forest. An ecological analysis developed by the project team shows existing animal and vegetation

⁴ Alvaro R. Tomé, "Informe paisaje. Parque Eólico Ucuquer, Rapel, VI Región," Chile, 2011, 8.

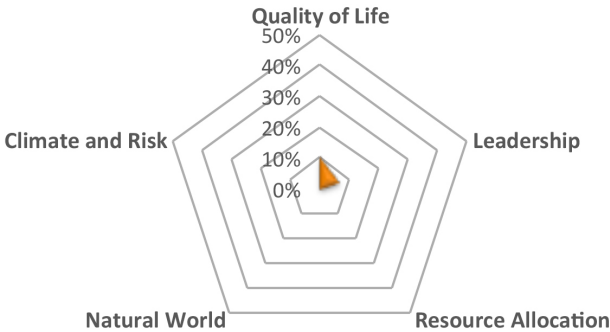

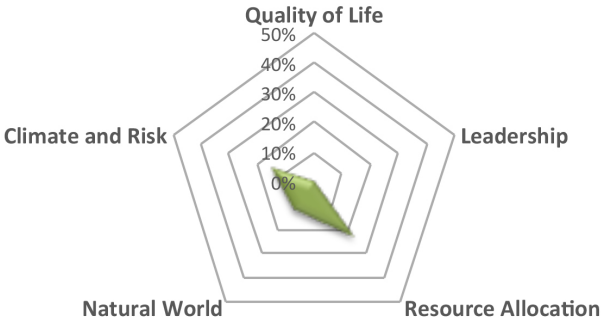

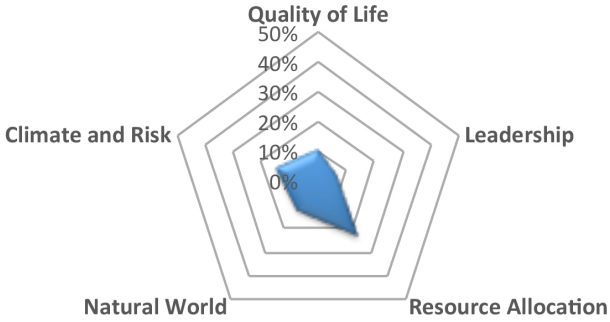

habitats. Biodiversity studies show that most of the native species on the site have been influenced by direct or indirect human activity, such as erosion and overgrazing as well as fires. The wind farm's area of intervention in direct contact with prime habitats is proportionally small, only 4.3% of the total site. Therefore, the project did not produce any relevant impact on them. Habitat restoration for degraded areas is part of the project owner's long-term vision. The remaining 95.7% of the project's surface area will be dedicated to restoring forest and enhancing agriculture.

During the construction phase, recognizing the ecological importance of the area, the wind farm did not interfere with surface water functions or other existing natural habitats, and it did not produce any surface or groundwater pollutants. According to Chile's VI Region's laws, the project includes environmental regulations, but buffer zones have not been pursued in areas close to the Rapel River, and neither a hydrological or stormwater assessment nor operational policies for controlling the application of pesticides and fertilizers have been developed.

Ucuquer Wind Farm is one of Chile's pioneering nonconventional renewable energy projects. Its actions are deeply connected to efforts to reduce greenhouse gas emissions. The project has expanded its lifespan from 20 to 30 years, maximizing the efficiency of the intervention. This accomplishment gives the project team the possibility of planning long-term adaptive measures for the site. No life cycle carbon assessment, climate impact assessment and adaptation plan, or long-term adaptability studies have been conducted yet. All are crucial for the future of the site and the development of these studies has been recommended to the project team. However, the project's design allows it to undertake certain actions and programs for long-term planning, as its intervention directly affects only 4.3% of the site. The remaining area has been designated for forest and agricultural activities, avoiding the use of non-permeable surfaces, reducing heat island effects, and aligning with future restoration projects. The project is located in a rural area; therefore, most of the adaptation strategies would refer to ecological restoration activities and other environmental programs.

Considering that Chile is an earthquake-prone region, the project team has taken a lead on short-term hazards. Wind turbine foundations have been designed according to earthquake-proof structural norms. Finally, the project has been successful in accomplishing its goals through leadership commitment to sustainability objectives and innovation. Ucuquer Wind Farm is a pioneering project in Chile's VI Region. Being one of the first projects to implement sustainable measures, it stands as a foundation for nonconventional renewable energy projects and will have a positive impact on Chile's expansion in this field. Yet, as Ucuquer Energy is a small-scale enterprise, it has not developed thorough studies for achieving high sustainability standards. Documenting and developing long-term climate adaptation plans in this area could result in great benefits, as could other studies such as life cycle analysis of material sources.

It is highly recommended to develop monitoring and evaluation systems for analyzing environmental impacts. The project takes advantage of the site's strategic location near the Rapel Dam; therefore, it has not produced more impact on the surrounding landscape. One of the project's main assets is the possibility of incorporating an ecological restoration project, enhancing agricultural and forestry activities. This action can incorporate economic and social development for the region and restoration of degraded habitat caused by problems in the area. Finally, the project's best opportunity for further achievement is to consolidate standards and best practices that might influence other future projects in Chile's VI Region.

	
Figure 02: People & Leadership award	
	
Figure 03: Climate & Environment award	
	
Figure 04: Infrastructure 360 award	