PUNTA DEL TIGRE COMBINED-CYCLE POWER GENERATION PROJECT

Uruguay

An application of the Envision™ methodology for infrastructure sustainability

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Cover picture: Ongoing works of the combined-cycle power plant. (Source: Curbelo, Rafael. Email correspondence. October 30, 2015)

EXECUTIVE SUMMARY

This evaluation applies the Envision™ Rating System on the Punta del Tigre Combined-Cycle Power Generation Project B (PTB) in Uruguay. Envision is a unique system that assesses the sustainability of infrastructure projects, which awards efforts to pursue sustainable values going beyond standards practices. The following assessment demonstrates the achievements of the project and aspects to improve, considering a broad range of criterion. The assessment is organized in 5 categories: Quality of life; Leadership; Resource Allocation; Natural World; and Climate and Risk.

The PTB is a public project developed and run by the Uruguayan National Administration for Power Plants and Electrical Transmissions (UTE). The project's general objective is to satisfy the growing demand for electrical energy, and contribute to diversifying the country's energy matrix by complementing it with renewable energy sources. The total cost of the project is estimated at between US $440 million and $550 million, with US $200 million funded through a loan from IDB. [1] The project's development started in 2011, and it is currently in the initial stages of construction. [2]

At the time of the project's planning, around half of Uruguay's installed generation capacity was hydroelectric, and the country had reached its maximum capacity for development of large-scale hydraulic plants. Wind energy was also being promoted at the time. Because they depend on fluctuating natural sources of energy (both wind and hydroelectric generation are subject to fluctuations in their output) in order to guarantee the supply of electricity during periods of low wind or rainfall, UTE proposed the development of PTB as a combined-cycle generating plant, which was presented as the thermal generation solution with the greatest efficiency and lowest environmental impact. In particular, combined-cycle plants complement wind and solar power because they present rapid response times, and thus are capable of offsetting fluctuations in the renewable power supply.

The project is located by the Plata River, where the 300 MW Punta del Tigre Power Generation Project A (PTA) is already built and in operation. The new plant's capacity is 530 MW and is expected to increase Uruguay's total generation capacity by between 13.4% and 18.6%.[3] The overall project comprises certain complementary works, which include a public park, improvements to existing roads, and a housing project plus fishing facilities to relocate a fishing community living in precarious conditions.

PTB presents a remarkable performance in matters related to quality of life of the affected communities, considering the well-being of individuals as well as of the larger social fabric as a whole. Several factors contribute to this achievement. First, the project offers a reliable energy supply while decreasing energy demand and air pollutants, in line with the needs and goals of Uruguay's development; second, the project stimulates growth and development by improving socioeconomic conditions at national and local levels; and third, the project team identified and incorporated community needs and goals. PTB has featured substantial engagement with the community from the early planning stage of the project.

The consideration of community concerns and inputs is exemplified by the development of the 4,000 m2 Colonia Wilson public park that increases livability and the Calcagno road realignment and lighting that allow for better accessibility.[4] Another significant

[1] UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B, 1, 3; Document of the Inter-American Development Bank (IDB). Resolution DE-225/12. December 2012 (2012).
[2] Cabal, Claudia. Interview by Beatriz Porcar. Phone Interview. August 27th, 2015.
[3] UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B, 3.
[4] MVOTMA, UTE, San Jose, Comision de seguimiento central térmica Punta del Tigre. Convocatoria de reunión 27 junio 2014 (2014); Comisión de Seguimiento de la Central Térmica de UTE de Punta del Tigre, Acta de la 7ª Reunión (2006); Comisión de Seguimiento de la Central Térmica de UTE de Punta del Tigre, Acta de la 3ª Reunión (2007); Dirección Nacional de Medio Ambiente (DINAMA), Notificación resolución ministerial de la Dirección Nacional de Medio Ambiente (DINAMA) No 1591/2014 - 30/12/2014, (2014); UTE, Pliego de condiciones particulares. Seccion III: Licitacion Publica P43025 - Proyecto y obra para la construcción del parque público de Colonia Wilson; UTE, Presentación: PTB – Proyecto obras anexas a la central.

result of the strong community engagement was the resolution of a social conflict encountered by the project team in the area. The temporary and irregular occupation of fishing groups on the coast was a source of conflict with the permanent community, which is dedicated to farming activities. To deal with this social conflict, the project team made efforts to develop dialogue among all stakeholders involved and proposed a solution considering new housing for fisherman and fishing facilities that would enhance local production and improve community social conditions.

An Environmental Impact Assessment (EIA) required by regulations was carried out during 2011-2013[5] , including an analysis of impacts to the local population and the environment. Among other things, the EIA considers studies to preserve cultural and archaeological heritage and landscape views. To preserve the views and local character, the EIA proposed several mitigation actions, including the implementation of a buffer zone and forest barriers allowing better integration of the project in the landscape of the area; analysis of the existing landscape and particularly the topographic profile and dimensions; the artificial reconstruction of existing landscape by reshaping artificial dunes; improving the green curtain; improving the quality of habitat; and the protection of the wetland edge areas allowing development of high-yielding vegetation.

Opportunities still remain to improve the overall quality of life of the community, including initiatives to encourage public transportation and nonmotorized transit, measures to prevent light spillage and glare from the plant facilities, actions to implement a clear signage design to promote safety, and programs to hire and train locally beyond the construction work. Regarding the integration of vulnerable groups and especially women, it should be noted that UTE created a gender equality commission after the start of the construction contract; however, PTB should assure that this commission will affect future stages of the project, bringing further opportunities to promote women's economic empowerment by providing job creation, capacity building, and training groups.

The project's significant achievements in improving the quality of life of the affected communities stems in part from the project team's emphasis on collaborative leadership, with a strong commitment to principles of sustainability, considering inputs from a wide variety of stakeholders, providing appropriate management, integrating the existing and new infrastructure, and presenting long-term plans for monitoring and maintenance. Specifically, UTE manifests substantial public commitments to the principles of sustainability. These statements extensively address environmental issues; commitments to social aspects of sustainability are presented to a lesser extent. In addition, UTE presents an annual report addressing achievements of its sustainability goals and an overall management policy that identifies, implements, and monitors sustainability targets.

Potential improvements in relation to leadership performance include: additional statements and policies addressing social aspects of sustainability; identifying unwanted by-products from nearby facilities and their possible use in this project; efforts to change standards that involuntarily create obstacles to sustainability; and consideration of a more durable and flexible design to extend the useful life of the project.

The project demonstrates awareness of the sustainable use of resources. First and foremost, UTE preferred combined-cycle technology due to its improved energy efficiency compared to conventional power plants. Specifically, PTB reduces about 30% the energy required to produce the same amount of electricity in a conventional gas turbine plant.[6] The water needed to operate the existing power plant (PTA) is extracted from the Raigon aquifer, which

[5] Cabal, Claudia. Email correspondence. January 11, 2016.
[6] MVOTMA - Dirección Nacional de Medio Ambiente (DINAMA) – Division Control y Desempeno Ambiental, Solicitud de Autorización de Desagüe Industrial, PTB (2013), 8; MVOTMA - Dirección Nacional de Medio Ambiente (DINAMA) – Division Control y Desempeno Ambiental, Solicitud de Autorización de Desagüe Industrial, PTA (2007), FH-5; Cabal, Claudia. UTE. Email correspondence. October 1, 2015.
[7] Cabal, Claudia. Email correspondence. January 11, 2016; Curbelo, Rafael. Interview by Beatriz Porcar. Phone Interview. January 27th, 2016.

is a potable water source largely used by the local community. To protect potable water resources, the plant has been modified during 2014-2015 to extract the required water for its operations directly from the Plata River.[7] On the other hand, the cooling water at the PTB plant will be discharged to the river, which can be a source of water pollution by altering the ecosystem; therefore, a detailed simulation and long-term monitoring of the effect of the power plant intake and discharge on the river was undertaken by the project.

As regards the use of materials, the project demonstrates a remarkable effort in balancing cut and fill to avoid taking excavated materials off site. Nevertheless, much room for improvement exists regarding the sustainable use of materials; among them, the project team might consider estimates of the net embodied energy of key materials utilized in all phases of the project. Also, efforts can be undertaken to incorporate locally sourced and recycled materials, and the project can support sustainable procurement practices by obtaining materials and equipment from suppliers that implement sustainable practices. In the future, a comprehensive waste management plan to divert project waste streams from disposal through recycling and reuse can be implemented during the operational phase of the project.

Specific actions are implemented by the project team to improve the conservation of the natural world and minimize the project's impacts on the environment. These actions contribute to preserving greenfields and surface and groundwater, controlling invasive species, restoring soils disturbed during construction, avoiding adverse geology and minimizing erosion of slopes. In particular, PTB conserves undeveloped land to some extent, since the plant itself is located in a previously developed greyfield; however, the complementary works, which constitute half of the project area, are located in greenfields. To prevent surface water contamination, this project focuses mitigation efforts on the increased temperature of the water which is discharged to the Plata River. In the reforestation at the coastal Wilson public park, native species are identified and a selection of those are planted, preventing the need for pesticides and fertilizers as well as avoiding invasive species. In order to avoid adverse geology, the project's EIA presents a study of the geomorphology of the site. With regard to risks of erosion and landslides, the coastal dunes were affected by the construction work, but the project is designed and constructed to minimize erosion in the dunes and considers a monitoring program.

Opportunities remain to improve other aspects in relation to project siting, land and water protection, and biodiversity. Especially, PTB is located in immediate proximity to flood-prone areas, which constitutes an adverse geological feature, and a coastal saline wetland of natural and conservation interest is affected by the project. For future projects, it is recommended that site selection criteria include avoiding adverse geology and prime habitat with high ecological value. Since farmlands constitute 3.1% of the project site, the project team should consider protecting this valuable type of soil by creating a vegetation and soil protection zone.[8]

The project team should also consider measures to increase the infiltration and evapotranspiration capacity of the site to reduce the project's impact on quality and quantity of stormwater runoff. Additional recommended actions to preserve species biodiversity are detecting possible movement corridors between habitat areas and active measures to control invasive species that are already on site.

Concerning climate and risk, PTB is prepared for short-term risks produced by natural and human factors, but further efforts should be made to address risks related to long-term climate change. It should be highlighted that PTB's natural gas combined-cycle technology CO2 emissions are about 20% lower than those of conventional natural gas power plants and 40% lower than those of most coal-fired power plants, thus reducing its overall greenhouse effect.[9]

[8] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 36.
[9] J.A. de Gouw1 , D.D. Parrish, G.J. Frost1 , M. Trainer, Reduced Emissions of CO2, NOx and SO2 from U.S. Power Plants Due to the Switch from Coal to Natural Gas with Combined Cycle Technology ("Earth's Future" - a journal of the American Geophysical Union, Jan. 8, 2014).

Regarding the project's ability to endure or adapt to long- and short-term changes, PTB has produced a study identifying risk factors for accidents that may be caused by short-term hazards. In particular, the project presents a thorough analysis of wave, wind, and current extreme regimes for the PTB site, carried out during the planning stage. The contractor was required to prepare an action plan to deal with emergency problems related to security and safeguard the integrity of the facilities, as well as an action plan for environmental contingencies. Considerable opportunities exist for improving the resilience of the project. The most important are avoiding configurations vulnerable to extreme weather events and incorporating measures to minimize floodplain impacts by restoring predevelopment floodplain storage capacity. Also, a comprehensive climate impact assessment and adaptation plan should be implemented, including changes in weather patterns and sea level.

In conclusion, PTB presents its largest achievements in topics related to the community's quality of life. The project responds to Uruguay's increasing energy demand promoting growth and development, having into consideration sustainability goals. UTE calls for a strong engagement of stakeholders and shows a large consideration for the views of the local community from the planning stage, as significantly exemplified by the development of the Colonia Wilson public park, the Calcagno road realignment, and the fishermen's housing project and fishing facilities. The EIA identifies a whole range of possible social and environmental impacts of the project and presents mitigation actions for the key impacts, which include extensive analysis and actions to preserve archaeological resources and local landscape, with special attention to the coastal dunes and water resources. The project's significant attainment in quality of life comes as a result of a substantial effort presented by the project team to realize a model of collaborative leadership, with a strong commitment to the principles of sustainability, and appropriate management to provide infrastructure integration. Further improvements can be achieved by concrete actions in this project to integrate and enhance the quality of life of vulnerable groups of the population, especially women.

Regarding the use of resources, conservation and protection of the natural world, and protection for short-term hazards and long-term changes, the project presents a scattered performance. Considerable achievements are attained in specific areas, while opportunities for improvement exist in others. Remarkable achievements include the reduction of energy consumption and CO2 emissions compared to conventional power plants; the reuse on site of all the excavated material; efforts to conserve and monitor water resources, avoiding extracting water from the local potable aquifer and including a long-term monitoring program for the water discharged in La Plata River; a study of indigenous species for reforestation of Wilson Park that are not expected to require pesticides or fertilizers; and plans to prepare for short-terms hazards and protect the investment. However, several opportunities for improvement remain, containing increasing the sustainable use of materials; addressing a broader scope of criteria for project siting; implementing programs to preserve species biodiversity and control invasive species; and assessing the effects of climate change, such as rising sea levels and extreme weather events, so as to improve project's resiliency and avoid failures of systems that can cause devastating consequences for the communities that rely on the project's energy production.

1 PROJECT DESCRIPTION AND LOCATION

The thermoelectric energy project Punta del Tigre Combined-Cycle Power Generation Project is a public project developed and run by the Uruguayan National Administration for Power Plants and Electrical Transmissions (UTE)[10], a governmental agency which aims to sustainably guarantee the electrical supply of Uruguay. The total cost of the project is estimated at between US $440 million and $550 million. The Inter-American Development Bank (IDB) has agreed to lend UTE up to US $200 million toward the construction of the project, with the government of Uruguay as a guarantor in the transaction.[11]

The project's general objective is to satisfy the growing demand for electrical energy, and contribute to diversifying the country's energy matrix by promoting renewable energy sources. The project's development started in 2011 and is currently in the initial stages of construction; it's expected to begin the combined-cycle operation in 2017.[12]

The project construction site that occupies 12-hectare is located on a 500-hectare UTE-owned property that includes buffer zone, in a rural area about 40 km northwest of the city of Montevideo.[13] The site is by the Plata River, where the 300 MW Punta del Tigre Power Generation Project A (PTA), operated by natural gas and diesel, is located. This plant supplies the transmission lines, polyduct, and gas pipeline needed in the new project.

The new plant's capacity is 530 MW, and the overall project comprises certain complementary works, which include the Colonia Wilson public park, a road realignment project, and new fishermen's housing and facilities. The Colonia Wilson park is a 4,000 m2 public park located on a UTE property in a coastal area in the Department of San Jose, with various recreational spaces, such as a coastal lookout, pedestrian paths to the beach, and a basketball court. The Camino Calcagno path realignment focuses on improvements to the existing road, such as drainage, paving, and signaling. The fishermen relocation project entails housing construction, a new designated fishing area, and the upgrading of the Los Pescadores path.

In 2011 Uruguay's national electricity network was supported by an installed generation capacity of around 2,692 MW[14]. When completed, the Punta del Tigre Combined-Cycle Power Generation Project is expected to increase the total generation capacity by 13.4% to 18.6%.[15]

At the time of the project's planning, 57.1% of Uruguay's installed generation capacity was hydroelectric, 10.4% originated from other renewable sources, and 32.5% was thermoelectric. It was also expected that annual growth in generation would be 3.8%.[16] Uruguay has reached its maximum capacity for development of large-scale hydroelectric plants. During years of normal rainfall or more, hydroelectric power is able to supply a large percentage of total electricity demand (during the period from 2001 to 2010, hydroelectric energy accounted for a minimum of 43% in 2006, and a maximum of 98% in 2001, of total energy demand). [17] However, in low rainfall years the ability to use thermal power generation is critical, as the hydroelectric system depends on a robust hydrological basin.

[10] Administración Nacional de Usinas y Trasmisiones Eléctricas (UTE)
[11] Document of the Inter-American Development Bank (IDB). Resolution DE-225/12. December 2012 (2012).
[12] Cabal, Claudia. Interview by Beatriz Porcar. Phone Interview. August 27th, 2015.
[13] Cabal, Claudia. Email correspondence. January 11, 2016.
[14] UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B, 1.
[15] Ibid., 3.
[16] Ibid., 1.
[17] Ibid., 1..

Additionally, nonconventional renewable energy sources were expected to increase in capacity when the project was planned. In particular, wind energy was being promoted at the time, with an expected increase of 460 MW to bring the total installed wind energy capacity to 500 MW by 2015. [18] Worth noticing that at present, the total installed wind energy capacity is over 800MW. [18] In order to guarantee the electricity supply during periods of low wind or rainfall, a firm, reliable, and responsive generation capacity is required. In this context, UTE proposed the development of the Punta del Tigre Combined-Cycle Power Generation Project, which was presented as the thermal generation solution with the greatest efficiency and lowest environmental impact.

Combined-cycle plants are highly efficient because they combine combustion turbines and steam turbines; the exhaust heat from a gas-fired combustion turbine is used to create steam to power a steam turbine. A typical natural gas combined-cycle power plant has a heat rate (i.e., the amount of fuel used per unit of electricity generation) that is about 30% lower than for a combustion turbine or gas-fired steam turbine plant.[20] Combined-cycle plants also complement wind and solar power because they present rapid response times, and thus are capable of offsetting fluctuations in the renewable power supply. In addition, combined-cycle plants emit significantly less emissions of carbon dioxide (CO2), sulfur dioxide (SO2), nitrogen oxides (NOx), and other types of air emissions than most conventional power plants. CO2 emissions from power plants using natural gas combined-cycle technology are about 20% lower than natural gas power plants and 40% lower than those of most coal-fired plants.[21]

2 APPLICATION OF THE ENVISION RATING SYSTEM

Punta del Tigre Combined-Cycle Power Generation Project, Uruguay

The Envision™ system is a set of guidelines that aid in optimizing the sustainability of an infrastructure project during the planning and preliminary design phases, as well as a means to quantify the relative sustainability of the project. In this case study, the infrastructure to be assessed is the Punta del Tigre Combined-Cycle Power Generation Project, Uruguay.

Envision consists of 60 credits [22] 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 whether the qualifications for each level of achievement have been met for a particular credit. In each of the five categories there is a special credit called "Innovate or exceed credit requirements." This is an opportunity to reward exceptional performance that applies innovative methods within the subjects that Envision

[18] Ibid. 2.
[19] Cabal, Claudia. Email correspondence. January 11, 2016.
[20] Center for Climate and Energy Solutions (C2ES), http://www.c2es.org/technology/factsheet/natural-gas.IDB. *Informe de Gestión Ambiental y Social, ESMR, Programa de Interconexión Eléctrica del Norte Grande* (March 2006), 7, 13, 20.
[21] J. A. de Gouw, D. D. Parrish, G. J. Frost, and M. Trainer, Reduced Emissions of CO2, NOx and SO2 from U.S. Power Plants Due to the Switch from Coal to Natural Gas with Combined Cycle Technology ("Earth's Future", a journal of the American Geophysical Union, January 8, 2014).
[22] Plus 3 new credits of the Vulnerable Groups subcategory

evaluates.

The criteria for the levels of achievement vary from credit to credit, but generally an "improved" level of achievement is awarded for performance that slightly exceeds regulatory requirements. "Enhanced" and "superior" levels indicate additional gradual improvement, while "conserving" often indicates performance that achieves a net-zero or neutral impact. "Restorative" is the highest level and is typically reserved for projects that produce an overall net positive impact. The Envision system weighs the relative value of each credit and level of achievement by assigning points. Credit criteria are documented in the Envision Guidance Manual, which is available to the public on the ISI [23] and Zofnass Program [24] websites.

3 QUALITY OF LIFE CATEGORY

Envision's first category, Quality of Life, pertains to potential project impacts on surrounding communities and their well-being. More specifically, it distinguishes infrastructure projects that are in line with community goals, clearly established as parts of existing community networks, and consider long-term community benefits and aspirations. Quality of Life incorporates guidance related to community capacity building and promotes infrastructure users and local members as important stakeholders in the decision-making process. The category is divided into three four subcategories: Purpose, Well-being, Community, and Vulnerable Groups.

Purpose

The Purpose subcategory addresses the project's impact on the overall quality of life for the host and affected communities, looking at the extent to which these communities were involved in the three project phases, how well their needs and goals were identified and considered, as well as sustainable community growth and development, including expanding local skills and capacity. In the case of Punta del Tigre power plant B (PTB), the community has been substantially involved in the project and its inputs affected the project plan considerably, including creating and improving local operational and recreational capacity. Further actions could be taken to hire local (with an emphasis on disadvantaged groups), and expand their skills in order to improve their ability to develop.

Regarding the effect of the project on local communities, from the earliest planning stage PTB has largely reinforced an existing monitoring committee, whose mission is to channel communication between local representatives of the community and the project team. Minutes of meetings held every fifteen days are documented, dating from 2006. [25] Also the Environmental Impact Assessment (EIA) required by Uruguayan regulations, carried out in 2011, includes interviews with these communities showing specific concerns as well as mitigation proposals. [26] The community inputs are incorporated into the project, being significantly exemplified by the development of the Colonia Wilson public park, the Calcagno road realignment (which gives better access for people and a chance for increased local productivity), and the construction of fishermen's new housing and facilities. [27] All of these actions contribute to the

[23] www.sustainableinfrastructure.org
[24] www.zofnass.org
[25] Comisión de Seguimiento de la Central Térmica de UTE de Punta del Tigre, Acta de la 7ª Reunión (2006).
[26] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre - Tomo III: Anexos (2011), Annex V-9.

sustainable growth and development of the local community. Moreover, at a national level the project responds to Uruguay's increasing energy demand having in to account sustainability goals, as reducing emissions of pollutants, thus improving its overall socioeconomic development.

In relation to the development of local skills and capacities, hiring and training are done as required by applicable regulations. Further efforts to identify local training needs, consider programs to hire and train locally while emphasizing disadvantaged groups, and include local firms in all phases of the process would ensure that the project contributes to a meaningful, long-term development of the community where it is located.

Well-being

The Well-being subcategory looks at how sustainable infrastructure addresses individual comfort, safety, health, and mobility, looking at aspects such as noise and vibration, light pollution, public and/or nonmotorized transport, and wayfinding. These matters should be approached having taken into account community participation and input. The project presents an ad hoc performance in relation to this subcategory. It should be noted that the project team has been substantially collecting and considering concerns and suggestions from the community by means of regular meetings which focus on some of the aforementioned matters. Specifically, mobility has been properly enhanced, and measurements and predictions of noise levels have been carried out. In addition, supplementary training has been provided with regard to the health implications of the combined-cycle technology, which is still new in Uruguay. To achieve higher levels of achievements in this category, further actions should be implemented with regard to light pollution, alternative modes of transportation, as well as safe site access and wayfinding, in ways that exceed current standards and common practices.

Regarding mobility improvement, considerable efforts were carried out to upgrade and construct pathways and roads, having considered input from the community. Specific actions to enhance mobility include upgrading Calcagno road, creating a new road for the relocated fishing settlement, establishing a new road during construction to alleviate construction traffic, as well as improvements to road lighting, pavement, and signage. [28] To minimize noise and vibration, analyses of existing and predicted levels of noise and vibration during operations have been undertaken, and mitigation actions have been incorporated, such as buffer zones and green barriers. The undertaken analysis concluded that PTB does not significantly increase the noise level above that already coming from PTA. [29] The noise level was also monitored during construction. [30] Regarding the health and safety implications of the new combined-cycle power plant, overall these aspects have been managed by common techniques applied to conventional thermal plants. Nonetheless, this type of plant is not common in Uruguay. Additional education for personnel is proposed by the Environmental Impact Assessment (EIA) which includes health and safety awareness and mitigation measures; as well as recognition of the different roles to be assumed during various emergency situations.[31]

Further actions could be implemented to increase the level of achievement in this subcategory. In particular, in order to prevent light spillage and glare, the project team might consider conducting an overall assessment of the lighting needs for the project, and include measures to minimize light pollution. Also

[27] Dirección Nacional de Medio Ambiente (DINAMA), Notificación resolución ministerial de la Dirección Nacional de Medio Ambiente (DINAMA) No 1591/2014 - 30/12/2014, (2014); UTE, Presentación: PTB – Proyecto obras anexas a la centra; UTE, Parque Publico Colonia Wilson: Memoria descriptiva; UTE, Pliego de condiciones particulares. Seccion III: Licitacion Publica P43025 - Proyecto y obra para la construcción del parque público de Colonia Wilson; Administración Nacional de Usinas y Trasmisiones Eléctricas (UTE), Proyecto de relocalización de los pescadores - viviendas - Punta del Tigre, San José: Memoria descriptiva (2013).

[28] Dirección Nacional de Medio Ambiente (DINAMA), Notificación resolución ministerial de la Dirección Nacional de Medio Ambiente (DINAMA) No 1591/2014 - 30/12/2014, (2014); UTE, Presentación: PTB – Proyecto obras anexas a la central.

[29] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 8, 9, 61, 74-78, 88, 89, 92, 94, 95; UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre - Tomo III: Anexos (2011), Annex V2.

[30] Recopilación de datos de monitoreo de ruido, 2012-2015.(2013).

[31] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 99, 100.

the project could implement actions to encourage public transportation and nonmotorized transit, coordinating linkages between the different modes of transportation, and enhance pedestrian access to multimodal transportation facilities. For safe access and wayfinding, it is possible to think of increasingly clear, identifiable, and intuitive design and signage, above common standards.

Community

The intent of the Community subcategory is to respect the project surroundings through context-sensitive design that preserves historic and cultural resources, views, and local character and enhances public space. The project presents significant achievements in these matters. Substantial efforts have been undertaken to analyze and preserve archaeological and cultural potential as well as local landscape. Also, public spaces are created having into account interests and suggestions from the community.

With regard to landscape, historical, and cultural resources, large coordination efforts were necessary between UTE, and local officials, agencies, and the community. First, an archaeological heritage study of the site is presented in the Environmental Impact Assessment (EIA), identifying the site as an area of high archaeological potential. [32] As a consequence, during construction extensive archaeological monitoring was performed. [33] It found no relevant archaeological assets to preserve. The Location Environmental Viability Assessment cited in the EIA explored in detail the presence of assets of cultural interest. Here also, no cultural resources were identified that would be affected by the project. Regarding local views affected by the project, an evaluation and planned mitigation actions are presented as part of the EIA. These include protection of dunes and wetlands as well as the implementation of the buffer zone and forest barriers, allowing better integration of the project into the landscape. [34] Moreover, public spaces are created and enhanced, including construction of the Colonia Wilson public park, upgrading of the Colonia Wilson school and sports facilities, and new housing for the fishermen.

To further improve achievement in this subcategory, additional evidence should be provided of the extent in which the housing project respects and incorporates the local character. Also, minutes of meeting or reports exploring possible negative impacts of the relocation on the fishermen's families, as well as difficulties in management or maintenance and mitigation actions, would contribute to the aim of this subcategory.

Vulnerable Groups

The Vulnerable Groups subcategory addresses the extent to which the infrastructure contributes to enhancing the quality of life of woman and diverse groups. This analysis takes into account that infrastructure projects are able to bring valuable opportunities to the surrounding communities in the form of jobs, capacity building, education, and improvements in accessibility for all members of the community. In this regard, UTE created a gender equality commission. The commission is working in various fields concerning gender equality and equal staff opportunities. Among the efforts, a gender equality clause was signed and included in the collective labor agreement. There have also been efforts to build the capacities and raise awareness within the staff to promote an organizational culture free of gender stereotypes. [35] However, this commission was formed after the start of the construction contract, and no indications are offered on how the interests of women have been identified and addressed in the PTB project or on the gender share of jobs created during design and construction. Therefore, it is recommended to consider meetings with stakeholders and representatives from these groups, integrate processes for collecting information

[32] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 47, 65, 92.
[33] UTE, Plan de Gestión Ambiental de Construcción (PGAC): Obra de toma y emisario, Central Térmica de Ciclo Combinado Punta del Tigre B (PTB). Gerencia Medio Ambiente - Generación Térmica (2013), Annex III 125-166.
[34] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 41-45, 61, 63-65, 89, 90-92, 94, 95.
[35] UTE gender equality commission http://portal.ute.com.uy/observatorio-de-g%C3%A9nero.

regarding these groups, and incorporate their input into the project design by providing the necessary instances and mechanisms to address their concerns. Furthermore, plans should be developed to increase women´s empowerment and involvement in the project or other ways in which the project could benefit local women. The identification of training needs could indicate the best educational programs to promote the growth and development of women and others, promoting their integration into the workforce.

Finally, besides the efforts made in providing road improvements and lightning which benefit the overall community, specific actions should be considered to identify and address the different patterns of mobility of women and diverse communities, and to adapt or modify the overall project in order to promote the safety and eliminate mobility barriers that limit accessibility for women and other groups.

4 LEADERSHIP CATEGORY

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

Collaboration

Successful sustainable projects require pioneering paths of leadership and commitment as well as additional collaborative ways of managing the process, strongly involving communities and stakeholders. The Collaboration subcategory evaluates to what extent these ideas have been incorporated. The PTB project team presents a remarkable involvement with the local affected community, and has considered inputs from these groups into the project planning, design, construction, and operation. Also, UTE presents substantial commitment to the principles of sustainability and management policies and mechanisms to identify, implement, and monitor sustainability targets. Some aspects can be improved, such as the integration of design and delivery methods in the planning stage.

Substantial public statements committing to the principles of sustainability are presented by the governmental agency UTE. These statements extensively discuss environmental aspects; commitments on social aspects of sustainability are offered to a lesser extent. In addition, an annual report is presented that includes achievements that enhance sustainability performance. [36] Further statements, policies, and actions on social and economic aspects of sustainability would improve effective leadership and commitment. In addition, for large projects it is recommended to consider the conducting of chartering sessions to address economic, environmental, and social sustainability aspects that would include the project owner, designer, contractor, and operator, with the elaboration of a charter document of agreement signed by all parties.

Regarding the project's sustainable management, UTE presents an overall management policy as well as management mechanisms to identify, implement, and monitor sustainability targets. Evidence is also presented of roles and responsibilities as specified during construction, but not in the operation stage.

[36] Memoria Anual UTE. http://portal.ute.com.uy/institucional-informaci%C3%B3n-econ%C3%B3mica-y-financiera/memoria-anual

[37] Further mechanisms to increase the robustness of the management system to be sure it is able to handle unexpected events exceeding sustainability standards and regulations, would advance the system goals. Additionally, integrated design and delivery methods could be implemented in the planning stage so that, from the early stages of project planning, the owner and the whole project team, including those that traditionally are involved typically later in the project (such as the constructor or commissioning agent), could participate in a collaborative process. This can help to eliminate conflicting design elements, optimize the system, and reduce costs.

The Punta del Tigre Power Plant B encourages lively involvement with the local community through the monitoring Committee, which is led by the National Environmental Agency (Dirección Nacional de Medio Ambiente, DINAMA). [38] This process of participation has led to substantial actions which reflect the feedback received from communities. In order to enhance this subcategory's goals, the project team could collaborate with authorities to ensure that political agents, governmental officials, and staff are informed about crucial impacts of the project, such as fairness and equity employment policies, gender matters, and other social and environmental issues.

Management

Sustainable infrastructure projects call for management practices in which the specific infrastructure is articulated within the larger system. This requires understanding the relation between the existing and new components, as well as looking for synergy opportunities. This approach helps to increase sustainability, reduce costs, expand the project's useful life, and avoid future problems. The Management subcategory evaluates efforts implemented to integrate the different infrastructure pieces and pursue by-product synergy opportunities. The Punta del Tigre power plant B (PTB) project carefully articulates new and existing infrastructure integration, considering inputs from the local community from the planning stage. This subcategory's goals could be further enhanced by exploring by-product synergies with nearby facilities.

The new Punta del Tigre power plant B (PTB) is located adjacent to the existing Punta del Tigre power plant A (PTA), which supplies the transmission lines, polyduct, and gas pipeline needed for the new project. [39] In addition, the project plan shows a conscious integration and coordination among the existing and new infrastructure, contemplating the social, geographical, and environmental framework of the site. It can be pointed out that the urban plan is substantially improved by the redesign of the fishermen's settlements and their appropriate integration into the general community organization. Also, the creation of the new Colonia Wilson park in a coastal area improves public facilities. Finally, the selected location, access, and connection between the new and existing constructions are carefully articulated and integrated in the overall municipal context. [40]

In relation to by-product synergies, there is much room for improvement. To further reduce waste, improve project performance, and reduce project cost, the project might consider identifying and assessing unwanted by-products from near facilities for possible use in this project during construction and operation. The project could also explore whether there are local by-product synergy projects already in place; if so, participating in these local programs might be considered.

[37] UTE, Gerencia de División Planificación de Inversiones y Medio Ambiente Sector Planificación de Inversiones, Evaluación económica de un ciclo combinado previsto como próxima expansión térmica del sistema (2011); UTE, Documento aplicable - Gestión Ambiental; UTE – Gerencia de Medio Ambiente: Generación Térmica, Plan de Gestión Ambiental de Construcción 07/08/2013 – Central Térmica de Ciclo Combinado Punta del Tigre B (PTB) (2013), 5, 6.

[38] MVOTMA, UTE, San Jose, Comision de seguimiento central térmica Punta del Tigre. Convocatoria de reunión 27 junio 2014 (2014); - Comisión de Seguimiento de la Central Térmica de UTE de Punta del Tigre, Acta de la 7ª Reunión (2006); Comisión de Seguimiento de la Central Térmica de UTE de Punta del Tigre, Acta de la 3ª Reunión (2007).

[39] UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B, 4.

[40] UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B , Annex III, 12; UTE, Parque Publico Colonia Wilson: Memoria descriptiva, 14.

Planning

Actions taken during the planning stage present a large potential to expand sustainability, allowing optimal long-term performance of the project and expanding the traditional project life span. The Planning subcategory examines planning issues, such as monitoring and maintenance considerations, the regulatory context and possible conflicts with current sustainability efforts, and considerations toward the extension of the useful life of the project. The Punta del Tigre power plant B (PTB) project team has extensively planned for long-term monitoring and maintenance, but documents are not provided showing that the required resources for maintenance and monitoring will be available following the delivery of the project.

During the design stage, detailed and comprehensive specifications are delivered describing project maintenance and monitoring for environmental matters as well as technical aspects connected to the optimal functioning of the plant. Also the role of those responsible for the different maintenance and monitoring tasks are specified from the design stage. [41] An important component to plan for long-term monitoring and maintenance is to establish and keep back from the design stage sufficient resources to implement the plan. To improve this subcategory level of achievement, the project team might provide documents or further explanations on how funding will be allocated, set aside, and maintained at sufficient level to fund the designed monitoring and maintenance.

Sustainable regulations and techniques are in continuous research and development. Cases have been observed in which sustainability intentions, usually those that break new ground, find barriers to their implementation due to conflict with current regulations. For example, the use of greywater for certain purposes is not allowed by many regulations and/or building codes, which may force designers and builders to use potable water for applications in which lower-quality water may be sufficient. In order to achieve a higher level of achievement in this subcategory, it would be possible to carry out efforts to identify and change regulations and standards that unintentionally create barriers to the implementation of sustainability. Furthermore, new and challenging practices could be initiated for the systematic assessment of laws and regulations applicable to the project that confront sustainability implementation.

Finally, the longer the useful life of a project, the less soon it will need to be replaced, substantially reducing the energy, water, and materials required for rebuilding. This can be achieved by considerations toward more durable design, using more durable materials, fostering resilience, considering changes and extreme events, and providing a flexible configuration to allow future expansion and reconfiguration.

The Resource Allocation category deals with material, energy, and water requirements during the construction and operation phases of infrastructure projects. The quantity and source of these elements as well as their impact on overall sustainability are investigated throughout this section of the Envision rating system. Envision guides teams to choose less toxic materials and promotes renewable energy resources. Resource Allocation is divided into three

[41] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 95, 96; UTE, Documentos de convocatoria K44149, Volumen III - Parte A - Especificaciones Técnicas Particulares, 109-117, 148-159.

subcategories: Materials, Energy, and Water.

Materials

The Materials subcategory encourages developers to minimize the total amount of natural resources that must be extracted and the energy required to produce and transport the materials utilized in the infrastructure project. First, the energy required to produce and transport the materials utilized in the project is evaluated. Also, the source of the materials matters; this subcategory as well asks whether providers follow sustainable practices and the distance from which the materials are sourced. The use of recycled materials, minimization of waste during operations by recycling or reuse, and reduction of excavated materials taken off site are also practices awarded in this subcategory. Moreover, at the design phase, the project should consider the recycling or reuse of its elements and the ease and efficiency of disassembly at the end of its useful life.

The sum of all the energy required to produce a material, from extraction till the material is ready to be used, is termed embodied energy. The project team does not present evidence of considerations of estimations of net embodied energy of materials used in construction, maintenance, or operation. Also, no evidence is provided showing efforts to incorporate recycled materials or to be sourced by providers using sustainable procurements practice. Neither does the project consider the reuse, recycling, and upcycling of its components at the end of the project's life.

Considerations are expressed toward being sourced locally [42], but no evidence is provided that these efforts have reached the minimum of 30% locally sourced materials required for achievement in this subject. Regarding reuse of the waste and by-products generated, a waste management plan is required by law that considers reuse of substances such as recovered oil or diesel, but no information is available on quantities of material reused. [43]

The project presents a remarkable performance in balancing cut and fill to eliminate excavated materials taken off site. This action required additional efforts and coordination between the constructor, project representatives, and authorities in order to improve the designed protocols. [44]

In this subcategory, it could be mentioned that at the stage of project planning, the Uruguay strategy for the energy sector planned the creation of a natural gas regasification plant near Montevideo; this would reduce the net embodied energy of the fuel used by the Punta del Tigre power plant B (PTB), which would be sourced locally. [45]

To improve the level of achievement of the project in this subcategory, the project might consider values of net embodied energy of key materials, which could be provided by manufacturers or reliable databases; implementing a sustainable procurement program; documenting the percentage of reused materials; acquiring soils, aggregate, plants, and other materials through local sources; and developing a waste management plan to divert project waste during operation. For the design of future projects, it is recommended to consider the use of structures, components, and materials that can be easily dismantled in order to be reused, recycled, or upcycled after the useful life of the project.

Energy

This subcategory aims to enhance the rational and sustainable use of energy by reducing energy consumption while maintaining comfort, increasing the use of renewable energies, and ensuring that the

[42] Garcia, Enrique. UTE. Interviewed by Beatriz Porcar. Phone Interview. September 11th, 2015.
[43] UTE-Genercia de Medio Ambiente, Solicitud de Autorizacion Ambiental de Operación (AAO)- Punta del Tigre (PTA y PTC), 22, 23.
[44] UTE, Plan de Gestión Ambiental de Construcción (PGAC): Obra de toma y emisario, Central Térmica de Ciclo Combinado Punta del Tigre B (PTB). Gerencia Medio Ambiente - Generación Térmica (2013), 19; UTE Gerencia de Medio Ambiente, Plan de Gestión Ambiental de Construcción, Central Térmica de Ciclo Combinado Punta del Tigre B (PTB) – Propuesta de modificación sobre extracción y disposición de material de excavación, Montevideo 22 de abril 2014, (Montevideo, 2014).
[45] UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B, 2.

project's energy systems function as designed through the useful life of the project. The Punta del Tigre power plant B (PTB) achieves a solid performance in relation to reducing energy consumption and commissioning and monitoring energy systems. However, in relation to the use of renewable energy there is room for **improvement.**

PTB cuts about 30% of the energy required to produce the same amount of electricity in a conventional gas turbine plant. [46] The principle behind a gas turbine combined-cycle power system is that the exhaust heat from the gas turbine that would otherwise escape through the exhaust stack is recovered by means of a heat recovery steam generator, which delivers it to the steam turbine. Apart from the power plant, in the small scale, the use of energy-efficient practices in the public complementary works, such as the school, would represent a valuable educational example, while also decreasing to a small extent the energy use, and therefore it is recommended.

Regarding the use of renewable energy, Uruguay's electric grid is sourced 36% from large hydroelectric facilities. [47] Nevertheless, PTB utilizes natural gas or diesel as a fuel. Considering that the amount of nonrenewable energy consumed by the plant is much larger than the energy used for the construction of the whole project and the operation of the complementary projects constructed, such as the public park, school, or roads, the overall renewable energy used does not reach the minimum percentage required by the Envision Rating System, which is equivalent to 10%. Regarding the complementary works of the project, it would be possible to consider other sources of renewable energies, as for example thermal heating. It has to be mentioned here, the added educational value of including these kind of energies in public spaces.

An initial commissioning, long-term monitoring of the energy systems, and advanced long term monitoring systems are implemented. [48] It is further recommended to engage a commissioning authority for the energy systems independent of both the design and construction team.

Water

Considering that the future of water availability is uncertain, this subcategory aims to protect potable water and reduce overall water use. Therefore, aspects such as the protection of freshwater availability, reduction of potable water consumption, and monitoring of water systems are awarded. The project has a solid overall performance, including different considerations to protect this limited resource.

The Punta del Tigre power plant B (PTB) conducted efforts to minimize long-term negative impact on fresh and potable water quality and quantity. In particular, the existing power plant (PTA) was designed to intake water directly from the Raigon aquifer, from which potable groundwater is extracted. This procedure impacted the quantity and quality of this aquifer, which is used for domestic and irrigation uses by the local community. Having potable water preservation in mind, the plant was modified during 2014-2015 to intake water directly from the Plata River instead of from the Raigon aquifer. [49] Also, the Environmental Impact Assessment (EIA) documents a detailed monitoring of water quality to assure that the impacts of the project on the freshwater of the Plata River are minimized. [50] It would be possible to implement further initiatives to reduce potable water consumption, for example by encouraging the use of recycled water in the operations of the plant facilities and complementary works.

[46] MVOTMA - Dirección Nacional de Medio Ambiente (DINAMA) – Division Control y Desempeno Ambiental, Solicitud de Autorización de Desagüe Industrial, PTB (2013), 8; MVOTMA - Dirección Nacional de Medio Ambiente (DINAMA) – Division Control y Desempeno Ambiental, Solicitud de Autorización de Desagüe Industrial, PTA (2007), FH-5.
[47] UTE, Cifras (2012).
[48] UTE, Documentos de Convocatoria Volumen III – Parte A: Especificaciones Técnicas Particulares, 109-117; UTE, Documentos de convocatoria K44149, Volumen II - Parte A - Condiciones Contractuales, 31-33.
[49] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 7, 33; Cabal, Claudia. Email correspondence. January 11, 2016; Curbelo, Rafael. Interview by Beatriz Porcar. Phone Interview. January 27th, 2016.
[50] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 78- 85.

Water monitoring is one of the strengths of the project; the agreement signed by UTE and the Institute of Fluid Mechanics and Environmental Engineering of the University of the Republic of Uruguay ensures long-term hydrodynamic and biological water monitoring of the Plata River, in particular for intake and discharge of the cooling system of the power plant.[51] For further improvement, the integration of impact and operational monitoring would allow responsive management, so that adjustments could be made during operations to reduce negative impacts and improve efficiency.

6 NATURAL WORLD CATEGORY

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

Siting

The Siting subcategory examines the location of the project in relation to its surrounding ecosystem. Sustainable infrastructure projects should be sited to preserve areas of high ecological value, habitats of species of high value, prime farmland, and greenfields, as well as to protect wetlands and surface water bodies and preserve floodplain functions. They should also try to avoid adverse geology, such as earthquake faults or tsunami-susceptible coastline locations, and inappropriate expansion on steep slopes. The Punta del Tigre power plant B (PTB) has an uneven performance in this subcategory, with greater efforts required for the preservation of high-ecological-value land and water systems.

The preservation of land classified as prime habitat or prime farmland was not explicitly documented among the criteria presented for site selection, which focused mainly on technical and economic matters. [52] Moreover, the intake and discharge lines of the cooling system are in an area identified as having natural and conservation interest. [53] The Punta del Tigre power plant (PTB) does conserve undeveloped land, with half of the project's area located in a previous developed greyfield, though the complementary works (that comprises a public park and fishermen relocation), which take about half of the project area, are located in greenfields. Farmland occupies 3.1% of the site where the project is located. [54] The project team should entitles at least 95% of the prime farmland as a vegetation and soil protection zone (buffer zone).

In relation to the protection of wetlands and surface water, considerations follow regulations. In particular, a 820-foot buffer zone on the Plata River is required by law. [55] Nevertheless, the water intake and effluent discharges are specifically within a wetland area

[51] UTE – Universidad de la Republica (UDELAR), Convenio entre UTER y UDELAR para llevar adelante monitories hidrodinámicos y biológicos en el Rio de la Plata en la zona de Punta del Tigre (Montevideo, 2013); UTE - Universidad de la República (UDELAR), Convenio de monitoreo.
[52] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo I: Documentos del proyecto (2011), 40, 41.
[53] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 41,42.
[54] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 34-37
[55] Cabal, Claudia. UTE. Email correspondence. October 27, 2015.

proposed to be included in the National System of Protected Areas. The project carries out extensive efforts to protect a highly representative sample of saline wetland and associated ecosystems. [56] Regarding floodplain functions, no considerations to minimize floodplain impacts or to optimize predevelopment floodplain storage capacity were reported by the project team. Besides, the project is located in immediate proximity to flood-prone areas. [57]

Geological conditions also matter when deciding the project's siting. It is important to avoid adverse geology to reduce risk of natural hazards, including hillsides with potential for erosion and landslides. A study of the geomorphology of the region where the project is located is presented in the Environmental Impact Assessment (EIA). With regard to erosion and landslides, the project affects coastal dunes; the project is designed, constructed, and monitored to minimize erosion in the dunes. [58] The fact that the project is situated in vicinity of flooding prone areas also constitutes an adverse geological aspect. To further preserve high-quality groundwater resources the project should stablish a program for monitoring aquifer damage and contamination that may be affected by hazards of these areas, as flooding, sinkholes or subsidence.

Land and Water

The Land and Water subcategory aims to minimize impacts on hydrologic and nutrient cycles, with special attention to contaminants through stormwater runoff and fertilizers, among other possible factors. This project focuses large attention and mitigation efforts on the temperature increase of the cooling water which is discharged to the Plata River, since the temperature is a physical pollution factor that may alter the ecosystem. Also, no pesticides and fertilizers are expected to be necessary in the project due to the plant selection. Nevertheless, in relation to water and land contamination due to uncontrolled stormwater runoff, no considerations are documented beyond those of the standards requirements.

The stormwater management used in the project meets regulatory requirements. [59] Nevertheless, none of the actions implemented are directed to enhancing the site's infiltration, evapotranspiration, or water harvest capacity. Increased surface runoff typically leads to increases in erosion of land surfaces, increased water temperatures, and an increase in pollutants reaching surface waters; therefore it is recommended that the project team consider measures to reduce the impact of the infrastructure on stormwater runoff quality and quantity, which may include rain gardens and bioretention, sidewalk storage, permeable pavers, soil amendments, and reduction of impervious surfaces, among others.

Regarding the use of pesticides and fertilizers, the project presents a study of possible indigenous species for reforestation of Wilson Park that are not expected to require these substances. [60]

In order to minimize impacts due to the increased temperature of the discharged cooling water, the project team commissioned a numerical simulation and biotic study of the cooling water intake and discharge, which concluded that phytoplankton monitoring to distinguish and quantify the different groups is required. Then, long-term phytoplankton monitoring has been implemented. [61] On the other hand, the system for treating industrial effluents is designed to comply with national and departmental

[56] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 10, 40-42; UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre - Tomo III: Anexos (2011), Annex V-6.
[57] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo I: Documentos del proyecto (2011), 43.
[58] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 89, 95; UTE, Plan de Gestión Ambiental de Construcción (PGAC), Central Térmica de Ciclo Combinado Punta del Tigre B (PTB), Gerencia Medio Ambiente Generación Térmica (2013), 10-12, 22.
[59] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo I: Documentos del proyecto (2011), 31; DINAMA, FL-DCDA-001-Solicitud de autorización de desagüe industrial (2013).
[60] UTE, Parque Publico Colonia Wilson: Memoria descriptiva, Anexo 1; Cabal, Claudia. UTE. Email correspondence. October 27, 2015.
[61] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 88,89,95-97; UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre - Tomo III: Anexos (2011), Annex V-6.

regulations. Besides, in case of fuel spillage due to pipeline rupture, a contingency plan is guaranteed. [62] To further prevent surface or groundwater contamination, at the design stage the project team should locate equipment and facilities containing potentially polluting substances away from sensitive environments and methods to monitor and minimize pollutants in stormwater runoff should be employed.

Biodiversity

Sustainable infrastructure should not interfere with species biodiversity, and actions should be implemented to minimize impacts on habitats on and near the site. The Punta del Tigre power plant B (PTB) project integrates several actions to mitigate the project's impacts, but still there is room for improvement. In particular, this project identifies habitat and species that may be affected by the project and implements mitigations actions to minimize the main impacts, but further efforts are required to ensure that net habitat quality and connectivity was maintained. Partial actions to maintain wetlands and surface water quality were considered, but the scope of the efforts should be expanded. Besides native species were utilized for reforestation and soils disrupted during construction were restored.

In more detail, the Environmental Impact Assessment (EIA) presents a study that includes richness and the number of endangered species as well as identifies and analyses the possible impacts of the project over the habitat and species and propose mitigation actions, which are implemented. [63] Nevertheless, disruption on animal movement corridors is not analyzed among the possible impacts. Finally, the extent of the mitigation efforts does not assure the maintenance of net habitat quantity, quality, and linkage at predevelopment conditions. To improve the efforts to preserve species biodiversity, it is recommended to detect possible movement corridors between habitat areas and potential barriers to these corridor, including existing obstacles that may result from development.

For the reforestation conducted at the Wilson coastal public park, native species were identified and planted.[64] Besides the project does not control invasive species already on site. It is recommended to identify invasive species on site and establish a comprehensive, multiyear management plan to control them. Also, strategies should be considered for minimizing potential invasive species, both plant and animal, that reappear after initial removal and/or enter the site for nearby areas.

Regarding soil disruption, the project identified as a main impact the deterioration of the coastal dunes during construction, and mitigation actions to repair these assets were implemented. [65] The project could consider restoring 100% of the soil disturbed as a result of previous development.

In order to maintain and restore ecosystem functions of waterways, wetlands, and riparian areas, there are four areas that can be approached: hydrologic connection, water quality, habitat, and sediment transport. The project documents actions to maintain water quality and habitats. [66] Nevertheless, no evidence supports that at least one of the ecosystem function is wholly maintained. For this purpose, actions could be implemented such as: connecting the Plata River waterway to its riparian floodplain at a 6-month to 2-year frequency flow event; and requesting a habitat survey of the water body by a recognized professional and presenting a plan including planting and other physical modifications to enhance habitat, such as eliminating existing obstructions to habitat connectivity (such as dams, roadway structures, or other infrastructure) that may block aquatic or shoreline species migration.

[62] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 100.
[63] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo I: Documentos del proyecto (2011), 11; UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 16-31, 49-103; UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre - Tomo III: Anexos (2011), Annex V-4.
[64] UTE, Parque Publico Colonia Wilson: Memoria descriptiva, Anexo 1.
[65] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 51, 52, 58, 59.
[66] Ibid. 78-85, 89-95.

7 CLIMATE AND RISK CATEGORY

Envision aims to promote infrastructure developments that are sensitive to long-term climate disturbances. The Climate and Risk category focuses on avoiding direct and indirect contributions to greenhouse gas emissions, as well as promoting mitigation and adaptation actions to ensure short- and long-term resilience to hazards. Climate and Risk is subdivided into two subcategories: Emissions and Resilience.

Emissions

The Emissions subcategory promotes the understanding and reduction of dangerous emissions. It aims to reduce greenhouse gas emissions that may conduce to increased long-term risks by contributing to climate change. In addition, six other dangerous air pollutants that might cause damage to human health, property, and the environment are evaluated.

Combined-cycle plants emit significantly less emissions of carbon dioxide (CO2), sulfur dioxides (SO2), nitrogen oxides (NOx), and other types of air emissions than conventional power plants. Specifically, CO2 emissions from power plants using natural gas combined-cycle technology are about 20% lower than natural gas power plants and 40% lower than those of most coal-fired plants. [67] It would be possible to consider a comprehensive life cycle carbon assessment for the key materials used during construction to further contribute to reduce net greenhouse gas emissions.

Regarding the emissions of six criteria pollutants, including particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead, as well as noxious odors, at a minimum projects should meet the California Ambient Air Quality Standards and create a maintenance program to ensure that these standards continue to be met throughout the project's life. No evidences are presented showing that these two last requirements were met by the project.

The Environmental Impact Assessment (EIA) does evaluate three of the six criteria pollutants that are considered to be relevant in this project: sulfur dioxide, nitrogen oxides, and particulate matter. Dispersion modeling of these air pollutants is used to determine the maximum concentration that could occur at floor level and wind direction. The dispersion model used is one approved by the U.S. Environmental Protection Agency. Comparing the results to local air quality standards, the EIA concludes that the analyzed emissions are meet these standards [68]; however, there are no evidence that they meet the California Ambient Air Quality Standards, which are more stringent.

Resilience

The Resilience subcategory evaluates the ability of the project to endure or adapt to long- and short-term changes and hazards that may be caused by climate change or by other natural and human factors, such as sea level rise or extreme weather patterns, flooding, or fires. For this purpose, this subcategory addresses the following key aspects: development of a climate impact assessment and adaptation plan, avoiding possible future resources constraints and other vulnerabilities that may create high long-term costs and risks, preparing for long-term climate change and short-term hazards, and managing heat island effects. The project presents an

[67] J.A. de Gouw1 , D.D. Parrish, G.J. Frost1 , M. Trainer, Reduced Emissions of CO2, NOx and SO2 from U.S. Power Plants Due to the Switch from Coal to Natural Gas with Combined Cycle Technology (Earth's Future - a journal of the American Geophysical Union, Jan. 8, 2014).
[68] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 65-74, 92, 93; Curbelo Rafael. UTE. Email correspondence. November 19, 2015.

analysis of likely natural induced short-term hazards, including wave and current extreme regimes for the Punta del Tigre project B (PTB) site, and plans to prepare for them are undertaken. These plans aim to deal with emergency problems related to the security and integrity of the facilities, as well as environmental contingencies. However, a considerable number of opportunities exist for improving the resilience of the project.

Primarily, a comprehensive climate impact assessment and adaptation plan are required. Some of the anticipated risks that could affect PTB are flooding and sea level rise. In particular, the project is located in immediate proximity to flood-prone areas. To remediate this, in some sectors drainage was incorporated in the construction of the existing power plant PTA. [69] In the new power plant PTB, no considerations were presented to minimize floodplain impacts or to optimize predevelopment floodplain storage capacity, since the works implemented at PTA are considered sufficient to avoid impact on PTB. Regarding sea level rise, the project is located 19 feet above sea level, and no impact due to climate change is expected by the team during the 20-year lifespan of the project. [70] Nevertheless, the PTB does not include a climate impact assessment and adaptation plan.

The project also does not present evidence of identifying and assessing possible traps and vulnerabilities that may arise due to resource depletion, extreme natural or human-caused events, and economic changes, among others stresses. In particular, the fact that the project is located next to flood-prone areas represents a configuration highly vulnerable to extreme weather events, given changing climate conditions. For future projects, it is recommended to give further consideration during the preplanning phase to avoiding dependence on resources that could become scarce and expensive, along with configurations vulnerable to extreme weather events and flooding; also to identify and perform above standards that do not align with changing environmental or operating conditions.

In relation to short-term hazards, a thorough analysis of wave, wind, and current extreme regimes for the PTB site is presented, which consider periods up to 100 years. [71] A study identifying risk factors for accidents some of which may be caused by short-term hazards, such as extreme waves and currents, was also carried out. In addition, the contractor was required to prepare an action plan to deal with emergency problems related to the security and integrity of the facilities, as well as an action plan to deal with environmental contingencies. [72] To improve the project's resilience and adaptability, a more systematic analysis of all the possible types of natural and human induced hazards in the region should be considered.

The main cause of the heat island effect is the large percentage of the incident solar irradiation absorbed by hard surfaces, such as pavements and roofs, which then heat the surfaces and the surrounding air. Heat island can affect communities by increasing summertime peak energy demand for cooling (increasing air pollution and greenhouse gas emissions), as well as heat-related illness; water quality, local vegetation, wildlife, and community comfort can also be impacted. The heat island effect can be minimized by the use of materials with high solar reflectance index (SRI), or by increasing vegetation cover, which cools the air via evapotranspiration and increased shade. PTB does not present evidence that at least 10% of hardscape surfaces are shaded or meet the required SRI, which constitutes the minimum requisite in this category. It is recommended to use hardscape surfaces with a SRI of 29 or higher or provide them with shading by means of structures or trees.

[69] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo I: Documentos del proyecto (2011), 43.
[70] Curbelo Rafael. UTE. Email correspondence. November 19, 2015.
[71] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre - Tomo III: Anexos (2011), Annex V-3.
[72] UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 98-100.

APPENDIX A: PROJECT PICTURES AND DRAWINGS

Figure 2: General location of the Punta del Tigre Combined Cycle Power Generation Project (PTB).
Sources: UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B, Anexo III, 11.

Figure 3: Aerial view of the PTB Project site organization.
Sources: UTE, Parque Publico Colonia Wilson: Memoria descriptiva, 14.

Figure 4: Aerial view of the PTB Project power plant site organization.
Sources: UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B (UR-L1070), Anexo III, 12

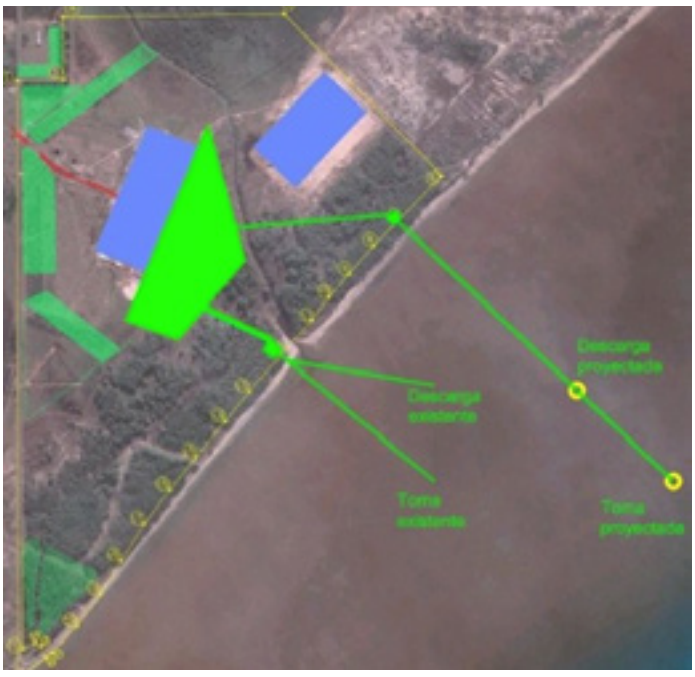

Figure 5: Points of water intakes and effluent discharges of the cooling system of the existing (PTA) and new (PTB) power plants within the Santa Lucia wetland area.
Sources: Cabal Claudia. UTE. Email correspondence. September 11, 2015.

Figure 6: PTB buffer zone width on La Plata River.
Sources: Cabal Claudia. UTE. Email correspondence. October 27, 2015.

Figure 7: Locations of noise measurements on the PTB power plant site
Sources: UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 75.

Figure 8: Photo 1st of the new fisherment's housing.
Sources: Cabal Claudia. UTE. Email correspondence. September 9, 2015.

Figure 9: Photo 2nd of the new fisherment's housing.
Sources: Cabal Claudia. UTE. Email correspondence. September 9, 2015

Figure 10: Photo 3d of the new fisherment's housing.
Sources: Cabal Claudia. UTE. Email correspondence. September 9, 2015.

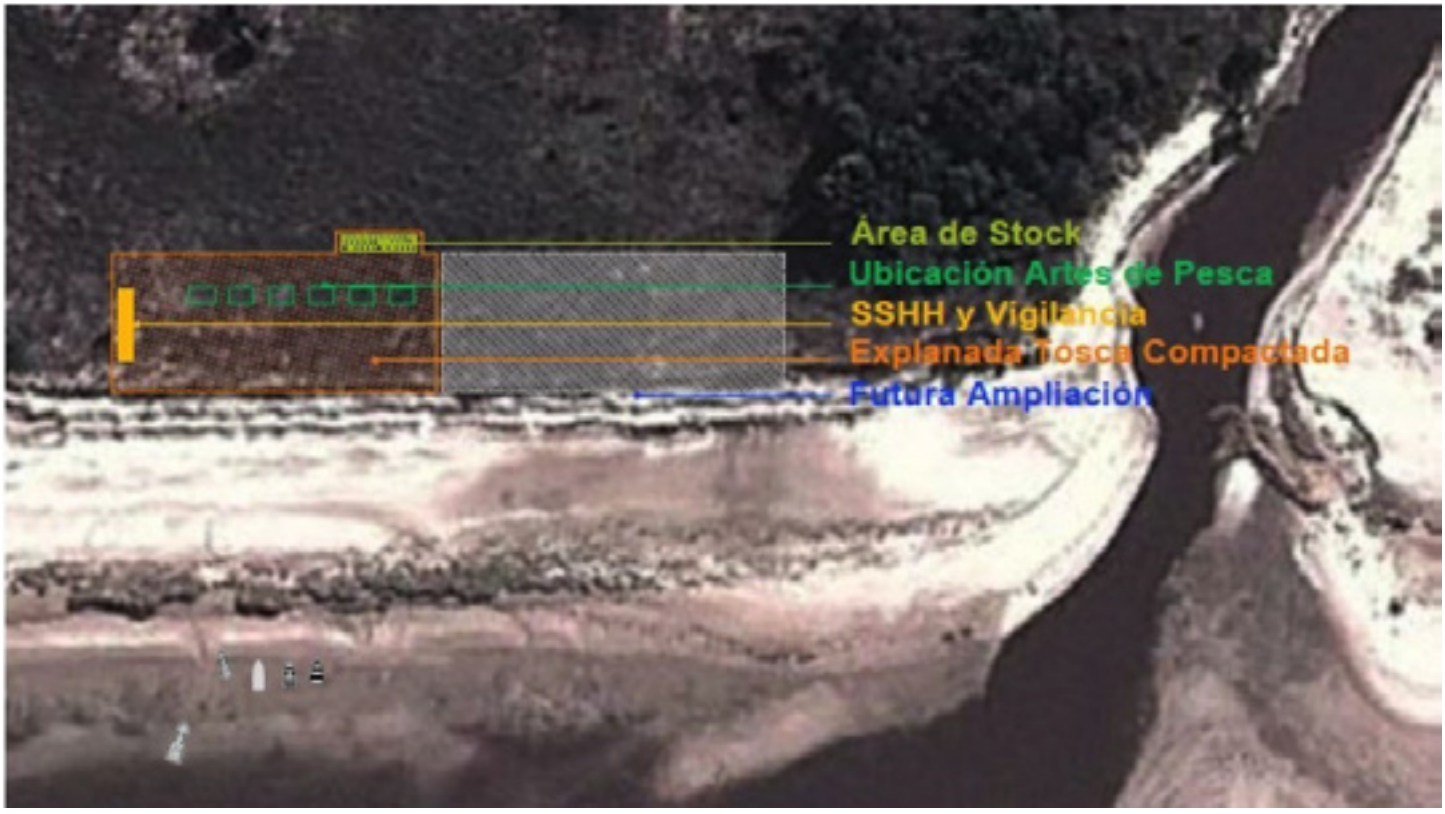

Figure 11: Fishermen gear area view and plan.
Sources: UTE, Presentación: PTB – Proyecto obras anexas a la central., 10.

Figure 12: Aerial view Parke Colonia Wilson site.
Sources: UTE, Parque Publico Colonia Wilson: Memoria descriptiva, 1.

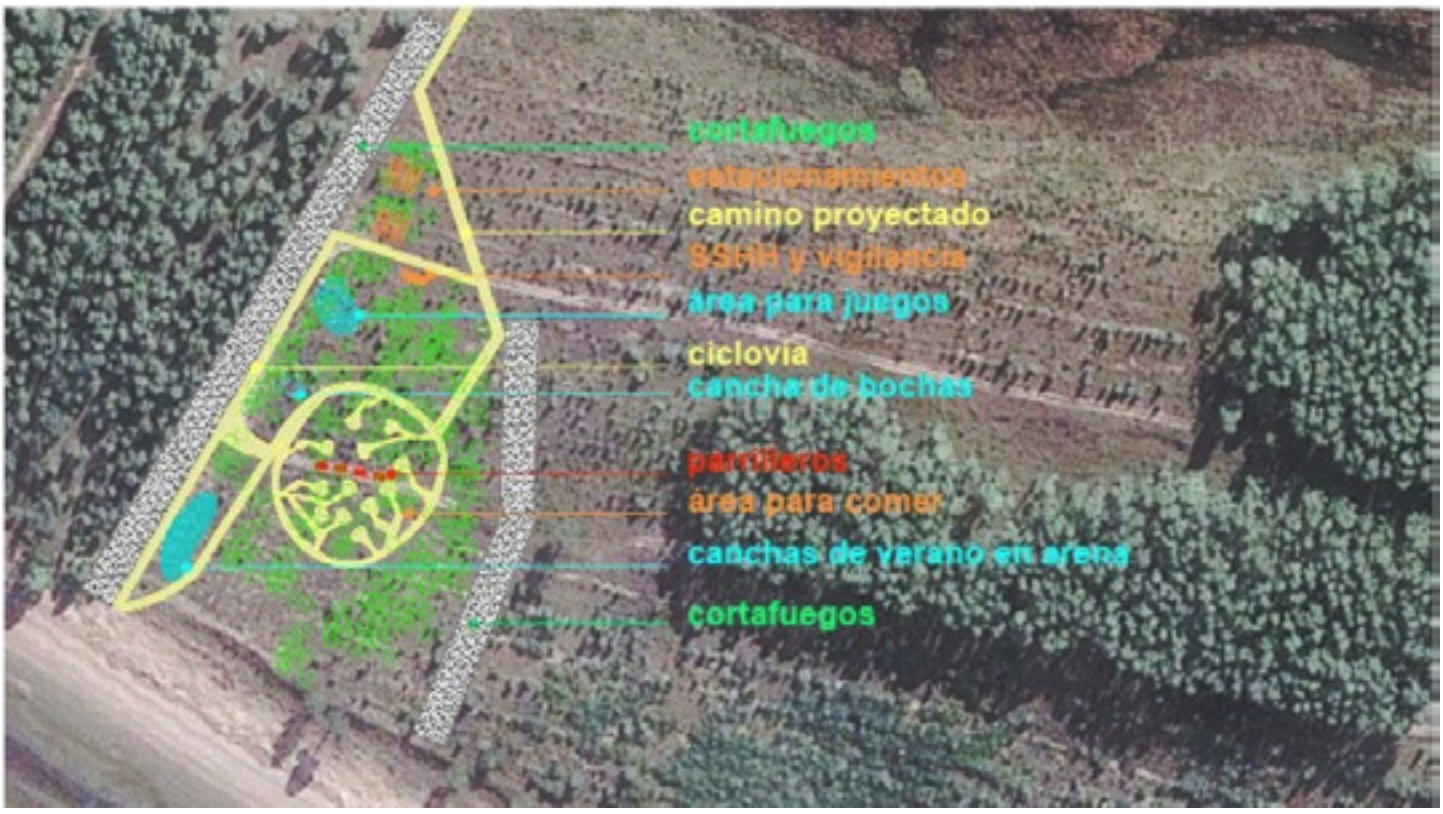

Figure 13: Coastal Public Park Wilson view and plan.
Sources: UTE, Presentación: PTB – Proyecto obras anexas a la central, 7.

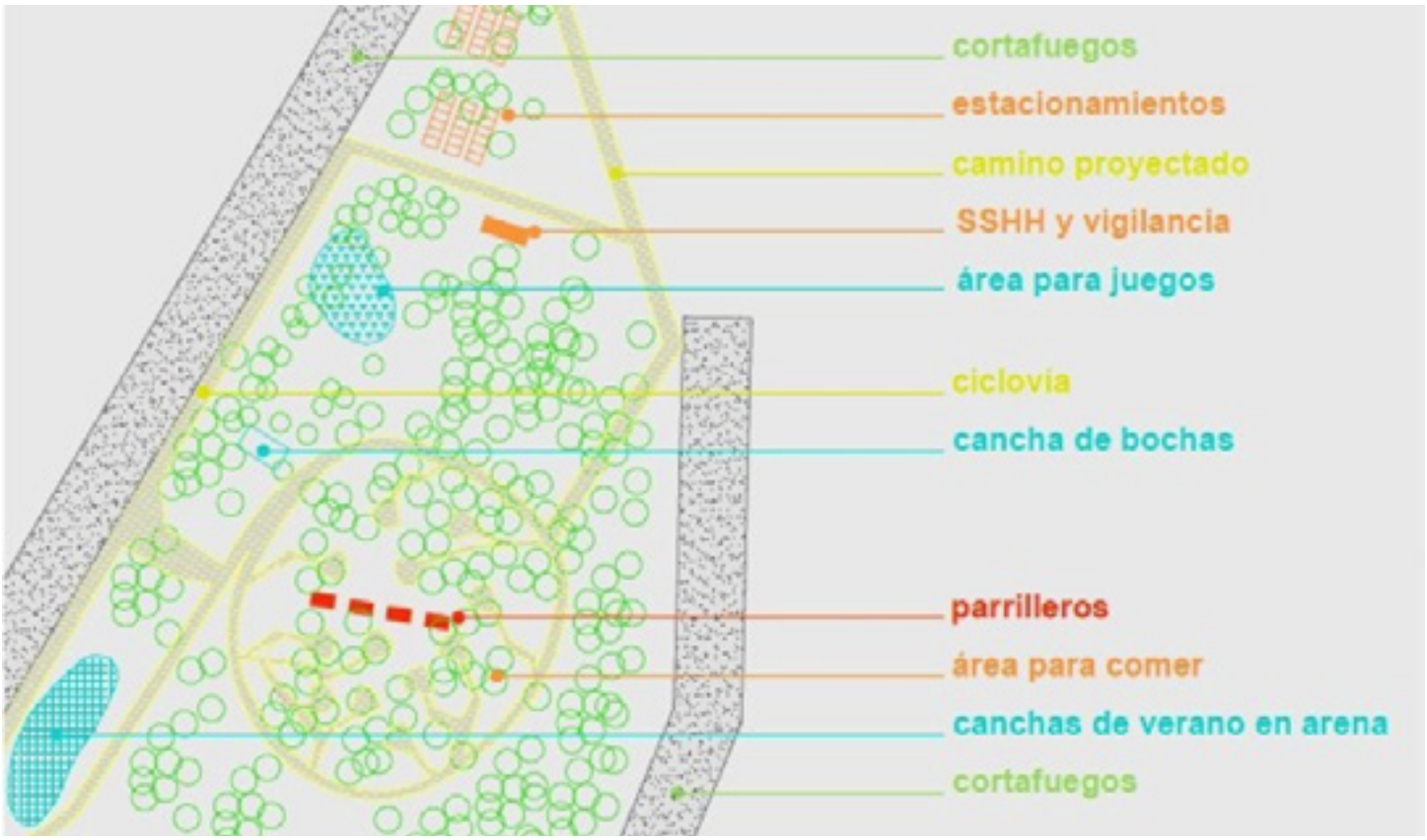

Figure 14: Coastal Public Park Wilson plan.
Sources: UTE, Presentación: PTB – Proyecto obras anexas a la central, 8.

Figure 15: Photo of road realignment at PTB.
Sources: Cabal Claudia. UTE. Email correspondence. September 9, 2015.

Figure 16: Photo of bridge and road improvements at PTB.
Sources: Cabal Claudia. UTE. Email correspondence. September 9, 2015.

Figure 17: Photo of construction works during road improvement at PTB.
Sources: Cabal Claudia. UTE. Email correspondence. September 9, 2015.

Figure 18: Colonia Wilson School photos.
Sources: Cabal Claudia. UTE. Email correspondence. September 9, 2015.

Figure 19: Site views to the wetlands.
Sources: (UTE, Evaluación de Impacto Ambiental (E.I. A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 42.

Figure 20: Site views to the "Desembocadura Arroyo del Tigre".
Sources: UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011), 45.

APPENDIX B: SOURCES

DOCUMENTATION PROVIDED
General Information.
UTE, Parque Publico Colonia Wilson: Memoria descriptiva.
Administración Nacional de Usinas y Trasmisiones Eléctricas (UTE), Proyecto de relocalización de los pescadores - viviendas - Punta del Tigre, San José: Memoria descriptiva (2013).
Administración Nacional de Usinas y Trasmisiones Eléctricas (UTE), Proyecto de relocalización de los pescadores – zona de pesca - Punta del Tigre, San José: Memoria descriptiva (2013).
Dirección Nacional de Medio Ambiente (DINAMA), Notificación resolución ministerial de la Dirección Nacional de Medio Ambiente (DINAMA) No 1591/2014 - 30/12/2014, (2014).
Ministerio de vivienda, ordenamiento territorial y medio ambiente, Autorización Ambiental Previa (AAP) PTA.
UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo I: Documentos del proyecto (2011).
UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo II: Estudio de Impacto Ambiental (2011).
UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre - Tomo III: Anexos (2011).
UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre – Completo (2011).
UTE, Plan de Gestión Ambiental de Construcción (PGAC), Central Térmica de Ciclo Combinado Punta del Tigre B (PTB), Gerencia Medio Ambiente Generación Térmica (2013). UTE, Plan de Gestión Ambiental de Construcción (PGAC): Obra de toma y emisario, Central Térmica de Ciclo Combinado Punta del Tigre B (PTB). Gerencia Medio Ambiente - Generación Térmica (2013).
UTE, Notificación resolución ministerial DINAMA No 961/2013. Conferencia de vista (art. 75 Decreto 500/991). Notificación certificado de proyecto (2013).
UTE, Notificación resolución ministerial DINAMA No 0093/15. Otorgamiento de vista (art. 75 Decreto 500/991). Notificación certificado de proyecto (2013).
UTE, Nota a DINAMA recategorización predios anexos (Montevideo, 2013). UTE, Cifras (2012).
UTE - Universidad de la República (UDELAR), Convenio de monitoreo.
Universidad de la Republica (UDELAR) - Facultad de Ingeniería, Proyecto Central Punta del Tigre U.T.E. Estudio de la toma y descarga del agua de enfriamiento: Simulación numérica de la pluma térmica y estudio biótico - Informe Final (2011).
DINAMA, FL-DCDA-001-Solicitud de autorización de desagüe industrial (2013). Contrato-Parte II: Normas generales (2012).
Contrato-Parte III: Anexo único - El proyecto: Proyecto Ciclo Combinado Punta del Tigre “B” (2012).
Contrato-Parte IV. Contrato de garantía entre la República Oriental del Uruguay y el Banco Interamericano de Desarrollo (BID). Préstamo a UTE, Proyecto Ciclo Combinado Punta del Tigre “B” (2012).
Banco Interamericano de Desarrollo (BID), Resolución DE-225/12 (2012).
UTE, Perfil de Proyecto Ciclo combinado Punta del Tigre B (UR-L1070)
Banco Inter-Americano de Desarrollo (BID), Propuesta de préstamo, Proyecto Ciclo combinado Punta del Tigre B (UR-L1070).

DOCUMENTATION PROVIDED
General Information.
UTE, Documentos de convocatoria K44149, Volumen II - Parte A - Condiciones Contractuales.
UTE, Documentos de convocatoria K44149, Volumen III - Parte A - Especificaciones Técnicas Particulares.
Ministerio de vivienda, ordenamiento territorial y medio ambiente, Autorización Ambiental Previa (AAP) PTB.
Comisión de Seguimiento de la Central Térmica de UTE de Punta del Tigre, Acta de la 3ª Reunión (2007).
Comisión de Seguimiento de la Central Térmica de UTE de Punta del Tigre, Acta de la 7ª Reunión (2006).
Recopilación de datos de monitoreo de ruido, 2012-2015.
UTE, Presentación: PTB – Proyecto obras anexas a la central.
UTE, Pliego de condiciones particulares. Seccion III: Licitacion Publica P43025 - Proyecto y obra para la construcción del parque público de Colonia Wilson.
UTE, Listado de resoluciones de eficiencia energética de UTE
UTE, Presentación – PTB – Proyecto obras anexas a la central.
UTE, Solicitud de Autorización Ambiental de Operación (AAO) de la Central Térmica Punta del Tigre A (PTA) y Central Térmica de Emergencia Punta del Tigre C (PTC) (Uruguay).
MVOTMA, UTE, San Jose, Comision de seguimiento central térmica Punta del Tigre. Convocatoria de reunión 27 junio 2014 (2014).
Gobierno de Uruguay. Ley 16466 Evaluación del Impacto Ambiental, publicada el 26/1/94 (1994) UTE, Política comercial 2015-2019
UTE, Expediente EX15003396, elevado por la Gerencia Dirección Operativa, Aprobación de documento “Política Comercial”. 19 de agosto de 2015 (2015).
DINAMA, UTE, Comisión de seguimiento central térmica Punta del Tigre, Convocatoria de reunión, 27 de junio de 2014 (2014)
Aquirrezabal D., Gazzan N., Keldjian E., COTACERO, Informe de actuación arqueológico subacuático central de ciclo combinado Punta del Tigre B (UTE) (2015).
Aquirrezabal D., Gazzan N., COTACERO, Informe parcial de actividades arqueológicas en central de ciclo combinado Punta del Tigre B (UTE) Agosto 2015 (2015).
Aquirrezabal D., Gazzan N., COTACERO, Informe parcial de actividades arqueológicas en central de ciclo combinado Punta del Tigre B (UTE) Abril- Mayo 2015 (2015).
Aquirrezabal D., Gazzan N., COTACERO, Informe parcial de actividades arqueológicas en central de ciclo combinado Punta del Tigre B (UTE) Enero 2015 (2015).
Aquirrezabal D., Gazzan N., COTACERO, Informe parcial de actividades arqueológicas en central de ciclo combinado Punta del Tigre B (UTE) Octubre 2014 (2014).
Aquirrezabal D., Gazzan N., COTACERO, Informe parcial de actividades arqueológicas en central de ciclo combinado Punta del Tigre B (UTE) Septiembre 2014 (2014).
UTE, Panfleto informativo: política ambiental UTE.
UTE, P O L Í T I C A – Gerencia Generación, Comunicado informativo sobre declaración de intenciones, 01-12-2009 (2009).
UTE, Control de los aspectos ambientales de las actividades - Procedimiento – Aprobación del procedimiento, 2008-09-11 (2008).
UTE, Memoria Annual. http://portal.ute.com.uy/institucional-informaci%C3%B3n-econ%C3%B3mica-y-financiera/memoria-anual

DOCUMENTATION PROVIDED
General Information.
UTE, Imagen: Clientes y partes interesadas
UTE, Documento aplicable - Gestión Ambiental. Gobierno de Uruguay, Ley Orgánica de UTE, aprobación: 12/8/1980 (1980).
Adjudicación de obra de PTB, Montevideo, 24 de abril de 2014 (Montevideo, 2014).
UTE, Compromiso de UTE en relación con la instalación de dos unidades de generación de energía eléctrica de respaldo en Punta del Tigre, San José, Uruguay 14 noviembre 2005 (San José, Uruguay, 2005)
UTE-Genercia de Medio Ambiente, Solicitud de Autorizacion Ambiental de Operación (AAO)- Punta del Tigre (PTA y PTC).
UTE – Gerencia de Medio Ambiente: Generación Térmica, Plan de Gestión Ambiental de Construcción 07/08/2013 – Central Térmica de Ciclo Combinado Punta del Tigre B (PTB) (2013)
Ley 16466 Evaluación del Impacto Ambiental (Uruguay, 1994)
UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo I: Documentos del proyecto (2011).
UTE, Evaluación de Impacto Ambiental (E.I.A.), Central de Ciclo Combinado Punta del Tigre B - Tomo I: Documentos del proyecto (2011).
Ministerio de Vivienda Ordenamiento Territorial y medio Ambiente (MVOTMA) (Montevideo), Concesión de Autorización Ambiental Previa a UTE para PTB.
UTE, Gerencia de División Planificación de Inversiones y Medio Ambiente Sector Planificación de Inversiones, Evaluación económica de un ciclo combinado previsto como próxima expansión térmica del sistema (2011).
UTE, Documentos de Convocatoria Volumen III – Parte A: Especificaciones Técnicas Particulares.
UTE Gerencia de Medio Ambiente, Plan de Gestión Ambiental de Construcción, Central Térmica de Ciclo Combinado Punta del Tigre B (PTB) – Propuesta de modificación sobre extracción y disposición de material de excavación, Montevideo 22 de abril 2014, (Montevideo, 2014)
MVOTMA - Dirección Nacional de Medio Ambiente (DINAMA) – Division Control y Desempeno Ambiental, Solicitud de Autorización de Desagüe Industrial, PTB (2013).
MVOTMA - Dirección Nacional de Medio Ambiente (DINAMA) – Division Control y Desempeno Ambiental, Solicitud de Autorización de Desagüe Industrial, PTA (2007).
UTE, Cifras 2014 (2014).
UTE - HYUNDAI, Water Mass Balance Diagram.
UTE – Universidad de la Republica (UDELAR), Convenio entre UTER y UDELAR para llevar adelante monitories hidrodinámicos y biológicos en el Rio de la Plata en la zona de Punta del Tigre (Montevideo, 2013).
Decreto 253/79 Se aprueban las normas para prevenir la contaminación ambiental, Montevideo 9 mayo 1979 (Montevideo, 1979).

DOCUMENTATION PROVIDED (ENGLISH)
General Information.
Document of the Inter-American Development Bank (IDB). Resolution DE-225/12. December 2012 (2012).
IDB - Office of Strategic Planning and Development Effectiveness, Progress monitoring report - UR-L1070- Punta del Tigre Combined Cycle Power Generation Project, 2012 2o period closed 7-May-2013. March, 2013 (2013).
IDB - Office of Strategic Planning and Development Effectiveness, Progress monitoring report - UR-L1070- Punta del Tigre Combined Cycle Power Generation Project, 2013 1o period closed 31-Oct-2013. September, 2013 (2013).
Document of the Inter-American Development Bank (IDB). Loan Proposal, Punta del Tigre B Combined-Cycle Project (UR-L1070)
Timothy J. Skone, P.E. and Robert James. National Energy Techonology Laboratory, US department of Energy. Life Cycle Analysis: natural Gas Combined Cycle (NGCC) Power Plant. September 10, 2012 (2012). https://www.netl.doe.gov/File%20Library/Research/Energy%20Analysis/Life%20Cycle%20Analysis/NGCC-LCA---Final-Report---Report---9-10-12---Final---Version.pdf
J.A. de Gouw1 , D.D. Parrish, G.J. Frost1 , M. Trainer, Reduced Emissions of CO2, NOx and SO2 from U.S. Power Plants Due to the Switch from Coal to Natural Gas with Combined Cycle Technology (Earth's Future - a journal of the American Geophysical Union, Jan. 8, 2014).
Center for Climate and Energy Solutions (C2ES), http://www.c2es.org/technology/factsheet/natural-gas


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