Author: Roberto Roca

BEP Advisors, Panama City, Panama – rroca@bepadvisors.com

Coauthor: Rodrigo Ronquillo

TRECSA Grupo Energia de Bogota- Guatemala City, Guatemala . info@trecsa.com.gt

Paper Title: **Improving EIAs and Application of Mitigation Hierarchy on Linear Projects**

Abstract ID# 316 : The TRECSA_ PET Project is part of the national development plan that integrates the electricity sector policy of the Government of Guatemala to the ongoing strategy about changing the matrix of power generation in the country. The PET project involves the construction of 853 km of transmission lines; 12 new substations and expansion of 12 existing substations. Based on the Equator Principles and according to IFC –based requirements of International Banks it was decided to improve the national EIA by identifying Critical Habitats following Performance Standard 6 from IFC, develop a Rapid Cumulative Impact Assessment, and a Biodiversity Action Plan with the aim of applying the Mitigation Hierarchy. Major challenges to overcome were a weak biodiversity baseline, Transmission line (T-line) crossing multiple ecosystems, major protected areas, Zero Extinctions Sites, Important Bird Areas, lack of institutional capacity, in addition to severe time restrictions. The presentation will show a novel qualitative approach to analyze priority setting on linear projects, PS6 Critical Habitat identification and application of the Mitigation Hierarchy focusing on avoidance, and mitigation measures along the T-Line.

Background

The Energy Transport Expansion Project (ETEP) involves the construction of 853 km of transmission lines; 12 new substations , expansion of 12 existing substations passing through 15 departments, 74 municipalities and 340 communities of Guatemala. Based on the Ecuador Principles and according to requirements of the International Bank Lenders of the Project it was decided to implement the Identification of Critical Habitats of the T-Line according to the Performance Standard 6 of the International Finance Cooperation; a rapid cumulative impact assessment and a Biodiversity Management Plan. Lenders provided a four months timeframe to complete the above studies, improve the EIA and comply with PS6-IFC.

Methodology

The Identification of Critical Habitats (CH) based on PS6 followed a systematic process of selection of priority areas In order to optimize resources and reduce implementation time (Figure 1). For the purpose of the study the area of influence (direct and indirect) of the project was defined as (1) kilometer on either side of the central axis of the T-Line. A General Assessment Process on the Identification of CH for the Project was developed (see Figure 1). The approach provided the steps necessary to meet criteria 1, 2, 3, 4, 5 of the PS6 including quantitative thresholds (Tier 1 and 2) of criteria 1, 2, 3 for species together with irreplaceability and vulnerability criteria for ecosystems (criterion 4). A key aspect of the approach involved the implementation of a workshop with the best experts in biodiversity of the country where the presence / absence of candidate species was determined in the area of study. The entire process of selection involved the following groups: plants, birds (resident and migratory), mammals (small, medium and large), reptiles, amphibians and fish. Lastly, a final list was developed from the master list of candidate species validated by experts.

Figure 1. Priority Sections A,B,C,D,E, F of the T-line

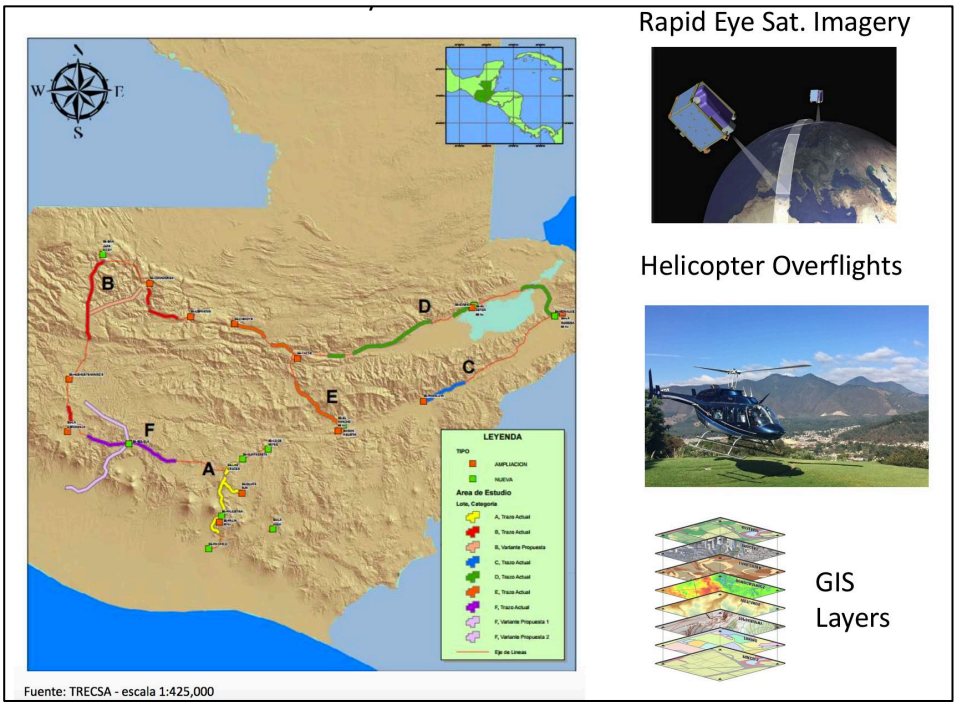


Figure 2. General Assessment Process and Steps

Results

For all Sections of the T-line (A, B, C, D, E and F) 164 Critical Habitat species in the Right-of-Way (30m) were identified: Plants (43 spp.), Birds (55 spp.), Mammals (24 spp.), reptiles (8

spp.), amphibians (27 spp.) and fish (7 spp.). Considering each section critical species were distributed as follows: Section A (35 spp.); Section B (53 spp.); Section C (16 spp.); Section D (43 spp.); Section E (39 spp.) and Section F (53 spp.) with a degree of shared species between Sections. Although the number of CH species is high, 116 species were considered potential occurrences (70.7%) and only 48 species were sighted in the EIAs of each Section.

35 species were included in PS6 Criterion 1. Regarding plants, 13 species were categorized as endangered via the local red list . At least 13 bird spp. and 9 mammal species were also classified as endangered. The vast majority of plant species examined (30 spp.), birds (30 spp.), mammals (15 spp.), amphibians (27 spp.), reptiles (8 spp.), fish (7 spp.) were endemic and/or of restricted range. Particularly in the case of amphibians, reptiles and fish all species conform within Criterion 2. Additionally 18 species of migratory birds comply with Criterion 3 including two migratory bat species. Amongst all species, eight (8) species shared Criteria 1,2 by example the masked quail was found to be endemic and also endangered according to the Official list of Guatemala.

Section D contains the largest number of Neotropical Migratory species that use the Atlantic route. Migratory ducks, storks and herons have significant concentrations in areas of Rio Dulce, streams and areas of the Wildlife Refuge of Bocas del Polochic. Appropriate mitigation measures were developed to avoid possible collisions with this section of the T-Line. In addition, as shown in Figure 2, five (5) unique ecosystems were identified: 1. Section B the Climax Montane Shrubland of the Sierra de los Cuchumatanes (between 3000m-3200m) . 2. Section C: Deciduous Xerophytic Shrubland. This ecosystem, located in Rio Hondo area, is unique in its vegetation of thorny scrub harbors high endemic species of cacti and other critical species of birds, reptiles and mammals; 3. Section D: Dominated by Grasslands and Shrubs. The ecosystem is on the edge of the Wildlife Refuge Bocas del Polochic is unique for the high diversity and large numbers of waterfowl and migratory birds that inhabits this area; 4. Section E: Dominated by Shrub and Grassland. It is located specifically at the Rancho. Known as Thorny Scrub or Chaparral. Habitats of these unique ecosystems are currently highly modified by the establishment of crops and pastures; and 5. Section F: Coniferous Forests. It covers the Forest Community of Totonicapan, including the most important stronghold of forest fir (*Abies guatemalensis*) being the largest and best preserved of the country (Figure 3).

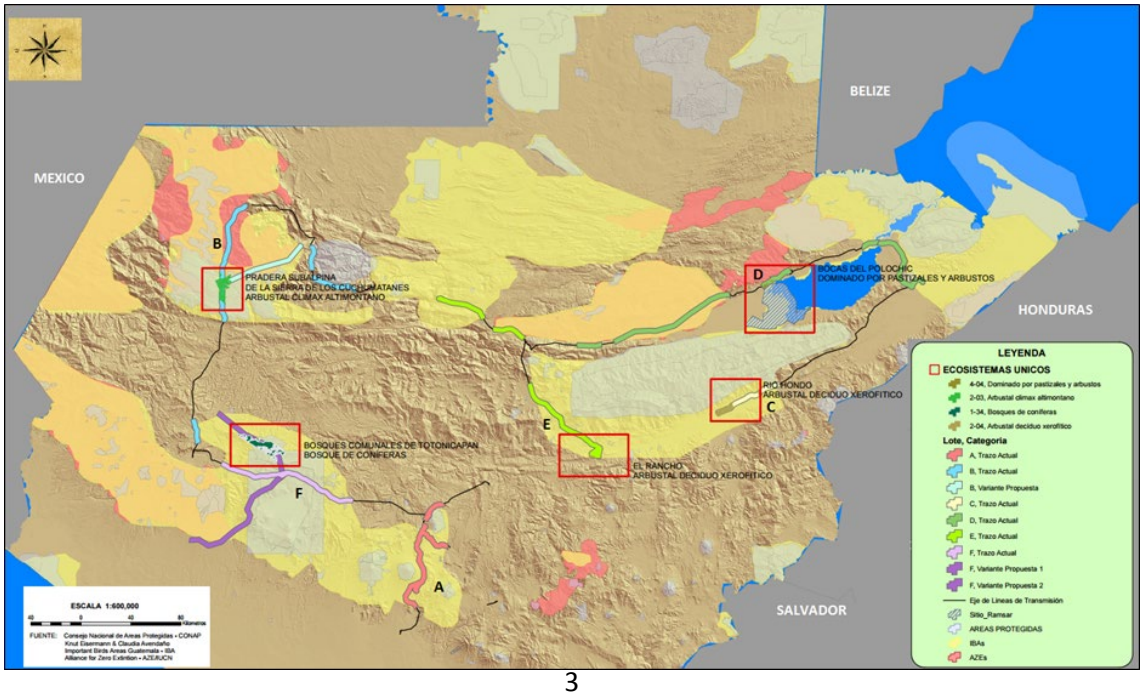
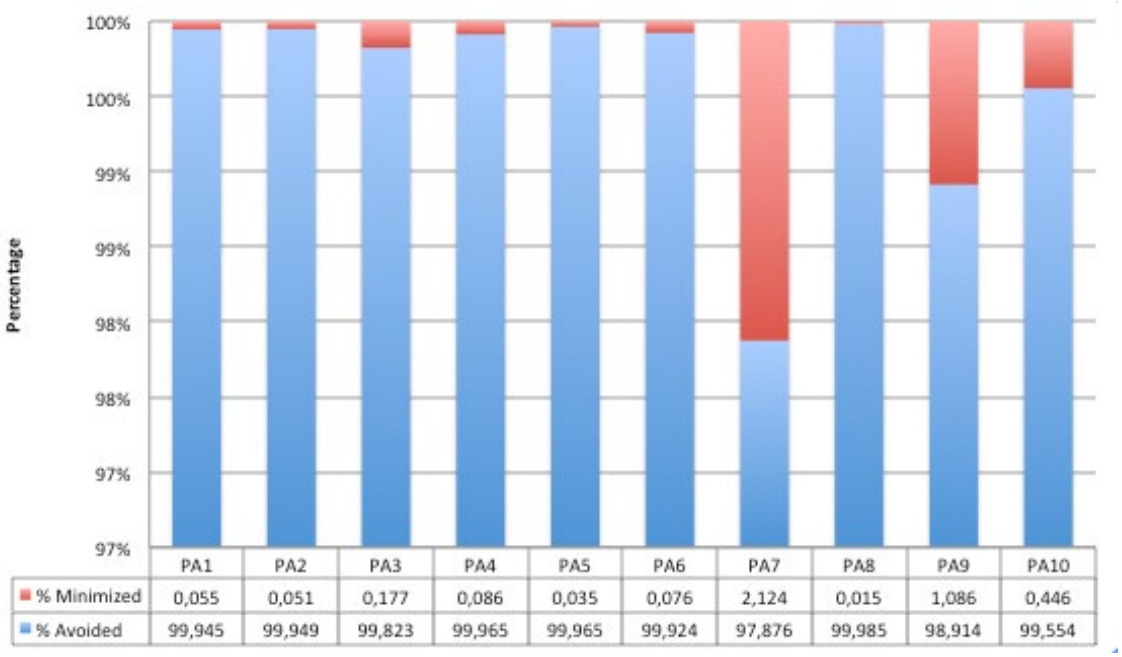


Figura 3. Priority Sections of the T-Line A,B,C,D,E, and F. Unique Ecosystems according to PS6-Criteria 4 are shown in red rectangles.

A Mitigation Protocol of Critical Habitat was produced as part of the Biodiversity Action Plan (BAP). The aim of the Protocol was to apply the Mitigation Hierarchy in priority areas and selected sites with a menu of specific mitigation options for each unique ecosystem and critical species. A Conceptual Framework for the PAB was developed. The general objectives of the BAP were: 1. ensure effective management of potential impacts of the project in areas of critical habitat during the construction and operation of the project; 2. minimize, rehabilitate, mitigate and offset (if necessary) the potential impacts on biodiversity in the area of direct and indirect influence of the project; 3.Develop and implement a program of effective monitoring and evaluation of environmental management including monitoring indicators and changes / trends in biodiversity (species and ecosystems selected).

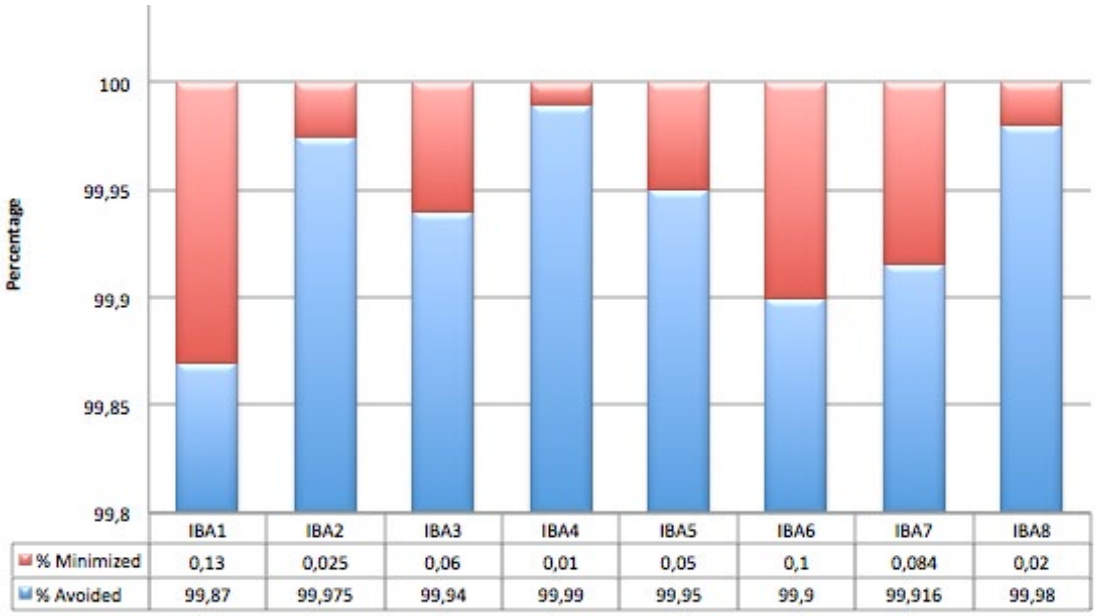
Based on the identification of CH, the Mitigation Hierarchy was applied to Protected Areas (PAs), Important Bird Areas (IBAs), and Zero Extinction Zones (AZEs) in sections were the T-line would potentially impact buffer areas. The current design of the T-line Trace (excluding variants) avoided nucleous zones and the main forest cover of PAs , IBAs and AZEs. Only marginal and not significant impacts were detected according to avoidance and minimization levels as shown in Figures 4 and 5. Additionally, the T-line trace of Sections A, C and E do not overlap with PAs and Sections A, C and F and do not cross AZEs.

Figure 4. Mitigation Hierarchy – Avoidance and Minimization Levels on PAs



	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10
% Minimized	0,055	0,051	0,177	0,086	0,035	0,076	2,124	0,015	1,086	0,446
% Avoided	99,945	99,949	99,823	99,965	99,965	99,924	97,876	99,985	98,914	99,554

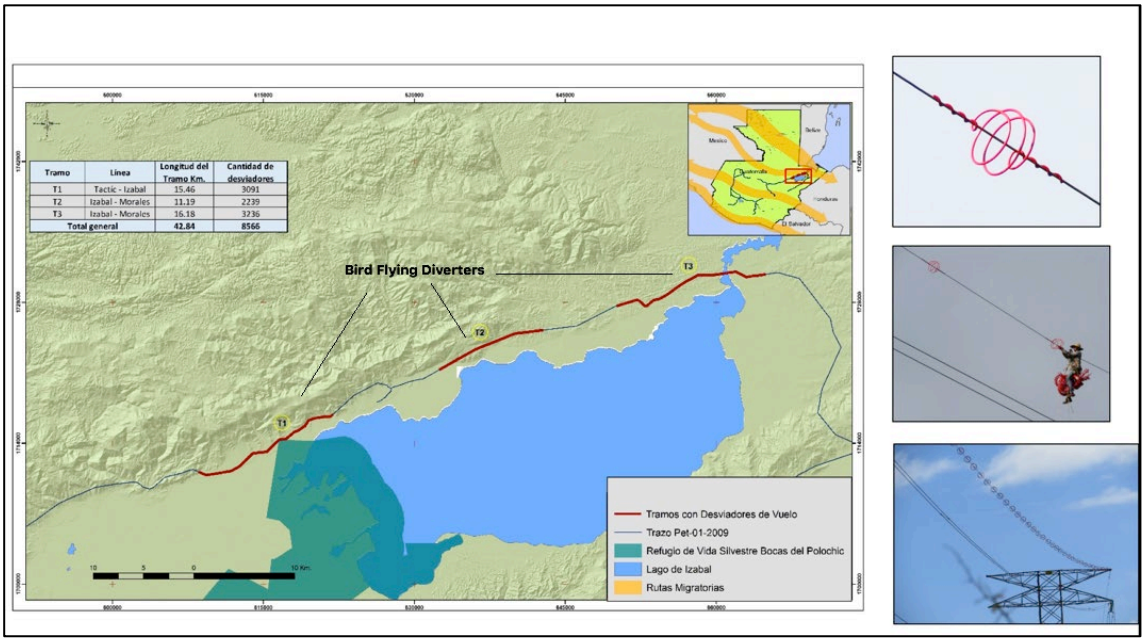
Figure 5. Mitigation Hierarchy – Avoidance and Minimization Levels on IBAs



Furthermore, to avoid potential bird collisions a total of 8566 Flight Diverting Spirals were installed along Section D of the T-line. For the selection of the sections where flight diversion devices were installed, the following aspects were considered:

1. The North-South migratory routes of Neotropical birds. It is known that there are 2 main routes of migration, the Pacific Route that begins in the western United States and Canada and crosses Mexico and Central America through the lowlands of the Pacific coast; and the Central Route that starts in the region of the great lakes between the United States and Canada, crosses the Gulf of Mexico and enters the country along the Caribbean coast (Ruiz, 2011).
2. The proximity of the trace of the transmission lines to wetlands. Wetlands are habitats where a greater number of birds tend to concentrate; the sections of the lines that are located at a distance of 2.5 km or less from these ecosystems were selected for the placement of the flight exclusion devices.
3. The presence of special areas such as mountain borders and river basins. Because there are daily or seasonal movements of resident birds, mainly on an altitudinal gradient, the placement of flight diversion devices on mountain edges and river basins was also considered.

Figure 6 . Mitigation Hierarchy – Bird Flying Diverters along D Section of T-line



Discussion

Understanding the nature of ecological impacts of linear infrastructure is essential to the identification of measures to avoid, minimize and restore critical habitats. It was determined that the ETEP project footprint was very small but due to its nation wide coverage had the potential of affecting (via habitat fragmentation) many critical habitats as a result of direct and indirect impacts.

Based on the Right-of-Way (30m) the total area of affected ecosystems was estimated in 433 ha excluding variants/alternate routes of the T-Line in Sections B and F. Ecological systems of the buffer zone of 2km considered in the analysis of Critical Habitats actually constituted a small portion of the total area of these ecosystems nationwide.

It was determined that a unique ecosystem level approach should be considered including monitoring activities in at least two of the following indicators: i) Trends in extent of forest cover (e.g., Coniferous Forest, Climax Montane-shrubland); ii) trends and extinction risks of Critical species dependent on these forests; iii) Trends in fragmentation of forests and shrubs; iv) Trends in Habitat Condition (optimal, fair, good, bad) of these ecosystems.

Recommendations

Concerning additional Sections of the Project where construction had not been initiated, it was recommended to also apply the mitigation hierarchy to avoid, mitigate possible patches of sensitive CH. This activity would involve a micro-design of the T-Line route. Subsequently, it was required to confirm the current Condition of Critical Habitats including geo-referencing of species and habitats along the 30 m RoW of the transmission line. In Sections already constructed it was recommended to assess the condition of CH and species to assess possible loss of biodiversity and mitigation measures.

If the Section F Variant is constructed, as a precautionary measure it was suggested to implement a method of participatory consultation with local communities actually responsible for the protection of the forest. In addition, should the Company (TRECSA) decides to build, it is recommended to avoid coniferous forest patches (sensitive critical habitat).

For critical species the following basic criteria should be considered: i) The species should be identified in the field with relative ease and have a stable taxonomy; ii) The species should be accessible in time/space iii) The species must be able to respond to the impacts associated with the project in a reasonable time. Habitat preferences and general natural history of the species should be relatively well known; iv) The current distribution and population trends in the project area should also be relatively known; The species must have a defined threat status according to Performance Standard 6 (Criteria 1,2,3), IUCN, and the Official List of Threatened Species of Guatemala. At the level of critical species identified in the T-Line individual monitoring plans are summarized for the pine-tree *Juniperus standleyii*; the bromeliad *Tillandsia xerographica*; the tree-frog *Plectrohyla guatemalensis*; the Hummingbird *Lampornis viridipallens*; the golden-cheeked warbler *Dendroica chrysoparia*; the blue-winged teal duck *Anas discors*; the migratory bat *Leptonycteris yerbabuenae* and the howler monkey *Alouatta pigra.*

In general, once Critical Species are identified and the Condition of the Habitat characterized it was recommended to apply the *Drive Away and Rescue Plan* of wild fauna and flora. Tree cutting activities would be systematically implemented according to existing layers, making pruning cuts and to minimize the effect on plant coverage present in the vicinity (unsolicited individuals for removal and / or use) of trees to be cut.

Concluding remarks

Applying the principles of PS6 to major linear projects passing through highly biodiverse natural and rural terrain usually involves complex technical and financial challenges in addition to long-term assessments. The General Methodology and Priority Setting presented here is described as an instructive process innovation in order to comply with PS6 in a cost-effective short time frame. Whereas PS6 was written with single-site projects (e.g. mines and hydro projects) primarily in mind, linear infrastructure like T-lines, pipes and railways, which of necessity pass through multiple ecosystems, called for adaptive thinking in order for the PS6 principles to be applied with adequate rigour.

Literature Consulted

De la Zerda, S., Rosselli, L. (2003). Migración de colisión de aves contra líneas de transmisión eléctrica con marcaje del cable de guarda. Ornitología Colombiana 1: 42-62.

Everlife y TRECSA (2011). Estudio de Evaluación de Impacto Ambiental del Proyecto PET -01-2009. Plan de expansión de transporte 2008-2018 Lote B. Guatemala.

Everlife y TRECSA (2011). Estudio de Evaluación de Impacto Ambiental del Proyecto PET -01-2009. Plan de expansión de transporte 2008-2018 Lote F. Guatemala. 549pp.

Farjon, A., Filer, D. (2013). An Atlas of the World's Conifers: An Analysis of their Distribution, Biogeography, Diversity and Conservation Status. Brill. 524pp.

Farjon, A. 2013. Juniperus standleyi. The IUCN Red List of Threatened Species 2013: e.T32501A2820961. http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T32501A2820961.en . Downloaded on 15 September 2015.

Geoambiente y TRECSA (2011). Estudio de Evaluación de Impacto Ambiental del Proyecto PET -01-2009. Plan de expansión de transporte 2008-2018 Lote D. Guatemala. 451pp.

Geoambiente y TRECSA (2011). Estudio de Evaluación de Impacto Ambiental del Proyecto PET - 01-2009. Plan de expansión de transporte 2008-2018 Lote E. Guatemala. 446pp.

Howell, S. N. G., y S. Webb. 1995. A guide to The Birds of Mexico and Northern Central America. Oxford University Press Inc., New York, E.U.A. 851 Pp.

Infante S, Neves J, Ministro J, Brandão R. 2005. Estudo sobre o Impacto das Linhas Eléctricas de Média e Alta Tensão na Avifauna em Portugal. Quercus Associação Nacional de Conservação da Natureza e SPEA Sociedade Portuguesa para o Estudo das Aves, Castelo Branco. Informe inédito.

King, D. y Rappole, J. (2000). Winter floking of insectivorous birds in montane pine-oak forests in Middle America. The Condor: 102, 664-672.

Kraker, C. (2015). La insospechada riqueza de murciélagos de Guatemala. Ecofronteras 19(53): 26-29.

Lazo, A., Castelló, A., Conde, J., Janss, G. (2014). Elaboración de metodología y protocolos para la recogida y análisis de datos de siniestralidad de aves por colisión en líneas de transporte de electricidad. Red Eléctrica de España. 161 pp.

Ponce C, Alonso JC, Argandoña G, Garcia Fernandez A, Carrasco M. 2010. Carcass removal by scavengers and search accuracy affect bird mortality estimates at power lines. Animal Conservation, 1: 1-10

Ruiz, R. 2011. Informe de Selección de Tramos para Colocación de Dispositivos Desviadores de Vuelo de Aves en el PET-01-2009. Transportadora de Energía de Centroamérica –TRECSA-. Guatemala.

Salguero, M. y TRECSA (2011). Estudio de Evaluación de Impacto Ambiental del Proyecto PET - 01-2009. Plan de expansión de transporte 2008-2018 Lote C. Guatemala. 886pp.

Yee ML. 2007. Testing the effectiveness of an avian flight diverter for reducing avian collisions with distribution power lines in the Sacramento Valley, California. Public Energy Related Environmental Research Program, California Energy Commission, Sacramento, California.