MOTT MACDONALD

Jilamito Hydropower project

Summary ESIA

11 April 2019

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Executive summary

Overview

Inversiones de Generacion Eléctricas S.A. de C.V. ('INGELSA or the 'Project Developer') has identified the need to expand the renewable energy generation portfolio in the north-east region of Honduras. INGELSA plans to develop a 14.48 megawatts (MW) run-of-river hydroelectric project on the Jilamito River, Atlantida Department, Honduras ('Jilamito Hydroelectric project' or 'the Project') to meet this need. The electricity generated by the Project will be sold to *'Empresa Nacional de Energía Eléctrica'* ENEE under a 30-year term power purchase agreement (PPA). INGELSA will develop and own the Project as a special project vehicle (SPV). HERMACASA is the Project Sponsor that owns the SPV. Equity ownership of HERMACASA is principally with a Honduran businessman, Emin Jorge Abufele Marcos and with Simonds Industries, Inc.

INGELSA has undertaken various feasibility studies, environmental and social assessment studies and stakeholder consultation activities since 2006 and this Summary ESIA is prepared to provide a coherent presentation of the current outcomes of the impact assessment process for the purpose of securing financing from international lending institutions. This summary ESIA provides no new assessment of impacts or mitigation measures.

Key facts about the Project

The Project is a run-of-river scheme that diverts the water from the Jilamito river and the Quebrada Jilamito to use for energy generation before returning the water back to the Jilamito river 5km downstream. The optimum design flow is 2.8m^3/s and an ecological flow of 0.25 m^3/s will be provided.

Two small diversion weirs will be used to route the water to a settlement pond where large sediments will be removed. The water will then be channelled through a low-pressure tunnel and pipeline to a high-pressure penstock that leads to the power house where the turbines and generators are housed. After passing through the turbines the water is returned to the river via two canals. In addition to the main project components the following infrastructure will be required to help construct and operate the plant. An 'ecological flow' will be maintained on the section of river between the diversion weirs and the powerhouse. The ecological flow is the volume of water deemed appropriate to maintain the ecological and aquatic function of the river ecosystem along the diverted section of river.

- Heavy lift skyline cable system from powerhouse to the upper basin (approximately 2 km).
- New 10.5 km, 34.5kV overhead transmission line (OHL) from Jilamito powerhouse to Lean switching station where it will connect into the existing regional transmission system.
- One new substation (at the power house) and switching station (Lean).
- New 7.5 km access roads from Mezapita to the project site and internal private site roads to link the powerhouse with the upper weir sites.
- Borrow pits for the road construction.
- Concrete aggregate quarries and aggregate crushing / processing plant which is located 60 kilometers from the project site. The locality of the plant is Santa Ana, Municipality de la Masica, Atlántida.
- Three material dump sites.
- General supporting infrastructure including: waste management facilities, sanitation facilities, medical center, satellite communication equipment and temporary generators.

- Worker accommodation (located in Mezapita as for the Mezapa hydroelectric project). There will also be a mountaintop workers' camp, with approximately 50-70 workers. This camp will be built located 50 meters downstream the surge shaft.

During the construction phase it is expected that 400 employees will be employed by INGELSA, the lead contractors and sub-contractors including heavy machine operators, bricklayers, carpenters, administrative staff, maintenance staff, security personnel and catering staff. The construction and commissioning works are expected to be completed within 40-months from start of site preparatory work. During operation 11 personnel will operate the site in three eight-hour shifts, seven days a week. Operational staff will include: operation engineers; maintenance engineers; administrative staff and reforestation assistants.

In considering alternative sites and technologies the Project has considered the best option based on technical, financial, environmental and social criteria. The transmission line considered three options with the preferred option offering the shortest route, lowest capital costs and use of local materials (wood poles). Where possible, the overhead line is routed to follow existing roads and rights of way.

The total capital expenditures (CAPEX) budget for the Project (including transmission line) has been estimated to be in the range of US$67 million.

The Jilamito hydroelectric project is planned to contribute to the existing renewable energy generation portfolio and offer opportunities for economic development through direct employment and opportunities for local companies to provide services and goods. The Project will also provide investment for community projects in the areas of water conservation, education and preservation of forests and watersheds which will be documented in a community development plan.

A land access negotiation has been implemented with 32 land owners, in different types of agreements (land purchase and easements).

Stakeholder consultation and participation

Since 2013 a program of stakeholder consultation, participation and disclosure has been implemented. Stakeholders have included: local government departments (cultural, forestry and environmental); local coordination boards, the water board, the agroforestry Cooperative CALIJINUL (Cooperativa Agroforestal Liberación Jilamito Nuevo Ltda.), local administration departments of the Arizona municipality, local business owners and local workers, landowners and occupiers, active non-governmental organisations including: Broad Movement for Dignity and Justice (MADJ in Spanish) and the Environmental Foundation PROLANSATE. Stakeholder engagement remains ongoing through meetings with community representatives and stakeholders and includes providing attention to requests for social benefits and queries about Project technical aspects. Several agreements have been signed with local organisation for environmental accountability, including a cooperative agreement with CALIJINUL and a joint agreement between ICF, PROLANSATE and INGELSA for protection of the Texiguat Wildlife Refuge.

The key expectations of the local community are in relation to job creation and implementation of social development projects. The local communities have high expectations in relation to the benefits that Jilamito could provide them, specifically in relation to the creation of employment and benefits of direct development (roads, schools, and similar benefits). The community has requested that INGELSA define a long-term agreement to secure investment in the area and to make commitments in relation to the number of people who will be employed from the area of influence and on the characteristics of the employment program. INGLESA has provided further information on these topics so that expectations on both sides are understood. The stakeholder engagement process will remain ongoing throughout the lifetime of the Project.

Project environmental and social management

Under General Environment Law, Decree No. 104-93 (June 30, 1993), the Project is classed as a 'Category 3' project and in accordance with this Law has secured its national environmental licence and resolution (Resolution 1429-2013) from national environmental body *Secretaría de Recursos Naturales y Ambiente* (SERNA), water use concessions, tree cutting permits from National Institute for Forest Conservation (*Instituto de Conservación Forestal)* (ICF) and 'certificate of no significant archaeological findings' from (IHAH) and approval of compliance with the environmental mitigation plan (PGA) from SERNA. The Project has committed to comply with local laws and policies specifically in relation to solid waste management, management of biodiversity in cloud forests including Decree 87-87 which is responsible for the creation of the Texiguat Wildlife Refuge, labour laws, health and safety and water and sanitation.

The Project documentation sets out a fundamental commitment to:

- Implement Good International Industry Practice (GIIP) as set out in the International Finance Corporation (IFC) Social and Environmental Policy, Environmental and Social Performance Standards (PS) and applicable WB Group Environment, Health and Safety (EHS) Guidelines.
- Recognise its obligations under international agreements and conventions as ratified by Honduras including those related to labour and biodiversity.
- Comply with national labour code and the requirements of IFC PS2 for labour which is underpinned by the eight core (fundamental) ILO conventions on forced and compulsory labour, collective bargaining, elimination of discrimination in respect to employment and occupation, abolition of child labour and Freedom of Association and Protection of the Right to Organize.

The Project has committed to the following key environmental and social obligations:

- Develop an environmental and social management system (ESMS) for coordinating EHS training, document control, identification of impacts, inspections, auditing, security, roles and responsibilities, monitoring and evaluation and setting to work procedures.
- Develop and implement (with support from the construction contractors / sub-contractors) a project specific construction and operation environment and social management plan (ESMP) and where necessary developing supporting thematic management plans on the topics of:
  - i) emergency preparedness and control,
  - ii) traffic management
  - iii) pollution prevention (noise, air quality, water dischargers and hazardous material management)
  - iv) waste management
  - v) occupational health and safety
  - vi) communications and community relations plan,
  - vii) community development program,
  - viii) natural resource management program (which includes reforestation plan)
  - ix) grievance redress mechanism
  - x) workers code of conduct
- Hire E&S personnel in the area of environment and forestry management, health and safety management, social coordinator and supporting personnel. Where necessary, outside consultants may also be used for specialist topics.

The project has already developed plans and cooperation agreements in the following areas:

- Watershed management plan for the Jilamito river basin, produced in collaboration with community residents,

- Socialisation agreement between INGELSA and CALIJINUL co-operative, and
- Co-operation agreement between the National Institute of Forest conservation (ICF) and INGELSA for the Texiguat wildlife reserve.

To meet Lender obligations for financing, the Project has committed to implement actions set out in the INGLESA Environmental and Social Action Plan (ESAP). The ESAP identifies a series of actions which, when completed, will align the Project with the requirements of the relevant International Finance Corporation (IFC) Performance Standards (PSs) 2012. Compliance with the Project ESAP is an ongoing requirement throughout the project lifetime. The project ESAP is provided in Appendix C of the Jilamito Environmental and Social due diligence report, Golder Associates (2017).

Impact assessment

The Project has prepared a national Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (environmental impact assessment, EIA) and Plan de Gestión Ambiental (PGA) *(Environmental Management Plan)* 'Hydroelectric Jilamito', Ambitec (2013) (environmental management plan, EMP). In addition, INGELSA has engaged outside consultant ERM to undertake complementary studies to strengthen the biodiversity and social baseline and to assess: biodiversity impacts; social impacts; transmission line impacts; traffic and transportation and cumulative impacts. The purpose of the studies has been to complement the national assessment work by making direct reference to Lender international standards and to help further define a sound mitigation and monitoring plan.

The assessment has considered impacts associated with the following activities within the direct impact area (project footprint) and indirect area (areas that may be impacted in a secondary or induced way):

1) Construction and operation of diversion weir, pipelines infrastructure and power house
2) Construction of new access roads
3) Construction of new 10.5km transmission line

The impact assessment documentation has considered impacts to key sensitive receptors including villages within 5km of the Project works, Texiguat Wildlife Refuge and the Lean watershed/ catchment area.

Project impacts

The Project impact assessment has identified the following impacts which may have a significant effect on the ecological, cultural, and socio-economic environment or pose a risk to community health or to worker safety and wellbeing. Details for each impact and impacts which have not been judged to be significant are given in Section 18, and in chapters 6 to 16.

Adverse

Construction

- Increased runoff and erosion and sedimentation into waterbodies
- Construction noise may cause some species (mammals and birds) to emigrate temporally outside of the impacted zone during the constructing stage
- Removal of vegetation cover may result in: reduced soil changes to natural drainage, landscape alterations, increased runoff resulting in soil loss and erosion, reduction in available habitat for wildlife, including protected and endangered species
- Habitat fragmentation will reduce connectivity for fauna, including protected and threatened species

- Direct mortality of individuals through collision with vehicles and machinery, damage to nesting sites, tree felling, or direct killing by project staff
- Increase in sexually transmitted disease in local population
- Reduced safety for workers and neighbours of the communities
- Community health and safety (dust, noise and accidents) from increased traffic movements on local roads
- Influx of foreign population could have a negative effect on local culture and could increase the risk of social conflict
- Security for the project may introduce hazardous situations for workers and local communities
- The project does not affect community drinking water sources in the area, however the project may raise concerns regarding water

Operation

- Changes in downstream river flow regime between the weirs and the powerhouse
- Changes to the erosion and sedimentation dynamic of the Jilamito river

Beneficial

Construction

- Avoided GHG emissions
- Jobs (total job expectation during construction is 400 people, local, national, regional and international workers)
- Incoming workers could increase demand for goods and services
- Effect on domestic demand and gross domestic product (GDP). This effect will be reflected primarily in an increased in demand for goods and services.
- Stimulation of the local economy and generation of indirect employment opportunities
- Social investment activities in community projects such as water, communications, and educational infrastructure, among others
- Improvement of domestic incomes and the dynamism of the local economy through recruitment of labour.

Operation

- The project contributes to the preservation of the watersheds and Texiguat Wildlife Reserve
- Income from the connection to the grid and stimulation of new investments in the complementary sectors of Jilamito
- Increased the energy offer in the national grid system.
- Social investment activities in community projects such as water, communications, and educational infrastructure, among others
- Improvement of domestic incomes and the dynamism of the local economy through recruitment of labour
- Jobs (during operation the total staff is 11 people)

No cumulative impacts have been identified based on the assessments performed for this Project.

Project mitigation measures

The Project will implement the following project specific mitigation:

- Undertake further water quality sampling to establish baseline up and downstream of the Project to assist future evaluation of monitoring results. During construction, establish quarterly monitoring of water quality to include current flow, rainfall and water quality.
- An ecological flow greater than 0.21 m^3/s at the proposed water intake no.1, and 0.03 m^3/s at the proposed water intake no.2
- Include a survey of local springs in the pre-construction geological survey work so these may be identified and protected during tunnelling and other works.
- Undertake a water use calculation for construction phase to help define the strategy for water supply during construction.
- Implement soil drainage, protection and stabilization work as close as possible following all excavation works, road works and construction of trenches.
- Install sediment traps, ditches and energy dissipators to help minimise erosion impacts.
- Where it is possible the planting of local vegetation perpendicular to the terrain will be undertaken to reduce erosion.
- Respect patterns of natural drainage to practice good management of rainwater and reduce erosion rates. Where required, drainage works are to be built which are suitable to handle rain water run-off from the main project buildings and access road areas.
- Install a sediment barrier or curtain in locations where there is potential for runoff to create sediment risk.
- The clearing of trees in the protection strip of the river bed will be avoided, and measures will be taken to protect them, except where the civil works are to be installed and where construction activities will be carried out on the river bed.
- Apply seismic building codes as set out in the Seismic Hazard Analysis of Honduras by the Civil Engineering Department, Earthquake Engineering Center of Stanford University (Ref: J.A. Blume).
- When water is used for human consumption (water from springs, rivers, streams), it must be treated in such a way as to guarantee the potability of it by carrying out periodic analysis, except for purified water purchased in bottles. The water to be used for construction activities may be supplied directly from a spring, provided that the latter is not used for human consumption and an adequate collection structure is created.
- Bury pipelines where possible
- Use skyway cable system to reduce need for access roads in steep slope areas under the high-pressure pipelines from the diversion weir to the power house
- Prohibit burning or accumulation of solid waste in and around the area of influence of the Project
- Remove sediment from behind the diversion weirs in a proper manner for disposal in a place where it does not affect the normal course of the river
- Chance finds procedure for cultural heritage
- Mitigation measures for biodiversity include:
  - Project staff will be forbidden from hunting wild fauna in the Project area and surrounding areas, including taking pets to site;
  - the introduction and spread of new / invasive species are forbidden;
  - commitment to implementing reforestation campaigns four times a year (locations, areas and number of years are not specified);
  - ongoing biodiversity management supported by the Smithsonian (Washington DC, USA)
  - a flora and fauna relocation plan to be included in the BAP

- training for Project staff (including subcontractors) on the biodiversity issues and mitigation for the Project,
- specific measures to prevent the introduction of non-local or invasive species,
- programmes to support the Texíguat nature reserve.
- offsetting by replanting
- pre-construction checks for wildlife

Disclose and socialise a risk management manual aimed at Project employees and residents in directly and indirectly affected communities.

Good International Industry Practice (GIIP) in the following topics will be applied and described in detail in the Project CESMP and OESMP:

- Solid waste management
- Hazardous material management
- Dust control (vehicles and aggregate processing and blasting)
- Occupational noise control (vehicles and equipment, blasting)
- Visual impact
- Waste management (including developing an Integrated Solid Waste Management Plan)
- Pest management (including developing an Integrated Pest Management Strategy (IPMS)
- Traffic management
- Transmission line signage,

Monitoring on the following topics will be an integral part of the ESMS for construction and operation:

- Occupational noise
- Daily visual inspections dust
- Occupational health and safety
- Traffic accidents and incidents
- Community and worker grievances
- Waste types, volumes and disposal methods
- Water quality
- Reforestation and re-vegetation

The assessment documentation concludes that the Sponsor and operator of the Project, in association with its consulting partners, has the means and the competencies to adequately manage the environmental and social risks associated with this Project, and comply with national and Lender environmental and social requirements including the policies of the IFC Performance standards 2012.

1 Introduction

1.1 Overview

Inversiones de Generacion Eléctricas S.A. de C.V. ('INGELSA or the 'Project Developer') has identified the need to expand the renewable energy generation portfolio in the north-east region of Honduras. INGELSA plans to develop a 14.5 megawatts (MW) run-of-river hydroelectric project on the Jilamito River, Atlantida Department, Honduras ('Jilamito Hydroelectric project 'or the Project'). The Project includes 10.5 km of new 34.5 kV transmission line from the powerhouse substation to a switching substation in the town of Lean where it will connect to the existing regional electrical transmission network.

Although a portion of the access road construction is underway, construction of the main works is anticipated to start in the first quarter of 2019 and is expected to be completed within 40 months. The power generated by the Project will be sold to *'Empresa Nacional de Energía Eléctrica'* ENEE under a 30-year term power purchase agreement (PPA). The objective of the Project is to use water from the Jilamito river for the generation of electrical energy.

Supported by feasibility consultants Lombardi S.A, local environmental consultant Ambitec S.A and international consultant Environmental Resource Management (ERM), INGELSA has commissioned various environmental and social (E&S) studies and assessments for the purpose of obtaining the Project's national environmental licence and to support funding from international lending institutions.

1.2 Document objectives

INGELSA is in the process of obtaining financing for the Project. Potential financiers include (Overseas Private Investment Corporation (OPIC) and/or Inter-American Development Bank (IDB) (together referred to as the 'Lenders'). The Lenders have requested a single document summarising all the environmental and social (E&S) documentation to provide a coherent presentation of the current outcomes of the E&S impact assessment process and a clear statement on the management and mitigation plans for the Project.

This document will be referred to as the 'Summary ESIA 2018'. The objective of the Summary ESIA 2018 is to synthesise information on the Project design, potential adverse and beneficial impacts identified to date and current mitigation and management plans for addressing E&S issues associated with the Project and its 'related[1]' and 'associated[2]' infrastructure. It is based on information set out in documentation up to December 2018. This document will be disclosed on the OPIC and/or IDB websites to receive public comments as part of the decision-making process regarding their financing of the Project

From this list, core documents referred to for this Summary ESIA are:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- Plan de Gestión Ambiental (PGA) *(Environmental Management Plan)* 'Hydroelectric Jilamito', Ambitec (2013) (referred to as PGA, 2013)

[1] Related is defined as and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project and may include transmission corridors, access roads, boor and disposal areas and construction camps.

[2] Associated are defined as facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.

- Lombardi, Jilamito Hydroelectric Project, Feasibility Study Final Report, July 2015 (referred to as Lombardi, 2015)
- ERM (2016) Jilamito Hydropower project complementary studies, 2016 (referred to as ERM, 2016) including:
  - Critical Habitat Assessment (CHA, 2016)
  - Social Impact Assessment (SIA, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission Line Alternatives considered (TLA, 2016)
  - Traffic and Transportation impact assessment (TIA, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Cumulative Impacts Assessment (CIA, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission line impacts (TLI, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Ecological Flow (EF, 2016)
- INGELSA Plan de Seguridad e Hygiene (Health and Safety plan) (referred to as INGELSA H&S Plan, 2013)
- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)
- Hatch Independent Engineering Report, August 2018 (referred to Hatch, 2018)
- Golder Associates (2017) environmental and social due diligence (ESDD), Jilamito Hydropower project, Honduras (referred to as Golder, 2017)
- Report of the socialisation process, Ingelsa (2015)
- Report of visits to the Mezapa Hydroelectric Power Station by communities and Educational Centers, Ingelsa (2018)
- Resolution 1429 of 2013, SERNA (2013)
- SERM-04 Form (Social and Environmental Risk Management Report), HREFF (3 August 2018)
- Social baseline for the Jilamito Hydroelectric project, Ingelsa (November 2018 & December 2018)
- Summary of the Socialisation Process of the Jilamito Hydroelectric project, Executive Document, Ingelsa (n.d)
- Forestry survey, Institute of Forestry Conservation, August 2015
- Baseline aquatic fauna survey of the area of influence of the Jilamito Hydroelectric project, Ambitec (2017)
- Baseline Studies for amphibians, reptiles and *Haptanthus hazlettii* for the Jilamito Hydroelectric project, Ambitec (2018)

Additional reports that relate to specific topics that have been referred to are noted in the topic chapters

Where discrepancies have been noted the most recently dated document has been assumed to contain the most current information.

1.3 Project participants

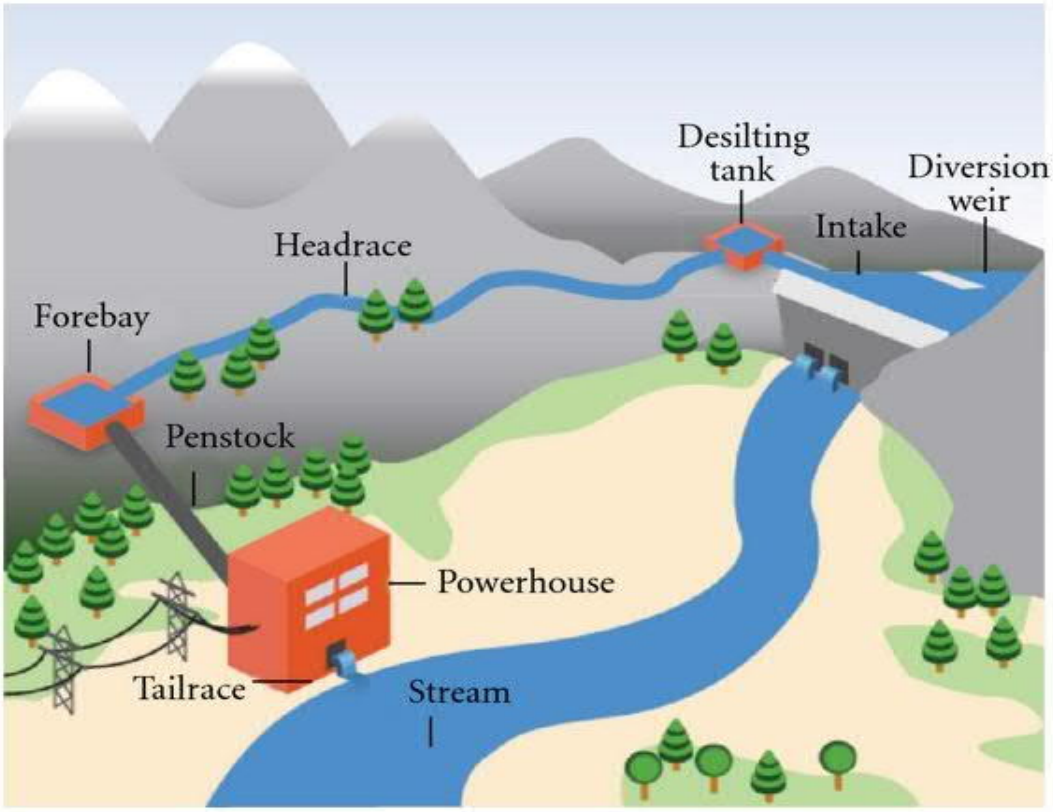
INGELSA is a special project vehicle (SPV) that will develop and own the Project. HERMACASA is the Project Sponsor that owns the SPV. Equity ownership of HERMACASA is principally with a Honduran businessman, Emin Jorge Abufele Marcos and with Simonds Industries, Inc. Emin Abufele

successfully developed the 8.8 MW Mezapa Hydro Project located in a drainage basin adjacent to the Jilamito Project (Hatch, 2018).

1.4 General description of a run-of river hydroelectric plant

A run-of-river hydroelectric plant uses the energy from flowing water to generate electricity in the absence of a large weir or reservoir. A small weir may be used to ensure enough water (energy potential) is available to go into the 'penstock' and possibly some storage for same day use only. The primary difference between this type of hydroelectric generation compared to large weirs is that run-of-river schemes primarily use the natural flow rate of water to generate power, instead of the power of water falling a large distance. However, water may still experience some vertical drop in a run-of-river system from the natural landscape or small weir[3]. The schemes are typically designed to operate on the lowest flow rate and typically require a good steady flow. The main components of a run-of-river project are illustrated in Figure 1 and include small water diversion or storage infrastructure, referred to as a weir, and a tunnel or channel known as the penstock to route the water to the power house where the generators are housed. After passing through the generators, the water is returned to the river downstream in a channel or tunnel often called the tailrace. Maintaining minimum ecological flow on the section of river between the weir and the tailrace is a critical element of a run-of-river project.

Figure 1: General overview of a run-of-river hydroelectric scheme



[3] University of Calgary, Energy education – run-of the river hydroelectricity (ttps://energyeducation.ca/encyclopedia/Run-of-the-river_hydroelectricity, 29 November 2018)

Source: Source publication December, 2010 Hydropower in the Context of Sustainable Energy Supply: A review of technology and challenges accessed 17/12/18 https:// https://www.researchgate.net/figure/Schematic-diagram-of-a-typical-run-of-river-hydropower-system-4_fig6_258404306

1.5 Background and history

A chronology of key activities, studies, permits and authorisations relevant to the E&S assessment process are summarised in Figure 2 below. From a national permitting perspective, the Project has secured its national environmental licence and resolution (Resolution 1429-2013) from national environmental body *Secretaría de Recursos Naturales y Ambiente* (SERNA), water use concessions, tree cutting permits from National Institute for Forest Conservation (*Instituto de Conservación Forestal)* (ICF) and 'certificate of no significant archaeological findings' from (IHAH) and approval of compliance with the environmental mitigation plan (PGA) from SERNA.

Figure 2: Project chronology

2006
- Hydrogeological studies and preliminary consultation commence

2010
- Contract No. 073-2010 power 73-2010 authorisation to supply power between ENEE and INGELSA Capital Variable (INGELSA) for the Jilamito Hydroelectric Project (valid for 30 years from COD) (Decree No. 2012-2010).
- INGELSA hires Lombardi S.A (Guatemala) for pre-feasibility works

2011
- November 9, 2011, SERNA grants a Contract for the Use of National Waters for the Electric Power Generation of the Jilamito Hydroelectric Project

2012
- Feasbility works completed
- September 7, 2012, Legal Opinion No. PGR-DNC-041-2012 issued: Supports agreement for the supply Power and Energy Contract No. 073-2010 between ENEE and INGLESA
- September 10, 2012, Operating Contract for the Generation, Transmission and Marketing of Power and Electric Power issued.
- Ambitec S.A commence Project environmental studies (commersurate with a Category 3 project under Honduran regulation) including preparation of DAC and PGA.

2013
- December 4, 2013, Environmental Resolution from SERNA (Environmental resolution No. 1429-2013

2014
- June 12, 2014, Certificate of environmental license 077-2014,
- June 12, 2014 Authorisation for Water Use (12 June 2015), Decree No. 341-2013), SERNA (valid for 50 years) with conditions on ecological flow and size of installation (14.85 MW)
- January 2014, Operations Permit SERNA (valid for 50 years)

2016
- INGELSA commision ERM to perform 'complimentary studies' to align project E&S documentation with Lender standards (traffic and transportation, social impact assesssment, critical habitat assessment, transmission line alternatives study, cumulative impact assessment
- Certificate of Opinion (no-objection) No. 089-SGP-2016 , Insitute of Honduran Anthropology (IHAH) - certifying no-evidence of archaeolgical finds in project site area

2017
- January 10, 2017, Resolution issued for Flora and Fauna Rescue Plan No. PS-DE-014-2016, ICF for cutting of trees of different species (valid until 10, Janury 2020)
- Variation Request for change of location of weir, desander, penstock and power house. (no supplementary EIA under national law was required)
- November 20, 2017, Approval of the notification of change in the configuration of the Project (Resolution No. 1233-2017 Environmental certificate No. 026-2017)

2018
- Approval of mitigation report (ICMA) Resolution No. 467-2018
- **Start prepartory site works (construction of new access roads)**
- August 2018, INGELSA prepare ESIA Addendum
- December 2018, Mott MacDonald prepare Summary ESIA report,

Source: Summarised by Mott MacDonald from project documentation (December 2018)

Going forward there will be municipal licenses and/or authorisations (mostly for temporary works) which are typically obtained once the contractor has submitted its plans for performing the work.

1.6 Summary ESIA process

The structure of this Summary ESIA is as follows:

- Non-technical summary - a summary of the current findings using non-technical language (English and Spanish)
- Chapter 1: Introduction - a general introduction to the scope of the Summary ESIA, a brief outline of objectives, an overview of chronology to date and the report structure
- Chapter 2: Project description – including a summary of needs case, description of the area of influence (direct and indirect) and a description of the current project components
- Chapter 3: Alternatives - a description of the alternatives assessed during decision making
- Chapter 4: Policy, legal and institutional framework - a summary of relevant national and Lender environmental and social standards and expectations
- Chapter 5: ESIA process and methodology - a summary description of the approach and methodology applied by the studies performed to date for assessing impacts and determining magnitude and baseline data collection
- Chapters 6 to 16 Topic specific chapters summarising impact assessment, and mitigation measures for: hydrology and water quality, soils, geology and landslides, biodiversity, noise and vibration, air quality and greenhouse gases, landscape and visual, socio-economic, hazardous materials and wastes, traffic and transport, cultural heritage, cumulative impact
- Chapter 17: Environment and social management
- Chapter 18: Summary of impacts and mitigation measures
- Chapter 19: Conclusion
- Appendices

2 Project description

2.1 Introduction

This section presents an overview of the Project including:

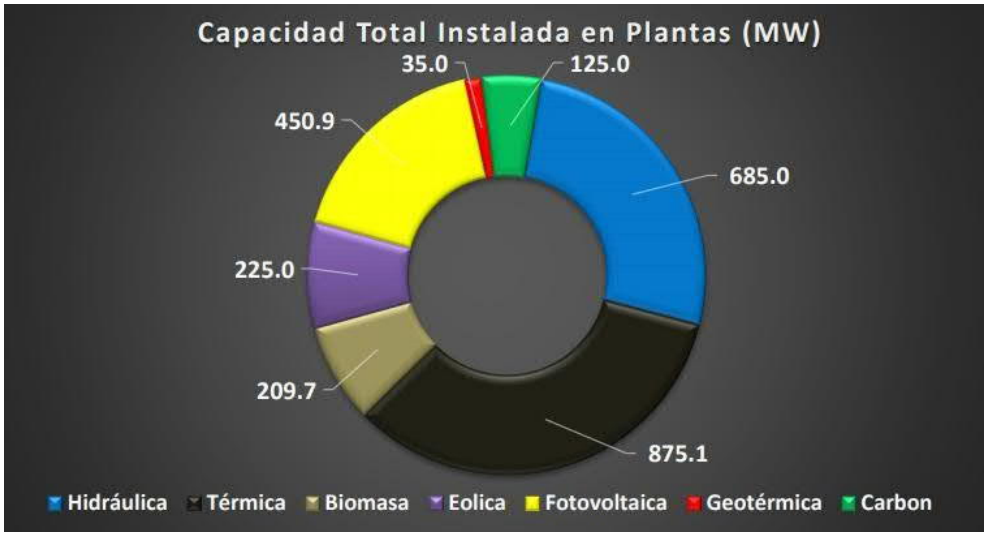
- Project needs case
- Project location and overview of character (including area of influence)
- Project components
- Natural resource use, waste management and energy supply
- Project stages and activities
- Associated facilities
- Budget
- Implementation arrangements and development schedule

2.2 Summary of needs case

A summary of the needs case is provided in DAC, 2013 and updated in the ESIA, 2018. Since the 1990's the national electrical system in Honduras has struggled to meet growing demand in Honduras. To increase capacity of electricity production ENEE, since 1994, has promoted private participation in the power generation market.

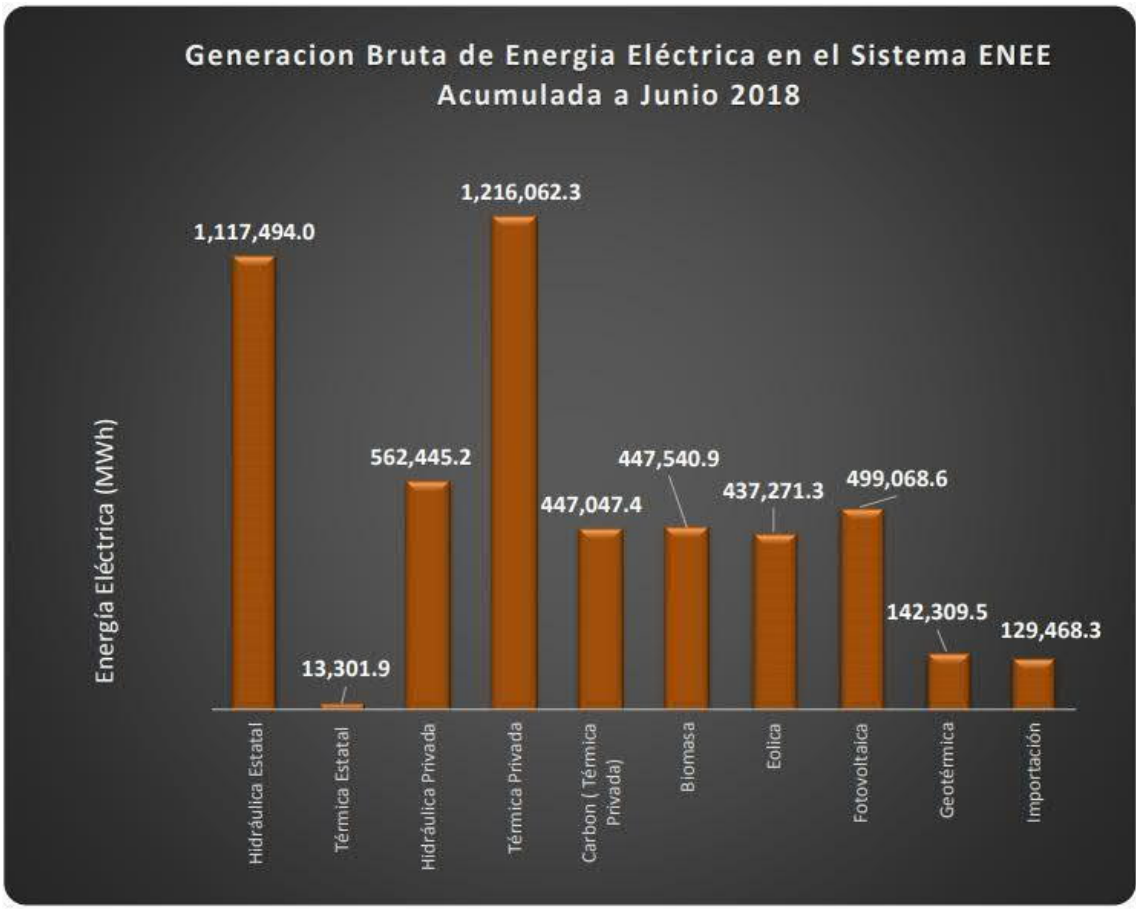
Since this time, the government has employed various strategies to meet demand with an increase from approximately 1,610.29 MW in 1994 to approximately 3,201,130 MW in June 2018 as illustrated in Figure 3, with the equivalent of 61.5% (1,605.6MW) of the country's generation deriving from renewable sources and the greatest percentage coming from hydropower as shown in Figure 4. It is noteworthy that Figure 4 shows that 129,468 MW/h is imported.

Figure 3: Installed electrical capacity (2018)



Source ESIA, 2018. Statistical Data Bulletin, June 2018. Notes: The generation type from left to right is translated as: hydroelectric, thermal, biomass, wind, solar PV, geothermal, carbon.

Figure 4: Gross Generation of Electric Energy in the ENEE System up to June 2018 (split by generation type)



Source: ESIA, 2018. Statistical Data Bulletin, June 2018

Notes: The generation type from left to right is translated as: state hydroelectric, state thermal generation, private hydroelectric, private thermal, coal (private thermal), biomass, wind, solar PV, geothermal, imported.

Honduras is a country with an important potential for hydroelectric generation, especially through small and medium-sized plants, due to its available water resources and its topography. Hydropower aligns with Honduras' direction to move away from thermal generation to renewable energy. The Jilamito hydroelectric project is deemed to contribute to this existing renewable energy generation portfolio and offer opportunities for local development (ESIA, 2018). INGELSA indicate in DAC (2013) that this has been evidenced with the Mezapa hydroelectric project where local employment and opportunities for local companies to provide services and goods all contributed to expanding the local economy. The Project will also provide investment for community projects in the areas of water conservation, education and preservation of forests and watersheds, and information on this is elaborated in Section 12.

2.3 Project location and character

The Project is located on the Jilamito River in the Lean River watershed, in the municipality of Arizona, Department of Atlantida, which is in the northern sector of the country between the coastal plains of the Caribbean Sea and the Nombre de Dios mountain range, refer to Figure 5.

Figure 5: Location of the Project site

Source: Hatch, 2018

The coordinates for the Project are provided in Table 1. The total concession area is 2,967 hectares according to the operation contract with SERNA (Decree No. 343-2013, Page # 64), as shown in Figure 12. The land for the hydroelectric project and the right of way for the new access road and the transmission line has been acquired by INGELSA (Hatch, 2018) and the current status is presented in Section 8. The land take for construction is 13.5 hectares (Ingelsa, 2018). The length of the dewatered reach of river between the diversion weir and the powerhouse is approximately 5 km.

Table 1: Project coordinates

Component	X	Y
Primary diversion weir	468139.18	1717085.27
Secondary diversion weir	468339.61	1717142.25
Desander	468133.92	1717120.02
Powerhouse	465824.41	1719132.14
Transmission line (start)	465812.03	1719197.27
Transmission line (finish)	465941.71	1728714.71

Source: Ingelsa, 2018, DAC, 2013 and ESIA, 2018

The general project environment is illustrated in Figure 6 to Figure 9.

Figure 6: The Jilamito Valley in the intake area, looking downstream

Source: Hatch, 2018

Figure 7: Quebrada El Danto in the intake area, looking upstream

Source: Hatch, 2018

Figure 8: Future site of the high-pressure penstock (including example of landslide)

Source: Hatch, 2018

Figure 9: Location of the powerhouse site (looking upstream (south-east). The Los Olivitos creek is to the right

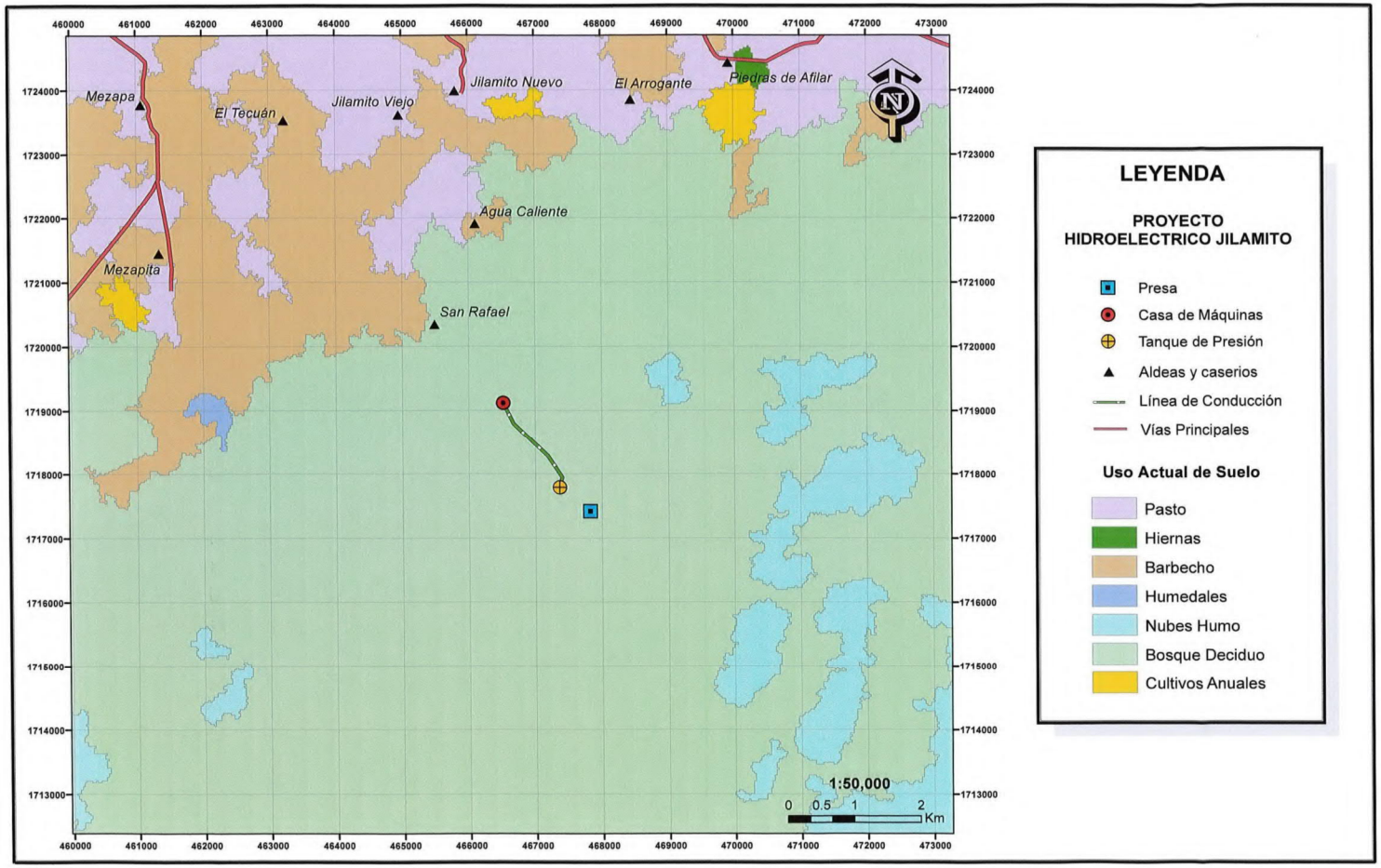
Source: Hatch, 2018

Table 2: Distance of nearby hamlets, villages and towns from Project site

Village or hamlet	Approximate distance from powerhouse (km)	Population / no. of inhabitants
San Rafael Hamlet	1	37
Jilamito Viejo	5.0	181
Jilamito Nuevo	5.2	511
Mezapita	6.2	1,643
El Retiro	Not stated	357
El Empalme	Not stated	160
Hilamo Nuevo	8.7	673

Figure 10 illustrates the type of habitat the Project is located in. The weir site is located within the buffer zone of the Texiguat Wildlife Refuge, while the powerhouse is located 1.0 km from the Refuge. The area where the Project will be developed is considered deciduous forest. The main income in the area is agricultural and livestock rearing. The local communities use the forest on a regular basis for wood and firewood and non-timber products such as food and medicine. Hunting (poaching) and harvesting of honey from wild hives are also common (DAC, 2013). Table 2 provides a summary of nearby hamlets, villages and towns.

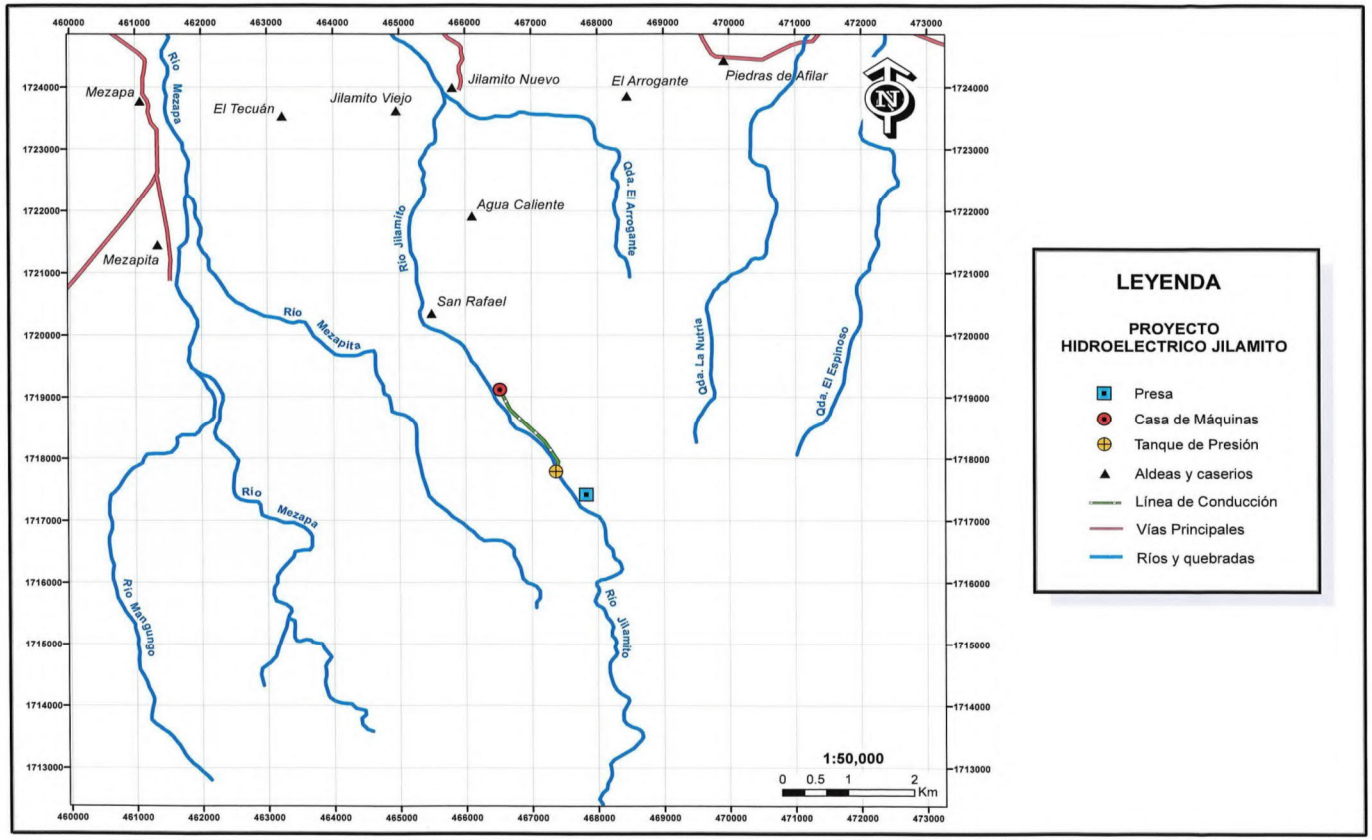
Figure 10: General Project habitat and nearby villages



Source: DAC, 2013

Notes: Presa (weir), Casa de Maquinbas (power house), Pasto (Grass), hernas (Hernas), Barbecho (Fallow), Humedales (wetlands), Nubes Humo (Cloud forest), Bosque Deciduo (Deciduous forest), Cultivos Anuales (annual crops).

Figure 11: Lean River watershed and nearby villages



Source: DAC, 2013

Notes: Rio (river); Tanque (settlement tank), Presa (Weir), Sala maqunias (powerhouse) Aldeas y caserios (Village and Town), Linea de conduccion (conduit), vies principalies (main roads), rios y quebrades (rivers and tributaries)

2.3.1 Area of influence

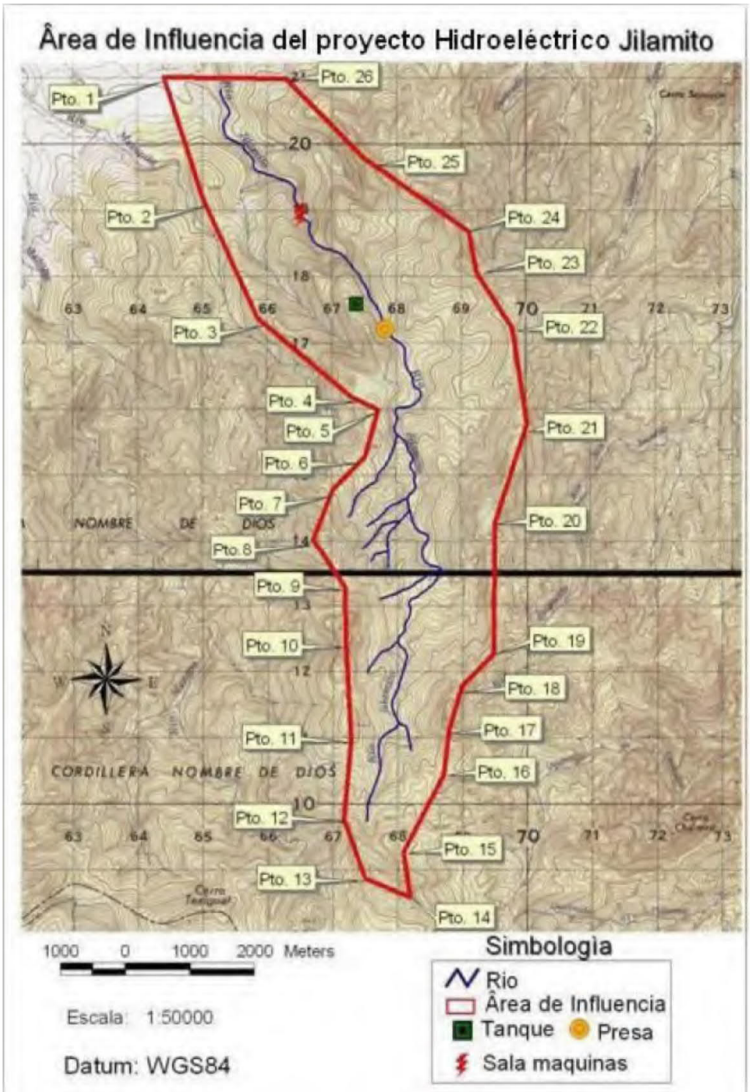
The Project Area of Influence (AOI) is the area over which the impacts of the Project are likely to be felt including all its related or associated facilities such as the transmission line corridor, water pipelines, access roads, borrow pits, and accommodation facilities as well as any reasonably foreseen unplanned developments induced by the Project or cumulative impacts. Note that the AOI in this report refers to a much larger area than that described above as it includes the study areas mentioned in the baseline studies of Biodiversity (amphibians and reptiles) and the area of social influence described in the social baseline report.

A general project AOI, from the perspective of the social and biodiversity baseline report, is comprised of areas of direct impacts and indirect impacts as follows:

- Direct AOI: considers the physical footprint of the Project such as the weir, project components during construction and operation and areas affected by works (e.g. buffer zone around existing roads).
- Indirect AOI: includes area which may experience Project related changes in combination with activities not under the direct control of the Project.

The concession area within which the project will be built is that defined in the Operation Contract as illustrated in Figure 12 below.

Figure 12: Project area of influence (according to the operation contract with SERNA)



Source: DAC, 2013

Notes: Rio (river); Tanque (settlement tank), Presa (Weir), Sala maqunias (powerhouse)

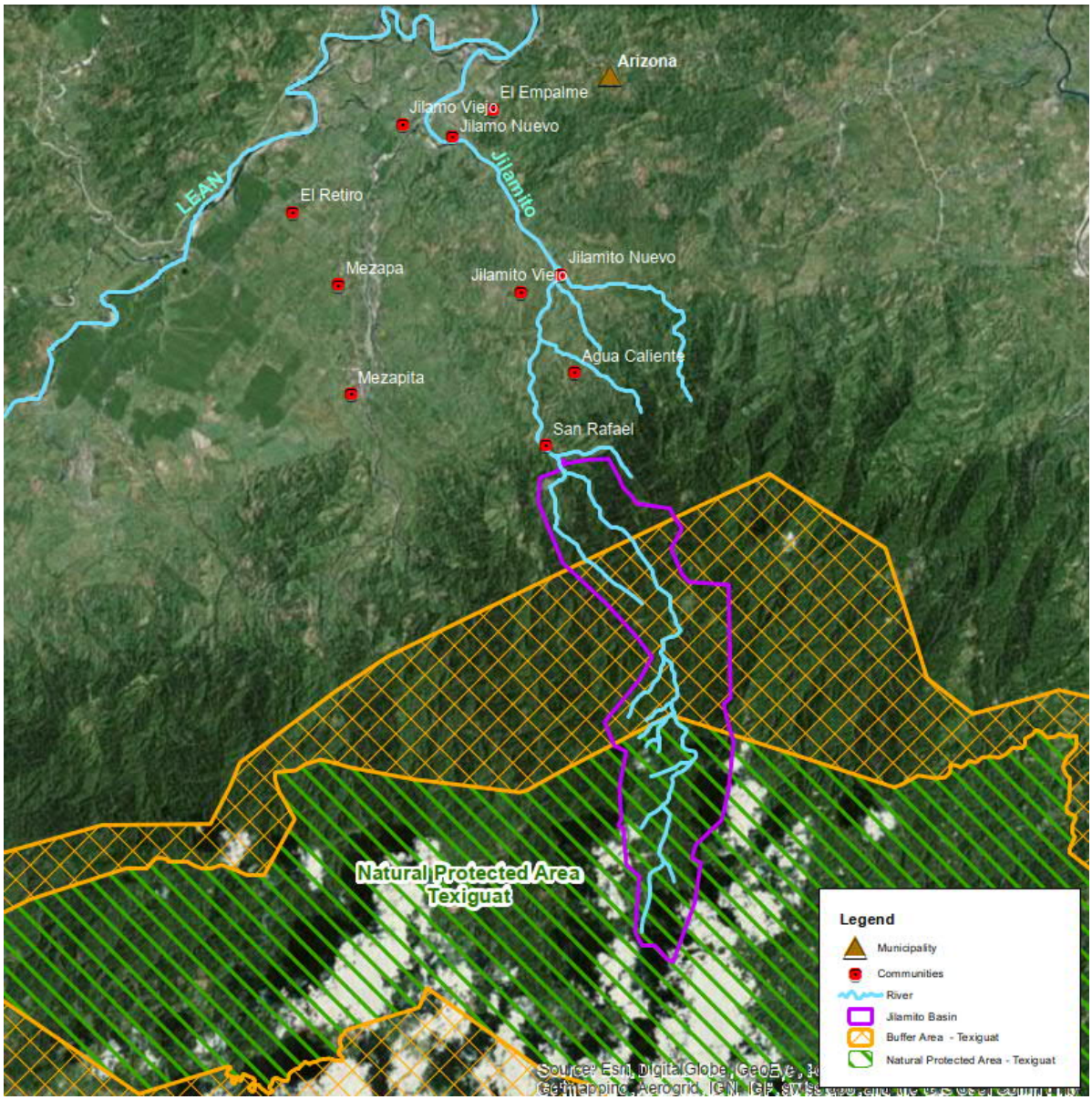
For the social baseline, the following five communities were considered for the survey (Ingelsa, 2018).

- Jilamito Viejo
- Jilamito Nuevo
- Jilamo Nuevo
- Mezapita
- San Rafael

The ERM CIA (2016) has identified the AOI for the 'cumulative study area' as the entire Project (weirs, power house, access roads); the travel route from CA-13 and the work camp in Mezapita to the Project site; and the portion of CA-13 between the Lean Bridge and Tela and is defined based upon consideration of the affected watersheds, the ecological footprint and stakeholder inputs related to extent of cumulative impacts.

The social area of influence is shown in Figure 13 (ingelsa, 2018). DAC, 2013

Figure 13: Project social area of influence (AOI)



Source: ERM, 2016

The existing documentation (DAC, 2013, CIA, 2016 and ESIA, 2018) have considered the temporal influence of the Project based on the duration of the likely phases of the Project as follows:

- Duration of the construction works (36 months).
- Predicted site operational lifetime (50 years) (CIA, 2016 and ESIA, 2018).
- Construction period plus three years post construction (cumulative impacts (CIA, 2016).

2.4 Project components

The Project is a 14.5 MW installed capacity run-of-river hydropower plant with a design flow of 2.8 m^3/s. In an average hydrologic year, the Project is expected to be capable of an annual net energy production of approximately 84.7 GWh per year. In any year, generation could be higher or lower depending on rainfall levels and the resulting stream flow in the Project watershed (Hatch, 2018). The expected generator efficiency at design flow is 97.4% with an estimated 97% availability. The environmental by-pass flow is currently defined as 0.25 m^3/s, equivalent to 10% of mean annual flow (MAF) (refer to section 6 for further discussion on this point). An overview of the scheme is presented in Figure 14.

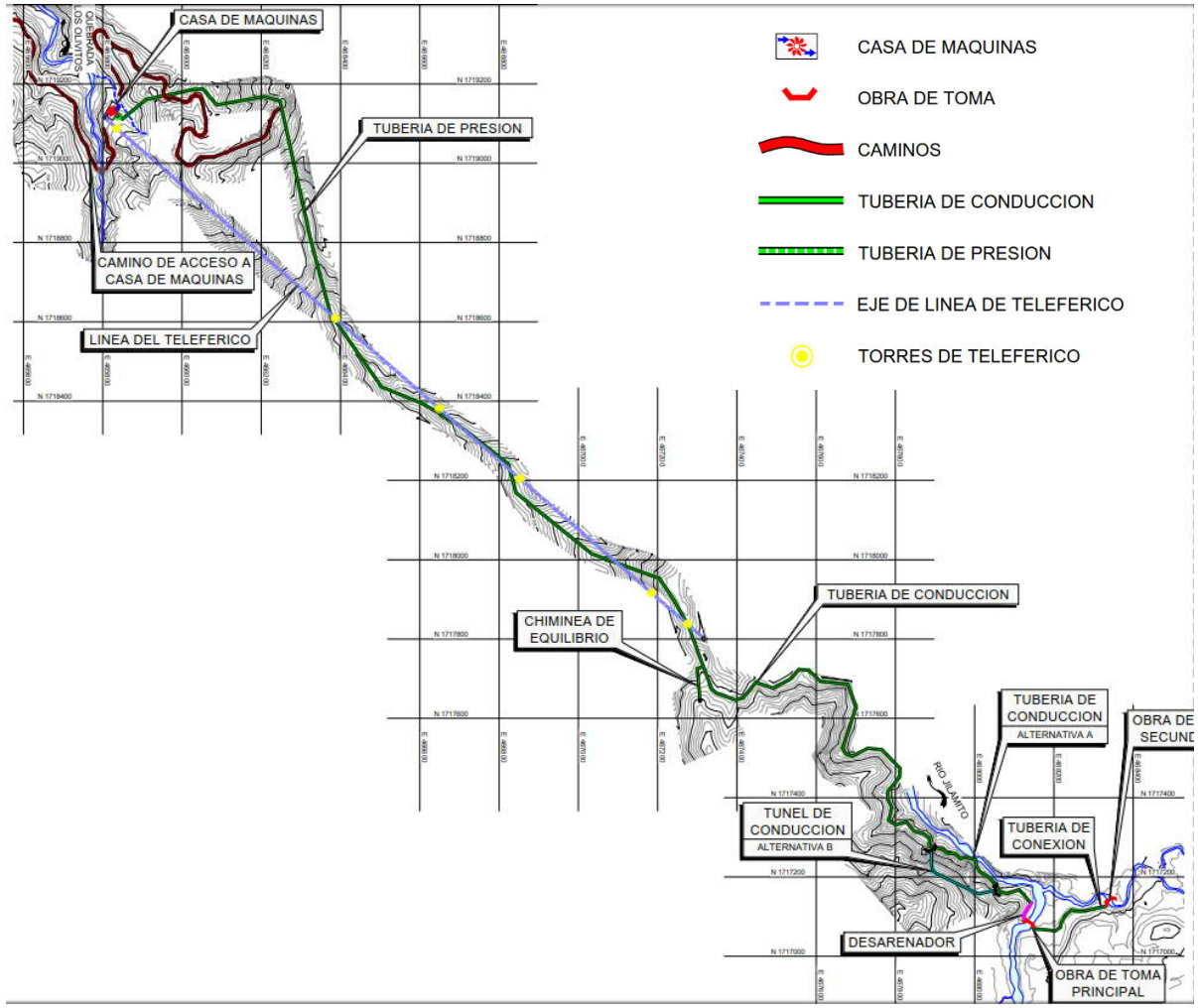
Based on information from the core project documentation the main hydroelectric generation components can be summarised as:

- Two diversion weirs on the Jilamito River.
- Two diversion channels to desander.
- Head race tunnel (made up on short tunnel, a conduction conduit, surge pipe). Alternative B (tunnel option) was chosen.
- Forebay (regulating chamber).
- Penstock (pressure pipe).
- Powerhouse.
- Two discharge canals (tailrace).

Related works and facilities include:

- Heavy lift skyline cable system (2km).
- Two new substations (Jilamito and Lean).
- New 34.5kV overhead transmission line (OHL) from Jilamito generation building to Lean 10.6 km.
- New access roads (7.5 km) and internal site roads (refer to section 2.4.3).
- Borrow pits for the road construction.
- Concrete aggregate quarries and aggregate crushing / processing plant and batching equipment.
- Material disposal sites (inert).
- Natural resource use (energy, water).
- Other facilities (waste management facilities, sanitation, medical, communication, temporary power).
- Worker accommodation. Mountain camp facilities and town accommodation.

Figure 14: General overview of project scheme



Source: Lombardi, 2015.

Notes: Desarenador (Sediment trap), Tuberia de conducción (headrace), Camara de carga (forebay), Campamento general (main camp), Casa de maqunias (power house)

2.4.1 Diversion weir and desander

The main diversion structure is located on the Jilamito River and consists of a Tyrolean intake with intake rack and adjacent concrete overflow spillway, a gated bottom outlet, and a conduit that leads to the Project desander (Hatch, 2018). The two diversion weirs will be constructed from reinforced concrete, located at approximately 983.1 (m.a.s.l). The main diversion weir will be 5.25 m high with a width of 10.0 m and overall length of approximately 22.0 m with an inclined self-cleaning grid at the intake. The diversion flow is 2.8 m^3 /s (Hatch, 2018). The Tyrolean intake and adjacent overflow weir can jointly pass the design flood of 300.0 m^3/s (this corresponds to a 500-year return period) with 3.6 m of head above the crest. The bottom outlet gate is 2.0 m x 1.5 m and will allow for localised flushing of accumulated sediments downstream of the intake. The bottom outlet can also be used to pass the environmental flow downstream especially during the dry season. Trash racks will be added in the intake structure and a desander to prevent debris from entering the pipelines.

The secondary diversion structure will be located on the Quebrada El Danto that is a tributary to Jilamito River and consists of an intake structure and chamber that leads to a 200 m conveyance pipe, and this pipe discharges into the Jilamito River just upstream of the main diversion structure. The diversion flow is 0.5 m^3 /s (Hatch, 2018).

The desander, located at 982.4 (m.a.s.l) will be located on the left bank of the river, immediately after the intake. The desander will be constructed of reinforced concrete and have a compound grader at the entrance for the evacuation of the largest solids that manage to pass the capture grid. The desander will be rectangular with a width of 4 m, length of 28.8 m and an approximate depth of 3.45 m. The sides will be a 3% slope and it will hold an approximate total volume of 320.0 m^3 for settling out solids greater than 0.30 mm. The desander will also help to regulate the operation of the plant (i.e. provide spillway control). The desander will include a purge system to release sediments towards the Jilamito River.

The optimum design flow for the project is 2.8 m^3/s and the mean annual river flow is 2.51 m^3/s according to Lombardi Feasibility Study (Lombardi, 2015). According to Resolution No. 1429-2013 issued by SERNA on December 04th, 2013, the ecological flow must be 10% of the mean annual flow, which is 0.25 m^3/s. This ecological flow defined by SERNA is higher than that defined by ERM Ecological Flow Analysis which resulted in 0.21 m^3/s for the primary intake and 0.03 m^3/s for the secondary intake for a total of 0.24 m^3/s.

2.4.2 Hydroelectric power plant

The conveyance conduit consists of headrace (tunnel, and low-pressure pipelines), forebay and penstock that transfer the water from the intake to the powerhouse. For the headrace portion the water will pass through a short tunnel and above ground conduit (steel pipe) supported on saddle structures.

The tunnel will be approximately 218 m length. The tunnel will be partially concrete lined to limit leakage. At the downstream end of the tunnel, a small forebay structure will be constructed for the transition from open channel flow conditions to pressurized flow in the low-pressure pipeline.

In addition, there will be a short glass fibre reinforced polyester (GRP) pipeline buried section that connects flows from the secondary diversion intake to the primary intake. Here, flows occur only under open channel flow conditions. From the primary intake, power flows pass through the desander, then a connecting buried GRP to the tunnel. Again, flows in this pipe section operate under open channel flow (approximately 400 m).

The forebay will be a square chamber 7.5m x 7.5m and with a depth of 8m connected on one side with the headrace and on the other side a pipeline to the power house. The forebay will be built from reinforced concrete and covered to prevent entry of pollutants and for protection from unauthorised access. It will also include a spillway for returning water to the Jilamito river during flood conditions.

The pipeline leading from the forebay will be a combination of low-pressure GRP pipe and high-pressure steel-lined penstock pipeline. The total approximate length will be 2,381m. The length of the dewatered reach of river is approximately 5km. The proposed design for the penstock alignment is summarised in Table 3. The pipeline will have a butterfly valve at the entrance to the powerhouse in case of emergencies. The pipeline will run from 967.40 (m.a.s.l) to 330.90 m.a.s.l (a gross drop of approximately 650 m). It is not convenient for the penstock to follow the alignment of the road because this would require the length of the penstock to be extended 40% beyond the Lombardi design (2015). This change would also increase losses due to multiple changes of directions further reducing power generation.

The powerhouse will be located on the right bank of the Jilamito river near the community of Quebrada Los Olivitos (330 m.a.s.l). It is proposed to have an estimated footprint of 540 m^2 housing two 7.41MW horizontal Pelton turbines, control room and electrical switch-house for electrical equipment and instrument control equipment. The cooling water system design for the turbine bearing oil system will be closed loop, so it won't be influenced by river sediments.

Two tailrace pipelines 1.4m in diameter and an approximate length of 108 m will return water back to the channel. A control room and site office will be located at the power house.

Table 3: Current proposed penstock design

Est. Initial (m)	Est. Final (m)	Type
0	244	Buried
244	365	Exposed (saddle structures)
365	1037	Buried
1037	1614	Buried
1614	1706	Buried
1706	2351	Exposed (saddle structures)
2351	2381	Exposed (saddle structures)

Source: Lombardi FS

2.4.3 Access roads

The Project will be accessed via national road (CA-13) from San Pedro Sula. At approximately 40km from Tela (en route to La Ceiba) the project will require users to turn onto a local unpaved road that heads east for approximately 3 km in the direction of the village of Mezapita, refer to Figure 15. After crossing the Mezapa river via a 'Bailey Bridge', installed for the Mezapa project, a new 7.5 km access road to the Project site will be constructed. This junction is sometimes referred to as the 'El Nance intersection'. The new road will have a width of 4.00m following the route of an existing track that can only be passed on foot or on horse. This work is ongoing and as of September 2018 4.2 km of this road has been completed. This road would be for Project use only; public use would be prohibited. The route from Mezapita is illustrated in Figure 16.

Figure 15: Overview of access to the project site

Source: Hatch, 2018

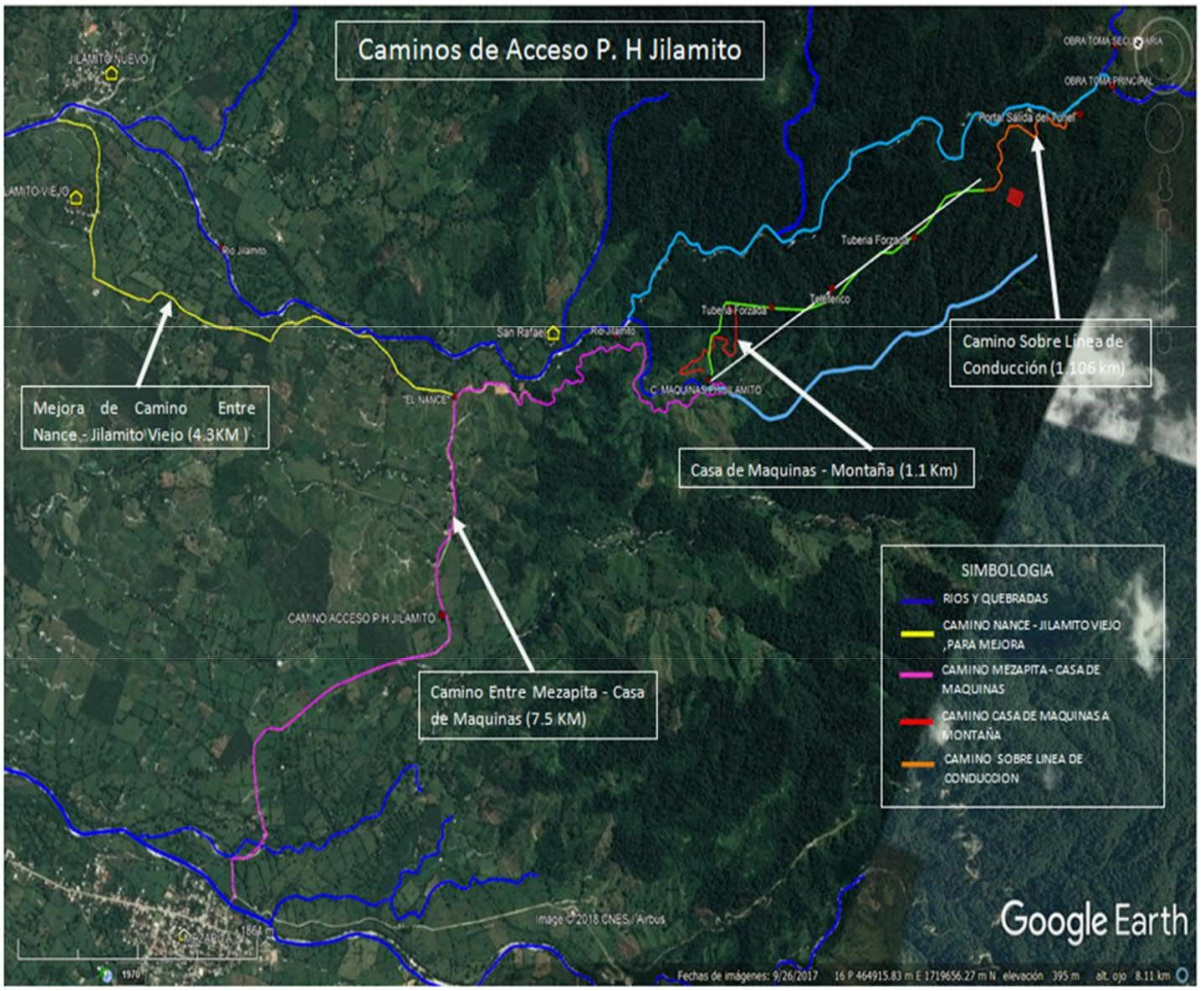
The new access and internal site access works can be broken down into four sections, these are described below and illustrated in Figure 17 and Figure 18.

- Section A and B[4]: National highway (CA-13) to the *El Nance* intersection, to the power house (*'casa de máquinas')* (approximately 7.5 km).
- Section C: Powerhouse to lower reach of the penstock structure (approximately 1.1 km) to support construction of the pressure pipe where it does not fall alongside the cable car. This will be a one-way road approximately 4.2 m wide.
- Section D: New road from top of skyline cable system to the tunnel entrance at the desander in the upper area of the mountain (approximately 1,106 km) and then a new road from opposite end of the tunnel to the diversion weirs. It is intended that the tunnel will be used as a waterway but when dewatered, it would provide maintenance access to the diversion weirs and desander structure in the future.
- Section E: Improvement of road where the transmission line will be located (El Nance-Jilamito) 4.3 km.

Internal project road will be built from the forebay to the weir. The skyline cable system will be used from lower penstock to upper penstock areas (refer to section 2.4.5 below).

[4] This is defined as two tranches in the Hatch 2018 report.

Figure 16: Access roads



Source: ESIA, 2018.

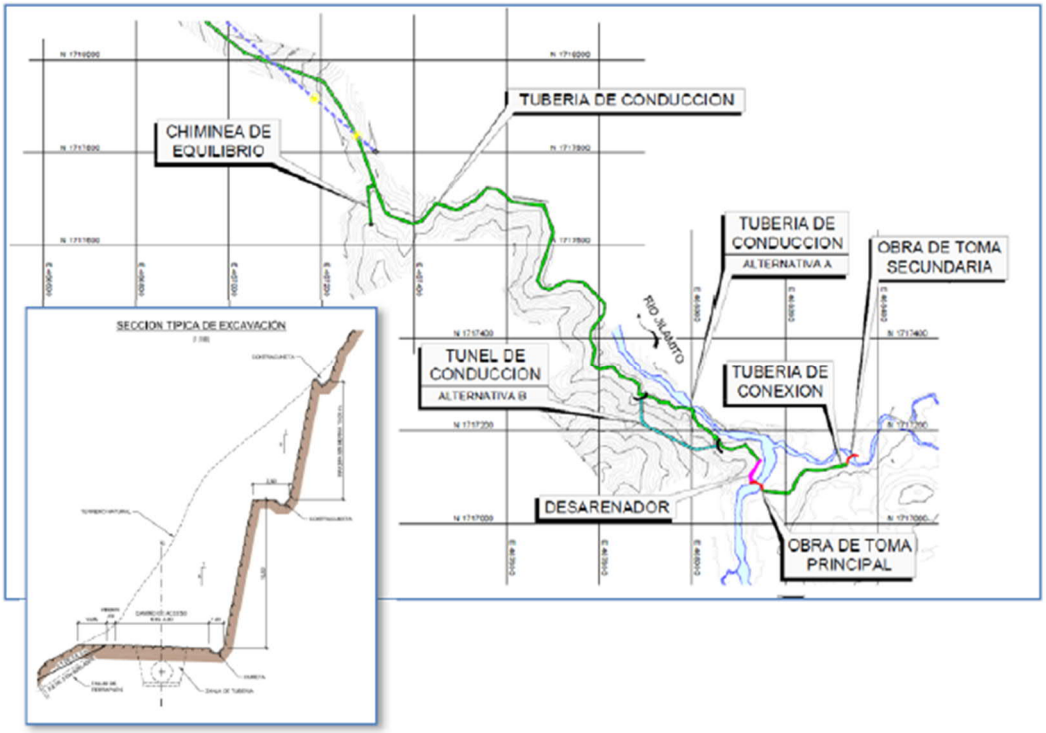
Notes: translation of text boxes from left to right 1. Improvement between El Nance and Jilamito Viejo (4.3km) 2. Road between Mezapito and Powerhouse (7.5km) 3. Road from Powerhouse to Mountain 4. Road from tunnel to diversion weirs

Figure 17: New Road sections A, B and C

Source: Hatch, 2018

Notes: Casa de Maqunias (power house), Tuberia de presion (penstock), Camino de accesso a case de maqunias (access road and powerhouse), linea de teleferico (transmission line)

Figure 18: Section D - access road between Penstock and diversion weirs



Source: Hatch, 2018

Notes: Chimnea de equilibrio (Surge Shaft), Tuberia de conduccion (headrace conduit), Tunel de conduccion (headrace tunnel) desarenador (desander), Tuberia de connexion (connection channed from weir to desander)

2.4.4 Transmission interconnection and substation

A 35 kV overhead line (OHL) with wooden poles will be constructed from the Jilamito outdoor substation (new) located adjacent to the powerhouse site to the Lean outdoor switching station (new) where it will connect into an existing transmission line. The overhead line runs parallel to existing passable roads. A 4.5 km section of the existing road will be upgraded to support construction of the OHL.

The Jilamito OHL poles will be constructed from wood and the OHL will require some tree clearing along the right of way. Maintenance of vegetation within the right-of-way is necessary to avoid disruption of power lines and towers. However, project maintenance will be minimal because the overhead line passes mostly on land with agricultural plantations and paddocks.

2.4.5 Skyline cable system

A 2 km skyline cable system will be used to transport equipment for the construction of the supporting saddles, anchor blocks and installation of the upper penstock. It will also be used for conveying equipment and materials needed for construction of the headworks facilities (diversion weirs, desander). The construction of the skyline cable system will follow construction of the access road to the powerhouse and to the lower part of the penstock. It is estimated that the skyline cable system will provide up to five full trips per 12 hour shift, carrying up to 10 tons / per trip (Hatch, 2018).

Figure 19: Example of heavy lift cable car

Source: DAC, 2013

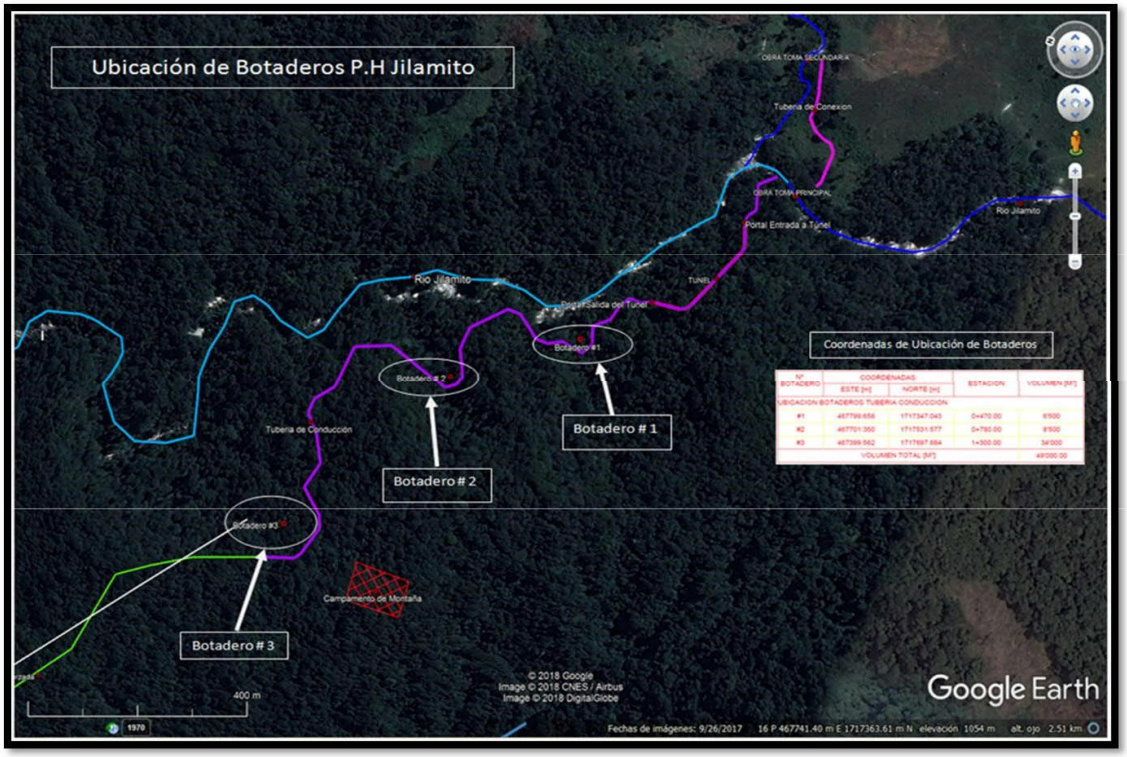
Figure 20: Example of heavy lift cable car

Source: DAC, 2013

2.4.6 Inert material disposal sites

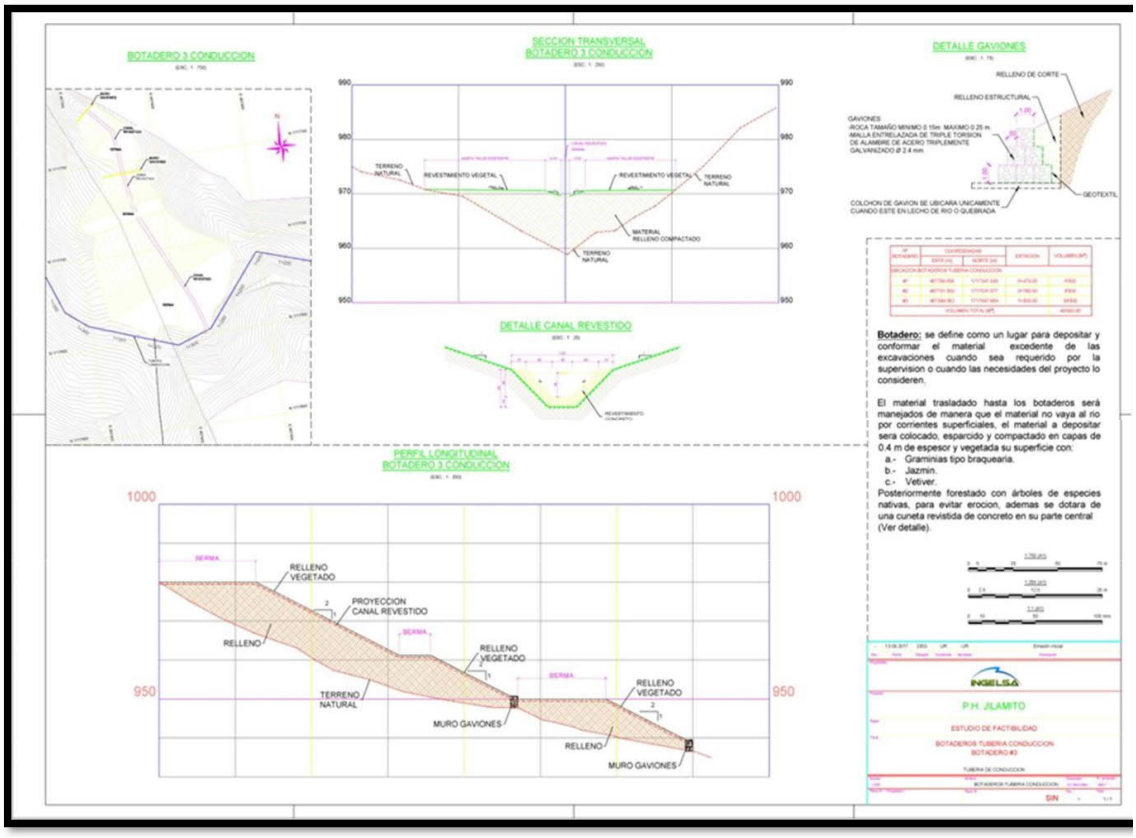
Surplus excavated material will be reused in the Project where possible or deposited, contoured and revegetated in one of three defined locations. The anticipated locations are illustrated in Figure 12. The sites will be located away from surface water and compacted in 40 cm layers. Once full, they will be contoured and planted with native species.

Figure 21: Location of three material disposal sites (Botaderos)



Source: ESIA, 2018

Figure 22: Design of the material disposal sites



Source: DAC, 2013.

Notes: Key word translation. Relleno (fill material), Muro Gaviones (Gabion wall), Proyeccion canal revestido (covered channel), Relleno vegetado (vegetated fill)

2.4.7 Other (sanitation, medical, communication)

During the construction and operation stages, the Project will be equipped with toilets and respective septic tanks. The individual toilets for the construction employees as well as the waters coming from cleaning activities will connect to the same septic tanks. In the area there is no telephone service, so the Project will have radio communication systems and satellite telephones. In the areas where the Project will be developed, there is no electricity. Power will be provided through a combination of mobile generators and stationary generators up to 700 kW capacity (DAC, 2013).

2.4.8 Worker accommodation

Most of the workers (about 80% of the total workforce of 400 employees) will be from the surrounding communities; therefore, they will continue living in their current homes. For administrative personnel not from the surrounding communities (about 5%), houses from the communities will be rented. The potable water, sewage system, and all other facilities are those already provided by the community to those houses.

For specific works (water intakes, tunnel, and section of the conduction line), the project will have a mountain top accommodation that will house 50-70 employees (including the corresponding administrative personnel) at any given time. It will be located approximately 50 meters from the surge chimney downstream. It will be equipped with dorms, offices, and warehouses. It will also be equipped with radio communications and first aid. It will be supplied with potable water and portable latrines by a professional contractor specialized in its management. They will only live there while working shifts. The rest of the time (vacations, rest days, etc.), they will leave in their hometowns. Once the project construction is completed this camp will be dismantled (DAC, 2013)

2.5 Natural resource use / waste management and energy supply

The predominant natural resource requirements for the Project site are envisaged as general construction materials (aggregates) during construction and water during operation. Coarse and fine aggregates for cement manufacture and road construction will be sourced from the Jilamito River at the lower part of the Project site. An aggregate processing plant will be located at the power house site. The processing plant will include a crushing mill, grading machine and pumping system for water supply and diesel generation for power supply. The plant will be equipped with filters and screens to capture sediments and oils / greases to avoid river contamination by diesel or grease waste.

Water during construction will be obtained from the Jilamito River. The design, logistics and operation of water supply and consumption will be under the responsibility of the civil work contractor in accordance with municipal environmental regulations established by the corresponding authorities (UMA). The water for human consumption will be bottled purified water. During operation water will be used for generation. An operational flow rate of 2.8 m^3/s will be diverted for use and returned to the Jilamito River after use.

Waste will be removed from the upper area and workers accommodation and general works area (sewage containers and general waste) via the cable car. Since there is no municipal garbage collection the Project will appoint a private collection service that will transfer the waste to the municipality disposal site approved by the Arizona Municipal Environmental unit (UMA)

This work will be the responsibility of the construction contractor during construction and will be undertaken in accordance with the environmental regulations established by the corresponding authorities (UMA).

Given the proximity of the site to the community of Jilamito it is planned to build a short electrical connection to supply the office, campus and workshops. For the forebay and diversion weirs, power will be supplied by one or two generators with a total of 600-700 kW generation capacity. During operation, electric power sufficient to operate the plant will be diverted for use from the main generation facility.

The powerhouse will be provided with a 150 kW diesel generating unit for essential services during emergencies. This unit will be installed on the outside of the powerhouse.

An emergency diesel generator will be constructed and will require a permanent diesel storage tank on site.

2.6 Project development and key activities

Although a portion of the access road construction is underway, construction of the Project will start shortly after financial close and is expected to be completed within 37.7 months. The power generated by the Project will be sold to ENEE under a 30-year term power purchase agreement (PPA) (Hatch, 2018). The main stages of the construction works are:

- Preparatory works construction of the access roads – ongoing.

- Site establishment - (site levelling and excavation works).
- Procurement.
- Construction and main civil works.
- Installation.
- Certificate of acceptance (owner).
- Commissioning and testing.
- Certificate of substantial completion.
- Commercial operation date (COD).
- Operation and maintenance.

2.6.1 Site preparatory works and construction

During construction phase it is expected 400 employees will be required. Construction workers are envisaged to work under a shift scheme of 11 continuous days (6:00 a.m. to 2:00 p.m), plus three days of continuous rest.

Temporary facilities during construction include guard house, warehouse, security housing, project accommodations and Owners and Contractor's office will be located at el Nance in the lower part of the access road from a 'Bailey bridge'[5] to the powerhouse site. The facilities will have a potable water supply, electricity, telephone and internet communications. To produce concrete the project will use mobile concrete plants.

Expected staffing arrangements during the construction phase are:

- Heavy machinery operators: 20 people.
- Light machinery operators: 10 people.
- Bricklayers and assistants: 50 people.
- Welders and assistants: 25 people.
- Carpenters: 10 people.
- Technical staff: 20 people.
- Administrative staff: 15 people.
- Laboratories and quality control: 10 people.
- Nursing: 1 person.
- Maintenance staff: 10 people.
- Security: 20 people.
- Electricians and linesmen: 20 people.
- Food and hygiene: 14 people.

2.6.2 Commissioning

Following construction of the diversion dams and powerhouse the electro-mechanical installation will commence. Once finalised the contractor will undertake performance testing to verify that all the equipment is in good working order. This testing will be undertaken in coordination with ENEE. Once the commissioning is finalised the Project will move to the operation phase.

[5] A bailey bridge is a type of portable, pre-fabricated, truss bridge. (Wikipedia, 10 December 2018)

2.6.3 Operation

During operation of the plant there will be qualified engineering staff and technicians on-site to oversee the operation and maintenance requirements of the plant. During operation it is expected to have 11 permanent employees as set out in Table 4, working three rotating shifts, with each shift totalling 44 hours per week. This will enable the plant to operate 24 hours a day, 365 days a year.

Table 4: Estimated employment figures - operation

Department	Number of employees
Operation	3
Maintenance	3
Civil works	2
Administration	1
Forestry	2

Source: DAC, 2013

The employees will receive, in addition to all the benefits granted by the Labour Code Law, the following benefits: transportation to work sites, accident insurance, medical insurance, and training against accidents.

2.7 Associated facilities

Associated facilities are defined as facilities that are not funded as part of the Project but would not have been constructed or expanded if the Project did not exist and without which the Project would not be viable (IFC PS1, paragraph 8, page 3).

The existing documentation does not identify any associated facilities as defined by IFC PS1 for this Project.

2.8 Project budget

The total capital expenditures (CAPEX) budget for the Project (including transmission line) has been roughly estimated to be in the range of US$67 million.

Operating costs have been estimated and include a budget allocated to social and environmental costs (monitoring, reforestation, community programs etc.). A total of US$2.3 million prior and during construction and US$70,000/year during O&M is currently allocated to environmental and social costs (INGELSA).

2.9 Project implementation arrangements

The Project will be constructed under an engineer, procure, construct and manage (EPCM) arrangement, where the EPCM contractor will be INGELSA with engineering design services to be provided by Lombardi, who performed the feasibility study and will support INGELSA in the preparation of contracting documents for construction and equipment procurement. Engineering design services is principally with the civil works, the conduction conduit and penstock, but there will also be the Owner Engineer's representative for factory acceptance testing (FAT) of the principal equipment components. INGELSA will hire the following companies for engineering, supervision and design services:

- SAYBE Y ASOCIADOS (Honduran): local day-to-day supervision, invoice approval and concrete and soil laboratory testing.
- Lombardi (Swiss): final design of the Project and monitoring of all aspects of its design.

- Ingenieros Consultores y Constructores Electromecánicos (ICCE) (Honduran): supervision of substation and transmission line construction.
- PROA: automation and control supervision of SCADA.
- Geoconsult (Honduran): geological supervision and installation and control of topographic survey requirements.
- Ricardo Matamoros: Independent Environmental Consultant for biodiversity study.

Within INGELSA the organisational structure will include people in supervision and implementation roles in all disciplines. Environment, health and safety risk management responsibilities will be allocated to staff at various levels within the organisation. Further information on proposed environment, health and safety management is provided in chapter 17.

It is anticipated there will be seven principle contractors for different components of the construction works as follows:

- construction of the access roads to the powerhouse site and 1.1 km beyond for construction of the lower penstock, construction of the powerhouse structure.
- construction of the penstock civil structure, construction of the main and secondary intake, desander, conduction pipeline (tunnel included), surge pipe and skyline operation.
- supply and mounting of the skyline cableway.
- supply and mounting of penstock pipe.
- supply of conduction and surge tank pipe.
- water to wire equipment supply and installation.
- transmission line and Substation equipment supply and installation.

In accordance with environmental license and resolution 1429-2013, the environmental office of the Municipality of Arizona (municipal Environmental unit) and the Directorate-General for Environmental assessment and Control (DECA) will be responsible for the monitoring of the Project's environmental mitigation activities.

Further information on the environmental and social implementation arrangements are provided in chapter 17.

3 Alternatives

3.1 Assessment of alternatives

The assessment of alternative sites and technologies in the project design documentation has taken account of various criteria including the Project requirements, existing infrastructure, topography and potential environment and social impacts.

The following documentation has been reviewed for information relating to the assessment of alternatives:

- ERM (2016) Jilamito hydropower project, Complementary Studies, Transmission Line Alternatives considered (TLA, 2016)
- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)
- Hatch Independent Engineering Report, August 2018 (referred to Hatch, 2018)
- Lombardi, Jilamito Hydroelectric Project, Feasibility Study Final Report, July 2015 (referred to as Lombardi, 2015).

3.2 Project alternatives

3.2.1 No-Project alternative

The no-project alternative, although offering a benefit in terms of no impact on natural resources, the environment or local community, does have disadvantages in that it does not support the supply of renewable energy to the Atlantic coast region. In addition, the state and municipality would not benefit from the taxes generated, the area would lose investment of 50 million to 80 million USD, and the Project would not realise the possible job opportunity so there would be loss of potential direct and indirect incomes (ESIA, 2018).

3.2.2 Site selection / technology selection

The hydroelectric power plant technology proposed for this Project is a proven method of electricity production (Hatch, 2018). The sites for the different project components within the project area have been selected based on suitable geology, soil and topography (Hatch, 2018). The main optioneering has been performed in connection with the cooling water design and the transmission line, both are elaborated below.

3.2.2.1 Cooling water optioneering

Two cooling water designs were considered, a closed loop system (preferred) or an option where cooling water is diverted from the penstock pipeline. The closed loop system has the following advantages over the use of penstock water:

- It is less likely to include river sediments.
- The design improves reliability (e.g., reduced outages).
- It reduces the possibility of silt plugging the water filter, which in turn results in more unnecessary unit outages.

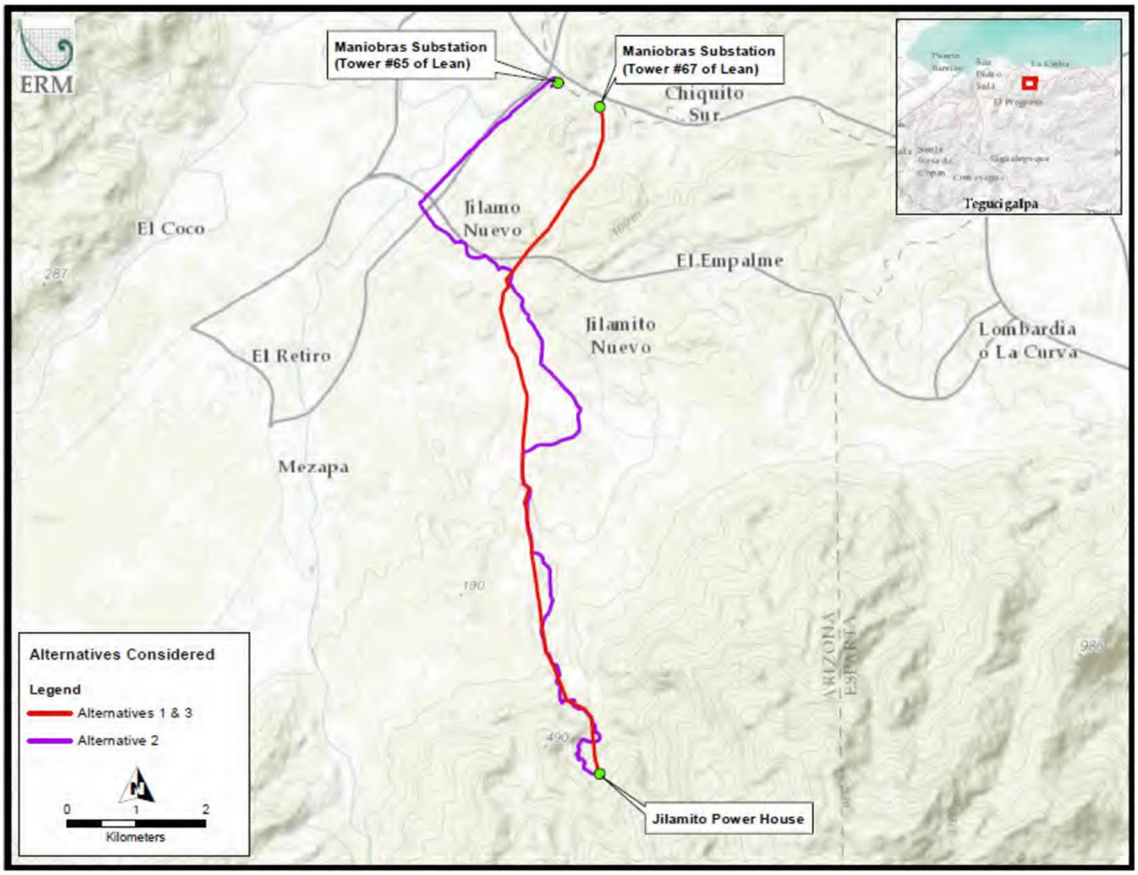
The Project considered two alternative approaches to access for the upper region of the site including: i) construction of an internal access road to facilitate construction of the penstock or ii) use of a skyline cable system (preferred option). The skyline cableway was preferred to avoid risks associated with construction of an access road from the lower valley to the upper valley. Excavation in very steep topography would have hindered Project construction due to the increased risk of slope instability Hatch, 2018). Furthermore, using a cable system reduces land take, ecological impacts and other construction related impacts (DAC, 2013).

3.2.3 Transmission Line

The Project has performed a detailed assessment of alternatives for the transmission line *(Jilamito Hydropower Project, Complementary studies, Transmission line, Alternatives considered, ERM, 2016).* The key determinants in selecting the preferred transmission line route as documented in this study are as follows:

- The purpose of the transmission line is to transmit energy generated by the Project to the existing national grid.
- Alternative options were considered using the following criteria:
  - Best technology
  - Compliance with laws and applicable regulations in Honduras
  - Minimum effects on the environment and surrounding communities
  - Best economic feasibility
  - Least occupational and community health risk
- Three alternative routes from the elevated substation in the Jilamito power house to the Maniobras substation or the existing substation in Lean for a new tie in point to the existing transmission system.
  - No Project alternative
  - Alternative 1: is a 10.4 Km line, of 138 kV, designed by ENERCOM. This line connects with the National Interconnected System, Line 516, at the tower #67 in the Lean Substation.
  - Alternative 2: is a 14.4 Km line, of 34.5 kV, designed by the DEHJISA Technician Office. This line connects with the National Interconnected System, Line 516, at the tower #65 in the Lean Substation.
  - Alternative 3 – the chosen alternative: is a 10.4 Km line, of 34.5 KV, designed by ENERCOM. This line also connects with the National Interconnected System, Line 516, at tower #67 in the Lean substation.
- Alternative 1 has the same route as the chosen alternative – Route 3, but Alternative 1 was not chosen because it required higher investment because it was a 138 kV line.
- Alternative 2 was discarded because it is too long compared with the other alternatives, it required too much investment to build the substation in Maniobras, it crossed too many water bodies and because it was too close to houses in the community of Lean. The cost of building Alternative 2 was US $12.5 m.
- The selected alternative, Route 3 is based on the design of Alternative 1. It is also a 10.4 Km, but it is a 34.5 kV transmission line that follows the path of Route 1 with the main difference that it uses wood poles fabricated in Honduras (not concrete poles as in the case of Alternative 1) and H shape structures instead of towers in the cross- country areas where it does not follow the roads (See Appendix 3 – Alternative 3).

Figure 23: Transmission line alternatives



Source: TLA, 2016.

4 Policy, legal and institutional framework Introduction

This chapter summarises the national and international legal framework for planning and environmental and social protection in Honduras as presented in the project documentation to date (DCA, 2013, PGA, 2013 and ESIA, 2018). In addition, reference has been made to relevant international lender standards applicable to the Project as defined by Golder (2017). The Project will be required to defer to the most stringent requirement except in cases where national law or regulations have been explicitly identified as taking precedence over more stringent international standards and the justification has been deemed reasonable.

4.1 National Legal and Institutional Framework

The Constitution of the Republic of Honduras is the pillar of its system of governance, from which are derived the principles, norms and concepts to be followed within the national legislation. This document establishes as main civil rights:

- Right to information
- Right to health
- Right to education
- Right to the environment
- Right to civil participation

Environmental governance in Honduras has its starting point in the following articles of the Constitution:

- Article 145: The right to health protection is recognized. The State shall preserve the adequate environment to protect the health of persons.
- Article 146: The regulation, supervision and control of food, chemical, pharmaceutical and biological products corresponds to the State, through its dependencies and the organisms constituted in accordance with the Law.
- Article 340: The technical and rational exploitation of the natural resources of the Nation is declared of public utility and necessity. The State shall regulate their use, in accordance with the social interest and shall set the conditions for their granting to private individuals. The reforestation of the country and the conservation of forests is declared of national convenience and of collective interest.

According to the hierarchy of the country's legal system, the Constitution is followed by laws (general and special), regulations and decrees. The key environmental policies and legislation applicable to the project are presented in the following sections.

4.1.1 Institutional Framework

The institutional framework of the government in which the project operates is presented in Table 5.

Table 5: Institutional framework of the project

Name	Description
Secretariat of Environment and Natural Resources (SERNA in Spanish)	It is the country's main institution responsible for the environment and climate change. SERNA is divided into a Department of Environment and a Department of Natural Resources and Energy. Within the first Department are the following directorates:

Name	Description
	• General Directorate of Environmental Management (DGA in Spanish), addressing general aspects of environmental management, development of environmental standards and regulations, etc. • General Directorate of Biodiversity (DIBIO in Spanish), in charge of aspects related to the management of ecosystems (marine and terrestrial) and protected areas. • Directorate of Environmental Assessment and Quality (DECA in Spanish), in charge of the National System of Environmental Impact Assessment (SINEIA in Spanish), and control and monitoring. • Pollutant Control and Study Centre (CESCCO in Spanish), in charge of aspects of environmental monitoring and provision of laboratory services In the Department of Natural Resources and Energy, there are the General Directorate of Energy (DGE in Spanish) and the General Directorate of Water Resources (DGRH in Spanish).
Secretariat of Health	It has jurisdiction over the emission control of pollutants that affect health, mainly in relation to atmospheric emissions, noise, vibrations, and radioactive emissions. Design and implementation of environmental sanitation programmes.
Secretariat of Governance and Justice	It coordinates and articulates local development actions through Municipal Governments and is the lead agency for the implementation of the Territorial Ordinance Strategy at the national level.
Secretariat of Planning and External Cooperation (SEPLAN in Spanish)	It has normative functions regarding the management of International Technical Cooperation and non-reimbursable aid, with binding effects for all the organs of the Central and Decentralized Public Administration; it also coordinates activities with non-governmental organizations that execute projects of public interest with resources from External Cooperation, with the purpose of orienting their activity and attending to national priorities. SEPLAN is an important institution for environmental governance and climate change, since it oversees the follow-up to the Country Vision and the National Plan.
Secretariat of Industry and Commerce	Formulation of national and international trade policies, export promotion, tourism, etc. National responsible for compliance with free trade agreements in general.
Secretariat of Agriculture and Cattle Industry	Formulation, coordination, implementation and evaluation of policies related to the production, conservation, financing of producers and marketing of agri-food products and raw materials of agricultural origin, as well as those derived from fishing, aquaculture, poultry, beekeeping and modernization activities.
Secretariat of Tourism	Encourage the development of the country's tourism offer and promote its demand; develop activities that tend to favour and increase investment and domestic and foreign tourism trends.
National Institute of Forest Conservation and Development, Protected Areas and Wildlife (ICF in Spanish)	Institution in charge of the implementation of the Forest Policy and the National Forest Program (PRONAFOR). The ICF oversees forest development, management of the Honduran National System of Protected Areas (SINAPH in Spanish) and basins protection, among others. It should be noted that the ICF is the main entity responsible for protected areas and biodiversity, functions that do not belong to SERNA's DIBIO.
National Advisory Council for the Environment (COCONA in Spanish)	An advisory body to the Secretary of State in the Environmental Office, which includes sectors such as civil society, academia, the private sector and indigenous and afro peoples, for the proper management of the environmental sector. However, it has remained as an inactive body.
Special Prosecutor's Office for the Environment (FEMA in Spanish)	It enforces compliance with international treaties and laws and deals with complaints, in accordance with the objectives and purposes established in the Public Prosecutor's Office Act.
Directorate of Environmental Management (DGA in Spanish)	Its objective is to contribute to the sustainable development of the country through the implementation of policies, strategies, projects and tools that encourage, promote and guide the environmental management of the public, private, academic and society sectors in general. Its work is carried out with the support of three departments: Solid Waste, Environmental Promotion and Prevention and Environmental Education.
Municipal Environmental Units (UMA in Spanish)	Units in charge of protection, conservation of ecosystems, attention to environmental problems, management of natural resources and ecotourism in municipalities, as well as prevention of natural disasters. It is hierarchically dependent on the Municipal Mayor.

Name	Description
Honduran Institute of Anthropology and History (IHAH in Spanish)	It has the purpose of orienting, planning and executing the works required for the defence and study of the Cultural Treasure of the nation. Its main purposes are the exploration, restoration, conservation and surveillance of archaeological monuments, the improvement in the organization and administration of museums, the study of history, among others.
Institute of Property	Manage and regulate the property regime; apply the Royal Folio of the property by registering it.

4.1.2 Environmental Management Framework

The main law for environmental management is the General Environmental Law (1993), under which a series of regulations have been developed to support its implementation. Table 6 presents the general legal framework for the environmental management of natural resources.

Table 6: Environmental Management Framework

Subject	Description
General	Constitution of the Republic, Decree 131 (January 20, 1982)
	General Environmental Law, Decree 104-93 (June 30, 1993)
	Amendments to the General Environmental Law, Decree 181-2007 (July 16, 2010)
	Regulation to the General Environmental Law, Executive Agreement 109-1993 (December 20, 1993)
	Regulation of the National System of Environmental Impact Assessment, Agreement 189-2009 (December 31, 2009)
	Regulation of National Registry of Providers of Environmental Services, Agreement 826-2009 (January 15, 2010)
	Regulation of Environmental Audits, Agreement 887-2009 (January 15, 2010)
	Environmental Categorisation Table, Ministerial Agreement 016-2015 (October 6, 2015)
	Special Law on Environmental Education and Communication, Decree 158-2009 (December 28, 2009)
	Organic Law of the Attorney General's Office for the Environment and Natural Resources, Decree 134-99 (September 29, 1999)
Institutional	Law of Municipalities and its reforms, Decree 134-90 (January 1, 1991); Decrees 48-91, 177-91 and 124-95
Territorial Planning and Risks	Territorial Planning Law, Decree 180- 2003 (December 30, 2003)
	Regulation of the Law of Territorial Ordinance, Agreement 25- 2004
	Law on the National Risk Management System, Decree 151-2009 (December 26, 2009)
	Regulation of the Law on the National Risk Management System, Executive Agreement 032-2010
Water and Sanitation	General Water Law, Decree 181- 2009 (December 14, 2009)
	Framework Law for the Potable Water and Sanitation Sector, Decree 118-2003 (October 8, 2003)
	Regulation of the Framework Law of the Potable Water and Sanitation Sector, Agreement 006 (February 3, 2004)
	National Technical Standard for Drinking Water Quality, Agreement 084 (July 31, 1991)
	Technical Standards for the Discharge of Wastewater to Receiving Bodies and Sanitary Sewerage, Agreement 058 (April 9, 1996)
Health and Hygiene	Health Code and its reforms, Decree 65-1991 (August 6, 1991); Decrees 191-1996 and 194- 1996.
	Environmental Health Regulation, Agreement 0094 (June 1997)
	Labour Code, Decree 189 (July 15, 1959)
	General Regulation of Preventive Measures for Work Accidents and Occupational Diseases, Executive Agreement No. STSS-001-02 (October 19, 2004)
Biodiversity, Forests and	Declaration of Protected Areas and Cloudy Forests, Decree 87-87 (August 5, 1995)
	Forestry, Protected Areas and Wildlife Law, Decree 98- 2007 (February 26, 2008)

Subject	Description
Protected Areas	General Regulations of the Forestry, Protected Areas and Wildlife Law, Executive Agreement 031-2010
	Regulation of the National System of Protected Areas, Presidential Agreement 921-97 (June 30, 1997)
	Convention on International Trade in Endangered Species of Wild Fauna and Flora, Decree 46- 2007
	Decree 87-87-Amparo of creation of the Refuge of wild life Texiguat This decree protects the creation and management of protected areas of cloud forests. From the enactment of this Law, the Area was defined under the Wildlife Refuge Management category. It provides for the creation of the Texiguat Wildlife Refuge.
	Regulation related to works in the national system of protected areas in Honduras (SINAPH) The national regulation allows unrestricted activity such as scientific activity, hiking, preservation or conservation works in the buffer zone as well as ecotourism. It also allows hydropower projects with a capacity up to 15MW in e buffer zones if the area under consideration approves this in the relevant management plan. The Texiguat Wildlife Refuge management plans makes this provision (ESIA, 2018) Other related ecotourism but regulated.
Solid Waste	Regulation for the Integrated Management of Solid Waste, Agreement 378-2001 (April 6, 2001)
Social and cultural	Law on the Protection of the National Cultural Heritage, Decree 81-84, 220-1997
	Organic Law of the Honduran Institute of Anthropology and History, Decree 118 (October 16, 1968)
	Framework Law on Public Policies in Social Matters, Decree 38-2011 (June 13, 2013)
	Law on Equal Opportunities for Women, Decree 34-2000 (April 11, 2000)
	Law of the Honduran Institute of Tourism, Decree 103-93 (July 14, 1993)

4.1.3 Specific framework of the energy sector

The Project is based on the following policy framework:

- Electric Subsector Framework Law, Decree 158-94.
- Regulation of the Electric Subsector Framework Law, Agreement 934-97.
- Agreement 631-2003 on regulation of permit applications to perform feasibility studies of hydroelectric generation projects.
- Law of Incentives for the Generation of Energy with Renewable Sources, Decree 70-2007.
- Law for the Promotion of Electric Power Generation with Renewable Resources, Decree 138-2013.
- Contract No.073-2010 for the supply of power and its associated energy generated with renewable resources, between the National Electric Power Company and INGELSA, Jilamito Hydropower Project.

4.1.4 Environmental Impact Assessment

The Environmental Impact Assessment (EIA) is the main instrument available to the country to ensure that development projects do not have significant environmental impacts. The EIA is regulated by the Regulation of the National Environmental Impact Assessment System (SINEIA in Spanish) (2009) and this establishes that every project, work or activity must have an environmental license before starting its execution. The process consists of the following steps:

- Categorisation of the project, work or activity through a ´Categorisation Table´ specified in the regulation. There are four categories, ranging from projects that are considered to have a low potential environmental impact or risk (category 1), through moderates (category 2), high (category 3) or very high (category 4). Those in category 1 are exempt from requiring an environmental license. This categorisation addresses environmentally fragile areas.

- Projects, works or activities in category 2 and 3 must present an environmental evaluation according to a predetermined form.
- For category 4 an Environmental Impact Study (ESIA) is required, for which SERNA will elaborate terms of reference and the public and NGOs can send comments.
- The results of the ESIA are published and 30 working days are granted so that the public can review the study and send their comments to SERNA.
- Along with the approval of the ESIA (obtaining of the environmental license), SERNA establishes mitigation, monitoring and control measures.

The responsibility for granting environmental licenses can be assumed by the municipalities. To determine if a municipality has the necessary capacities to assume this function, a self-evaluation process is applied and a subsequent verification by SERNA.

Environmental licenses are issued with a validity of up to 50 years and typically have two years from date of issue to start construction.

In this regard, the Project has Environmental Resolution 1429-2013 and environmental license 077-2014 from SERNA.

4.2 International guidelines and standards

4.2.1 Lender standards

In addition to the national requirements described above, the Project will meet the requirements of the IFC Performance Standards. Specifically, the following standards and guidelines applied:

- IFC Environmental and Social Performance Standards (PS)
- WB Group General EHS Guidelines
- WB Group EHS Guidelines for Electric Power Transmission and Distribution
- IFC Good Practice Note: Environmental, Health and Safety Approaches for Hydropower Projects
- IFC Environmental and Social Management System (ESMS) Implementation Handbook.IFC Environmental and Social Management System (ESMS) Toolkit
- IFC Good Practice Handbook: Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets

4.2.2 International agreements and conventions

The Project (ESIA, 2018) recognises its obligations to meet the obligations of the relevant international agreements and conventions as ratified by Honduras, specifically:

- Convention on International Trade of Endangered Species of wild Flora and Fauna (CITES), signed on March 3, 1973.
- Convention for the Conservation of biodiversity and protection of priority wilderness areas in Central America, approved with Decree 177/94, date of issue: 15.12.94, date of publication: 04.03.95.
- Convention 105-ILO on the abolition of forced labour, approved by agreement No. 2 of the executive branch March 10th, 1958. Ratified by Decree No. 39 of the National Congress of April 24, 1958. Published in the Official journal ‘La Gaceta’ No. 16, 487 of May 23, 1958.
- Convention 169-ILO on Indigenous and tribal Peoples in Independent Countries. Ratified by Decree No. 26-94 of the National Congress of May 10, 1994. Published in the Official journal ‘La Gaceta’ No. 27.413 of July 30th, 1994.

In addition, Honduras has ratified the following international and regional environmental treaties, which may be relevant for the context of the project:

- United Nations Framework Convention on Climate Change
- Kyoto Protocol to the United Nations Framework Convention on Climate Change
- Vienna Convention on Ozone Protection
- United Nations Convention on Biological Biodiversity
- Convention on Wetlands of International Importance (Ramsar Convention)
- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal
- Stockholm Convention on Persistent Organic Pollutants
- Rotterdam Convention on the Prior Informed Consent Procedure Applicable to Certain Pesticides and Hazardous Chemicals in International Trade
- Inter-American Convention for the Protection and Conservation of Sea Turtles
- Convention to Combat Desertification in Countries Affected by Serious Drought or Desertification.
- Regional Convention on Climate Change (1993)
- Agreement for the Management and Conservation of Natural and Forest Ecosystems and the Development of Forest Plantations (1993)
- Regional Agreement on the Transboundary Movement of Hazardous Waste (1992)

4.2.3 International labour law

ESIA (2018) sets out a commitment by the Project to comply with national labour code and the requirements of IFC PS2 for labour which is underpinned by the eight core (fundamental) ILO conventions, namely:

- ILO Conventions 29 and 105 on elimination of forced and compulsory labour.
- ILO Convention 98 on collective bargaining.
- ILO Conventions 100 and 111 on elimination of discrimination in respect of employment and occupation.
- ILO Conventions 138 and 182 on abolition of child labour.
- ICO Convention 87 on Freedom of Association and Protection of the Right to Organise.

4.2.4 IFC Performance Standards

The Project is required to align with the requirements of the IFC's Policy on Social and Environmental Sustainability and social and environmental Performance Standards (IFC PSs) in its project review process. There are eight IFC PS which are outlined in Table 7 along with their applicability to the Project.

Table 7: Applicability of IFC PS to the Project

Performance Standard	Scope and Triggers	Applicable to Project
PS1 - Assessment and Management of Environmental and Social Risks and Impacts	PS1 establishes the importance of: (i) integrated assessment to identify the environmental and social impacts, risks and opportunities of projects (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of social and environmental performance throughout the life of the project.	Yes
PS2 - Labour and Working Conditions	PS2 recognises the need for economic development to be balanced with workers' rights. PS2 aims to: establish, maintain and improve the worker-management relationship; promote the equal opportunity of workers, and compliance with national labour and employment laws; protect the workforce by addressing child labour and forced	Yes

Performance Standard	Scope and Triggers	Applicable to Project
	labour; protect vulnerable workers; and, promote safe and healthy working conditions and the health of workers.	
PS3 – Resource Efficiency and Pollution Prevention	PS3 recognises that economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. PS3 aims to: avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities; promote more sustainable use of resources including energy and water; and reduce project-related emissions that contribute to climate change.	Yes
PS4 – Community Health, Safety and Security	PS4 recognises that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. PS4 aims to: anticipate and avoid adverse impacts on the health and safety of the affected community during the project life cycle; and ensure that the safeguarding of personnel and property avoids or minimises risks to the community's safety and security.	Yes
PS5 – Land Acquisition and Involuntary Resettlement	PS5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons who use this land. PS5 aims to: avoid or at least minimise involuntary resettlement wherever feasible by exploring alternative project designs; mitigate adverse social and economic impacts from land acquisition by (i) providing compensation for loss of assets and (ii) ensuring that resettlement activities are implemented with appropriate consultation and disclosure; and improve or at least restore the livelihoods, standards of living and living conditions of displaced persons.	No
PS6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources	PS6 encourages sustainable development while recognising that the protection and conservation of biodiversity and sustainably managing living natural resources are fundamental to sustainable development. PS6 aims to: protect and conserve biodiversity; maintain the benefits from ecosystem services; and promote the sustainable management and use of natural resources through practices that integrate conservation and development.	Yes
PS7 - Indigenous Peoples	PS7 aims to: ensure that the development process fosters full respect for Indigenous Peoples; anticipate and avoid, minimise or compensate adverse impacts of projects on Indigenous Peoples and provide opportunities for development benefits; establish and maintain an ongoing relationship with affected Indigenous Peoples throughout the life of the project; ensure free, prior and informed consent of Indigenous Peoples; and respect and preserve their culture, knowledge and practices.	No (There are no indigenous peoples in the project area)
PS8 - Cultural Heritage	PS8 recognises the importance of cultural heritage for current and future generations. PS8 aims to: protect cultural heritage from the adverse impacts of project activities; support its preservation; and promote equitable sharing of benefits from cultural heritage.	No

The project documentation (ESIA, 2018 and Golder, 2017) refers to the Projects' commitment to comply with relevant World Bank EHS guidelines. These include:

- EHS General Guidelines (April 2007) (cover four areas if GIIP: Environmental, Occupational health & safety (Community health & safety (CHS) and construction and decommissioning).
- EHS Guidelines for Electric Power Transmission and Distribution (April 2007).

The Golder 2017 report highlights that a key requirement for this Project is to understand the applicability of IFC PS6. IFC PS6 requires that conservation importance is allocated to the ecological features (protected areas, habitats and species) which are likely to be directly or indirectly impacted in the Project AOI. IFC PS6 states that '*the requirements of IFC PS6 must be considered for Projects*

in all habitats, whether those habitats have been previously disturbed and whether they are legally protected. Specifically, a Project is required to:

- *Assess significance of Project impacts on all levels of biodiversity as an integral part of the social and environmental assessment process.*
- *Consider differing values attached to biodiversity by specific stakeholders.*
- *Assess major threats to biodiversity, especially habitat destruction and invasive alien species.*

In accordance with IFC PS6, '*habitats are divided into modified, natural and critical habitats. Critical habitats can be either modified or natural habitats supporting high biodiversity value, including:*

- *Habitat of significant importance to Critically Endangered and/or Endangered species (International Union for Conservation of Nature and Natural Resources (IUCN) Red List).*
- *Habitat of significant importance to endemic and/or restricted-range species.*
- *Habitat supporting globally significant concentrations of migratory species and/or congregatory species.*
- *Highly threatened and/or unique ecosystems.*
- *Areas associated with key evolutionary processes.*

5 ESIA Process and Methodology

5.1 Introduction

An ESIA to international standards is required to undertake an impact assessment to identify potential beneficial and adverse, direct and indirect, and cumulative impacts of the Project related to the bio-physical and socio-economic environment that are considered to have a potential significant impact on the environment. The potential scope of the ESIA may include:

- Environment, social, labour, gender, health, safety, risks and impacts.
- Project and related and associated facilities (where relevant).
- Risks and impacts that may arise for each activity in the Project cycle, including site establishment, panel installation and testing, and site closure / decommissioning.
- Role and capacity of the relevant parties including government, contractors and suppliers.
- Potential third-party impacts including supply chain considerations.

5.2 Summary of assessment to date

The Golder 2017 report states that as a result of the national categorisation of the Project as a category 3 project there was originally insufficient baseline studies performed to enable a thorough assessment of impacts to be performed. Specifically it stated the Project Environmental Report (DAC, 2013*)* did not include any baseline surveys or evaluation of environmental and social risks or impacts commensurate with the scale of a greenfield hydropower project located in or near a legally protected area known to have a number of endemic species, some of which are categorised as Endangered (EN) or Critically Endangered (CR) by the International Union for Conservation of Nature (IUCN). Baseline information contained in the DAC includes only a brief summary describing the physical, biological and social characteristics of the project area.

Following this, supplementary biodiversity and social baseline studies have been performed by international organisations to align the baseline characterisation with international standards. The biodiversity baseline study, including audio surveys for amphibians, was performed under the supervision and direction of the Smithsonian Institution.

Further sources of information for baseline characterisation include publicly available data and information in the Lombardi feasibility study, 2015 (Lombardi, 2015).

Complementary impact assessment reports have subsequently been prepared by ERM to assess impacts of the project in relation to traffic and transportation, cumulative impacts, transmission line impacts, social impact assessment, ecological flow analysis, critical habitat assessment against the IFC PSs and to address the comments raised by the Golder 2017 report.

5.3 ESIA methodology (existing studies)

The ESIA (2018) includes a detailed description of an impact assessment methodology that considers how to define impact magnitude and receptors sensitivity. This is known as the Leopold matrix or the ‘matrix of important environmental impact’ and is also recognised under Honduran national law as a means for identification of environmental impacts. The DAC (2013) presents a matrix of important environmental impact and a qualitative description of impacts and describes insignificant, moderate significance or significant.

In the ERM complementary studies, ERM has employed international assessment techniques that align with international approaches for impact assessment.

5.4 ESIA methodology (summary ESIA)

This Summary ESIA has been prepared for the purpose of presenting a more comprehensive and cohesive understanding of the project impacts. No new baseline data or impact assessments has been conducted to support it. It represents a collation of existing information from a range of reports and studies undertaken in the last 5 years and synthesizes this information into one report.

This document has summarised the findings from the existing studies in impact summary tables collating information on impact magnitude and receptor sensitivity and summarising significance, mitigation and residual significance.

5.5 Data limitations and uncertainty

These are described in the relevant topic chapters where noted in the project documentation.

5.6 Stakeholder consultation, participation and disclosure

Consultation and disclosure have been undertaken by INGLESA including key stakeholder meetings, focus groups and questionnaires. These are described further in Section 12. No further consultation has been undertaken for the purposes of this Summary ESIA.

6 Hydrology and water quality

6.1 Introduction

This section presents the identification and assessment of potential impacts to the quality and quantity of water in the river as a result of the project, as identified in the following project documentation:

- ERM (2016) Jilamito Hydropower project complementary studies, 2016 (referred to as ERM, 2016) including:
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Ecological Flow (EF, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission line impacts (TLI, 2016)
- Hatch Independent Engineering Report, August 2018 (referred to Hatch, 2018)
- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)
- Plan de Gestión Ambiental (PGA) *(Environmental Management Plan)* 'Hydroelectric Jilamito', Ambitec (2013) (referred to as PGA, 2013)

6.2 Baseline

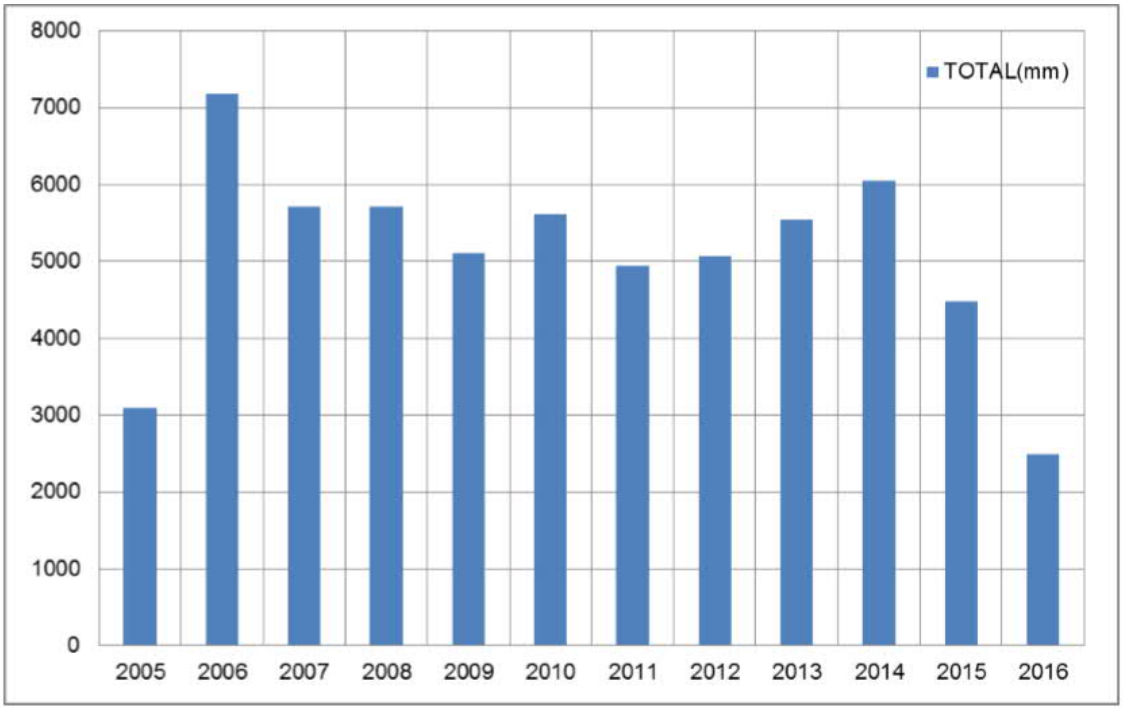
6.2.1 Climate

In the Municipality of Arizona, a tropical rainy climate predominates, which is characterized by abundant rains throughout the year without a marked winter season; the average annual temperature is 26 ºC, but also reaches up to 29 ºC. The minimum temperature is around 19 ºC. The prevailing winds from the Northeast bring humid air to the coast; the mountain mass of Texiguat and Pico Bonito causes humidity that arrives at the coast to fall as rain, making the most humid zones of the country those of the plains and mountains of the Atlantic. The estimated relative humidity is 80%, although it can be higher. The humid tropical climate in this area is characterized by good water conditions. The coastal plains and mountain slopes located north of the Texiguat Wildlife Refuge receive rainfall between 1,800 and 2,800 mm / year; the rainiest months are October and November, and the least rainy months are from March to May (Hatch, 2018).

6.2.2 Precipitation

The Project is located in an area that receives an average annual precipitation of 5085 millimetres (mm), based on records from the Don Arnulf rain gauge operated by INGELSA from August 2005 to July 2016. Ingelsa believe the gauging station is representative of the precipitation in the basin as it is located in close proximity to the proposed intake in the same catchment (ESIA, 2018). Based on gauging station records, the wettest season is from June to November and the season with lower precipitation rates from December to May (ESIA, 2018 and Hatch, 2018). Annual variation in precipitation is shown in Figure 24.

Figure 24: Historical precipitation records measured at the Don Arnulfo rain gauge



Source: ERM, 2016

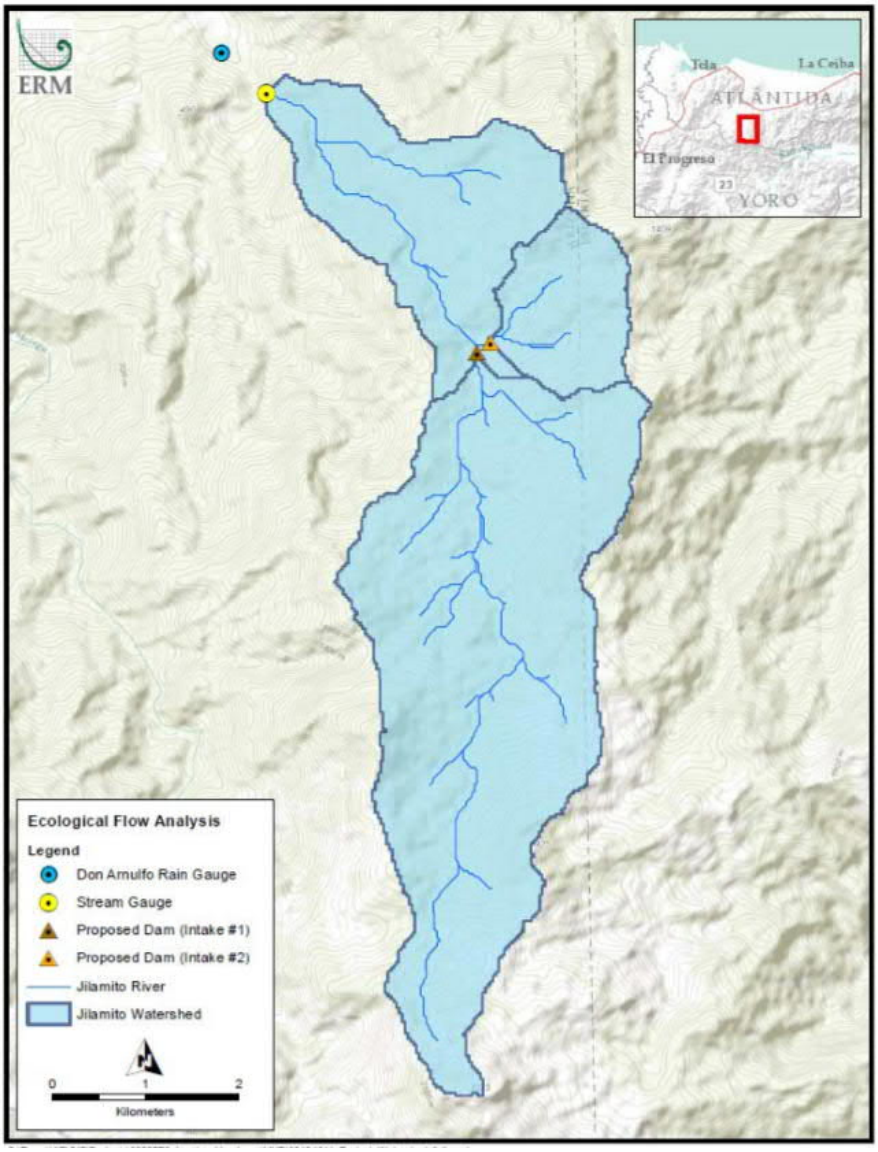
6.2.3 Hydrology

6.2.3.1 Method

The project catchment is approximately 18 km^2 and the basin has an asymmetrical rainfall pattern as a result of the topographic relief to the north, with high gradients and short slopes (ESIA, 2018). The catchment extends approximately 10 km upstream of the proposed intake location (ESIA, 2018). The hydrology of the basin is typical of a wet tropical river.

The project designers utilised daily flow series of gauged flows from the Jilamito River. The gauging site (shown in Figure 25), located just downstream of the proposed intake location, used a water level sensor and data logger, from which data was downloaded periodically from 2006-2017 (12 years). In addition, periodic flow gauging was performed at the site (Hatch, 2018).

Figure 25: Jilamito river catchment areas at the streamflow and proposed water intakes



Source: ERM, 2016

Ingelsa have built a robust understanding of the river's hydrology based on:

- long term research and hydrometric analysis of Mezapa and Jilamito rivers
- examination of the relationship between the flows of both rivers
- analysis of the relationship between flows and precipitation in the region

This analysis has allowed the estimation of the daily average flows for the Jilamito River, presented in Figure 26.

6.2.3.2 Ecological Flow Study

Hydrological studies were complimented by an ecological flow assessment undertaken by ERM in 2016 to evaluate how much of the natural flow regime of the river should continue to flow through the weir into the downstream stretch to maintain specified, valued features of the ecosystem. ERM used

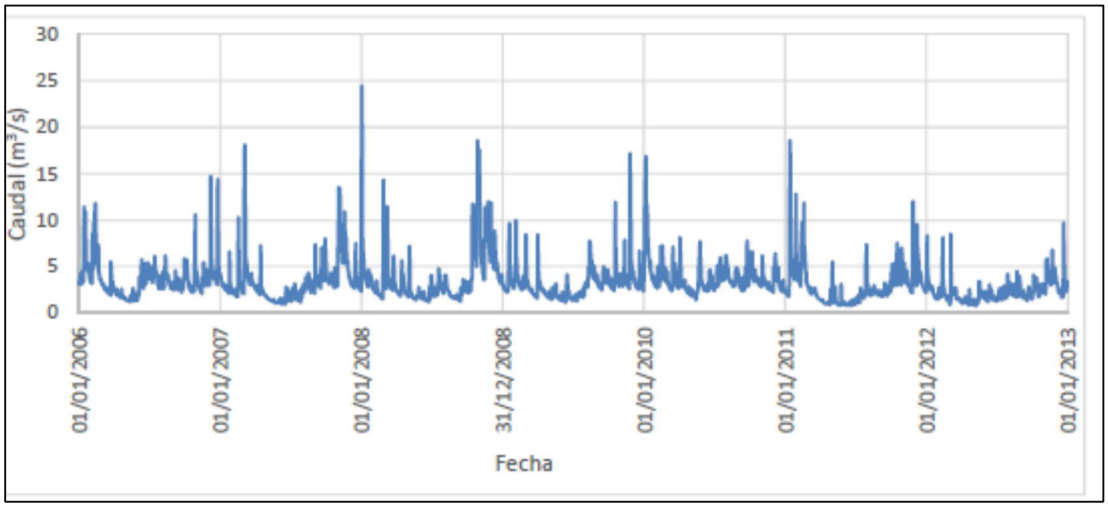
hydrological tools to evaluate ecological flow for the Jilamito HPP (EF, 2016). The study's objectives were to:

- Determine if the Project will affect other water users downstream of the proposed site;
- Describe flows during drought events for 10, 25, 50 and 100-years;
- Provide recommendations for additional measures to mitigate environmental impacts due to changes to downstream flow

The methodology used by ERM to undertake ecological flow analysis is detailed in their 2016 study. ERM used the drainage-area ratio method described by USGS (2008)[6] to estimate the statistical flows at both proposed water intakes.

6.2.3.3 Hydrograph

Figure 26. Hydrograph showing daily average flows for the Jilamito River from 2006 to 2012.



Source: ERM, 2016

Figure 26 shows the streamflow hydrograph ERM created using the available historical streamflow records collected from the streamflow gauge and estimated with the drainage-area ratio method for both proposed water intakes. The results of this analysis are shown in Table 8.

Table 8: Streamflow records (measured at the streamflow gauge, and estimated at the intakes)

	Streamflow Gauge (m^3/s)	Intake no.1 (m^3/s)	Intake No.2 (m^3/s)
Average streamflow records	3.10	2.04	0.31
Minimum streamflow records	0.91	0.60	0.09
Maximum streamflow records	29.56	19.48	2.93

Source: ERM, 2016

[6] U.S Department of the Interior, U.S Geological Survey (USGS), 2008. Estimating Flow-Duration and Low-Flow Frequency Statistics for Unregulated Streams in Oregon. Scientific Investigations Report 2008-5126

ERM conducted statistical analysis of ecological flow and floods for both sites. Table 9 shows the flow statistics for the Jilamito gauge and the proposed weir sites.

Table 9: Jilamito HPP - Flow Summary (all flows in m^3/s)

Parameter	Gauge	At Jilamito Gauge Site	At the proposed intake No.1	At the proposed intake No.2
	Drainage area (km^2)	21.98	14.14	2.18
Flow exceedance curve (one day flows)	90%	1.56	1.03	0.15
	95%	1.37	0.90	0.14
	50%	2.67	1.76	0.26
Statistical low flows	1Q2	1.28	0.84	0.14
	1Q5	1.56	1.03	0.18
	1Q10	1.73	1.14	0.21
	1Q25	1.95	1.28	0.25
	1Q50	2.11	1.39	0.28
	1Q100	2.11	1.49	0.32
	7Q2	1.42	0.94	0.14
	7Q5	1.85	1.22	0.18
	7Q10	2.14	1.41	0.21
	7Q25	2.54	1.68	0.25
	7Q50	2.86	1.88	0.28
	7Q100	3.19	2.10	0.32
	Mean Annual daily flow	3.16	2.08	0.31
	10% of mean annual daily flow	0.32	0.21	0.03

Source: ERM, 2016

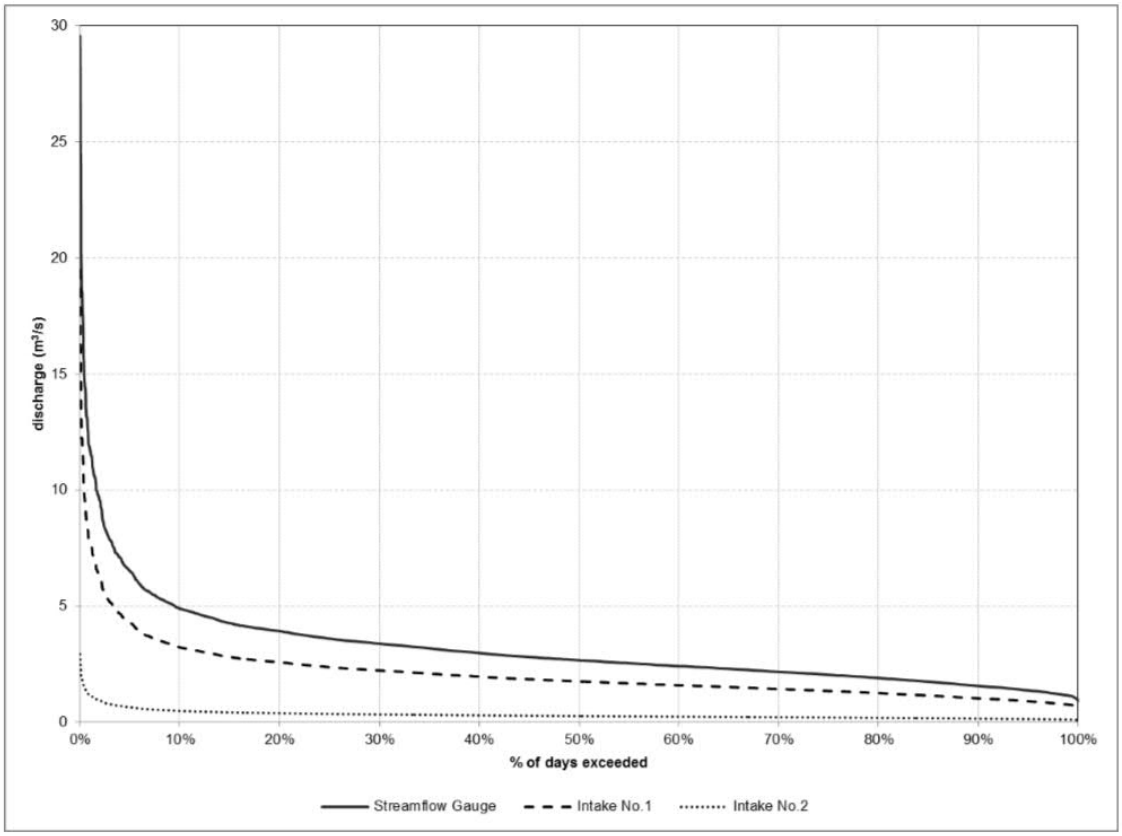
6.2.3.4 Duration curve

The flow duration curve is a graphical representation, in descending order, of the flows observed on a river to show the expected frequency that a flow will be exceeded. The flow duration curve for the Jilamito river at the location of the proposed intake is shown in Figure 27.

Figure 27 shows the flow exceedance curves[7] calculated for the Jilamito streamflow gauge and for both proposed water intakes. The flow exceedance values for a 90% of occurrence correspond to 1.56 m^3/s, 1.03 m^3/s and 0.15 m^3/s at the Jilamito streamflow gauge, intake no. 1 and intake no. 2, respectively (ERM, 2016).

[7] These curves show the percentage of days a particular flow was exceeded in the river at Jimalito streamflow gauge and the proposed intake sites

Figure 27: Flow exceedance curves – streamflow gauge, at intake no. 1 and intake no. 2



Source: ERM, 2016

6.2.3.5 Peak Flows

Table 10 shows the 2-year, 1-day peak flows that tend to define primary channel morphology. Field observations confirm what the stream gauge data report (ERM, 2016).

Table 10: Jilamito HPP – Peak Flows Summary (all flows in m³/s)

	At Jilamito Gauge Site	At the Proposed Intake No.1	At the Proposed Intake No.2
Watershed area (km²)	21.98	14.48	2.18
2-year, 1-day peak (m³/s)	17.45	11.50	1.73
5-year, 1-day peak (m³/s)	22.74	14.98	2.26
10-year, 1-day peak (m³/s)	26.12	17.21	2.59
25-year, 1-day peak (m³/s)	30.28	19.94	3.00
50-year, 1-day peak (m³/s)	33.31	23.91	3.30
100-year, 1-day peak (m³/s)	36.29	25.87	3.60

Source: ERM, 2016

6.2.3.6 Design flow

To determine the design flow, analysis compared different design flows and outputs ($/GWh-year) for a flow range between 2 m^3/s and 3.5 m^3/s. This process determined the optimum flow rate to be 2.8 m^3/s. Water will mostly be taken from the Jilamito River but also supplemented by a maximum of 0.5 m^3/s from the Quebrada El Danto. This will be diverted at intake no. 2 and conveyed into Jilamito River upstream of the proposed intake no. 1 through a 218.6-m long pipe (Lombardi, 2015).

With the run-of-river operation:

- the proposed design flow rate of 2.8 m^3/s would be exceeded approximately 26.5% of the time
- the minimum operating flow rate of 0.44 m^3/s (to operate one unit plus the ecological flow) would be exceeded 99% of the time

The project has been designed to accommodate a flood with a 500-year return period, equivalent to a flow rate of 300 m^3/s (Lombardi, 2015).

6.2.4 Groundwater

The geology in the area is represented almost entirely by intrusive granodiorite rocks covered in large part by vegetation. This allows moisture retention, ensures soil generation processes and maintains high rates of groundwater recharge.

6.2.5 Water Quality

Water quality sampling shows water quality in the river to be within normal ranges, the results are given in Table 11.

Table 11: Results of water quality monitoring

Parameter	Result	Normal range
pH (lab)	7.59	6.5-8.5
Temperature (lab)	25.1 C	18-30 C
Turbidity	1 unit	1-5 unit
Apparent colour	9 mg/l	-
True colour	5 mg/l	1-15 mg/l
Suspended solids	<5 mg /l	-
Biological oxygen demand	<4 mg / l of O_2	50 mg/l
Chemical oxygen demand	<6.65 mg / l of O_2	200 mg/l

Source: Fundacion Hondurena de Investigacion Agricola (9th of October 2018)

In addition, when gathering information for the aquatic biodiversity baseline, AMBITEC undertook water quality sampling of the river at the project site in March 2017. The results are shown in Table 12.

Table 12: Water quality parameters

Parameter	Value	Unit
Biological oxygen demand	7.9	mg/l
Chemical oxygen demand	4.4	mg/l
pH	6.9	pH

Source: ESIA, 2018.

The monitoring found the river to have good water quality with a pH of slightly less than 7.0, which is suitable for aquatic life (ESIA, 2018).

6.2.6 Water users

Downstream aquatic ecology is the main receptor for changes to downstream flows, discussed in Section 8.

There are no communities or other water users who depend on the section of the Jilamito River that will be diverted for the hydropower project (ERM, 2016). Although there are several communities in proximity to the river, the baseline surveys suggest the river is not used as a source of water supply for human consumption or irrigation. Similarly, the river is not thought to be used for subsistence fishing, those people who do fish do so occasionally and for recreation only (ESIA, 2018).

6.3 Impact assessment

6.3.1 Construction Impacts

The documentation identifies impacts from erosion and sedimentation, increased storm water runoff, contamination by accidental spills, and wastewater generation, as key impacts related to the project. Each of these is discussed in turn below.

- **Erosion and sedimentation:** Erosion will occur during the preparation and construction of trails and access roads, and clearance for the transmission line. Construction machinery and equipment will cause local erosion which could increase sediment in the river (ESIA, 2018). These impacts could be expected around the construction of the access road, area of the power house, area of the dam site, and along the road that will be constructed from the forebay to the dam site, for example.
- **Increased storm water runoff:** Ground in the construction areas will be compacted during the preparation of site works. Compaction may lead to a reduction of water filtration and recharge of aquifers. This could lead to increased storm water runoff and subsequent erosion and sedimentation (ESIA, 2018). There will be compacted areas at the power house, offices, dam site and access roads, for example.
- **Contamination by accidental spills:** There is a risk of contamination of surface water streams as a result of accidental releases of hazardous substances during construction and operation. Higher risk substances are fuels, lubricants and residual oils that would cause contamination in the water bodies. The main effect of this impact is the deterioration of water quality and degradation of aquatic ecosystems (ESIA, 2018 and ERM, 2016). Typically, these materials are handled in the area of the construction camp, the area of the power house, and occasionally at the access road to the dam site.
- **Water Resources and Wastewater generation:** Water will be imported onsite prior to being diverted to dedicated water storage tanks. It is anticipated that this water would mainly be used for domestic purposes. During the construction phase, waste water will be generated by the camp and the portable latrines. The volume of wastewater generated by the floating personnel (340 maximum) and 50-70 permanent workers in the mountain camp, is estimated at 3075 liters per day. The personnel that will live in the town will use the drinking water and individual latrines that exist in the houses they will occupy in the town (ESIA, 2018).
- **Impact to groundwater and local flow from springs due to tunneling:** It is expected that none to minimal water would be encountered during tunneling activities, this specific impact has been therefore considered as not significant.

6.3.2 Operational impacts

The documentation identifies changes to the downstream flow regime, changes to erosion and sedimentation dynamic, contamination by accidental spills and wastewater generation as key impacts related to the project. Each of these is discussed in turn below.

- **Changes to the downstream flow regime**. The project design will divert water from a 4,55 km stretch of the river, which in the absence of an environmental flow provision would be dry and so have a significant negative impact on the aquatic ecology in the river. There will be an increase in the flow of Quebrada Olivos after venting in a 1,1 km stretch, before it joins Jilamito River. Impacts to aquatic ecology are discussed in Section 8. This impact is anticipated to be mitigated by the environmental flow, described in the mitigation section below (ERM, 2016).
- **Changes to erosion and sedimentation dynamic.** Hydropower projects typically disrupt erosion and sediment dynamics of a river. However, the natural morphology of the Jilamito River at the proposed site is not predicted to be susceptible to erosion impacts from the new flow regime (ERM, 2016).
- **Contamination by accidental spills.** There may be impacts as a result of improper handling of oils, fuels, chemicals and lubricants required during operations and maintenance. These could spill to soil, groundwater or surface water if poorly managed, leading to soil contamination, and in turn impact water quality and ecosystems (ESIA, 2018). Typically these materials are only handled in the area of the power house and occasionally at the access road to the dam site.
- **Wastewater generation**: During the operation phase wastewater will be produced by approximately 25 workers, estimated at approximately 75 liters per day (ESIA, 2018), which if incorrectly managed could have impacts upon water quality.
- **Hydrogeomorphology and water quality modifications in the dewatered stretch:** No impacts on the hydrogeomorphology and water quality are anticipated at this stage of the project.
- **Sediment dynamic associated with desander and desander purging:** It is anticipated that the volume of purged water would vary from none up to the purging capability of the desander, with this specific activity occurring 12 times per year. This impact has been therefore considered as not significant.

6.4 Mitigation measures

6.4.1 Construction phase mitigation measures

The documentation identified a range of mitigation measures to address the construction phase impacts which may occur. These measures are listed below, grouped by the impact which they seek to address. In addition, the project will be implementing good international industry practice (GIIP) as outlined in the IFC Environmental, Health, and Safety Approaches for Hydropower Projects good practice note, March 2018.

6.4.1.1 Erosion and sedimentation

- Slopes will be stabilized and consolidated to avoid risks of landslides or erosion. The slopes may be covered with native plant species.
- Install sediment traps and ditches in locations where erosion is likely to increase the sediment load of the river.
- Run off from stockpiled aggregate can increase sediment load in the river so material not suitable for use as an aggregate in construction will be deposited on shallow gradients, away from water sources and stacked in such a way as to allow for subsequent revegetation.

- Civil stabilization works must be installed on the site of the power house and the tailrace channel, to avoid erosion and sedimentation of the spillway. Where it is possible the planting of local vegetation in strips perpendicular to the terrain will be undertaken to reduce erosion.
- The clearing of trees in the protection strip of the river bed will be avoided, and measures should be taken to protect them, except where the civil works are to be installed and where construction activities will be carried out on the river bed.

6.4.1.2 Increased storm water runoff

- Respecting patterns of natural drainage existing in the area
- Drainage works will be built which are suitable to handle rain water for the main works and access road areas.
- Sediment barriers will be installed in locations where runoff creates the risk of sediment inflow to the river.

6.4.1.3 Contamination by accidental spills

- Containers for both solid and liquid wastes will be resistant and of sufficient capacity. Temporary domestic solid waste must follow the guidelines established in the regulation for the management of solid waste and in the manual for the integral management of solid waste.
- Waste will be managed to avoid risks of contamination/spillage and transferred to appropriate waste processing facilities.
- When completing the work, all construction equipment, leftover material, waste and temporary installations will be cleaned and removed from the ground and properly disposed of.
- In the selection of areas for waste storage, areas near water and areas identified as unstable will be avoided.
- The dumping of fuels and waste of oil on the soil or bodies of water is prohibited.
- Sites for locating portable latrines (in work areas) or septic tank (in office), will be outside the protective strips of surface or groundwater sources.
- Contamination of watercourses with construction material waste will be avoided by the construction of sand filters or drains. In addition, the correct storage of materials should be observed, making trenches and around sites with potential for spillage.
- If a water recharge area is identified, then this must be marked and labelled so that workers are aware of its location.

6.4.1.4 Water Resources and Wastewater generation

- A water management will be established and implemented with the main aim of introducing mitigation measures associated with water protection, water resources availability, wastewater generation.
- Water used for domestic purposes will be stored in a dedicated water storage tank.
- Contractors must understand limits of both surface and underground watercourses, in the area of direct or indirect influence of the project, in order to reduce the impacts derived from construction works.
- When water is used for human consumption (water from springs, rivers, streams), it must be treated in such a way as to guarantee the potability of it by carrying out periodic analysis, with the exception of purified water purchased in bottles. The water to be used for construction activities may be supplied directly from a spring, provided that the latter is not used for human consumption and an adequate collection structure is created.
- Establish quarterly monitoring of the quality of the water during the construction period, to include current flow, rainfall and water quality. These indicators must be compared to the baseline.

6.4.2 Operations phase

The documentation identified a range of mitigation measures to address the operation phase impacts which may occur. These measures are listed below, grouped by the impact which they seek to address. In addition, the project will be implementing good international industry practice (GIIP) as outlined in the IFC Environmental, Health, and Safety Approaches for Hydropower Projects good practice note, March 2018.

6.4.2.1 Changes to the downstream flow regime.

- ERM concluded that if the Project maintains an ecological flow greater than 0.21 m3/s at the proposed water intake no.1, and 0.03 m3/s at the proposed water intake no.2, the impacts on downstream water users will be consider minor or insignificant.[8]
- To comply with the requirements of the ecological flow, the operator must ensure that its flow is continuous, so that there is always flow in the river. INGELSA is committed to preserving 10% of the average annual flow at all time to prevent significant impacts to downstream water users and aquatic biodiversity. The retention weirs at both water intakes locations must include, in their final design, details of the hydraulic structures that will release an ecological flow equal or greater than 0.21 m^3/s and 0.03 m^3/s.
- The mitigation measure is a requirement of the Honduran Water Law (Ley General de Aguas) which emphasizes the importance of preserving water availability without affecting water quantity and/or quality for other water users (DORH, 2009). The Natural Resources and Environment Secretariat (SERNA) establishes that all hydropower projects in Honduras must conserve and meet the ecological flow of 10% of the annual average flow even during the dry season to conserve the natural downstream aquatic and terrestrial ecosystems (ERM, 2016).
- The project design will include details of the hydraulic structures that will release the specified ecological flow in both proposed weirs.

6.4.2.2 Changes to erosion and sedimentation dynamic.

- Implement the sediment check structures downstream of the proposed intakes to prevent river scouring and/or erosion.
- Material build up from sedimentation of the weir or any work of the infrastructure must be properly removed and placed where it does not affect the normal course of the river.
- Continuous environmental maintenance of the project structures by tree planting and vegetation on slopes and inter-institutional forest protection activities

6.4.2.3 Contamination by accidental spills

- Continue conducting monitoring activities downstream of the Jilamito HPP (streamflow, precipitation and water quality) during operation phase of the Project, undertaking monitoring every six months, including the parameters of dissolved oxygen, temperature, turbidity, pH, suspended solids, heavy metals and colour. This should be undertaken at the following monitoring points: upstream of weir, downstream from the site of the intake and discharge site.
- Report results to Natural Resources & Environmental Office (SERNA) and lenders at least every six months of monitoring activities, including results of historical streamflow, precipitation and water quality records and their compliance with national and international environmental guidelines (e.g. IFC).
- The use of herbicides should be avoided since they can contaminate the surface water, fauna and flora of the site. Preferably use manual cleaning instead of mechanical or herbicides.

[8] There has not been any assessment of the flow requirement of existing aquatic ecology

- Suitable and safe management, containment and disposal of chemicals and oils.

6.4.2.4 Wastewater generation.

- A septic tank will be installed with an absorption well and irrigation field, with the appropriate technology and size for the number of people expected in the office.

6.4.2.5 Hydrogeomorphology and water quality modifications in the dewatered stretch:

- Robust procedural control measures associated with purging activities will be established and implemented.
- As the impact has been assessed as not significant, no other mitigation measures are proposed at this stage of the project.

To meet the necessary requirements for the existence of aquatic life, the developer, as required by the environmental permit, will monitor water quality every six months for dissolved oxygen, temperature, turbidity, pH, suspended solids, heavy metals, and colour at the following monitoring points:

- upstream of the weir,
- downstream from the intake and
- downstream discharge site,

Copies of these records must be submitted to the DECA, comparing them with the information described in the project's baseline. The monitoring will start once there is vehicular access to the weir site.

7 Soils and geology

7.1 Introduction

This section presents information on the identification and assessment of potential geological and soil impacts resulting from the Project as identified in the following project documentation:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- ERM (2016) Jilamito Hydropower project complementary studies, 2016 (referred to as ERM, 2016) including:
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission line impacts (TLI, 2016)
  - Traffic and Transportation impact assessment (TIA, 2016)
- Golder Associates (2017) environmental and social due diligence (ESDD), Jilamito Hydropower project, Honduras (referred to as Golder, 2017)
- Hatch Independent Engineering Report, August 2018 (referred to Hatch, 2018)

7.2 Baseline

7.2.1 Climate

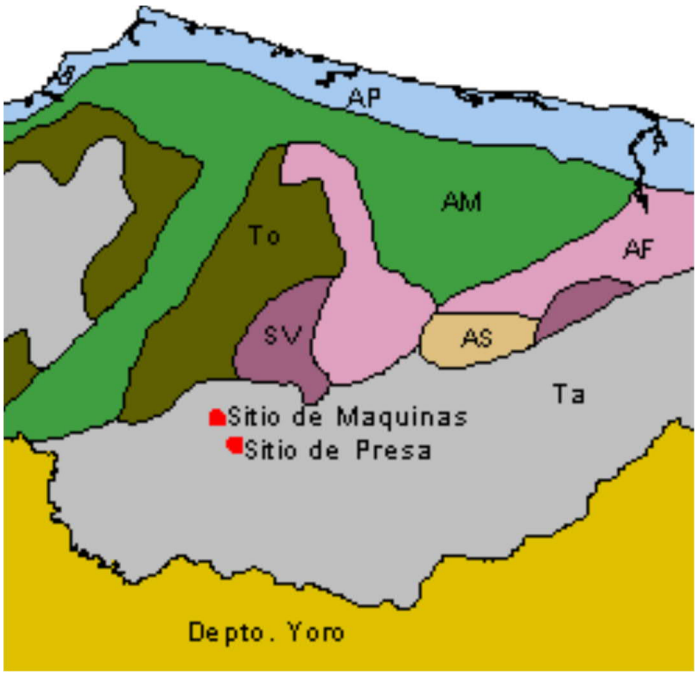
In the Municipality of Arizona, the very tropical rainy climate predominates, which is characterised by abundant rains throughout the year without a marked winter season. The average annual temperature is 26 ºC, but also reaches up to 29 ºC. The minimum temperature is around 19 ºC. The prevailing winds from the Northeast bring humid air to the coast; the mountain mass of Texiguat and Pico Bonito causes the humidity that arrives at the coast to fall as rain, making the most humid zones of the country those of the plains and mountains of the Atlantic. The estimated relative humidity is 80%, although it can often be higher. The humid tropical climate in this area is characterised by good water conditions. The coastal plains and mountain slopes located north of the Texiguat Wildlife Refuge receive rainfall between 1,800 and 2,800 mm / year; the rainiest months are October and November, and the least rainy months are from March to May (Hatch, 2018). General information on rainfall indicates the project area receives an annual rainfall ranging from 1400 to 1600 mm[9]. More recent information collected by the Project Company on average rainfall in the watershed indicates that up to 5,520 mm during the rainy season may fall (Hatch, 2018)

7.2.2 Soils

Soils in the area where the Project will be located are typically classed as ‘Tomalá’ soils, which are well-drained soils, shallow derivatives of Cacaguapa schists with a mixture of marble and quartzite. The slopes of these soils are steep with gradients of up to 60%. Up to 20 centimetres in depth can be loamy silty soils of yellowish-brown colour. These soils have moderate content of organic material composed of litter and humus, with granular structures and in angular and sub-angular blocks of different sizes, with few coarse fragments. Within the profile, it may also be possible to find areas of stones and gravels of highly weathered metamorphic rock. The soils typically remain moist most of the year, due to the vegetal cover they support (DAC, 2013)

[9] DAC 2013 summarised from ‘The modailitie of rain in Honduras, Edgardo Zuniga Andrade, 1990

Figure 28: Soil classification in project area



Source: DAC, 2013.

Notes: (Ta) Tomalá, (Sv) Valleys Soils, (AM) Alluvial, (AS) Alluvial Soils, (AF) Alluvial Soils, (To) Toyos, (AP) Beach Sands) b) Project infrastructure: Sito de maquinas (powerhouse site), sitio de presa (weir site)

There is no record or evidence of historical activity at the site that may have resulted in previous land contamination.

7.2.3 General geology

As part of the Feasibility Study, a preliminary geological and geotechnical survey program was prepared in November 2014 by Lombardi. The Project is located on the northern side of a mountain range called Nombre de Dios and in a structural area called the Central Axis Nucleus, an area composed of Paleozoic metamorphic rocks (graphitic and sericitic schists) and meta-volcanic rocks. The Nombre de Dios range is rich in intrusive rocks, mainly granite and granodiorite. Weathering processes are important due to the high temperature and rain fall and local rock can be badly weathered over more than 10 m. Colluvium, talus, debris flow and residual soils cover most of the Project area, with rock outcrops being found only along rivers (Hatch, 2018). More detailed studies to support detailed design will be performed once the access to the site has opened.

The ESIA (2018) summarises the salient aspects of the Geological Survey conducted by the company Geoconsult in July 2015. The general conclusion of the geological survey is that conditions in the area are favorable, but it highlights that there are some key design requirements (design mitigation) that is required to be incorporated during detailed design phase. These design mitigations are summarised below:

- The weir site presents good conditions for the construction of work with exposed rock and good conditions for foundations.
- Geological conditions along the headrace and penstock pipelines show residual soils with thicknesses more than 4-5 m. The resistance parameters of these soils are low, which can result in instable foundation for developing infrastructure which is exacerbated when slopes are exposed to surface runoff. The abundant presence of this type of terrain, will make it difficult for

construction. The characteristics of the soil in this area is the main reasons for using the skyway cable system (rather than construction roads).

- The powerhouse is located in a geological zone with structures that show weaknesses and some unstable areas due to the presence of alluvial deposits. No valid alternate locations were identified for the power house and therefore this location will be used. The design of the power house will be specified to include additional measures for improving stability. These measures will include:
  - Limited depth excavations
  - Designing all the slopes of excavation with low slope (1:1)
  - Include measures for stabilization of the area on the building e.g. systematic drainages at the foot of the building, gutters on the building to route water away from the site in a controlled manner.

7.2.4 Seismic conditions

Honduras is in the north-western part of the Caribbean Plate that is surrounded by the Cocos and North America Plates. Historically at least five major seismic events occurred during the last century between 1915 to 2009 with magnitudes ranging from 6.0 to 7.3 with the strongest documented earthquake on July 11, 1999 with a moment magnitude scale of 6.7 and on May 28, 2009 with a magnitude of 7.3. A probabilistic assessment of seismicity along the Honduras Territory has been documented to be between 50 to 90% probabilities of non-exceedance in a 50-years interval, with a highest peak acceleration of the soil (PGA) value of 0.4g occurring along the borders between Honduras, Guatemala and El Salvador (Ref: D. Caceres; O. Kulhanek; Honduras & Uppsala Sweden Universities, Seismic Hazard of Honduras, 1999). (Hatch, 2018).

According to Hatch (2017), the 2009 Honduras earthquake had its epicentre located in the Caribbean Sea, 64 kilometres (40 mi) northeast of the island of Roatan, 130 kilometres (81 mi) north-northeast of La Ceiba. The quake occurred at a depth of around 10 kilometres (6.2 mi) in a transform fault zone known as the Swan Islands Transform Fault in the Cayman Trench. The Cayman Trench forms the tectonic boundary between the North American Plate and the Caribbean Plate and continues onshore as the Motagua Fault and the Chixoy-Polochic Fault. The Project area is embedded within the Nombre de Dios mountain range that formed five major alignments parallel to the offshore faults. Both the Mezapa and Lean rivers are considered as being formed as a result of the tectonic activity from the Nombre de Dios range. According to the RESIS II project (which is an earthquake risk reduction study performed in Central America), the seismic chance for the PGA of this area is around 0.18 g for a return period of 100 years.

7.3 Impact assessment

The documentation identifies risk from seismic events and landslides and soil erosion as key risks related to the Project. Each of these is discussed in turn below.

7.3.1 Soil erosion / landslides

Most of the Project components will be built in steep highly vegetated slopes composed of usually non-plastic residual soils of low compacity and bearing capacity that can be easily eroded and destabilized if not adequately and rapidly protected. The very high annual amount and strength of rainfall during the rainy season will enhance erosion of all newly exposed soil surface (Hatch, 2017). The risk of erosion is of high significance. For the transmission line the risk of soil erosion and impact on forestry and agroforestry soils is deemed medium to high (TIA, 2016). During operation the risks are deemed to be low or non-significant (TIA, 2016)

7.3.2 Seismic conditions

As the Project does not have a weir structure that would result in a high-consequence of safety risk from downstream inundation in the event of failure, the Project plans to apply national building standard for the seismic risk. The significance of seismic risks based on the proposed design parameters is considered moderate.

7.4 Mitigation measures

7.4.1.1 Protection from soil erosion / landslides

Hatch (2017) recommend that drainage, protection and stabilisation works follow as close as possible all excavation works, being roads, trenches, slopes. This will require effective integrated team work and adequate and timely supply of materials required (Hatch, 2017). DAC (2013) specifically commits to the following mitigation actions:

- The slopes must be stabilised and consolidated to avoid risks of landslides or erosion, by the construction of works of bioengineering, structures, among others. The slopes may be covered with native plant species such as vetiver, grasses, izote and others specific to the site.
- It is necessary to install sediment traps, ditches and energy dissipaters at the required sites to minimise risk of water contamination from sediment laden run-off.
- The pipe anchors in this type of material must be robust and, in general, it is preferred to bury pipes where the slopes and natural terrain will allow.

7.4.1.2 Protection from seismic events

The 100-years return period for all structures is noted as at the low end of what is typically provided for other small hydro projects, which seismic criteria is needed for the design of powerhouses, penstock anchor blocks and small diversion structures and desander. Hatch (2018) recommends the seismic value should be confirmed upon review of the '*Código Hondureño de Construcción*', which may require a higher return period for essential type buildings like powerhouses and weirs. Hatch (2018) recommend that design standards used for the Mezapa Facility be used for the Project, which were based on the 'Seismic Hazard Analysis of Honduras' by the Civil Engineering Department, Earthquake Engineering Centre of Stanford University (Ref: J.A. Blume).

In addition, an ESMP against international standards is under preparation (Golder, 2017 and ESIA, 2018). The Golder (2017) report includes an Annex that sets out that the following sub-plans will be prepared:

- Emergency response plan
- Natural disaster management plan (this may be integrated into an integrated emergency plan, along with the emergency response plan)
- Disaster risk assessment (to be completed within 90 days of financial close) for the purpose of reviewing disaster and climate change risks and preparing a business continuity plan.

8 Biodiversity

8.1 Introduction

This section presents the identification and assessment of potential impacts to the biodiversity in the project area as a result of the project, as identified in the following project documentation:

- Baseline aquatic fauna survey of the area of influence of the Jilamito Hydroelectric project, Ambitec (2017) (referred to in this chapter as the “Aquatic fauna study”)
- Baseline Studies for amphibians, reptiles and *Haptanthus hazlettii* for the Jilamito Hydroelectric project, Ambitec (2018) (referred to in this chapter as the “Herpetofauna baseline study”)
- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- ERM (2016) Jilamito Hydropower project complementary studies, 2016 (referred to as ERM, 2016) including:
  - Critical Habitat Assessment (CHA, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission line impacts (TLI, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Cumulative Impacts Assessment (CIA, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Ecological Flow (EF, 2016)
- Golder Associates (2017) environmental and social due diligence (ESDD), Jilamito Hydropower project, Honduras (referred to as Golder, 2017)
- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)
- Listado Especies Fauna Jilamito, Matamoros Flores Ricardo (2015) (referred to in this chapter as the “Fauna Species List”)
- Mitchell Aide, Campos-Cerqueira and Nieves, 2018. Identification of presence and absence of six anuran species in audio recordings from Jilamito, Honduras, Final Report for INGELSA
- Plan de Gestión Ambiental (PGA) *(Environmental Management Plan)* ‘Hydroelectric Jilamito’, Ambitec (2013) (referred to as PGA, 2013)
- Plan de Reforestación, Ingelsa (n.d) (referred to in this chapter as the “Reforestation Plan”)
- SERM-04 Form (Social and Environmental Risk Management Report), HREFF (3 August 2018)
- Sieve Analytics 2018. Six Anuran Species Audio Recording Final Report

8.2 Methodology

8.2.1 Desktop review

A literature review was completed as part of the Herpetofauna baseline study (Ambitec, 2018) to enable the evaluation of the diversity, richness and distribution of *Haptanthus hazlettii*. Prior to the herpetofauna field work, a review of different bibliographical sources was completed to understand the distribution of amphibians and reptiles in the department of Atlántida, Honduras.

8.2.2 Field studies

8.2.2.1 Terrestrial Habitats and Flora

Terrestrial habitat types were noted in the Herpetofauna Baseline Study (Ambitec, 2018) but this did not include habitat mapping. Random transects of forested areas were carried out to record flora within the project area. These transects were 100m in length and 20m wide (observing 10m either side). Whilst the study focused on locating the rare shrub species *Haptanthus hazletti* (as well as herpetofauna), other flora species (trees, shrubs, grasses, and epiphytes) encountered were also recorded. Where species could not be identified in the field, samples were collected and identified later.

A tree inventory using a buffer of 20m from the central axis of the headrace pipeline, penstock and cable car route, and 40m from the central access roads was completed for the Reforestation Plan (Ingelsa, n.d). The results of the tree inventory are shown in Section 8.3.3.

8.2.2.2 Terrestrial Fauna

Detailed field surveys for herpetofauna (Ambitec, 2018) have been undertaken to provide a baseline. Visual surveys took place in the rainy season within terrestrial and riparian habitats present in the project area. Transects of between 50m and 150m in length and 2m wide were walked within the project area and areas adjacent to it. This was based on the methodology proposed by Crump and Scott (1994). The survey area covered approximately 11.3 km².

As well as recording species during transect surveys and incidental observations, a total of 34 acoustic monitoring systems for amphibians were placed in 34 sampling points. These sampling points covered the area of direct and indirect influence of the project, as well as control sites. They were programmed to record 1-min sound between 10-min intervals, 24:00h over 12 – 14 days. The recordings were analysed using ARBIMON II software.

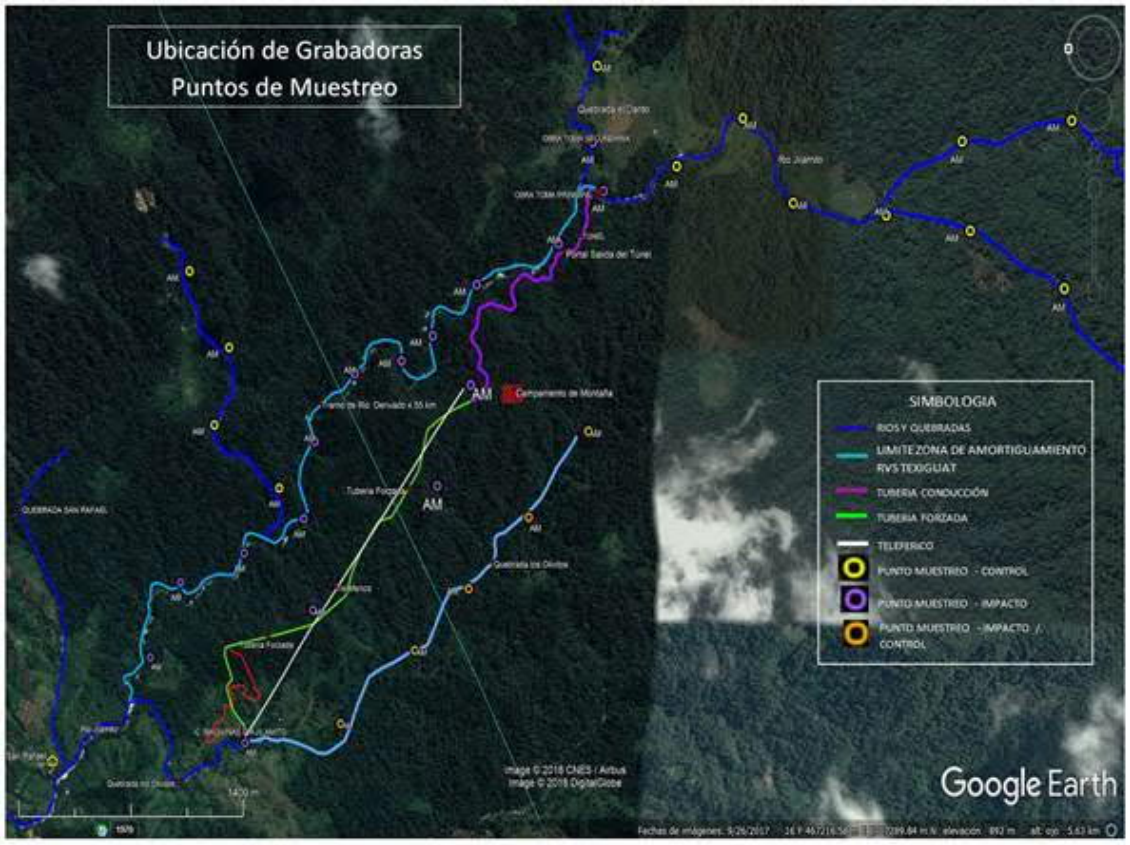
Samples were obtained from amphibians, which were taken by means of a non-lethal technique, to detect the presence of the amphibian chytrid fungus *Batracochytrium dendrobatitis* (Bd) in the laboratory.

No field surveys of the project area were carried out for mammals or birds. The information regarding these groups of species was compiled using secondary sources.

8.2.2.3 Aquatic Habitats and Fauna

Aquatic habitats were recorded in The Aquatic Fauna Study (Ambitec, 2017). The survey was conducted on the Jilamito river in March 2017. The study involved ‘quick sampling’ at 50m intervals along the river and interviewing two local fishermen.

Figure 29: Biodiversity study area



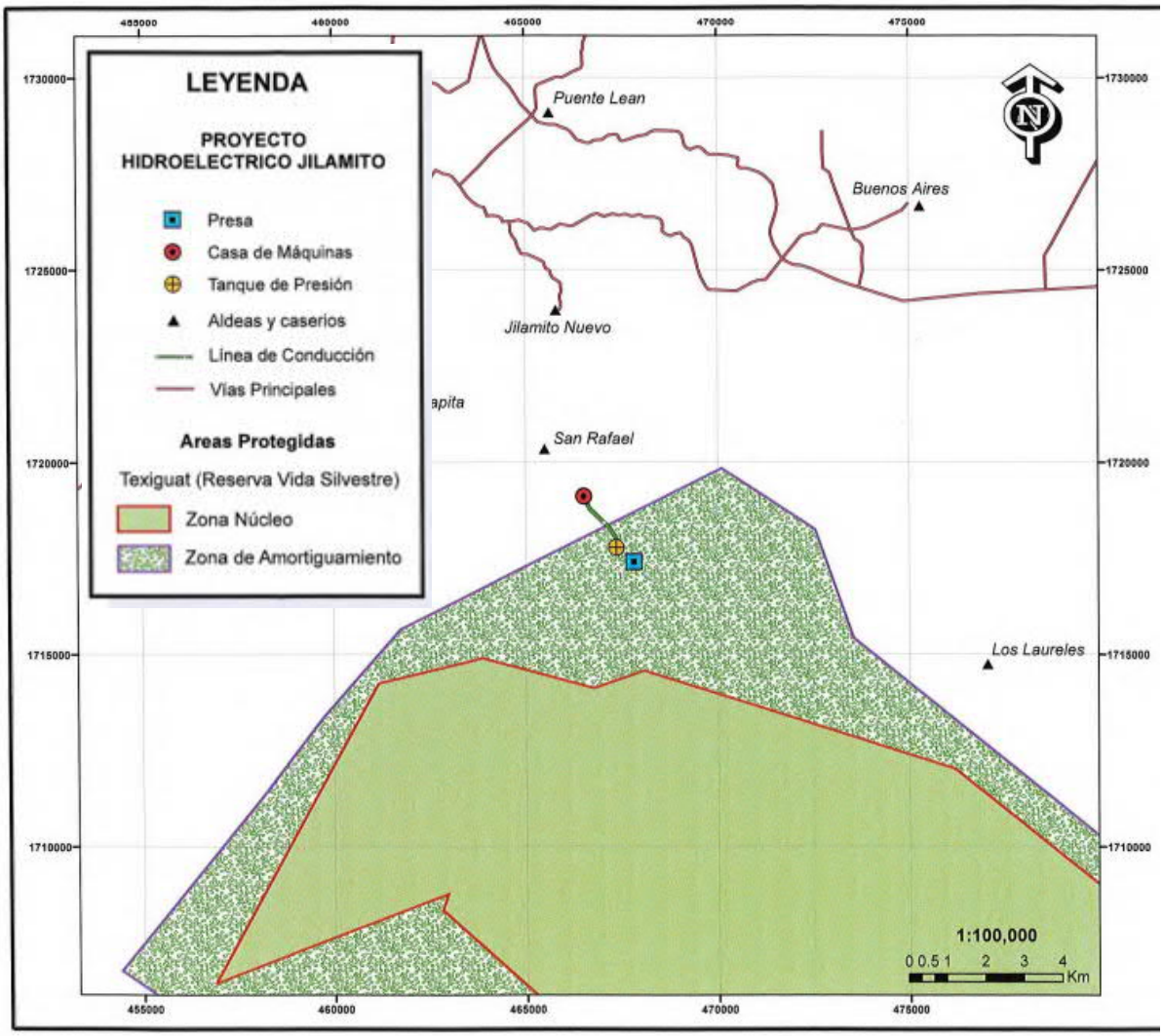
Source: ESIA, 2018

8.3 Baseline

8.3.1 Legally Protected and Internationally Recognised Areas

The nationally-designated Texíguat nature reserve, located near to the project, was established in 1987, and has an area of approximately 16,000 ha. Part of the project (the weir, pressure tank, and a portion of the headrace is located within the buffer zone of the Texiguat nature reserve. The powerhouse is located at a distance of 1.0 km from the buffer zone, as shown on Figure 30. The reforestation plan states that approximately 50% of the project site is in the buffer zone. The project is located approximately 4km from the boundary of the nature reserve ("Zone Núcleo") (ERM, 2016).

Figure 30: Location of the Jilamito hydropower project in relation to the Texíguat nature reserve ("Zone Núcleo") and its buffer zone ("Zona de Amortiguaniento")



Source: DAC, 2013

The ecosystem of the Texíguat nature reserve is described in the Herpetofauna Baseline Study (Ambitec, 2018) as cloud forest, broadleaf forest and tropical forest, which represents one of the most important sites for biodiversity in terms of endemic species of Honduras and Central America.

The Texíguat reserve contains endemic/range-restricted and endangered species, which the Critical Habitat Assessment (CHA, 2016) stated makes the area a Tier I Critical Habitat (as discussed further in the section 8.4 below). This is due to the presence of the following species which are only found in the Texiguat nature reserve:

- *Anolis kreutzi* (lizard, no common name or IUCN listing)
- *Geophis damiani (*snake, no common name, IUCN Critically Endangered - CR*)*
- *Tantilla olympia* (snake, no common name or IUCN listing)

The CHA reports that the IUCN has identified the Texíguat area as a Key Biodiversity Area (KBA) based on the presumed presence of a significant population of the frog *Isthmohyla insolita*. This area also qualifies as a KBA for various other species. Based on the above, the area is also classed as an

Alliance for Zero Extinction Area (AZE). The CHA does not state if these classifications include the buffer zone of the Texíguat nature reserve, or beyond it, nor how much of the project falls within such designations (CHA, 2016).

The CHA recognises that enforcement in Honduras of regulations and management plans is weak. INGELSA propose to develop a plan to improve the protection of the Texíguat nature reserve from illegal deforestation, timber extraction, poaching, and other unauthorised activities. INGELSA intend to support the nature reserve with the provision of lodging and laboratory space for scientific research of the area. INGELSA security personnel will report unauthorised access to the national authorities for enforcement. The CHA concludes that impacts of the Jilamito project and its Biodiversity Action Plan should bring net gains over the lifetime of the project (CHA, 2016).

8.3.2 Habitats

8.3.2.1 Terrestrial Habitats

The Herpetofauna Baseline Study (Ambitec, 2018) noted the following habitat types in the project area:

- broadleaf forest;
- riparian forest;
- scrub; and
- grasslands used for agriculture.

Many of the forest habitats are noted as degraded. The project is located in deciduous forest, which provides a resource for timber and hunting opportunities for local communities. Land cover data (medium resolution) for the Jilamito river basin from the Institute of Forest Conservation (ICF) was used in the Herpetofauna Baseline Study (Ambitec, 2018). A comparison of historical land cover maps showed an accelerated forest loss of 11.86ha per year between 2012 and 2016, compared to 3.82ha per year between 2000 and 2006.

The Herpetofauna Baseline Study (Ambitec, 2018) noted that increased forest clearance for crops, and the introduction of domestic animals poses a risk to the existing forest ecosystem. The study also notes that human activities are causing a species imbalance through activities such as hunting.

The Reforestation Plan (Ingelsa, n.d) states that many of the forested areas are classed as secondary forests due to their management as part of agro-forestry, resulting in fewer species of conservation importance. The plan also noted increasing crop areas (e.g. palm, pineapple, cereals, coffee) encroaching on forest areas. The report stressed the opportunity as part of the project to implement a management plan to stop deforestation in this area and improve environmental conditions for the Texíguat nature reserve.

8.3.2.2 Aquatic Habitats

The Aquatic Fauna Study (Ambitec, 2017) provides information on the aquatic conditions based on a survey in March 2017 for the Jilamito river through the project area. The report states that pH was 6.9, and that the river is considered to have clean water which is high in dissolved oxygen, with a temperature range of between 16 and 23°C.

8.3.3 Flora

The Herpetofauna Baseline Study (Ambitec, 2018) describes the onsite flora based on a survey from random transects of forested areas between trails in the area surrounding the project. Whilst the study focused on locating the shrub species *Haptanthus hazletti* (as well as herpetofauna), other flora species (trees, shrubs, grasses, and epiphytes) encountered were also recorded.

The area is predominantly forested, characterised by the presence of epiphytes on most trees. *Haptanthus hazlettii* was found downstream from the Jilamito site though not in close proximity to the project components. The Critical Habitat Assessment notes that this species has restricted range and is only found in the hillsides of the Cordillera Nombre de Dios mountain range (its IUCN status is Not Evaluated). This species is considered a priority as it is the only member of its genus, first discovered in 1980 and not found again until 2010 (approximately 8km west of the project area). The report assumes that this species is endemic to the area around its only known locality (ERM, 2016).

The Herpetofauna Baseline Study (Ambitec, 2018) noted 182 species of flora as being recorded in the direct and indirect area of influence of the Project. Trees were predominant in the flora recorded (45%), followed by terrestrial herbaceous species (21%) and shrubs (17%). The 83 species of trees recorded include: *Platymiscium dimorphandrum, Ilex tectonica, Spondias mombin, Bursera simaruba, Inga vera, Symphonia globulifera, Tabebuia chrysantha, Schizolobium parahyba*. The plant families most represented were Fabaceas (10.5%), Araceas (5%), Orchidaceae (4.4%), and Arecaceae (4.4%).

The Reforestation Plan (Ingelsa, n.d) presents a tree inventory using a buffer of 20m from the central axis of the headrace pipeline, penstock and cable car route, and 40m from the central access roads. In the inventory, 64 species of trees were identified (including 20 species that are considered commercially valuable). This comprised 3,871 individual trees, of which 4% were described as mature trees, which the report states as a sign of the agro-forest management.

8.3.4 Fauna

A fauna species list was compiled for the project (Matamoros, 2015). The list includes 85 species of fauna that occur in the project area of influence. The list includes species that are noted from secondary sources such as previous research studies, or interviews with community members but does not comprise fieldwork itself. More detailed studies on herpetofauna and the shrub *Haptanthus hazletii* (Ambitec, 2018), and the aquatic environment (Ambitec, 2017) provide more information on the fauna baseline.

8.3.4.1 Mammals

The CHA (2016) noted two endangered species of mammals found in the Atlantida side of the Texíguat nature reserve: Geoffroy's spider monkey (*Ateles geoffroyi,* CR*)* and Baird's tapir (*Tapirus bairdii,* EN*)*. The ESIA notes four species of bats using the wider area of the project (*Glossophaga soricina, Artibeus intermedius, Desmodus rotundus*) none of which are of conservation importance.

8.3.4.2 Birds

The ESIA (2018) notes three species of birds using the wider area as wintering habitat:

- *Penelopina nigra* VU
- *Electron carinatum* VU
- *Dendroica Chrysoparia* EN

The CHA, 2016 noted that there is one endangered species of bird found in the Atlantida side of the Texíguat nature reserve: golden-cheeked warbler (*Setophaga chrysoparia*, syn. *Dendroica chrysoparia,* EN*)*. This species breeds in Texas, USA and winters in the Texíguat region. The same report described that the Texíguat nature reserve as not known to be a site of importance (i.e. known to sustain at least one percent of the global population at any point of the species' life cycle) for any migratory or congregatory species of bird.

8.3.4.3 Herpetofauna

The project is located in northern part of the Cordillera Nombre de Dois mountain range, which the ESIA described as an area of high endemism and biodiversity of herpetofauna in Central America. Many species here are classified as endangered or critically endangered by the IUCN. As described above, the Texíguat nature reserve is considered an area of importance because of its herpetofauna.

The Herpetofauna Baseline Study (Ambitec, 2018) includes a detailed literature review of the previous herpetofauna studies in the project and wider areas. The Department of Atlantida (where the project is located) is known to support 99 species of herpetofauna, which represents 23.7% of the total number of herpetofauna species in Honduras. Forty-two species of herpetofauna were recorded in the direct and indirect area of influence (not mapped) of the project in studies undertaken by Matamoros (2015), ERM (2016) and Golder (2017).

The herpetofauna survey undertaken in 2018 for this project (Ambitec, 2018) recorded 14 species of amphibians and 27 species of reptiles in its study area in the vicinity of the project.

Of the species recorded, four are classed by the IUCN as critically endangered, and a further three as endangered, as listed below:

- *Incilius leucomyos* (EN) – 10 individuals found;
- *Craugastor aurilegulus* (EN) – 20 individuals found;
- *Atlantihyla cf. spinipollex* (CR) – 64 individuals found;
- *Duellmanohyla salvavida* (CR) – 85 individuals found;
- *Plectrohyla chrysopleura* (CR) – eight individuals found;
- *Norops loveridgei* (EN) – one individual found; and
- *Bothreichis guifarroi* (CR) – four individuals found.

The herpetofauna study was undertaken after the CHA and therefore the species listed above are not included in the existing CHA. Most species of amphibians recorded belong to the Craugastoridae and Hylidae families (five species each), and the most represented reptile families were Colubridae and Dipsadidae (five species each). The majority of the herpetofauna species recorded are typical of forest habitats (78.5%).

Acoustic monitoring was completed in order to detect species of toads or frogs which are difficult to identify through surveys (such as arboreal or cryptic species). The study consisted of placing automated recorders between the project areas of direct and indirect influence, in order to determine the potential distribution of the anurans. The audio equipment recorded 1 minute of sound every 10 minutes, between 15:00 and 6:00 over a number of days. Of the 34 acoustic monitoring systems that were placed in the field, results were obtained from 31. The 31 acoustic monitoring systems took approximately 54,313 recordings in order to analyse the distribution and dynamics of five key species:

- *Incilius leucomyos*
- *Hyalinobatrachium Fleischmanni*
- *Teratohyla pulveratum*
- *Duellmanohyla salvavida*
- *Atlantihyla* cf. *spinipollex*

Key conclusions drawn from the studies were that:

- Five of the six species were detected in the recordings from the 31 sites. *Incilius leucomyos* was not detected in any of the sites.
- *Atlantihyla aff. spinipollex* was detected in 10 control sites and in nine impact zone sites.

- *Duellmanohyla salvavida* was detected in three control sites and four impact zone sites.
- *Hyalinobatrachium fleischmanni* was detected in six control sites, six impact zone sites and one intermediate zone.
- *Craugastor sp*. was detected in three impact zone sites.
- *Teratohyla pulverata* was detected in one control site.
- Species distribution models were created for the four species with sufficient data (i.e. present in 7 or more sites). Only two species had significant results.
- The probability of occupancy of *Atlantihyla aff. spinipollex* increased with elevation.
- The probability of occupancy of *Hyalinobatrachium fleischmanni* decreased with elevation (Mitchell Aide *et al* 2018.).

8.3.4.4 Aquatic Fauna

The CHA, 2016 described that the Jilamito river, downstream of the project site, contains populations of widespread migratory fish *Joturus pichardi* and *Agonostomus monticola* (mountain mullet, LC) (DAC, 2013). The Jilamito basin is considered by the CHA to be unlikely to contain more than one percent of the global migratory fish species.

The sampling results showed the identification of eight species of fish belonging to the families of *Poeciliidae, Heptaridae, Characidae,* and *Mugelidae*. Furthermore, three species of macro-invertebrate were noted, including the mollusc *Pachylychulus largilerti* and two shrimp species. The presence of the shrimp was described as being a positive bio-indicator for water quality. A total of 80 individuals across the 11 species were noted, equivalent to between 0.1 and 0.3 individuals per m^2 which was described as being a 'low' abundance.

8.4 Critical Habitat Assessment

8.4.1 Introduction

An initial critical habitat assessment (CHA, 2016) was produced for the project. It was prepared based on a comprehensive literature review, prior to the Herpetofauna Baseline Study (Ambitec, 2018) and Aquatic Fauna Study (Ambitec, 2017) so does not take into consideration results of those studies.

The CHA stated that, in line with IFC PS 6:

"*In areas of critical habitat, the client [Ingelsa] will not implement any project activities unless all of the following are demonstrated:*

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
- The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program."

INGELSA fully recognises the high biodiversity value of the Jilamito watershed and the broad landscape of the Cordillera Nombre de Dios mountains, and is committed to developing and implementing actions that will bring net gains to these biodiversity values. This is in line with the requirement, under IFC PS6, to demonstrate net gain of biodiversity for projects located in critical habitat.

8.4.2 Legally Protected, and Internationally Recognised Areas

The CHA stated that works for this project will not take place within the Texíguat nature reserve itself. However, parts of the project will be located within the buffer zone of the reserve (but not including the access road or transmission line). The CHA states that the Project does not require modification of the Texíguat reserve's boundaries, and that hydropower schemes of this scale are permitted in reserve buffer zones under national regulations (Article 358 of the Reglamento General de la Ley Forestal, Áreas Protegidas y Vida Silvestre, Decreto).

8.4.3 CHA Study Area

The CHA focuses on the northern side of the Cordillera Nombre de Dios mountain range, specifically on the Jilamito watershed. The study considered the Texíguat nature reserve as a Tier 1 critical habitat for endangered and critically endangered species, primarily due to the presence of range-restricted herpetofauna. In addition, the higher elevation humid forests are considered to be highly threatened in Honduras. This island of higher elevation forest is considered to have provided the evolutionary opportunity for species not found elsewhere, resulting in high levels of endemism. As such the project is located in critical habitat.

The CHA described that the Jilamito river, downstream of the project site, contains populations of widespread migratory fish *Joturus pichardi* and *Agonostomus monticola*. The Jilamito basin is considered not to provide habitat for more than one percent of the global migratory fish species, and therefore does not meet the criteria for critical habitat migratory or congregatory species on this basis.

The assessment stated that the IUCN has identified the Texíguat area as a KBA and it is also classed as an Alliance for Zero Extinction Area. See earlier section on Internationally-Recognised Protected Areas.

8.4.4 Impacts on Critical Habitats

The initial CHA concluded that the project was not likely to lead to measurable adverse impacts upon the biodiversity values for which the critical habitat was designated. It noted that whilst impacts may be felt, it does not consider it likely that these will be felt beyond the immediate scheme area, or that the project would be a risk for a species or ecosystem. It states that the loss of terrestrial and aquatic habitats in the Project footprint would amount to ecologically insignificant impacts at the species level for even the most range-restricted endemic species of the RVS Texíguat or Cordillera Nombre de Dios.

It also states: 'the [critically endangered] and [endangered] species known or expected to occur within the footprint of the Project all are found in other portions of the RVS Texíguat or the Cordillera Nombre de Dios. No species have ranges restricted to or largely concentrated within the Project footprint.' However, Townsend *et al* (2011) noted that *Plectrohyla chrysopleura* appeared to have been extirpated along the Quebrado de Oro. The CHA concluded that the Jilamito project and its Biodiversity Action Plan will bring net gains over the lifetime of the project.

8.4.5 Biodiversity Action Plan

The key mitigation discussed in the Critical Habitat Assessment is the production and implementation of a Biodiversity Action Plan (BAP). Under IFC PS6, the BAP is a requirement when the project is located in critical habitat. The details of what is to be included in the BAP are presented in the mitigation section.

8.5 Impact Assessment

8.5.1 Overview

The sections below summarise the project impacts presented in the previous studies. The ESIA (2018) and TLI (2016) provide information on the predicted environmental and social impacts.

8.5.2 Construction Impacts

The ESIA (2018) described the following construction impacts for biodiversity:

- Changes in water flow: During construction there will be no changes in the flow in the river section. Due to the above, no impacts to the herpetofauna are expected due to changes in its flow.
- Disturbance of aquatic environment: Runoff from construction activities can alter water quality, potentially reducing their biodiversity. These impacts are expected around the construction of the access road to the power house, area of the power house, area of the dam site, and along the road that will be constructed from the forebay to the dam site, for example.
- Water contamination: Adverse impacts from construction activities can result in accidental spillages of dangerous or toxic material which can enter water courses. This can lead to a deterioration in water quality, affecting the aquatic ecosystem, as well as the riparian environment. Typically these materials are handled in the area of the construction camp, power house, and occasionally at the access road to the dam site.
- Noise impacts: Potential for construction activities and plant to result in adverse noise disturbance to biodiversity. However, it is anticipated that species (mammals and birds) would emigrate temporally outside of the impacted zone during the construction stage, but would return once construction is completed, as encountered in the nearby Mezapa project
- Removal of plant cover: the removal of plant cover is required for the construction of the project, including access roads and cable car. This will result in soil changes, effects on natural drainage, reduced habitat and food for fauna, and directly reducing the number of plants, some of which may be rare and protected. The ESIA reports that 13.5 ha of vegetation will need to be removed (comprising 3.4 ha in the buffer zone to the Texíguat nature reserve). It also reports that 62.2 ha in total is proposed for re-foresting after construction.
- Habitat fragmentation: Construction activities associated with the project including access roads and the removal of plant cover, can result in habitat fragmentation, which can result in adverse impacts upon biodiversity.This impact is mainly related to the construction of the access road from the forebay to the dam site, and by the penstock.
- Construction activities causing direct mortality of individual fauna: Direct fauna mortality, including affecting nesting sites, is possible with the construction activities through collisions with construction vehicles or plant, or from tree felling, in addition to direct killing by workers.
- Impacts on Critical Habitats: Based on the CHA (2016) the project is not likely to lead to measurable adverse impacts upon the biodiversity values for which the critical habitat was designated. Whilst impacts may be felt, it is not likely that these would be felt beyond the immediate scheme area, or that the project would be a risk for a species or ecosystem.
- Habitat loss causing bird and bat population reduction: Baseline surveys for birds and bats have not been undertaken. The Texíguat nature reserve is not known to be a site of importance for migratory or congregatory bird species (nor does the transmission line transect any such area). However, the wider area is used by the endangered golden cheeked warbler *Setophaga chrysoparia* for wintering.
- New access roads provide increased access to the project area: The Transmission Line Assessment (ERM, 2016) identifies the risk of the opening up of new pathways into the forest to

enable future tree felling and conversion of the forest environment to agriculture, which would threaten biodiversity.

The Transmission Line Assessment also considered that the construction of, and presence of, the transmission line could impact upon bird migratory flyways, although this was considered to be a low risk.

The Herpetofauna Baseline Study (Matamoros, 2018) includes a more detailed impact assessment of the amphibian and reptile species of conservation importance. Most construction impacts on these species are predicted to be moderate and high for amphibians, and low and high for reptiles. The environmental mitigation measures proposed are believed to have high and moderate positive impacts for both amphibians and reptiles.

8.5.3 Operational Impacts

The following operational impacts were considered in the ESIA (2018) for biodiversity:

- Reduced flow in the River Jilamito in section between diversion and venting: The reduction of the flow in the diversion section will be significant in summer. The impact will be mitigated by the ecological flow and inflow from other streams in the diversion section. In the Mezapa Hydropower Plant the same principles were applied with adequate results for water quality, aquatic fauna and herpetofauna.
- Water contamination: The accidental release of harmful or toxic liquids which enter the river due to operational activities (such as oils and lubricants) would then result in adverse impacts upon river quality, affecting the aquatic and riparian ecosystems. Typically, these materials are handled in the area of the power house and occasionally at the access road to the dam site.
- Collisions and electrocutions of birds and bats from the transmission line: This can occur when a bird simultaneously touches energised and non-energised parts of the transmission line. The ESIA states that the area is not considered to be a site of importance for birds or bats. The transmission line assessment also considers that the presence of the transmission line could impact upon bird migratory flyways, with this considered a medium risk.
- Change of land use from the human population: Terrestrial forest habitats are already under increasing pressure from agriculture, this impact is therefore not considered to be significant.

The more detailed impacts assessment in the Herpetofauna Baseline Study (Ambitec, 2018) indicates that most impacts on herpetofauna species of conservation importance will be low and moderate for amphibians, and low for reptiles. The environmental mitigation measures proposed will have moderate and high positive impacts for both amphibians and reptiles.

8.6 Mitigation Measures

A summary of the mitigation measures proposed across the range of studies undertaken is presented below.

8.6.1 General Biodiversity Management

To help protect fauna, the PGA (2013) and ESIA (2018) stated the need for the following measures:

- Project staff will be forbidden from hunting wild fauna in the project area and surrounding areas, including taking pets to site;
- The introduction and spread of new / invasive species is forbidden; and
- The project should consider designing the infrastructure so that the free movement of terrestrial and aquatic species is allowed.

The ESIA (2018) described INGELSA's environment management policies, which include the following:

- commitment to implementing reforestation campaigns four times a year (locations, areas and number of years are not specified);
- ongoing biodiversity management supported by the Smithsonian (Washington DC, USA).

The Critical Habitat Assessment highlights design alternatives selected that avoid or minimise impacts to biodiversity such as the use of a suspended cable car to access the upper reaches of the project and the selection of a run of river design that minimises loss of riparian and terrestrial habitats.

The SERMF study (H-REFF, 2018) requires:

- a flora and fauna relocation plan to be included in the BAP,
- training for project staff (including subcontractors) on the biodiversity issues and mitigation for the project,
- specific measures to prevent the introduction of non-local or invasive species,
- programmes to support the Texíguat nature reserve.

The Herpetofauna Baseline Study (Ambitec, 2018) outlines measures as part of the construction works, such as:

- offsetting by replanting
- pre-construction checks for wildlife
- removal of wildlife that gets trapped in trenches

The Herpetofauna Baseline Study also provides mitigation measures for each of the seven endangered and critically endangered species it notes. This mitigation includes good practice, generic environmental measures such as:

- installation of sediment traps
- stabilisation of slopes
- revegetation of degraded areas by anthropic human activities.
- avoidance of tree removal within the protection strips alongside watercourses (in line with the Forestry Law)
- permanent promotion of conservation to prevent illegal wild animals hunting
- avoidance of contamination of water courses
- banning the burning of waste on site
- cover and protect stockpiles of materials to prevent dust generation and runoff

8.6.2 Tree Management and Reforestation

The PGA (2013) and ESIA (2018) lists the following measures:

- avoid tree felling in the protective strip of the river
- the burning of the felled material or other associated waste will not be allowed except in particular cases where regional authorities need to be consulted and it should be undertaken with supervision of these authorities.
- where tree felling is required, the trees should be felled so that they are delimbed first, and cut in a way to fall into felled areas so surrounding vegetation is not damaged.
- pre-felling checks and removal of fauna for where tree removal is proposed should be undertaken.
- for the clearance of vegetation for trails, areas that are clearly used by wildlife should be avoided.

- vegetation removal should be done by manual clearing and not use of herbicides or other chemicals.

A Reforestation Plan has been developed for the project. The plan proposes 77ha of forest planting (58,000 plants) with a mix of native trees, shrubs, grasses and other smaller vegetation. Specific measures are:

- replanting in areas of temporary tree removal and reforesting areas of forest in the vicinity of the weir that have been damaged by livestock. This will be at a ratio of three trees planted for every single tree felled.
- a forest nursery established prior to construction for the site to help grow local specimens, reducing the need to transport specimens in to the area.
- topsoil removed for construction works will be retained for reforestation and use on the on-site plant nursery.
- areas for reforestation, will also include other areas of forest in the area that have been degraded or removed due to human interference.

8.6.3 Biodiversity Action Plan (BAP)

The CHA (2016) outlines the need for a BAP, which is a requirement for projects located in critical habitat (IFC PS6). The BAP will outline the protective measures for construction and operation, proposing an approach to biodiversity conservation. It is stated in the Critical Habitat Assessment that the BAP will undertake to achieve net gains for the critical-habitat triggering species and ecosystems in the Jilamito project area of influence. The BAP has not yet been produced but will include actions to:

- avoid loss of habitat due to illegal activities (such as hunting, deforestation, livestock);
- monitor and control invasive species in the project's area of influence;
- reforest affected areas using native species, engaging local communities;
- enhance management of the Texíguat reserve by supporting staff to patrol and monitor and research the area's biodiversity in consultation with stakeholders.

The BAP should include specific measures targeted for the endangered, critically endangered and endemic/restricted-range species identified, as well the wider ecological system accounting for biological connectivity and cycles in the area.

8.6.4 Aquatic Environment

The following mitigation and monitoring measures are presented in the existing project documents to reduce the projects impacts to aquatic ecology:

- the Ecological Flow Analysis recommends that the project maintains an ecological flow greater than 0.21 m^3/s at the proposed water intake no.1, and 0.03 m^3/s at the proposed water intake no.2 (EF, 2016).
- quarterly water quality monitoring during the construction and operation phase. This should be done at points upstream of the weir and downstream of the project including the parameters of: dissolved oxygen, temperature, turbidity, pH, suspended solids and heavy metals, and colour (Ambitec, 2017).
- ongoing monitoring of ichthyofauna during the dry season (Ambitec, 2017)
- correct storage of chemicals for both construction and operation. This will reduce the risk of accidental spillages entering the watercourse, damaging the aquatic ecosystem.

8.6.5 Further Studies and Monitoring

The ESIA (2018) specifies that the following should also be included in the BAP:

- a survey of riparian amphibians (including larvae);
- studies on invertebrates, terrestrial reptiles and small amphibians using traps (the Herpetofauna Baseline Study (Ambitec, 2018) that has been provided did not include trapping in its methodology);
- studies on the diversity of avifauna; and

For the removal of the current vegetation during the construction phase in those specific areas where the construction will take place, an inventory was performed identifying the type of vegetation, its size, and exact location of each tree with GPS, all in compliance with the Institute for Forestry Conservation of Honduras. The revegetation activities will take place during the construction phase, if possible, to recover the areas disrupted. The Herpetofauna Baseline Study (Ambitec, 2018) recommends a herpetofauna monitoring plan for both construction and operation phases, which includes twice-annual surveys (duration and locations not stated) to ensure inclusion of both rainy and dry seasons.

In order to improve the knowledge of the aquatic ecological baseline, the Aquatic Fauna Study (Ambitec, 2017) proposed that further studies in the period of April to June are undertaken to provide an indication of aquatic fauna presence at other times of year (it suggests information on the impacts resulting from El Niño/La Niña climatic events would be useful to know). The study also highlighted that the authors have asked local fishermen to provide them with regular updates (via phone message) on the fish types they find in the river in order to help provide anecdotal evidence.

9 Noise and Vibration

9.1 Introduction

This section presents the identification and assessment of potential noise impacts from the Project as identified in the following project documentation:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- Traffic and Transportation impact assessment (TIA, 2016)

9.2 Baseline

The general baseline characterisation as summarised in Section 2 of this document does not indicate any existing noise emitters in the project AOI. The existing studies do not document any primary baseline noise data for nearby sensitive receptors or communities in the AOI.

9.3 Impact assessment

9.3.1 Sensitive receptors

Nearby communities are scoped out of the noise assessment based on their distance from the worksites (stated as more than 1000 m) (DAC, 2013). The DAC (2013) notes that the key receptors for noise and vibration impacts will be ecological receptors (fauna) and workers (occupational noise impacts).

9.3.2 Construction

The DAC (2013) identified the main activities to create noise impacts as:

- Land clearance, including the demolition and removal of structures, trees and rocks.
- Excavation works.
- Laying of foundations, including the conditioning of the old roads and the compaction of the ditches.
- Lifting, including structures, placement of walls, floors, windows and pipe installations.
- Finishing, including filling, paving and cleaning.
- Vehicle movements at site and along the access roads and vehicle idling for construction works and for vehicles handling, loading and transferring materials and waste.

For land general works (land clearance, excavation works) using construction traffic and heavy rolling equipment, DAC (2013) describes the sound emission as a continuous noise, noise of long duration and with less intensity than impact noise (e.g. from piling). Typical noise levels for construction equipment 15 m from the activity have been presented in the DAC (2013). This assessment indicates that noise levels for workers within 15 m will be between 70 dB(A) and 100 dB(A). These levels vary from 72 to 96 dBA for earthmoving equipment from 75 to 88 dBA for material handling equipment and from 68 to 87 dBA for fixed equipment with impact equipment such as impact piling causing the highest noise level at between 90 and 100 dB(A).

DAC (2013) notes that the environmental impacts related to noise during the preparation and construction phase of the site are of a temporary nature (an estimated 40 month total construction and commissioning period is envisaged, earthworks (which will create most noise) will have shorter duration that this. The impact from noise will mainly be on the local fauna, since it will be frightened away and displaced. DAC (2013) states that this adverse effect will be reversed once the activities

and human presence on the site is finished. The DAC (2013) considers noise related to daytime only in line with expectations that work will only be performed during day-time hours.

For impacts to the wider population, DAC (2013) notes that the nearest population is 500 m from the project site and therefore no impacts are expected to be realised from construction equipment or construction traffic noise. Noise related to the substation and OHL works have been scoped out from assessment (TIA, 2016).

9.3.3 Operation

The DAC (2013) identifies the following sources of operational noise:

- Occupational noise impacts from the turbine generators (in excess of 90 dB).
- Environmental noise from the powerhouse and other activities.

The assessment concludes that occupational noise impacts are likely to be generated and without mitigation could result in exposure to workers that exceed occupational noise exposure guidelines. The DAC (2013) considers that environmental noise will not be significant noting that noise generating equipment will be housed within buildings.

9.4 Mitigation measures

For management of operational noise, the DAC (2103) recommends the following mitigation measures:

- Refer to manufacturer's specifications regarding the noise levels produced by the different machines installed and apply required occupational noise mitigation
- Undertake occupational noise monitoring during operation to verify noise impact and to verify occupational noise protection requirements.

The project will apply noise exposure limit guidelines values for work in noisy areas according to Table 13 below.

Table 13: Maximum occupational exposure limits to be applied to the working environment

Allowed Exposure Time per Day (Hours)	Medium Level of Sound Pressure Measured on the Scale (Decibels)
8	85
4	90
2	95
1	100
0.50	105
0.25	110
0.13	115

Source: DAC, 2013.

For construction noise, there is minimal discussion on specific noise mitigation measures for control of noise from site activities or vehicle movements. The DAC (2013) notes the importance of monitoring speed as a function of noise and to minimise idling by trucks in a concentrated area (e.g. at the site entrance). Additional mitigation measures may include the provision of ear devices for noise protection, the avoidance of using excessive machinery, the adoption of sound barriers.

The preparation of an updated Project ESMP aligned to IFC PSs and GIIP is ongoing. It is intended this document will incorporate the above noise mitigation measures and GIIP in relation to noise

control (including noise from blasting and aggregate processing). The stakeholder engagement plan makes provision for informing the local community prior to the start of works.

10 Air quality and Greenhouse gases

10.1 Introduction

This section presents the identification and assessment of potential beneficial and adverse air quality impacts and risks of the Project as identified in the following project documentation:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- Golder Associates (2017) environmental and social due diligence (ESDD), Jilamito Hydropower project, Honduras (referred to as Golder, 2017)

10.2 Baseline

No specific statement on ambient air quality baseline has been provided in the documentation. The general baseline characterisation (as summarised in chapter 2) does not indicate any significant existing pollutants emitters, areas of high-density traffic movement or areas of high-density population in the project AOI that might indicate a degraded airshed.

10.3 Impact assessment

10.3.1 Sensitive receptors

The DAC (2013) notes that the key receptors for dust and fugitive emissions are workers within the direct work area and impact on flora and fauna. For workers, the impact of health including eye irritations, headaches and breathing / respiratory difficulties are most likely. For flora and fauna poor air quality can lead to abnormal growth, discoloration and mottling of leaves and death.

The nearest communities are located more 500m from the proposed worksites.

10.3.2 Construction

The DAC (2013) identifies potential air pollutants as particulate matter (PM) and other fugitive emissions associated within the construction phase e.g. volatile organic compounds (VOC's). Specifically, the DAC (2013) identifies the following impacts which are elaborated in turn below:

- Dust and particulates from removal of organic soil and rocks (excavation works) during construction.
- Fugitive dust emissions from vehicles (light and heavy) across unpaved roads during construction.
- Fugitive gas emissions (carbon monoxide CO and oxides of nitrogen (NO_x and VOCs) from increased in vehicle movement during construction resulting in effects on human health.

At the site preparation stage where it involves excavations, removal and transfer of soil and aggregate quarrying and processing, these activities produce PM in suspension, which can be classified as total suspended particles (TPS) and PM_{10} (particles less than 10 microns) which may both cause pollution to the environment and cause health implications for workers. DAC (2013) states that the environmental impacts that affect air quality will be temporary and their magnitude may vary from moderate to significant depending on the implementation (or not) of good dust control practices.

Particulate matter (PM) including particles smaller than 10 microns in aerodynamic diameter (PM-10) and particulate material smaller than 2.5 microns in aerodynamic diameter (PM-2.5) emissions occur whenever vehicles move on unpaved roads or land. Dust clouds are left behind as the vehicles. The

extent of dust emissions is dependent on the condition of the road, the volume of traffic, the type of vehicle (weight), the speed, weather conditions and the properties of the road surface material.

During the construction stage it is expected that there will be a degree of air pollution due to the contribution of gas from area sources derived from the traffic of both light vehicles, and heavy rolling equipment, since they generate emissions such as nitrogen oxides (NO_x), sulphur dioxide (SO_2), carbon dioxide (CO_2), carbon monoxide (CO), water vapor and volatile organic hydrocarbons (VOCs). The impact magnitude is expected to have a moderate effect on worker health and to a lesser extent the natural environment.

DAC (2013) notes that the emitted gases also include greenhouse gases, mainly CO_2 and SO_2. No estimate of direct GHG emissions from construction activities is presented.

The contribution of vehicle emissions to atmospheric pollution during construction is deemed to be moderate and impact is primarily related to the effects on occupational health and to a lesser extent to the natural environment.

The TIA (2016) does not raise emissions to air as a potential impact associated with the transmission line works

10.3.3 Operation

The only point source emission during operation will be from the back up diesel generator to be used under emergency or abnormal operating conditions.

DAC (2013) concludes there is no significant impact related to the increase of gaseous emissions to the atmosphere during operation since there is no associated combustion process, nor will operation of the plant result in alterations to the existing air quality.

The assessment notes that vehicle emissions are likely to increase compared to the pre-project level but not by a significant amount and lower than during the construction phase.

Golder (2017) states that the Project is not expected to produce more than 25,000 tonnes of CO_2 – equivalent annually. It highlights that as a run-of-river scheme it does not include a large upstream reservoir and therefore it is not expected to generate GHG from the storage of water upstream of the diversion weirs. As a renewable energy source the project will avoid some GHG emissions.

10.4 Mitigation measures

The following embedded mitigation measures are noted in the Project documentation.

- The cable car will reduce fugitive dust emission from construction works that would otherwise be required to build an access road from the power house to the forebay.

In addition, the following good practice mitigation measures are highlighted for implementation:

- Establishment and implementation of: i) Reforestation plan, ii) Forests Conservation and protection, iii) Watershed protection and conservation, with the primary aim to offset greenhouse gas emissions.
- Good practice measures such as sprinkling water, covering stockpiles and good material handling during periods of high traffic volume.
- Use of awnings to cover trucks of aggregate or stockpiles to reduce the likelihood of suspended particles.
- If water abstraction is not possible in the project area the roads should be covered with gravel to minimise the emission of dust into the atmosphere.
- The burning of oil will not be allowed at any time.

- If there are paved access roads, they should be kept clean of materials, waste or debris, to avoid dragging material by rain or the generation of suspended particles into the atmosphere.
- Vehicles used in the hauling of materials and / or construction waste should not exceed their capacity limit.
- Use tarps or plastics that completely cover the stacks of soils and aggregates to minimise the emission of dust or the dragging of sediments by the action of rain. Protect stockpiles with removable boards (wooden for example) to ensure their containment.
- Use equipment and mobile machinery in good condition, which must have appropriate devices to prevent air pollution and excessive generation of noise. Options that are friendly to the environment, such as biofuels, should be preferred where feasible.

A maintenance program for machinery and equipment will be established to maximise the efficiency of combustion and minimise emissions of pollutants. This should include, but not be limited to, tuning the engine, checking oil and tires. Records of this activity must be maintained. The preparation of an updated Project ESMP aligned to IFC PSs and GIIP is ongoing. It is intended this document will incorporate the above air quality mitigation measures and GIIP in relation to dust control (including emissions from mobile or stationary generators, blasting and aggregate crushing)

11 Landscape and visual

11.1 Introduction

This section presents the identification and assessment of potential beneficial and adverse landscape and visual impacts and risks of the Project as identified in the following project documentation:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)ERM (2016) Jilamito Hydropower project complementary studies, 2016 (referred to as ERM, 2016) including:
  - Traffic and Transportation impact assessment (TIA, 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission line impacts (TLI, 2016)

11.2 Baseline

General photographs of the project area are presented in Section 2.3.

11.3 Impact assessment

11.3.1 Sensitive receptors

The DAC (2013) states that there is no recognised landscape value in the site that has given rise to recreational activities or any tourist value. The TIA 2016 recognises that landscape features such as contour and vegetation will be affected by the transmission line works. The nearest settlement is 1 km from the powerhouse site.

11.3.2 Construction

The DAC (2013) identifies potential impacts on the landscape character and visual amenity as:

- Removal of natural habitat for the establishment of infrastructure, storage areas and equipment use.
- Visual impact from the short-terms use of construction equipment (e.g. scaffolding, mobile cranes).
- Visual impact from the long-term installation of key infrastructure (weir, pipelines, forebay and powerhouse.

DAC (2013) concludes that the construction works would temporarily change the visual amenity of the area due to the presence on the site of plant equipment and construction activities. It notes the construction of scaffolds will temporarily change the current conditions of the site although this will only be short-term since after construction these will be removed. The presence of mobile cranes will make changes but again only in a localised manner.

There is no recognised landscape value in the site that has given rise to recreational activities and tourist value, for this reason the DAC (2013) has concluded that construction works will not affect landscape value.

For the linear components (skyway cable and transmission line) activities that may generate impacts on the quality of the landscape include (TIA, 2016): preparation of trails and access roads, drilling and excavations, deforestation (clearing of vegetation), construction of supporting infrastructure, transport of machinery and equipment to the project area, construction of cableway platforms and

erection of skyway and transmission line towers. It considered that the environmental unit most affected during the construction phase is the landscape character. Deforestation is the main activity resulting in impacts, supplemented with impacts from preparatory works for roadways and access roads, temporary installations and the passage of machinery, vehicles and equipment used in hauling construction material and the transfer of workers along the roadways. ERM TIA 2016 applied a quantitative assessment of the impact on visual quality using on impact assessment matrix approach. Considering all aspects such as timing, intensity of impact and persistence the resulting significance was considered low.

11.3.3 Operation

The presence of the powerhouse is deemed to cause a permanent change in the local landscape character. However, DAC (2013) notes that the conditions at the site will not change significantly given there will be no permanent inundation. The Project does not anticipate significant permanent alteration in land cover (e.g. removal of trees) as it is intended to revegetate much of the area around the project infrastructure once construction is complete.

During operation the presence of the overhead line is identified as the main operational impact (TIA, 2016). Considering such factors as type of impact, intensity, reversibility and importance the impact significance was deemed to be low.

11.4 Mitigation measures

The existing project documentation does not specify any specific mitigation measures to minimise changes to visual amenity or landscape character.

The preparation of an updated Project ESMP aligned to IFC PSs and GIIP is ongoing and will include general good practice principles for minimising visual impact on surrounding receptors. The Project is required to rehabilitate cleared land quickly in order to minimise soil erosion potential and this will help to minimise impacts on landscape character.

A communication and community relations plan will be prepared with requirements to inform nearby receptors when major works are about to commence.

12 Social impacts

12.1 Introduction

This section presents information on the identification and assessment of potential social impacts resulting from the Project as identified in the following project documentation:

- Golder Associates (2017) environmental and social due diligence (ESDD), Jilamito Hydropower project, Honduras (referred to as Golder 2017)
- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)
- Environmental License Application Form for Projects Category 2 and 3 - SINEIA F-02 'Hydroelectric JILAMITO', Ambitec (2013)
- Plan de Gestión Ambiental (PGA) *(Environmental Management Plan)* 'Hydroelectric Jilamito', Ambitec (2013) (referred to as PGA 2013)
- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- ERM (2016) Jilamito Hydropower project complementary studies, 2016 (referred to as ERM 2016) including:
  - Social Impact Assessment (SIA 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Cumulative Impacts Assessment (CIA 2016)
  - ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission line impacts (TLI 2016)
- Report of the socialisation process, Ingelsa (2015)
- Report of visits to the Mezapa Hydroelectric Power Station by communities and Educational Centres, Ingelsa (2018)
- Resolution 1429 of 2013, SERNA (2013)
- SERM-04 Form (Social and Environmental Risk Management Report), HREFF (3 August 2018)
- Social baseline for the Jilamito Hydroelectric project, Ingelsa (November 2018 & December 2018)
- Summary of the Socialisation Process of the Jilamito Hydroelectric project, Executive Document, Ingelsa (n.d)

12.2 Area of Influence

The project is located over the Jilamito River (Lean River basin), in the Jilamito village, Arizona Municipality, Atlántida Department, on the north coast of Honduras. Upstream of the project is the buffer zone of the Texiguat Wildlife Reserve (TWR), a legally protected area; while downstream are several villages and settlements, located both sides of the Jilamito River and its tributaries (ERM 2016).

In 2013, the area of influence (AoI) of the project was presented in the Environmental Qualitative Diagnosis (DAC in Spanish) and the Environmental License Application Form SINEIA F-02, documents developed by Ambitec, which included the following settlements: San Rafael, Agua Caliente, Mezapita, Jilamito Viejo, Jilamito Nuevo, El Retiro and El Empalme. The same information is summarised by ERM in 2016, for the complementary study of social impacts.

Subsequently, Ingelsa presents in the Environmental and Social Impact Study ESIA (2018) and the Social Baseline (2018), that the determination of the AoI of the project was carried out based on the analysis of the Jilamito River basin area. According to Ingelsa, the concept of forest management was considered, in which the minimum area of management is the basin, where a certain river drains with all its relevant environmental and socioeconomic interactions (ESIA, 2018).

In this way, the area of social influence was determined by Ingelsa in 2018 as presented in Table 14.

Table 14: Social area of influence

Type of influence	Community / settlement	Distance from the project	project interactions
Direct influence (within the river basin limits, except Hilamo Nuevo)	Caserío San Rafael	1.0km	Land acquisition for project facilities including access roads
	Aldea Jilamito Viejo	5.0km	Workforce provision, improvement and use of access road, social investment
	Aldea Jilamito Nuevo	5.2km	Workforce provision, improvement and use of access road, social investment
	Aldea Hilamo Nuevo[10]	8.7	Use of access road
Indirect influence (outside of the river basin limits)	Aldea de Mezapa	-	Workforce provision, use of access road, goods and services provision
	Aldea El Retiro	-	Transmission line, use of access road, social investment
	Caserío El Empalme	-	Transmission line, use of access road, social investment
	Caserío Lean	-	Use of access road
Special influence*	Aldea Mezapita	6.2km	Use of access road, Ingelsa personnel housing, goods and services provision, workforce provision, social investment
*Considered a special area of influence for its current economic development, geographic location and construction considerations of the Jilamito project, as they provide some services such as gas station, access roads, provision of room services and suppliers of ironmongery materials and equipment. This situation of provision of goods and services is currently presented for one of the companies of the IESA Corporate Group, so it is taken as a reference for the execution of the Jilamito project.			

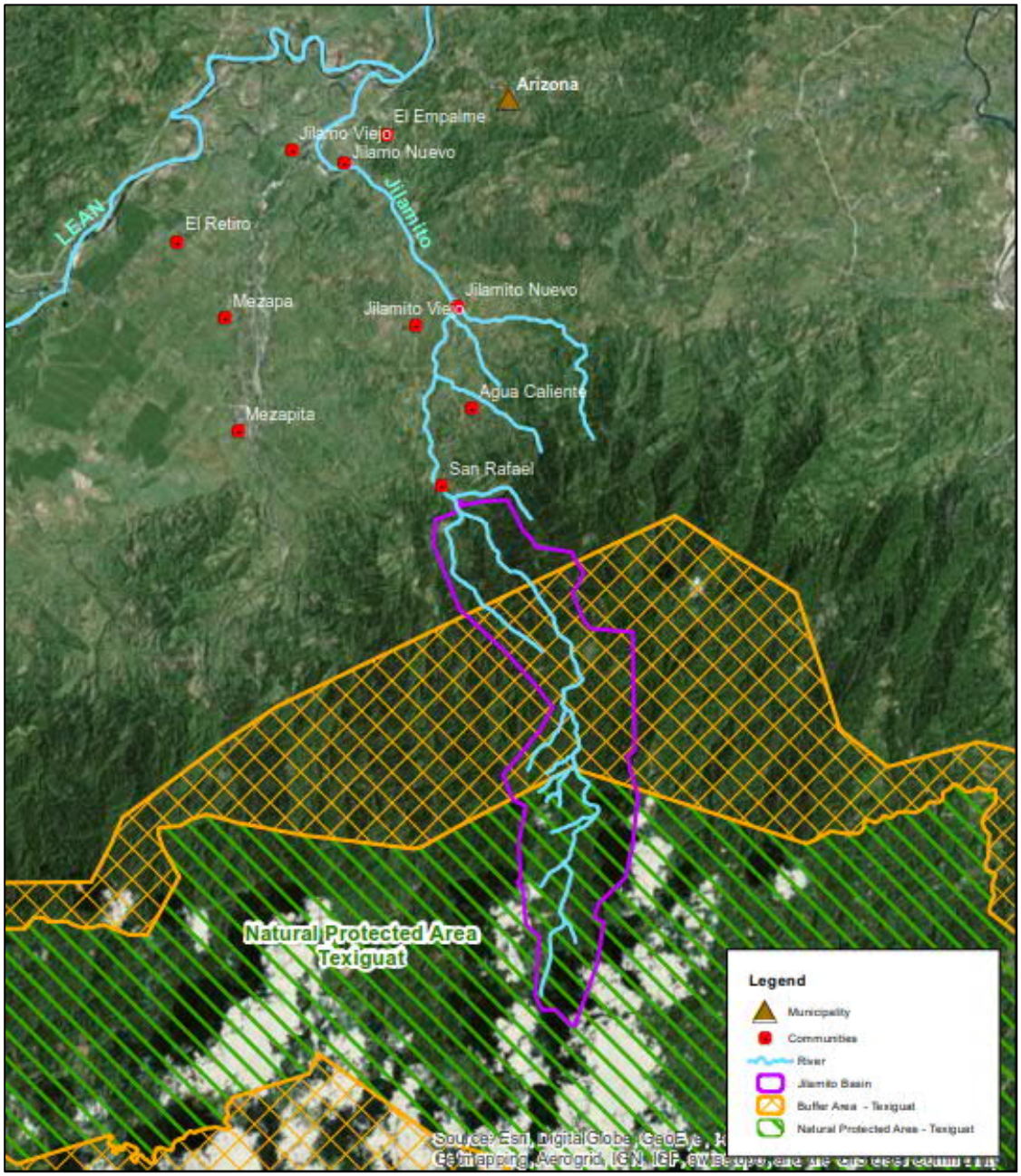
Source: ERM, 2016 and ESIA, 2018

The village of Matarras is mentioned in the Social Baseline (2018) and Summary of the Socialisation Process (Ingelsa, n.d) reports as having been part of the socialisation process, however it is not identified in the consideration of the AoI due to the distance and its location (outside the Jilamito River Basin).

Location of the social AoI determined in 2013 and 2018 are presented in Figure 31 and Figure 32 respectively.

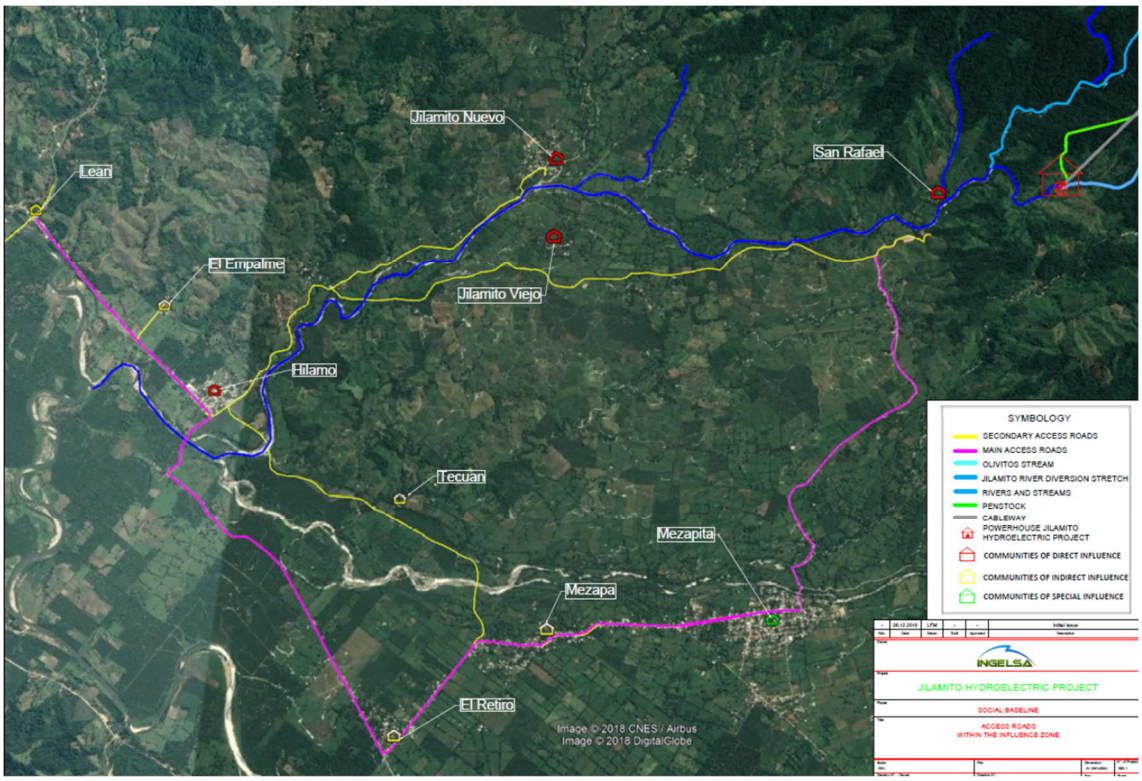
[10] In some documents this village is referred to as 'Jilamo Nuevo'. To avoid confusion, we have used 'Aldea Hilamo Nuevo' throughout this document.

Figure 31: Social area of influence



Source: ERM, 2016

Figure 32: Social area of influence - 2018



Source: Ingelsa, 2018

12.3 Identification of stakeholders

Key stakeholders of the project were identified through the socialisation process and the ERM analysis which included field work and document review (ESIA, 2018). Stakeholders are listed below:

- **Coordination Boards (Patronatos):** Local organisations created for self-management, legally recognised by the government, led by the president of the board. All board members are elected every two or three years. The boards must be registered in each municipality (ESIA, 2018).
- **Water Boards (Juntas de Agua):** Created with the purpose of managing water resources for human consumption. Members are responsible for maintaining community water systems (ESIA, 2018).
- **Agroforestry Cooperative CALIJINUL (Cooperativa Agroforestal Liberación Jilamito Nuevo Ltda.):** CALIJINUL integrates the populations of Jilamito Nuevo and Jilamito Viejo, to protect forests and forest use. It has a concession area of 1315ha, legally granted by the National Institute of Forest Conservation and Development, Protected Areas and Wildlife (ICF in Spanish) in 2011, it is located in the buffer zone of Texiguat, within lands that will be used by the project. Given this situation, in August 2016 the cooperative entered into an agreement with INGELSA called 'Socialisation Agreement for Coexistence, Tolerance and Acceptance of the Development of the Jilamito Hydroelectric project between Ingelsa and the Cooperative' (ESIA, 2018).
- **Arizona Municipality:** Local administration currently focused on education, electrification and road improvements projects. Along with the Foundation for the Protection of Lancetilla, Punta Sal and Texiguat (PROLANSATE in Spanish; see below for more information), the Municipality is a signatory of the co-management agreement for the Texiguat Wildlife Refuge (TWR) (ESIA, 2018). An association of municipalities from central Atlantida (MANMUCA) who oversees implementing projects within the project boundaries (ERM, 2016)

- **Business owners/ local workers:** In Aldea Jilamo there are two small local businesses: 'Balneario Los Cocos' and the agroindustry and exporter 'Chacón' (ESIA, 2018). There is also a Hotel and tourist center in Jilamito Nuevo and 'Balneario La Roca' in Mezapita.
- **Broad Movement for Dignity and Justice (MADJ in Spanish):** MADJ is a social and political movement against the corruption and mismanagement of public goods in Honduras. The Movement is known to be the main opponent of hydroelectric projects in the area (ESIA, 2018).
- **Land owners/occupants** of the land where the different facilities of the project will be built, including access roads and the transmission line (ESIA, 2018).
- **Environmental Foundation PROLANSATE (Foundation for the Protection of Lancetilla, Punta Sal and Texiguat):** Potential stakeholder. Non-profit and non-political organisation that aims to improve the quality of life of the population living in the bay of Tela basin (Cuenca de la Bahía de Tela), through the conservation of natural resources, agroforestry, community development, ecotourism, environmental education and defence of public policies. With the Municipality of Arizona, this foundation co-manages the Texiguat Wildlife Refuge (TWR) and coordinates actions with agroforestry cooperatives to protect the area of illegal loggers (ESIA, 2018).
- **Council of Popular and Indigenous Organisations of Honduras (COPINH in Spanish):** Potential stakeholder. Founded in 1993 with the objective to defend rights in context of exploration and exploitation of natural resources, working mostly in the departments of Intibucá, La Paz, Cortez, Comayagua and Lempira. One of the emblematic projects that COPINH has been following is the hydropower project Agua Zarca, developed by Desarrollos Energéticos (DESA). Which has been included in this list for its potential to generate risk to the project associated with an environmental agenda. COPINH has contacted some opponents from the Jilamito project to support protests, but this engagement is neither formal nor organised (ERM 2016). The CODEH is a National Human Rights Organization that acts autonomously in its studies and analysis of some situations in particular of the Honduran society. The Honduran Association of Renewable Energy (AHER) and the CODEH have completed analysis of the different hydroelectric projects in Honduras and their situation regarding Human Rights, making several visits to the Project and other Projects throughout the national territory.

In addition, the following stakeholders are mentioned in the reports are:

- Municipal Environmental Unit (UMA in Spanish)
- Secretariat of Natural Resources and Environment (SERNA in Spanish)
- National Association of Forest Producers (ANPFOR in Spanish)
- Regional Agroforestry Cooperative of Colon Atlantida Hondura Ltda (COATLAHL in Spanish)
- Cooperation Society for International Development (SOCODEVI)
- ELECNOR Foundation
- Collective Society 'Margarito Deras y Asociados de Jilamito'
- Collective Society 'Fausto Flores de Jilamito'
- Forest Association of Forest Producers, Broadleaf Forest (ANFHORBL in Spanish)
- Forest Conservation Institute of Tela and Ceiba
- Foreign Cooperation Agency of the Catholic Church of Ireland TROCAIRE
- Bishop Michael Leninham of the Catholic Church, in the City of Ceiba National Inter-Institutional Security Force (FUSINA in Spanish)
- Chamber of Commerce of La Ceiba

The law firm Foley Hoag have undertaken further outreach to stakeholders aiming to ensure that INGELSA's leadership efforts to transparently obtain a social license to operate are recognized at the international level. This work also aimed to establish open channels of communication with local

and international stakeholders regarding the Jilamito Project and INGELSA's intention to engage in good faith throughout the process. The outreach included the following:

- Community members in support of Jilamito project
- Members of MADJ encampment at Jilamito project site
- Chargé d'affaires, Economic Counsellor, and Human Rights Officer, US Embassy
- Commissioner and individual responsible for social/environmental issues at the Comisión Nacional de los Derechos Humanos
- Meeting with Inter-American Human Rights Commission
- Outreach to UN Special Rapporteur on the situation of human rights defenders
- Outreach to human rights NGOs
- Organizations with links to MADJ: Front Line Defenders, Trocaire Honduras, Oxfam Honduras
- Other highly-reputable NGOs: Human Rights Watch, Amnesty International, RFK Center for Justice and Human Rights
- Engagement with US State Dept (DAS Scott Busby) and US Embassy (Human Rights Officer Jason Smith)
- Engagement with representatives of Honduran human rights institutions
- Secretary for Human Rights (Karla Cueva) and Comisión Nacional de Derechos Humanos de Honduras (Marcos Tulio Gomez)
- Meetings with representatives from the Inter-American Development Bank

12.4 Socialisation process

The socialisation process of the project started in 2006 by Sociedad Eléctrica Mesoamericana S.A. (SEMSA[11]). In 2013, the process was continued by INGELSA, with continual engagement into 2018. The socialisations were developed through different interactive methods, with the objective of providing technical information of the project in its different stages to the local population and interested parties. This includes the benefits it will generate and attention to questions and concerns about environmental and social impacts (ESIA, 2018).

According to ERM (2016), the socialisation process implemented by INGELSA, in compliance with national legislation, remains ongoing through meetings with community representatives and stakeholders. In general, the level of engagement and identification of the company within communities of the area of influence is close and on-going, a situation that has allowed them to gain acceptance of the project development (ERM, 2016).

The timeline of the socialisation process is presented in Table 15.

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[11] SEMSA and INGELSA belongs to the same business group (ERM, 2016).

Table 15: Socialisation process timeline

Phase	Year	Description	Interested parties
Initial phase	2006	November - Presentation of the project to the representatives of the communities.	Arizona Municipality, Arizona UMA, SERNA, ICF, ANPFOR, COATLAHL, SOCODEVI, PROLANSATE, ELECNOR, Jilamito Nuevo and Jilamito Viejo Coordination Boards and Water Boards, Collective Society 'Margarito Deras y Asociados de Jilamito', Collective Society 'Fausto Flores de Jilamito'
Intermediate phase	2013	May - Tour of the project area.	ICF, SERNA, Arizona UMA and community leaders of Jilamito
		June - Presentation of the project to the communities of Jilamito.	Arizona UMA, Coordination Boards representatives, Water Boards, advisory councils, CALIJINUL
	2015	March - Presentation of the project to the communities. Community leaders met later to develop a proposal on priority needs in the community.	Community leaders of Jilamito Nuevo and Jilamito Viejo, CALIJINUL
		April - Reception of proposal and personalised socialisation process only for the members of CALIJINUL, this is separate from the community socialisation process in general, since this cooperative is one of the most important actors for the project.	CALIJINUL
		July - Presentation of INGELSA's proposal to the community and signature of the investment agreement.	Jilamito Viejo community
		August - Meeting with the communities, where acceptance for the construction of project is reached.	Jilamito Viejo and Jilamito Nuevo communities
		August – Presentation of the area of influence of the project in relation to the TWR and the area under CALIJINUL management.	Arizona UMA, CALIJINUL, PROLANSATE, COATLAHL, ANFHORBL, Forest Conservation Institute of Tela and Ceiba
		September – Presentation of the project to the representatives of the communities.	Jilamito Nuevo community
		September - Presentation of the project to the representatives of the communities.	Major of the Arizona Municipality, communities' leaders, Coordination Boards and Water Boards presidents of Jilamito Nuevo, Jilamito Viejo, Mezapa and Mezapita.
		September – House by house socialisation campaign to present the project and get to know people's opinion regarding the construction and operation of it.	Jilamito Viejo, Jilamito Nuevo, Mezapita, Mezapa, El Retiro, Matarras
		October - Informative talks and training for communities, about run-of-river hydropower projects	Mezapita, Matarras, El Empalme, Mezapa
		November – Educational tours and meetings with communities.	Jilamo, Jilamito Viejo, Jilamito Nuevo,

Phase	Year	Description	Interested parties
		First contact with the community of Jilamo, visits to the Mezapa Hydroelectric Power Station, presentations about run-of-river hydropower projects and project	
		November - Open council meeting to declare the Arizona Municipality free of mining and hydroelectric activities. Proposal turned down after council voting in light of general support for the Project	Arizona Municipality, Coordination Boards, Water Boards, MADJ, Cattlemen's Association, representatives of the communities
Updated Phase	2016	May - Adoption of the acceptance agreement between INGELSA and CALIJINUL.	CALIJINUL
	2017	June to December - Communities of the area of influence in favour of the project, meet with different entities to show their acceptance.	TROCAIRE, OEA, Catholic Church of La Ceiba Municipality, Police Commissioner of Atlántida, Regional Head of FUSINA, Coordinator of Environmental Prosecutors of the Atlántida sector, Chamber of Commerce of La Ceiba
	2018	January to April - The educational tours to the Mezapa Hydroelectric Power Station, environmental talks and informative talks with different communities are resumed.	Jilamo Nuevo, Jilamito Nuevo, Jilamito Viejo, El Retiro, El Empalme, Mezapa, Mezapita, Montes Los Olivos.

Source: Ingelsa, 2015, (ESIA, 2018, Ingelsa, n.d and Ingelsa, 2018

12.4.1 Achievements

According to the ESIA (ESIA, 2018 and Ingelsa, n.d), the main achievements of the socialisation process are:

- Compliance with the socialisation process, according to legal requirements of the national regulation entities such as SERNA.
- There is an acceptance agreement between CALIJINUL and INGELSA.
- Signing of an agreement between ICF, PROLANSATE and INGELSA, to join efforts for the protection of the TWR, especially the area of the Jilamito river basin.
- Support for the project from some stakeholder groups with a recognition of social and economic benefits of the Project

12.5 Stakeholder support for the project

According to the information provided, below are the main demonstrations of support and opposition by stakeholders to the project.

An open town hall meeting was held in November 2015 at the request of local organisations opposing the project of the municipality of Arizona, where according to the Municipal Act Certification, the number of people who demonstrated in favour of the project was a majority; therefore, it is accredited that the project was duly socialised (ESIA, 2018 and Ingelsa, n.d). According to ERM (2016), underlying this protest and the opposition to the project is political conflict between the 'councilman' and the Mayor of Arizona, as well as a local businessman economic interest in Jilamito area. From the interviews with local authorities, there is no evidence of a relationship between these local opposition groups with national organisations such as COPINH, except for some informal contacts, however, these local opposition individuals could be using the environmental agenda of the national NGOs against the project to get media attention (ERM 2016).

According to HREFF (n.d), the directly influenced communities express their support for the project and maintain a good relationship with the person responsible for the environmental and social management of the project.

On 15 May 2017, a MADJ camp was set up with representatives of communities from outside the project's area of influence, in El Nance, in opposition to the construction of the project. On 29 May 2017, the communities in favour of the project installed another camp 100m away from the MADJ camp, to demonstrate that there is a population of the communities who are directly influenced that are in favour of the project, as well as other communities that already enjoy the benefits of a hydroelectric plant in operation (hydroelectric project in Mezapita) (Ingelsa, 2018).

The ESDD report (Golder, 2017) of the project states that, despite the apparently good working relationship between Ingelsa and the local communities, the risk in terms of social aspects remains moderate. This is due to the existence of anti-renewable energy movements in Honduras and the expression in favour of, or against hydropower or renewable projects by local politicians.

The Broad Movement for Dignity and Justice (MADJ in Spanish) is the main opponent of hydroelectric projects in the area. Some approaches have been made with members and leaders of the movement and a Memorandum of Understanding has been proposed between INGELSA and the MADJ, of which there is no response as of the date of the report (ESIA, 2018).

According to Ingelsa, the authorities of Jilamito Nuevo and Jilamito Viejo referenced that the owners of Jilamo's businesses are pressuring their workers (and the population) not to accept the project, threatening them that they will lose their jobs, because they are afraid of competing with the salaries that the project will pay given they are equal to or above the minimum wage defined by Honduran legislation (ESIA, 2018).

12.5.1 Expectations

Stakeholders believe that the main benefit generated by the project will be job creation. Job creation is associated with better living conditions because it provides more stable and higher incomes in comparison to the incomes obtained from cattle breeding and agriculture. However, job creation can be both beneficial and problematic because if the selection process is not clear and transparent enough, it is possible to create a perception of favouritism from Ingelsa towards the residents who receive this benefit. To this end, the population required further information campaigns to be carried out, in which the hiring procedures used by the company will be explained (ERM, 2016).

Another expectation about the project is the social support that Ingelsa will provide. Social support is expected to be received through the implementation of sustainable projects, such as social infrastructure improvement. According to Ingelsa representatives, and photo evidence, to date (2016) the company has made projects and during commercial operation, at the beginning of each year, the company will sign an agreement with Coordination Boards to determine the projects to be implemented over the year. Expectations for this type of assistance are large among communities and interviewees agreed on the need to define a long-term agreement with Ingelsa to secure investment in the area (ERM, 2016).

12.5.2 Concerns

The main concerns and fears of local populations was that;

- the project might cause potential damage to the water bodies from pollution
- particulate matter (dust) will affect the quality of the pastures used to feed the cattle;
- workers will leave solid waste scattered in the countryside;
- important flora species of the lands where the operations will be carried out will not be relocated;
- fertile lands or lands with agricultural potential will be used as dumps;
- fish populations will decrease due to engineering activities for the construction of the hydropower project.

Ingelsa´s socialisation process has helped to clarify some doubts around impact in water quality and quantity, especially with the guided tours to the Mezapa Hydroelectric Power Station (ERM, 2016).

In El Retiro, a settlement located in the access road and transmission line route, there is a concern around health impacts associated with closeness of houses to power transformers, and the lack of consultation and information related to this issue (ERM, 2016).

Another concern of the community is the potential risk of a breach of the commitments made between Ingelsa and the communities' representatives which could cause the loss of Ingelsa's social license to operate, even though the project has complied with the socialisation process. To help prevent this, it was recommended that all agreements are made with legitimate representatives of the communities (ERM, 2016).

Communities in favour of Jilamito project, such as Jilamito Nuevo and Jilamito Viejo, are concerned about the opposition of some members of Aldea Jilamo, and fear that they will lose their job opportunities (ERM, 2016).

12.6 Baseline

12.6.1 Methodology

The social baseline information survey, implemented by Ingelsa, was carried out for the communities within the direct and special areas of influence for the project (see Table 14). The methodology implemented is based on the Program for Strengthening Local Capacities (FOCAL in Spanish) and aims to systematise the social indicators of the AoI populations, including updated data on

livelihoods, education, health, safety and infrastructure, which allow monitoring of the contribution to social improvement of the population due to the project. Information is collected from primary sources if deemed necessary (ESIA, 2018 and Ingelsa, 2018).

This methodology was developed by the Japan International Cooperation Agency (JICA) in the years following the Second World War and has been successfully used in Honduras since 2010 by the Association of Honduran Municipalities (AMHON in Spanish) and the Secretary of State in the Interior and Population Offices (SEIP in Spanish), with the technical and financial support from JICA (ESIA, 2018 and Ingelsa, 2018).

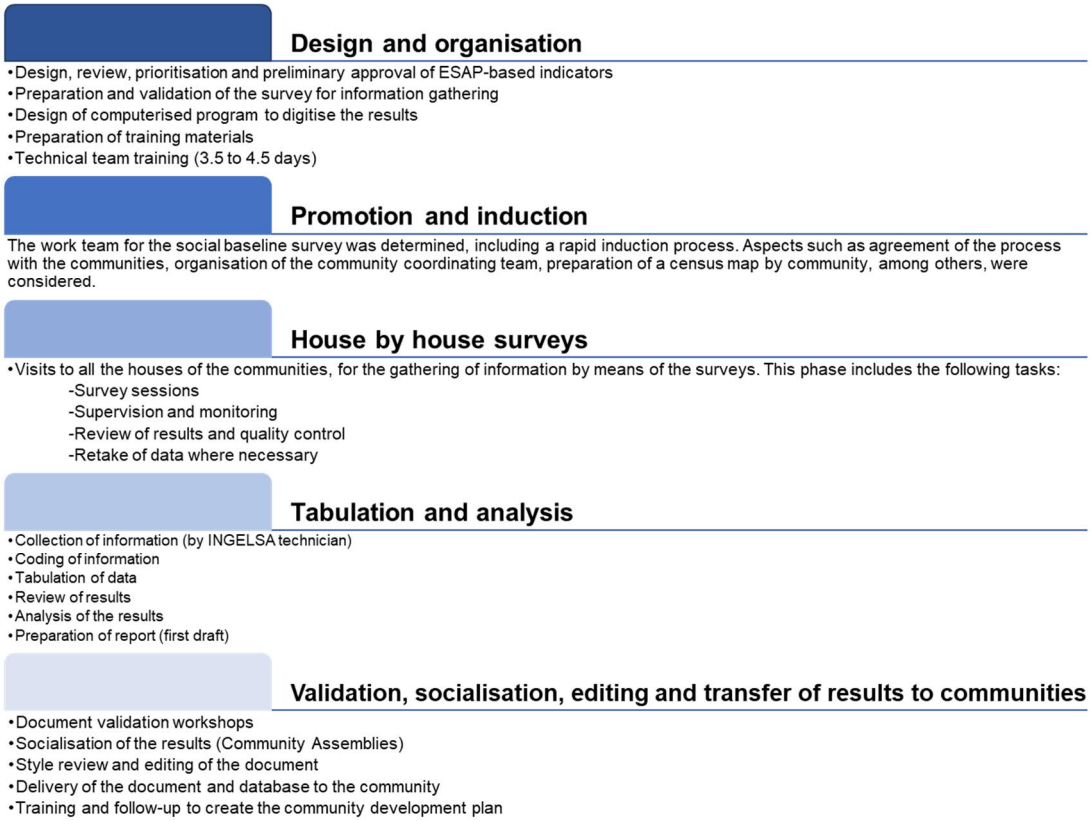
The FOCAL Model is composed of (ESIA, 2018 and Ingelsa, 2018):

1. A survey of socioeconomic indicators baseline at community and municipal level
2. Community development planning (PDC in Spanish)
3. Municipal development planning (PDM in Spanish)
4. Unified cycle of municipal community management of social investment projects
5. Development of local capacities

For the purposes of the Jilamito project, the following items were specifically developed: 1. survey of socio-economic baseline indicators at the community and municipal level; and 2. community development planning (ESIA, 2018 and Ingelsa, 2018).

The phases and main characteristics of the implemented methodology are presented in Figure 33.

Figure 33: Methodological process of social baseline survey



Source: Ingelsa, 2018

The following are the thematic axes that were considered for the project:

- Territorial planning
- Health and nutrition
- Education
- Natural resources and environment
- Vulnerable groups
- Housing
- Water and sanitation
- Economy
- Food safety
- Land
- Participation
- Public safety
- Social Infrastructure
- Tourism

12.6.2 Administration

The Municipality of Arizona was created on 14 February 1990, with an area of 568.77km^2. Previously it was part of the Municipality of Sparta, and its creation is largely due to the efforts made by the leaders in what is now the municipal seat, as well as pressures from the community of Atenas de San Cristóbal (also known as Kilómetro 17). Currently, Arizona Municipality is divided into three zones as presented in Table 16 (Ingelsa, 2018).

Table 16: Classification of communities according to Municipal zoning

Zone	Community / Settlement
Zone #1	San Martin
	KM 12 and La Leona
	Hicaque
	Planes de Hicaque
	Planes de Tiburones
	KM 16
	KM 17 or Atenas de San Cristóbal
	Sizama
	San José de Tiburón
	Zanzíbar
	Coloradito
	San Francisco de Saco
	San Francisco del Portillo
Zone #2	Arizona (urban setting)
	Santa María
	Dakota and La Pita
	La Suiza
	Las Piedras
	El Coco
Zone #3	Rio Chiquito Sur and Barranquilla Sur
	Puente de Lean and El Empalme
	Hilamo Nuevo*

Zone	Community / Settlement
	Jilamito Viejo (including San Rafael) *
	Jilamito Nuevo*
	El Retiro
	El Astillero
	Mezapa de Lean
	Mezapita**, Los Olivos
	El Edén
	Matarras
	La Aurora
	Las Lomas or Uluasito
	Col. Guillen
	San José de Texiguat
*Direct area of influence	**Special area of influence

Source: Ingelsa, 2018

As the local representative of the State of Honduras, the Municipal Corporation of Arizona oversees each community and aims for their development, including local organisations (Ingelsa, 2018).

Local communities are being assisted by some government organisations (ICF, UMA), NGOs (FHIA[12], PROLANSATE, SOCODEVI) and private companies (SEMSA, INGELSA, Dinant Corporation, Chile Chacon, ELCAE, among others). In this way, the perception of municipal performance is very low, since there are major deficiencies in basic aspects of the citizen's daily life that are not satisfied by municipal management (Ingelsa, 2018).

Civil society in communities is stronger and is represented by local organisations in each community such as Coordination Boards, Water Boards, Educational Societies, among others (Ingelsa, 2018).

12.6.2.1 Jilamito Viejo

The community of Jilamito was founded in the 1960s with the arrival of the first settlers from the departments of Copan and El Lempira to exploit virgin lands. In 1974 the community suffered a catastrophe caused by the hurricane Fifi, which led to the migration of the inhabitants to a higher area, emerging with the community name ‘Jilamito Viejo’ (Ingelsa, 2018).

This community has the following organisations (Ingelsa, 2018):

- Coordination Board
- Water Board (for a basin near San Rafael that supplies 127 properties)
- Associations of Parents of ‘Escuela Leopoldo Aguilar’ and ‘Jardin de niños Bertha Rosa Polanco’

The results of the main performance indicators of the municipality and its impact on the community of Jilamito Viejo are very low, since there is no presence of local authorities, this is leading to a growing lack of the necessary support for the improvement of the quality of life of the population (Ingelsa, 2018).

There has been no social investment by the municipality since 2007. It is mainly private investment that helps to improve the conditions of the population. Currently the Project is the only form of investment projected as part of the community's development. Ingelsa has also implemented other social projects of education, health, employment and infrastructure, such as the construction of a

[12] Honduran Foundation for Agricultural Research (FHIA in Spanish)

classroom, the construction of a sanitary bathroom in the kindergarten and the construction of an access road, among others (Ingelsa, 2018).

12.6.2.2 San Rafael

The community of San Rafael is a hamlet belonging to the village of Jilamito Viejo. The community began in the 1970s with the arrival of one family. Due to its proximity to the Project (1 km), it is considered a special area of influence (Ingelsa, 2018).

This community does not have a Coordination Board; however, some of its residents are part of the Jilamito Viejo Board. They also do not have a Water Board or other representation associations from civil society. There is an Association of Parents of 'Escuela Carlos Alfredo Padilla', located 3km from the community (Ingelsa, 2018).

As in Jilamito Viejo, this community has little institutional presence, municipal underperformance and non-existent social investment. Private investment is through the companies SEMSA (Mezapa Hydroelectric Power Station) and INGELSA (the Project). The project is the only form of investment currently foreseen as part of the community's development (Ingelsa, 2018).

12.6.2.3 Jilamito Nuevo

The community of Jilamito Nuevo was founded in the 1970s, from the catastrophe of the hurricane Fifi that caused the migration of the population, which also caused the creation of the community of Jilamito Viejo (Ingelsa, 2018).

This community has the following organisations (Ingelsa, 2018):

- Coordination Board
- Water Board (for a micro basin that supplies 120 properties, in addition to the communities of Hilamo Nuevo[13], El Empalme and Lean)
- Association of Parents of 'Escuela Ibrahim Gamero Idiáquez' and 'Jardin de niños Eudolfo Cristino Portillo'
- CALIJINUL Agroforestry Cooperative

The community of Jilamito Nuevo is sporadically supported by the different governmental institutions, national and international organisations. However, it is mainly private investment that helps to improve the conditions of the population. The project is the only form of investment projected as part of the community's development (Ingelsa, 2018).

12.6.2.4 Hilamo Nuevo

The community of Hilamo Nuevo is located 8km from the municipal seat of Arizona and was founded in the 1950s with the installation of families and people in proximity to the confluence zone between the Jilamito River and the Mezapa River (formerly known as Río Locomapa) (Ingelsa, 2018).

This community has the following organisations (Ingelsa, 2018):

- Coordination Board
- Water Board (for the aqueduct system, which is in one of the secondary tributaries of the Jilamito River called 'Quebrada La Cristalina')
- Association of Parents of 'Centro Básico Manuel Bonilla'

[13] Ingelsa presents this information, although later it is mentioned that Hilamo Nuevo has its own stream for water supply.

As for the other communities, Hilamo Nuevo has little institutional presence and non-existent social investment; it is private investment that helps to improve the conditions of the population. The project is the only form of investment projected as part of the community's development. It should be noted that the agroindustry and exporter 'Chacón' operates in this area, and other activities such as livestock and spas are developed, which provide some jobs to the community (Ingelsa, 2018).

In relation to municipal performance, the results of the main indicators and their impact on the community are acceptable; this is due to its proximity to the municipal seat, which allows the presence of local authorities that can respond to some of the needs of the population (Ingelsa, 2018).

12.6.2.5 Mezapita

Mezapa was founded in the 1950s, with the arrival of people escaping the war between El Salvador and Guatemala, to explore virgin and mountainous lands. Later, two people bought the lands from the Salvadorans and began to form the community by building houses in what was once a hamlet. The natural catastrophe of the hurricane Fifi in 1974 caused the separation of the community of Mezapa and the name of Mezapita arose (Ingelsa, 2018).

The community of Mezapita has among the strongest economies amongst the villages within the Municipality of Arizona, in addition to being organised and prominent. This is due to the construction of several private infrastructure projects, such as the Mezapa Hydroelectric Power Station (SEMSA), the Mangungo Hydroelectric Power Station (ECAE) and the DINANT palm processing plant, which provide employment to the population of this community. They also have a very active and dynamic Coordination Board and Water Board (for its own water distribution and storage system, in 'Flor del Valle' stream) (Ingelsa, 2018).

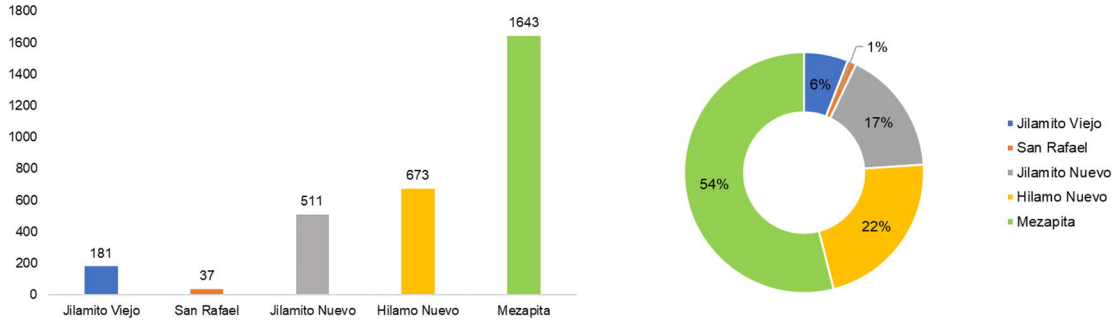
The results of the main performance indicators of the municipality and its incidence in the community are high, since it is one of the communities where most people pay taxes, for which the municipality is obliged to carry out larger community projects. Their presence and performance are improved given that their inhabitants have been mayors and currently represented councillors, which gives better responses to the different needs of the population (Ingelsa, 2018).

In this community investments are made and managed by the municipality and private companies located in its territory; however, there are still some problems that must be resolved, which requires investment, especially in health, basic sanitation, education and environment (Ingelsa, 2018).

12.6.3 Demographics

The total population in the communities of the area of direct and special influence is 3045 people, distributed in 623 homes (Ingelsa, 2018). The distribution of the population by community is shown in Figure 34 and Table 17.

Figure 34: Distribution of population by community



Source: Ingelsa, 2018

Table 17: Population data

	General survey result	
Community	Population	Number of households
Jilamito Viejo	181	37
San Rafael	37	9
Jilamito Nuevo	511	112
Hilamo Nuevo	673	75
Mezapita	1643	390
Total	3045	623

Source: Ingelsa, 2018

The main data related to demographic characteristics of the five communities of the AoI are listed below (Ingelsa, 2018):

- 30.1% of the population are children
- 23.3% of the population are young people (between 13 – 23 years old)
- 50.3% of the population are women
- 13.3% of the population are senior citizensThe average number of people living in a house is five.
- In general, 50.3% of the population are women and the remaining 49.6% are men.
- The age range with the highest proportion is 13 to 50 years, with 56.6% of the population; while the age range with the lowest percentage (13.4%) is over 50 years. Children under 12 years represent 30.1% of the population.
- The total number of births between 2017 and 2018 is 255 new inhabitants for the five communities.
- Of the total female population in reproductive age, 12.11% are single mothers. The age of mothers is between 13 and 50 years.
- Mezapita reported one maternal death after childbirth, while Jilamito Nuevo reported one still birth, so mortality indicators are very low (Ingelsa, 2018).
- Of the total population, 20.7% are school-age children. Of this percentage, 53.5% of all boys and 46.2% of all girls in school age are studying.
- Of the total population, 63% can read and write.
- As for the type of land tenure, 74.1% of the reference population own land or property, 12% rent and 13.9% borrow.
- Slightly over half (52%) of the economically active population is employed. Of this percentage, only 4% receive equal or more than the minimum wage (≥8000 Lps/month).
- There are no ethnic groups in any of the communities.

12.6.3.1 Vulnerable groups

The methodology implemented for the survey of the social base line (JICA methodology) recognizes and identifies vulnerable groups as follows:

- In terms of productive age: children, even if they are living at home, are considered vulnerable because they are dependent on the care of their parents. Taking into account that the AoI has

very limited social services to support the children in case their parents or relatives would not be able to do so, it is valid to consider children as a vulnerable group.

- In terms of gender: women are considered vulnerable in the project environment. In the context of the project AoI there local traditions and habits limit the opportunities women have. This shows for example as limited opportunities for studying or finding jobs outside the home, or to gain access to the public sphere and achieve leadership roles in the communities, as the prevalent traditional role of rural women is to stay at home taking care of the house and children, while men provide for the family. In this context also single mothers are considered especially vulnerable.
- In terms of security, in the project environment: the three groups (children, women and the elderly) are considered vulnerable to situations of physical violence and abuse. In the local context this applies especially to women and young girls, as domestic violence and abuse is sadly common, but often unreported in areas similar to the AoI.
- In terms of physical and economic dependence: all the groups depend physically or economically on someone else so are considered vulnerable. The project AoI, like most countryside areas of Honduras, is characterized by weak or absent social services for taking care of those members of the society that are not able to provide subsistence for themselves. In this context grops of people such as the elderly, disabled, disabled children, orphans, and women depending for subsistence on their husbands, are considered vulnerable groups. In this context also mothers of disabled children are especially vulnerable.

Further information on vulnerable groups is presented in Table 18.

Table 18: Vulnerable groups information

Communities	Disabled children under of 18 Years old	Disabled adults	Women (13-50 years old)	Single Mom's Household Heads	Orphans	Elderly (over 50 years old)
Jilamito Viejo	0	0	53	10	0	19
San Rafael	0	0	15	1	0	5
Jilamito Nuevo	3	3	142	19	3	59
Hilamo Nuevo	0	0	212	18	4	138
Mezapita	4	1	490	95	5	230
Total	**7**	**4**	**1349**	**143**	**12**	**451**

Source: Ingelsa

According to INGELSA, the social survey shows that a small number of children lost their parents and that they live with relatives such as uncle's or grandparent's

12.6.4 Education

As previously mentioned, of the total population, 20.7% are school-age children; of this percentage, 53.5% of all boys and 46.2% of all girls in school age are studying. Each community has a school, except Caserío San Rafael. School attendance is limited to the economic resources of parents (Ingelsa, 2018).

In Jilamito Viejo, there is an educational centre called 'Escuela Leopoldo Aguilar' to serve the student population. The community of San Rafael does not have any educational institutions and the student population must attend the educational centre called 'Escuela Carlos Padilla', in the community of Mezapita. In Jilamito Nuevo there is an educational centre called 'Escuela Ibrahim Gamero Idiáquez' and a kindergarten called 'Eudolfo Cristino Portillo' (which does not have its own

infrastructure, but the children receive classes at the teacher's house), to serve the student population. The children of basic education (seventh to ninth grade) receive classes in the institute of Hilamo Nuevo called 'Manuel Bonilla'. Other educational centres (craft training, literacy, distance education, university) are in the Municipality of Arizona or in the Municipality of Tela, 20km away. Mezapita has a preschool called 'Jardin de Niños Jorge Reyes', in addition to the basic education centre called 'Rafael Heliodoro Valle'; the students who complete their basic training (first to ninth grade), enrol in the 'Juan Antonio Pineda' institute, in Mezapa. (Ingelsa, 2018).

Table 19 below shows the numbers of students attending each type of school in each village in the AoI.

Table 19: Educational institution attendance

	Currently in education			
Community	Pre-school	Primary school	Secondary school	College
Jilamito Viejo	27	17	2	1
San Rafael	2	3	0	0
Jilamito Nuevo	111	22	7	2
Hilamo Nuevo	29	8	5	3
Mezapita	258	155	38	6
Total	427	205	52	12
% out of the total population (3045 people)	14%	6.7%	1.7%	0.4%

Source: Ingelsa, 2018

12.6.5 Infrastructure

Table 20 and Table 45 (refer to annex) shows the information provided regarding provision of public lighting, domestic electricity, water supply and sanitation in the villages within the AoI. All of the communities have an unpaved secondary access road, and a few have tertiary roads. Some regular maintenance is done in the case of important secondary roads. There are two routes to the Jilamito Viejo community. The first route goes through a secondary road that connects to a tertiary road in poor condition. The second route goes through a secondary road that connects to a road built by Ingelsa. The first route is also used by San Rafael, as it belongs to the community of Jilamito Viejo. From there, the route connects to San Rafael by foot or animal. Both routes are also used by Jilamito Nuevo and from there connect to the community by foot or animal. Mezapita is connected through its own secondary route.

Table 20: Summary of infrastructure in the project area

Infrastructure	Details
Roads Access	100% of the communities have access by road. At least the communities have 40 Kilometers of regular shape road access.
Electricity	68.22% of the people surveyed said it has street lighting but complain about the poor service provided by the State of Honduras.
Schools	4 schools operate in the area. Each community has one with the exception of the San Rafael hamlet which has no school
High Schools	There is an Institute in the community of Mezapa where students from the different nearby communities attend. The students of Jilamito Nuevo, Jilamito Viejo and Hilamo goes to Arizona High School.
Health centers	There are two health centers in the area. One located in Hilamo Nuevo and the other one in the community of Mezapa
Community Centers	We found 2 community centers in the area. One of the centers belongs to Hilamo Nuevo and the other belongs to Mezapita village.

The water bodies that communities use for water supply are presented in Table 21 and Figure 35.

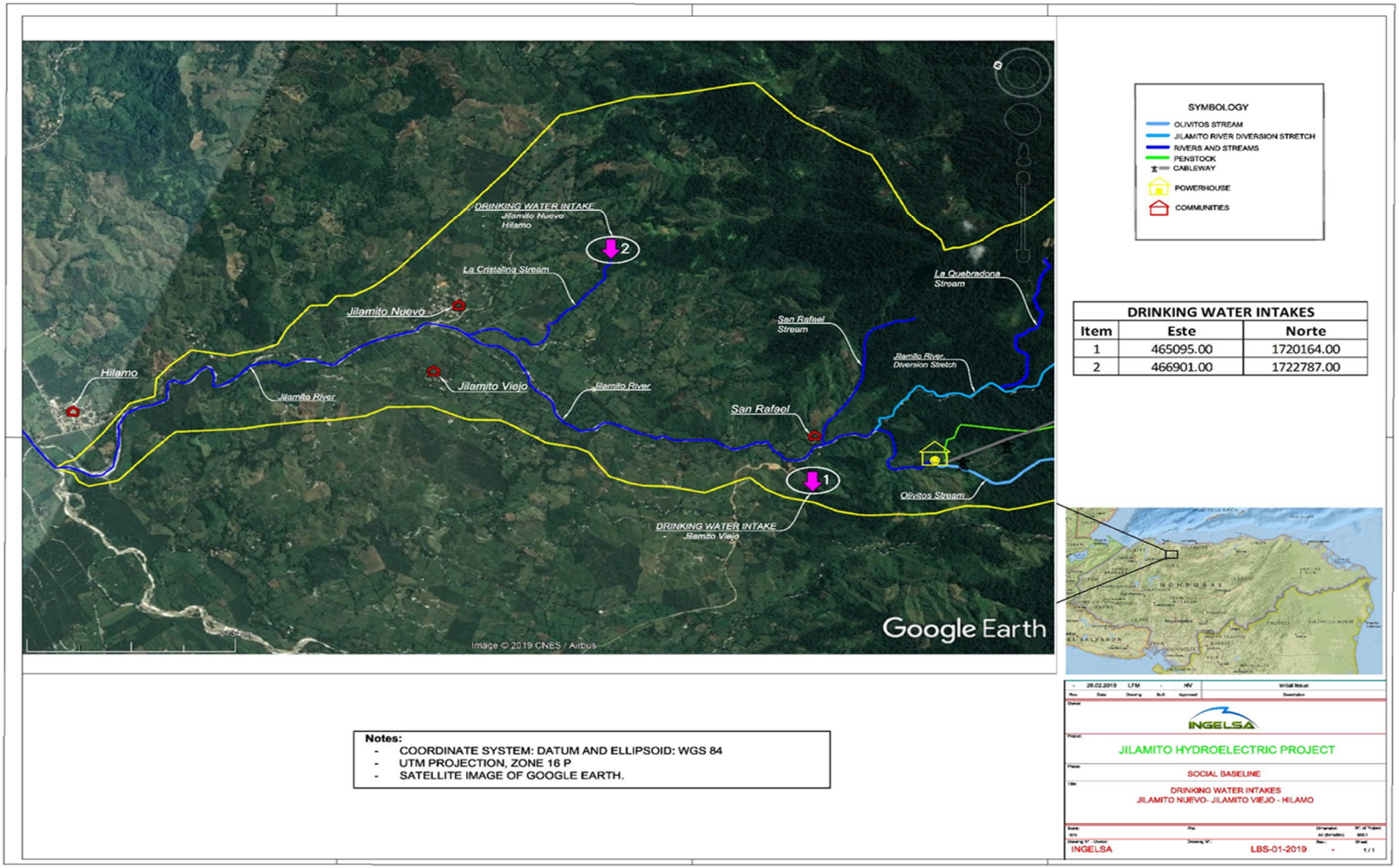
Table 21: Access to drinking water by community

Community	Water Body	Managed by Water Boards
San Rafael	San Rafael Stream	No
Jilamito Nuevo y Hilamo	La Cristalina Stream	Yes
Jilamito Viejo	El Naciente Stream	Yes
Mezapita	Flor del valle or Mezapita stream	Yes

Source: Ingelsa

Note: Local water boards, in representation of the communities, have the obligation to protect and preserve the water bodies managed by them as natural resource areas

Figure 35: Location of water bodies for water supply



Source: Ingelsa

12.6.6 Economy and Livelihoods

According to the information reported in the ESIA (ESIA, 2018), the following characteristics are found in the AoI relating to economy and livelihoods:

- The main activities of the communities are related to agriculture, livestock breeding, and the use of forest resources. Some agricultural products such as lychee, coffee and palm are sold locally to small, medium and large buyers, and certain products such as maize are used for family consumption.
- Pastures used as cattle feed are one of the main crops in the area. Cattle raising is spread throughout the area, both for sale and for meat and milk production. There is no dairy processing plant in the area.
- The wood extracted from the area's forests is exploited under concession contracts granted by the Forest Conservation Institute (ICF) for sustainable management purposes; however, the presence of illegal loggers who are clearing the area has been identified. The wood is used to manufacture furniture for local market and family use.
- Despite the proximity of the Jilamito River to these communities, it is not used as a source of water supply for human consumption or irrigation, nor has it been identified that fishing is a widespread activity in the area or that the communities depend on it as a means of subsistence. It is important to mention that according to the Census of Population and Housing (INE 2013), only four heads of household in the Municipality of Arizona declared themselves as fishers or as workers of the fishing/aquaculture, both in freshwater and coastal waters, which shows that fishing is not a predominant economic activity in the area.

In the social baseline developed by INGELSA (2018), the following characteristics are presented in relation to the economy and livelihoods of the communities in the AoI:

- The most important crops are palm (46%), fruit trees (35%), basic grains (10.3%), coffee (4.5%) and cocoa (4.2%).
- The most important economic activities are livestock (47.9%), intensive agriculture (36.1%) and trade (16%).
- Basic grains, milk and meet (beef and pork) represent the main auto-crop consumption for the communities.
- Of the total number of families, 30.9% receive remittances from people living in the United States.
- Forty-eight percent of the economically active population does not have a job.
- Sixty seven percent of the population are in the income range of less than 4000 Lps/month (the minimum wage is ≥8000 Lps/month).
- Of the total population, only 14.9% report to have been beneficiaries of a financial credit through the national finance system.
- The main occupations are housewife (35.4%), daily worker (25.1%) and student (19.3%).

Table 22 shows the number of people in each village who rely on forest products.

Table 22: Community members who rely on forest products

Communities	People who work with wood.	People who make wicker
Jilamito Nuevo	3	0
Jilamito Viejo	2	0
San Rafael	2	2
Jilamo Nuevo	12	0
Mezapita	19	1
Total	28	3

Table 23: Economy and livelihoods in the AoI villages

Aspect	Jilamito Viejo	San Rafael	Jilamito Nuevo	Hilamo Nuevo	Mezapita
No. of people working the land	14	5	45	30	69
Livestock	Kitchen gardens 4 Hens, ducks and turkeys 652 Cows, sheep's and goats 73 Pigs 40	Kitchen gardens 1 Hens, ducks and turkeys 227 Cows, sheep's and goats 39	Kitchen gardens 21 Hens, ducks and turkeys 1625 Cows, sheep's and goats 390 Pigs 44	Kitchen gardens 15 Hens, ducks and turkeys 210 Cows, sheep's and goats 120 Pigs 25	Kitchen gardens 93 Hens, ducks and turkeys 1830 Cows, sheep's and goats 515 Pigs 169
Crops (monthly production) * **	Corn 50qq; beans 20qq; coffee 20qq; African palm 20ton	Corn 100qq; beans 1qq; coffee 8qq; milk 10l	Corn 379qq; beans 8qq; coffee 90qq; African palm 25ton; lychee 3600 baskets; milk 900l	Corn 500qq; beans 50qq; African palm 100ton; milk 900l	Corn 9009qq; beans 300qq; coffee 20qq; African palm 1200ton; lychee 1500 baskets; milk 25,000l
Job distribution of the Economically active population by gender	Female 10 Male 62	Female 1 Male 16	Female 30 Male 159	Female 26 Male 25	Female 327 Male 385
Occupations	51 daily workers; 2 carpenters; 9 bricklayers; 47 housewives; 17 people with other occupations	7 daily workers; 10 housewives; 9 people with other occupations	82 daily workers; 6 carpenters; 4 bricklayers; 7 teachers; 86 housewives; 103 people with other occupations	55 daily workers; 2 bricklayers; 2 teachers; 79 housewives; 76 people with other occupations	288 daily workers; 11 carpenters; 23 bricklayers; 7 teachers; 446 housewives; 503 people with other occupations
Average income***	≤4000Lps: 98 4000 – 12,000Lps: 65 ≥12,000Lps: 18	≤4000Lps: 31 4000 – 12,000Lps:5 ≥12,000Lps: 1	≤4000Lps: 349 4000 – 12,000Lps: 112 ≥12,000Lps: 50≥	≤4000Lps: 392 4000 – 12,000Lps: 276 ≥12,000Lps: 5	≤4000Lps: 1162 4000 – 12,000Lps: 445 ≥12,000Lps: 36
Logs used per month	23,100	750	81,870	31,320	171,990

*qq (quintal): 1qq = 100 pounds
** 1 basket = 500 lychees
*** 1USD = 24.42Lps

Source: Ingelsa, 2018

12.6.7 Land use and tenure

In the Municipality of Arizona, the land is distributed mainly among large farmers, such as the Cressida corporation, which owns about 7,500ha of cultivated flat lands of banana, African palm and a small forest reserve located in the National Park 'Punta Izopo'. There are also small independent African palm producers and ranchers, most of whom have full ownership granted by the National Agrarian Institute as in 1995-1996 there was a large-scale campaign for land titling financed by the Government.

Regarding the information obtained from INGELSA's baseline survey (2018), in the communities of the area of influence it is evident that 74.1% of the tenure is owned, 12% is rented and 13.9% is borrowed. Table 24 presents the main land tenure data for each of the communities.

Table 24: Land tenure in the AoI villages

Item		Jilamito Viejo	San Rafael	Jilamito Nuevo	Hilamo Nuevo	Mezapita
Tenure	Owned	72	7	72	25	323
	Rented	1	-	11	27	35
	Borrowed	1	2	29	23	32
Gender of owner	Female	11	5	54	33	190
	Male	26	4	58	42	200

Source: Ingelsa, 2018

12.6.8 Public health

Regarding health and nutrition issues, the following information is presented (Ingelsa, 2018):

- There are two health centres, located in Hilamo Nuevo and Mezapa, for the attention of the population of Zone # 3, which an average of 120 - 150 people attend daily, coming from more than 12 communities in the area.
- Eighty eight percent of the communities have access to state health services and only 12% can afford private health care.
- The perception of most of the population is that state health services are of very low quality, as they do not have the medicines and inputs necessary to provide a good service.
- The most common diseases in the population are respiratory diseases followed by stomach diseases and skin diseases.
- In terms of reproductive health, among the contraceptive methods most used by women are pills and injection. Condom use is very low among men (only 4% use it).
- The number of births in the period 2017 - 2018 is 2555 among the 5 communities. Of the deliveries, 15% were attended by a midwife, 28% by a nurse and 57% by a doctor.
- Regarding food security, 28% of homes are reported to be fed three times a day, while 47% are fed twice.

Table 25 shows a summary of the data provided at the village level for villages within the AoI.

Table 25: Public health data for the AoI villages

Aspect	Jilamito Viejo	San Rafael	Jilamito Nuevo	Hilamo Nuevo	Mezapita
Health infrastructure	None.	None.	None.	One Health Centre	None.
Most common diseases	Respiratory infections (61%); Classic dengue (33%); Paludism (6%)	Respiratory diseases (67%); Classic dengue (16%); Paludism (17%)	Respiratory diseases (62%); Classic dengue (36%); Haemorrhagic dengue (1%); Alcoholism (1%)	Respiratory diseases (25%); Classic dengue (45%); Haemorrhagic dengue (10%); Alcoholism (20%)	Respiratory diseases (75%); Classic dengue (18%); Haemorrhagic dengue (2%); Paludism (2%); Alcoholism (2%); Chagas's disease (1%)
No. births 2017-2018	30	5	52	14	154
Births attended by nurse; doctor; midwife	50%; 40%; 10%	40%; 40%; 20%	27%; 54%; 19%	50%; 36%; 14%	21%; 64%; 15%
Food security - fed three times a day; fed twice a day; fed once	13%; 76%; 11%	0%; 89%; 11%	39%; 39%; 22%	67%; 27%; 6%	19%; 51%; 30%

Source: Ingelsa, 2018

12.6.9 Ecosystem services

The area where the project is located is classified as deciduous forest. This resource is used on a regular basis, obtaining mainly wood and firewood, as well as other non-timber products in minimal quantities. In addition, illegal hunting is practiced for consumption and honey is harvested from wild beehives (ESIA, 2018). In this way, there is evidence of the presence of ecosystem services of provisioning for the population of the area.

The various documents mention the supply of water from local sources, which also implies an ecosystem service of water provision. In addition, there are thermal waters and the protected area of the Texiguat Wildlife Reserve (TWR) (with a high biodiversity), which provide ecosystem services of regulation, sustainability and culture.

Regarding the area of the TWR, the National System of Protected Areas of Honduras (SINAPH in Spanish) allows the following activities (DAC 2013):

- In an unrestricted way, in the buffer zone to the protected area, scientific-cultural activities, hiking, contemplation, preservation or conservation and regeneration of the ecosystem and / or landscape can be carried out. In the same area and with the permission of the competent authority, hunting activities, wildlife species collection, forestry, beekeeping, agro-silvopastoral practices[14], hunting farms and zoo breeding grounds and others authorised by the State may be carried out too.
- The execution of projects for the generation of hydroelectric power with a capacity of up to fifteen (15) megawatts in the buffer zones, if the area has the corresponding delimitation and the corresponding approved Management Plan, will be allowed.
- Other related to ecotourism but regulated.

Additional information related to ecosystem services, collected from social baseline surveys, is presented in Table 26.

Table 26: Ecosystem services in the AoI villages

Community	Energy used for cooking (Electricity, Gas, Firewood, Kerosene)	Number of logs used as an energy (logs/month)	People who works with wood	People who make wicker
Jilamito Viejo	0%; 12%; 83%; 5%	81,870	3	0
San Rafael	100% firewood	23,100	2	0
Jilamito Nuevo	3%; 10%; 86%; 1%	750	2	2
Hilamo Nuevo	4%; 51%; 44%; 1%	31,320	12	0
Mezapita	10%; 30%; 58%; 2%	171,990	19	1

Source: Ingelsa, 2018

12.6.10 Tourism, leisure and recreation

As a valley in the north coast of the country, the Lean Valley and its communities have tourist attractions such as the TWR, thermal water spas in the low areas and important coastal cities such as Tela and Ceiba (Ingelsa, 2018). Table 27 below presents the sites of interest for each of the communities of the AoI.

[14] Russo (1996) describes an agro-silvo-pastoral system as 'a land-use system, implying the combination or deliberate association of a woody component (trees or shrubs) with cattle in the same site. Essentially, these systems are a model of production and conservation based on silvi-cultural practices complementary to pre-existing agricultural activities.'

Table 27: Touristic, leisure and recreational sites in the AoI villages

Community	Description
Jilamito Viejo	The community has a high potential for rural adventure and scientific tourism, because its geographical location on the slopes of the mountain 'Nombre de Dios' (one of the entrances to the TWR), has well preserved and protected areas but in the process of continuous deterioration. Additionally, near this community there are some spas and hot springs operated by local micro-entrepreneurs from the communities of Jilamito Nuevo and Hilamo Nuevo.
San Rafael	This community has no sites of tourist interest, leisure and/or recreation.
Jilamito Nuevo	In this community is located the tourist centre and hotel 'Termales Jilamito'.
Hilamo Nuevo	In this community is located the tourist centre and spa 'Los Cocos'.
Mezapita	In this community is located the spa 'La Roca'.

Source: Ingelsa, 2018

12.6.11 Political tensions and vulnerability

Despite the concern of the government and public opinion on the need to develop hydroelectric projects that guarantee the country's renewable energy supply, there is growing national attention to hydropower concession's impacts, especially in relation to water sources for human consumption, the lack of socialisation of environment impact assessments, the criminalisation of opposition protests, and in some cases the killing of environmental activists. Honduras has been classified by Global Witness as the country with the highest number of environmental activist murders per capita in the world, with 12 cases in 2014. One of the most notable being the murder of activist and General Coordinator of the indigenous organisation COPINH, Berta Caceres on February 2016 (ERM, 2016).

In relation to the project, as mentioned in section 12.4, in November 2015, a social protest was organised by a group of residents calling for a town meeting in Arizona Municipality to declare the area free of mining and hydroelectric exploitation. According to the same report, local population, with support of a city councilman, had concerns that the municipality authorities were allowing companies to operate in contradiction to the Environmental General Law, according to the opinion of protesters. Protest actions include a road blockage of the bridge over the Lean River (ERM, 2016).

Although INGELSA has developed a long process of socialisation, and good communication with stakeholders is demonstrated, misinformation and disputes continue to be a risk that can affect the company's reputation and delay the project schedule; therefore, its management should be continued.

Finally, the ESDD report (Golder 2017) recommends that INGELSA should contract a consultancy to carry out a study of the political context of the project, to measure the social climate in the region regarding the government elections and any changes to legislation for hydropower or renewable power projects.

12.7 Impact assessment

12.7.1 Construction

The documentation identifies social impacts as land acquisition, nuisance during construction, new roads, water use conflicts, incoming workers, accidents and incidents, community safety, effects on local roads. Each of these is discussed in turn below.

12.7.1.1 Beneficial

- **National economic development:** According to ERM, the investment for the construction will have an effect on domestic demand and gross domestic product (GDP). This effect will be reflected primarily in an increase in demand for assets from the suppliers of materials for construction. It will also increase demand for consumables and services for homes. It may benefit

commercial sectors of food and hotels. There are anticipated to be benefits for the personnel of the various construction firms, such as services of telecommunications, private transportation, private security, clothing and industrial equipment (ERM, 2016).

- **Supply of goods and services in the area:** According to Ingelsa, this would be a positive impact, especially related to access to housing for Ingelsa workers and the minor purchases required in the Mezapita area, with the potential to stimulate the local economy and generate indirect employment opportunities (Ingelsa, 2018).
- **Social investment activities in community projects:** A benefit of the project is the social investment in community projects such as water, communications, and educational infrastructure. According to Honduran law, social investment must begin in the operation phase when revenue taxes are generated on the volume of production and sales. However, INGELSA has started these actions already (Ingelsa, 2018).
- **New roads:** The project plans to build a road to access the power house, and give maintenance to the existing access roads to the area, which will benefit communities such as Jilamito Viejo which currently does not have access to an existing public road.
- **Jobs:** The recruitment of labour in the area will have a positive impact on local communities by improving domestic incomes and promoting the dynamism of the local economy. It is estimated that about 400 jobs will be needed during the construction phase (mainly through contractors, most of them as unskilled labour).
- **Temporary and permanent economic displacement:** No displacement is expected at this stage of the project.
- **Labour issues and more detailed consideration of occupational health and safety:** The project would introduce beneficial impacts associated with improved labour skills, and improved health and safety practices among populations.
- **Ecosystem services impacts:** The project will encompass restoration of areas dedicated to crop production and reforestation programs.

12.7.1.2 Adverse

- **Land acquisition:** Land acquisition will be necessary for the construction of various facilities, including roads and transmission line. A voluntary and transparent land access negotiation has been implemented with 32 owners, in different types of agreements (land purchase, easements and leases). All land transactions are carried out on willing seller-willing buyer basis. (Golder, 2017, ERM, 2016 and Ingelsa, 2018).
- **Nuisance during construction:** Transportation of machinery and excavations are the main activities that could generate disturbances during construction activities. These activities will create dust and noise near the construction areas, access roads and areas of material management (ERM, 2016).
- **New roads:** The traffic of the project could generate dust and noise, with the potential to affect the public health of the communities located along the road, such as Mezapa, Mezapita, El Retiro, Jilamo and others, it also represents a potential risk of traffic accidents (Ingelsa, 2018).
- **Water use conflicts:** Concerns regarding loss or potential loss of drinking water in communities. The impact on community drinking water sources is not anticipated to be significant since the communities of the area use different water streams, that are not part of the Jilamito River or its tributaries, and the project is not expected to adversely affect the water quality of the river (regarding impacts on water quality of the river see chapters 6 and 8). However, if there were spills or accidents during construction, these streams could be impacted and impaired for human consumption (ERM, 2016).
- **Incoming workers.** Influx of foreign population stimulated by job opportunities could have a negative effect in the culture and have a (low) risk for social conflicts (ERM, 2016 and Ingelsa, 2018).

- **Accidents and incidents:** Accidents can occur during the construction phase. All construction activities could result in accidents to the workers.
- **Community safety:** Access to the construction area, weir, power house, or the transmission towers could result in accidents. The impact will be in areas were activities are carried out, whether that is access to the cableway locations, transmission line or substation (ERM 2016). Also the presence of social and political movements such as MADJ may increase tensions and concerns regarding community safety in the area.
- **Effects on local roads:** The roads in the AoI are not designed to withstand the traffic of machinery and equipment, so could deteriorate in quality under construction traffic (Ambitec, 2013).
- **Jobs:** Influx of foreign population stimulated by job opportunities could have a negative effect in the culture and have a risk for social conflicts. To mitigate this impact a local recruitment program will be established.
- **Detailed consideration of vector borne disease and sexually transmitted infections:** Influx of workers may contribute to an increase of sexual transmission diseases among local communities.
- **Impacts relating to blasting:** Blasting activities would contribute to additional occupational risks among workers if not managed properly.
- **Risks and impacts relating to provision of security for the project:** if not properly managed, security activities may introduce hazardous situations towards workers and local communities in the course of any local conflicts.

12.7.2 Operation

The documentation identifies of operational social impacts which may be caused by the project, each of these is discussed in turn below.

12.7.2.1 Beneficial

- **Drinking water:** The project would not impact on the local water resources and will improve the drinking water system through the CALIJINUL agreement, in addition to establish watersheds preservation programme.
- **National economic development:** The impact of the income from the connection to the grid, will benefit the region of Honduras. Stimulation of new investments in the complementary sectors by companies that provide goods and services to Jilamito, is an effect that has already begun in the region with the construction of the Mezapa HPP and it is expected to continue during the operational phase of the project (ERM, 2016).
- **Social investment activities in community projects:** Social investment activities in community projects such as water, communications, and educational infrastructure, among others (Ingelsa, 2018).
- **Jobs:** The recruitment of labour in the area will have a positive impact on local communities by improving domestic incomes, promoting the dynamism of the local economy. It is estimated that about 11 jobs will be needed during the operational phase (Ingelsa, 2018).

12.7.2.2 Adverse

- **Effects on local roads**: Due to low traffic volumes, traffic and transportation impacts during Project operations are likely to be minimal (ERM, 2016). The communities will benefit from the road maintenance that the Project will do on all access roads during operation.
- **Accidents and Incidents:** Once towers have been installed, the impact could be generated during maintenance activities for the workers, and to the communities because of access to high voltage towers and other infrastructure (ERM, 2016).

12.8 Mitigation measures

12.8.1 Construction

The documentation sets out a range of measures to mitigate the impacts identified for the construction phase. Key plans are the communication and community relation plan, health and occupational safety, transit and transportation, and ecosystem services. These are outlined below.

12.8.1.1 Communication and Community Relations Plan

A Communication and Community Relations Plan will comply with national legislation and Equator Principles requirements. This will be to proactively engage with stakeholders and local communities to maintain the social license to operate (ERM, 2016 and Ingelsa, 2018). This Plan will include the following actions (ERM, 2016 and Ingelsa, 2018):

- Land may be purchased upon condition that a fair financial gain is provided to local villagers, in addition to infrastructure improvements.
- Implement a permanent information office in the project area, equipped with material such as a scaled model of the project to visually explain the project's principal characteristics. This office will also attend and register grievances, claims, and enquiries related to the project expressed by communities' residents.
- Continuous informative events to keep the population abreast on progress regarding the implementation of the project's social and environmental management.
- Engage with the local communities through ongoing disclosure of project-related information and consultation on matters that directly affect them.
- Ensure that engagement is free of external manipulation, interference, coercion, or intimidation, and is conducted based on timely, relevant, understandable, and accessible information.
- Provide stakeholders with periodic reports that describe progress in implementing any action plans on issues that involve ongoing risk to/or impacts on affected local communities and on issues that the consultation process or grievance mechanism has identified as causes of concern to those local communities.
- Establish a grievance mechanism to receive and facilitate resolution of local community concerns and grievances.
- Keep a continuous stakeholder mapping system (at least one every two years) and implement independent perceptions studies.
- Keep a documentation system of all community and stakeholder agreements, solicitudes, communications, meetings, to keep track of social management and engagement.
- Implement a robust community health and safety program and align all subcontractors with its strict compliance order to avoid conflict with neighbouring communities related to road traffic accidents.
- Develop and implement a Program for handling calls about jobs and selection.

The project will also implement a range of compensatory measures committed to during the socialisation process between Ingelsa, the representatives of the communities of Jilamito and the authorities of the Municipality of Arizona (SERNA, 2013).

12.8.1.2 Health and occupational safety

- An Occupational Health Plan for all stages of the project (SERNA, 2013).
- Prepare an Internal Regulation for Field Employees that includes general rules of human behaviour, hygiene and health, environmental and road circulation, mandatory for all employees and / or workers who work or provide their services through contractors and subcontractors. The regulations shall be in accordance with the guidelines of the Ministry of Labour (SERNA, 2013).

- Develop, implement and update a Contingency Plan against accidents that contemplates the situations of the different stages of the project (SERNA, 2013).
- Provide workers with the required personal protective equipment, in accordance with the activity performed, to prevent damage to workers' health (SERNA, 2013).

The existing INGELSA work code addresses all of those recommendation of SERNA 2013 and it is included as an annex in each contractor contract.

12.8.1.3 Transit and Transportation

- INGELSA's Occupational Health and Safety Management will be responsible for requesting, installing and using (or requiring the installation and use of) GPS-based monitoring systems, to ensure respect for speed limits and other traffic regulations, and to monitor the activity of vehicles and drivers, including personnel dedicated to traffic control (Ingelsa, 2018).
- All vehicles will use mutually compatible communication systems (Ingelsa, 2018).
- Implement a formal grievance mechanism that allows residents and road users to report and receive communications about road and traffic incidents related to the project (see Communication and Community Relations Plan activities). As part of this measure, all project-related vehicles are required to be identified with specific project badges to facilitate the reporting of complaints and avoid misreporting (Ingelsa, 2018).

12.8.1.4 Ecosystem services

- Establish a quarterly monitoring and follow-up, of water quality during the construction period according to the quality indicators in the sections of the river that will be altered by the activities of the project (Ingelsa, 2018).
- Prevent the logging of trees in the buffer strip of the riverbed and take measures for its protection; except where civil works will be installed and where construction activities will be carried out (Ingelsa, 2018).
- The water to be used for construction activities may be supplied directly from a spring, provided that the latter is not used for human consumption and an adequate collection structure is created (Ingelsa, 2018).

12.8.2 Operation

The documentation sets out a range of measures to mitigate the impacts identified for the operation phase. Key plans are for communication and community relations, power lines, risk management, health and occupational safety, compensatory measure and ecosystem services. These are outlined below.

12.8.2.1 Communication and Community Relations Plan

Implement in the operational phase the same activities/measures listed in section 12.8.1.

12.8.2.2 Power lines plans

- Label the towers of the transmission line (with legends indicating danger, high voltage, etc.) when they are 69kV or more. The signs should consider the literacy level of the residents of the area (SERNA, 2013).
- The construction of the project will be carried out in accordance with the standards for this type of works, dictated by the ENEE and the IEC, following the necessary recommendations and considering the exposure to electric and magnetic fields of both construction and maintenance personnel (Ingelsa, 2018).

12.8.2.3 Risk management

- Disclose and socialise a Risk Management Manual aimed at project employees and residents in directly and indirectly affected communities (SERNA, 2013).
- All areas should be properly demarcated and marked according to the local literacy rate, especially those related to temporary closure of access roads, handling of hazardous materials, etc (SERNA, 2013).
- Maintain proper storage of toxic or hazardous materials, have instructions for their use and what to do in case of accidents in visible places, also have a file of Health Sheets and train employees on the handling of these materials (SERNA, 2013).

12.8.2.4 Health and occupational safety, and security

Implement in the operational phase the same activities/measures listed in section 12.8.1. In addition, a Contingency Plan shall also contain the acquisition of health equipment and the training of personnel in its use, including fire extinguishers to be located in strategic locations, which shall be defined in the Plan (SERNA, 2013).

12.8.2.5 Compensatory measure

The commitments subscribed between Ingelsa, the representatives of the communities of Jilamito and the authorities of the Municipality of Arizona, during the socialisation process, must be considered as compensatory measures of mandatory compliance (SERNA, 2013).

12.8.2.6 Ecosystem services

- Carry out periodic maintenance activities of the easement areas of the transmission lines. The use of herbicides should be avoided, preferably manual cleaning (Ingelsa, 2018).
- Meet the requirements of the ecological flow. Ensure that there are always appropriate volumes of water in the river and that its flow is continuous (Ingelsa, 2018).

13 Materials and wastes

13.1 Introduction

This section presents the identification and assessment of potential adverse impacts from waste management and hazardous materials handling as discussed in the following project documentation:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission line impacts (TLI, 2016)

13.2 Baseline

The Project will not be serviced directly by a municipal waste collection service (DAC, 2013, section 6.2). The project and its contractors will implement a waste management plan to address waste generation. Organic waste will be stored on site (El Nance). Inorganic recyclable wastes will be removed by specialized contractors with appropriate environmental license to operate.

For the rest of materials the project will create a landfill in consistency with the environmental license parameters and the Environmental Municipal Unit (UMA) (DAC, 2013, Section 6.2).

Certain types of wastes are generated according with the phase and activities developed by the project. Sections 8.1.2 and 8.2.2 of the DAC (2013) states that is expected the generation of solid waste from domestic sources and hazardous waste, that must be temporarily stacked and disposed separately. For the collection of these wastes will be available properly labeled containers or dumpsters, which must have a hermetic cover to prevent the generation of bad odors and rodents' access to them; then they will be transferred to a specific temporary storage site and finally to its disposal site.

13.3 Impact assessment

Waste is typically defined as 'any solid, liquid or contained gaseous material that is being discarded by disposal, recycling, burning or incineration'[15]. Hazardous materials are typically defined as *'any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors'* [16]

13.3.1 Sensitive receptors

The DAC (2013) has identified ground and surface water resources as key receptors potentially impacted by the uncontrolled management of waste or poor hazardous material management. Releases to air may be realised where handling and disposal of waste or materials gives rise to particulates (dust emissions) or fumes or gases.

13.3.2 Construction

The DAC (2013) and TLI (2016) identified the following potential impacts from generation of waste and handling of hazardous materials:

[15] Specific definitions may be found in local legislation or international conventions.

[16] Specific definitions may be found in local legislation or international conventions.

- Removal of vegetation cover during site clearance.
- Uncontrolled release to receiving environments from site construction works involving the removal of soil, rock and biomass.
- Generation of household (non-hazardous waste) that may result in contamination of receiving environment (ground, water or air) from increases in personnel / workers in the project area.
- Uncontrolled releases of hazardous materials during site construction and installation works.

13.3.2.1 Hazardous material use

No materials that are banned under the following conventions and guidelines will be used in connection with Project works.

- Materials defined as Annex A or Annex B materials under the Stockholm Convention.
- Chemicals listed in Annex III of the Rotterdam Convention of prior informed consent for certain hazardous chemicals and pesticide in international trade.

All handling of materials will be in accordance with SERNA regulations as a minimum (DAC, 2013).

During construction no materials (in significant quantities) with the potential to release significant toxic, hazardous, flammable material is planned to be used. Explosives for blasting will be used for construction of the tunnel and quarrying works.

13.3.2.2 Liquid waste streams

Table 28 summarises the expected liquid waste streams to be generated by the Project.

Table 28: Expected liquid waste streams (construction and operation)

Liquid waste	Description of impact	Management method
Sewage	Dependent on number of workers at site. Assuming 400 people during construction the total generation of foul / grey water per day is 3,075 litres per day	Project will be equipped with toilets and washing facilities with their respective waterproofed septic tanks.
Sediment laden run off	Generated from activities such as aggregate washing, vegetation clearance, vehicle movements	Settlement of water before drainage to surface water courses in a controlled manner (under discharge consent from UMA as necessary)
Concrete processing water	Generation of water with slightly elevated pH and temperature and possibly containing sediments.	Settlement of water before drainage to surface water courses in a controlled manner (under discharge consent from UMA as necessary).
Oily contaminated water (including lubricants, greases)	Release of hydrocarbons to water or ground.	Implement GIIP for performing activities with potential to release hydrocarbons to water or ground. avoid, as much as possible, significant adverse impacts of a permanent nature due to contamination of the soil, surface water and groundwater resources produced by spills of oil. The correct disposal of such highly polluting liquid waste is essential before being taken to an appropriate and authorized collection centre for this type of waste.

Source: DAC, 2013

13.3.2.3 Solid waste management

As described in DAC (2013), during construction, much of the solid waste would be generated within the immediate environment of the works area and equipment laydown areas. Table 29 summarises waste streams that are expected to be generated as part of the Project as well as their potential

impacts. It also describes how wastes will be handled/stored and the method of disposal for each waste stream.

Table 29: Expected solid waste streams (construction)

Solid waste	Description of impact	Management method
NON-HAZARDOUS WASTE STREAMS		
Household waste (work fronts and workers accommodation) Plastic packaging, wrapping paper, cardboard packaging, aluminium sheets, food waste, used toilet paper, cleaning cloths	Increased waste using up landfill space from additional personnel Degraded visual amenity / nuisance if not contained.	Collection points for household waste will be available in all areas of the project and will include properly labelled containers or dumpsters, which must have a hermetic cover to prevent the generation of bad odours and to prevent rodents' access to them. Waste will then be transferred to a specific temporary storage site prior to transfer to municipal landfill. This will be either by a municipal garbage collection truck or by a truck hired for that purpose.
Vegetation (biomass)	Impact on visual amenity / nuisance if not contained.	Not specifically defined in DAC (2013)
Excavation Spoil (soil and rocks)	Pollute receiving environments e.g. increased sediment levels in surface water bodies. Fugitive dust emissions from excavation works Land take for disposal of spoil and excavation material not re-used by the project.	Disposed in the local area in a safe and differentiated place from the rest of non-degradable inorganic and inert waste (refer to Figure 21). The selected site should not be exposed to runoff, and away from surface water bodies.
Wood (non-hazardous)	Degraded visual amenity / nuisance if not contained.	Separated from household waste and disposed of as scrap for recycling or reused, according to be the case.
HAZARDOUS WASTE STREAMS		
Oily waste (oily rags/ oily filters) / greases	Pollute receiving environments (releases to water or gaseous release if burned in an uncontrolled manner). Use of municipal landfill space.	Separated from household waste in suitable containers to be destined for hazardous waste collection company and disposal via municipal waste disposal routes.
Metal scrap and metal containers	Increased waste using up landfill space if not reused or recycled.	Separated from household waste and disposed of as scrap for recycling or reused, according to be the case.
Concrete washings	Pollute receiving environments (surface water/ ground) from increased sediment load and changes in local pH.	Not specifically defined in DAC (2013)
Cement mix / leftover concrete	Fugitive dust emissions. Increased waste using up landfill space.	Separated from household waste in suitable containers to be destined for landfill (if not able to be reused).
Welding rods	Pollute receiving environments (surface water/ ground).	Separated from household waste in suitable containers to be destined for hazardous waste collection company and disposal via municipal waste disposal routes.
Paints, adhesives	Pollute receiving environments (surface water/ ground) Degraded	Separated from household waste in suitable containers to be destined for hazardous waste

Solid waste	Description of impact	Management method
	on visual amenity / nuisance if not contained.	collection company and disposal via municipal waste disposal routes.
Electric cables offcuts / poly pipes, PVC pipes	Pollute receiving environments (surface water/ ground) Degrade visual amenity / nuisance if not contained.	Separated from household waste in suitable containers to be destined for hazardous waste collection company and disposal via municipal waste disposal routes.

Source: DAC, 2013

The production of household waste per person is expected to be one kilogram per day. It is determined that the total production of household waste at site will be 600 kg per day based on 400 employees in the construction stage [17].

The DAC (2013) states that waste disposal should be established in coordination with the local environmental management unit (UMA), and in case of limitations, alternate sites should be found that meet the appropriate and approved conditions. No information is provided as to the suitability of waste disposal options in the region and whether this will be difficult to comply with.

13.3.3 Operation

13.3.3.1 Hazardous material use

During operation materials used on site are typically connected with the powerhouse maintenance works and maintenance of the transmission line right of way. It is envisaged that most materials used will be low volumes of inert materials, oils, greases, solvents, adhesives and paints.

13.3.3.2 Liquid waste management

Table 30: Expected liquid waste streams

Liquid waste	Description of impact	Management method
Sewage	Dependent on number of workers at site. Assuming 11 people during operation the total generation of grey water is 440 gallons per day. This waste will go to landfill using up landfill space.	Project will be equipped with toilets with their respective waterproofed septic tanks.
Oily contaminated water (including lubricants, greases)	Release of hydrocarbons to water or ground during maintenance works and oil changes in transformers.	Implement GIIP for performing activities with potential to release hydrocarbons to water or ground. avoid, as much as possible, significant adverse impacts of a permanent nature due to contamination of the soil, surface water and groundwater resources produced by spills of oil. The correct disposal of such highly polluting liquid waste is essential before being taken to an appropriate and authorized collection centre for this type of waste.

[17] ESIA 2018 based upon Regional evaluation carried out by the IDB, PAHO and AIDIS

Source: DAC, 2013

The DAC (2013) concludes that the foul /grey water generated by 11 people will not result in an environmental impact nor will it likely create a risk to the hygiene and occupational health of workers.

Planned maintenance activities in the powerhouse and along the transmission line will generate higher quantities of waste oil, oily rages and used lubricating greases which may pose a potential impact to nearby receptors (land, water). The Project commits to putting in place a solid waste management plan that will make provision for correct storage, handling and disposal of hazardous wastes.

13.3.3.3 Solid waste management

During operation, most waste streams (other than general waste) are generated during maintenance work in the powerhouse (DAC, 2013), and maintenance of the transmission line right of way and works in the substation (TLI, 2016). Table 10 summarises the waste streams likely to be generated during the maintenance and operation phase, the likely impact and proposed management method.

Table 31: Potential solid waste streams (operation)

Solid waste type	Description of impact	Management method
NON-HAZARDOUS WASTE STREAMS		
Household waste including plastic packaging, wrapping paper, cardboard packaging, aluminium sheets, food waste, used toilet paper, cleaning cloths	Increased waste using up landfill space from additional personnel Unplanned releases to ground, water or air.	Implement GIIP waste management for the correct and safe disposal of different waste to an authorised landfill site, authorised by UMA Develop an integrated Solid Waste Management Plan in line with GIIP.
Metal	Use of municipal landfill space if not reused or recycled. Degrade visual amenity.	Separated from household waste and disposed of as scrap for recycling or reused, according to be the case.
Packing Wood	Use of municipal landfill space if not reused or recycled. Degrade visual amenity.	Separated from household waste and disposed of as scrap for recycling or reused, according to be the case.
HAZARDOUS WASTE STREAMS		
Silt build up collected behind the weir and in the settlement tank	Temporary increase in sediment load in the Jilamito river.	Controlled purging to minimal impact on the normal course of the river.
Oiled rags contains with lubricating residues (fats and oils), paints, solvents, sawdust impregnated with oils	Pollute receiving environments (surface water/ ground) Use of landfill space.	Collection and treatment by authorised hazardous waste management company authorised by UMA.
Insulating oils and fuels	Pollute receiving environments (surface water/ ground) Releases to air (SF6 have global warming potential).	Measures must be implemented for the prevention and control of hazards associated with the prevention of spills, emergency responses, cleaning and remediation of contaminated soils.
Petroleum	Pollute receiving environments (surface water/ ground) from unplanned releases during re-fuelling. Improper handling may affect the health and occupational hygiene of the worker.	Measures must be implemented for the prevention and control of hazards associated with the prevention of spills, emergency responses, cleaning and remediation of contaminated soils Develop an integrated Solid Waste Management Plan in line with GIIP.

Solid waste type	Description of impact	Management method
Pesticides	Pollute receiving environments (soil, groundwater and surface water) by polluting rainwater runoff Improper use may affect the health and occupational hygiene of the person does the application.	Manged as part of an integrated Pest Management strategy (IPMS) with a documented plan, consideration of alternatives. Manufacture' recommendations for application should be followed to minimize or eliminate risks both from container spills and improper handling., Follow IFC recommendations for the application of pesticides or in the unavoidable case the recommendations for a correct application. Follow recommendations issued at the country level by la Secretaría de Agricultura y Ganadería (SAG) y el Instituto de Conservación Forestal (ICF).
Wood preservative (poles)	Pollute to soil and ground and surface water by rainwater runoff from unplanned releases e.g. Worker health and safety	Follow manufacturer' recommendations for application to minimize or eliminate risks both from container spills and improper handling affecting the health and occupational hygiene of the person does the application Develop an integrated Solid Waste Management Plan in line with GIIP.

Source: DAC, 2013

The TLI (2016) quantified the impact for transmission line waste as low for the operation phase.

13.4 Mitigation measures

During construction the following mitigation measures are specifically noted in addition to the general disposal plans as highlighted in Table 29.

- The burning or accumulation of solid waste in and around the area of influence of the project is prohibited.
- In addition, a detailed construction waste management plan will be established and implemented, taking into consideration waste disposal or recycling options proposed by the respective suppliers and manufacturers.

For the operation phase, Table 31 highlights the intention to develop the following plans for the management of waste and hazardous materials:

- Integrated Solid Waste Management Plan (ISWMP) in line with GIIP.
- Integrated Pest Management strategy (IPMS).

The ISWMP will follow the requirements of current national solid waste management legislation and GIIP for integrated management of solid waste such as that set out in UNEP 2009, Developing Integrated Solid Waste Management plan training Manual, Volume 4.

For pest management the IPMS will follow recommendations issued at the country level by La Secretaría de Agricultura y Ganadería (SAG) y el Instituto de Conservación Forestal (ICF) and the requirements of IFC PS3.

The preparation of an updated Project ESMP aligned to IFC PSs and GIIP is ongoing and will include general good practice principles for addressing waste including verifying the capacity of the capacity and capability of facilities in the municipality of Arizona or the wider region (Department of Atlantida or further afield) to deal with Project waste in accordance with GIIP, Requirements to deal appropriately with all types of hazardous waste batteries, chemicals, high pH concrete wash water, used solvents and tyres will be included. The ESMP will also address the requirements for the Project landfill.

14 Traffic and transport

14.1 Introduction

This section presents the identification and assessment of potential adverse impacts from traffic and transport as discussed in the following project documentation:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- Traffic and Transportation impact assessment (TIA, 2016)
- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)

Management of impacts from traffic and transportation are also addressed in the noise and air quality impact assessment sections (section 10 and 11 respectively).

14.2 Baseline

The national road network in Honduras consists of approximately 14,044 km of roads, including approximately 2,977 km of paved road and 11,067 km of unpaved roads (Fondo Vial 2016a). Maintenance of pavement and road quality is a substantial concern throughout the nation, due to limited available public funding and the need to address landslides, potholes, and other effects of the country's six-month rainy season. Much of the maintenance work on the nation's paved road network is conducted by a series of microenterprises, funded through the Fondo Vial (national Road Fund) (World Bank 2015), (TIA, 2016).

Table 32 summarises the anticipated Project road requirements and the information available on the existing road condition and traffic baseline (as provided in the project documentation).

Table 32: Summary of Project road baseline

Description	Road categorisation	Road name / number	Description of condition	Traffic volume data
San Pedro Sula to turn off from national highway (approximately 40 km past Tela)	National	CA-13	Two [2] lane paved highway with pavement width of 7.5 m	Annual traffic growth on the CA-13 is 6.7%.
National highway to Mezapita community / Mezapita to El Nance intersection (total of 3 km)	Series of unpaved rural roads)	Vecinal 311 or unnamed	Width between 6 and 9 m and unpaved.	None (low and unfamiliar with heavy goods vehicles)
El Nance intersection to Project site (new 7.5 km road)	Public rural road (unsurfaced)	Unnamed	Width between 6 and 9 m and unpaved.	None (volume is low and users unfamiliar with heavy goods vehicles)
Lean to Jilamito Nuevo to El Nance	Public rural roads (unsurfaced)	Unnamed	Width between 6 and 9 m and unpaved.	None (volume is low and users unfamiliar with

Description	Road categorisation	Road name / number	Description of condition	Traffic volume data
				heavy goods vehicles)
New internal access roads	Private road	Between power house and penstock and the weirs at the upper end of the project.	Within the project boundary there are no roads, current access is via foot or pack animal	n/a

14.3 Impact assessment

The TIA (2016) report identifies that all phases of the Project will involve the use of public roads by Project-related trucks, buses or other vehicles.

Specifically, during project construction the following activities are identified as having the potential to result in traffic and transportation safety impacts:

- Construction of non-public access roads.
- Construction of the 2 km long skyway cable system from the power house to the penstock.
- Excavation and haulage of excavated material.
- Haulage of rock, gravel, and other fill material (if excavated material cannot be reused).
- Delivery of aggregate and concrete for weir construction.
- Delivery of pipe for the penstock construction materials for the power house and other permanent buildings and structures.
- Delivery of supplies to the site offices, worker accommodation and work sites.
- Daily bus movement of workers from the Mezapita worker accommodation to the Project site.
- Construction of the 34.5 kV overhead distribution line and substation.

During project operation the following activities are identified as having the potential to result in traffic and transportation safety impacts:

- Vehicles connected with operational personnel (estimated 11 persons).
- Vehicles connected with maintenance works for the powerhouse and OHL.

The TIA (2016) impact assessment concludes the following salient points:

- Project-related traffic would represent less than a five [5] percent increase over existing traffic volumes on CA-13, and a 10 to 15 percent increase in heavy truck traffic on CA-13.
- Project related traffic on CA-13 could result in increased road maintenance costs and an increase in the potential for crashes and injuries.
- Substantial increase in traffic on local roads (e.g. Vecina 311) affecting traffic function and safety where existing users are likely to be un-accustomed to heavy trucks.
- Impact on local communities of Jilamito Nuevo, Jilamito Viejo, Mezapa, Mezapita, El Retiro, and Lean.
- Damage to rural roads. Heavy truck traffic would likely degrade the quality of unpaved rural public roads, including the Lean – Jilamito Nuevo, as well as the rural roads between Jilamito Nuevo and the El Nance intersection.
- Increased travel risk. The presence of heavy truck traffic on rural public roads would increase the risk of crashes involving Project and non-Project traffic, as well as the risk of property damage and injury associated with those crashes.

- Due to low traffic volumes, traffic and transportation impacts during Project operations are likely to be minimal.

14.4 Mitigation measures

Mitigation is defined in the ERM 2016 and DAC (2013) reports and is summarised together below:

- Mandatory adherence to all existing traffic regulations on Project access roads, including speed limits.
- Mandatory use of seat belts for drivers and all passengers.
- Periodic checks to ensure that vehicles and equipment are in proper working order, including:
  - Major vehicle systems such as brakes (capable of stopping the vehicle when fully loaded), steering, and headlights.
  - Safety devices such as directional signals, windshield wipers, tyre pressure alarm systems; mirrors, backup signals, etc.
  - Speed governors.
  - Use of stop blocks for vehicles near excavation areas.
- Appropriate driver and maintenance training. All drivers must possess valid driver's licenses, and all vehicle maintenance staff must be qualified to provide maintenance services.
- Self-reporting of fatigue, illness, or other factors preventing the safe operation of vehicles.
- Prohibition on transporting both passengers and hazardous materials simultaneously.
- Install and use (or require the installation and use of) GPS-based monitoring systems to ensure adherence to speed limits and other traffic regulations, and to monitor vehicle and driver activity, or any other monitoring measure, including the personnel dedicated to traffic control.
- Contactor to establish and enforce procedures for cleaning of tyres prior to entering paved roads, to avoid damage to other vehicles.
- Contractor to ensure that all vehicles use mutually-compatible communication systems.
- Contractor / owner to establish a formal grievance mechanism that enables residents and road users to report and receive communication about Project-related road and travel incidents. As part of this measure, require all Project-related vehicles to carry Project-specific markings, to make grievance reporting easier, and to avoid incorrect grievance reports.

  The preparation of an updated Project ESMP aligned to IFC PSs and GIIP is ongoing and will include general good practice principles for addressing traffic management as described above.

15 Cultural heritage

15.1 Introduction

This section presents the identification and assessment of potential beneficial and adverse cultural heritage impacts and risks of the Project as identified in the following listed project documentation:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)

The IFC Performance Standard 8 (PS8) recognizes *the importance of cultural heritage for current and future generations. In accordance with the Convention on the Protection of the world Cultural heritage and Natural, this performance standard aims to ensure that project proponents protect cultural heritage during their project activities. The PS8 prescribes that in addition to complying with local law (Honduran) on protecting cultural heritage, the project proponent will identify and protect the cultural heritage by ensuring that internationally recognized practices for the protection, field study and documentation of the cultural heritage are implemented.* The ESIA (2018) commits to implementing IFC PS8 as relevant (ESIA, 2018).

15.2 Baseline

The Institute of Honduran Anthropology and history (IHAH) conducted a site visit and issued an opinion that there are of no significant archaeological remains at the site. Specifically, IHAH opinion No. 089-SGP-2016 (18th of October 2016) states that:

- No evidence of archaeological remains that could be damaged along the surface of the route where the diversion weir (s) will be installed. The same situation was found in the area where the project will locate the power house and the transmission line.
- In the event of historical, anthropological, archaeological or paleontological findings or artifacts that have not been detected during inspections IHAH will be notified to enable appropriate procedures for recovery or mitigation of damage to be defined.

15.3 Impact assessment

IFC PS8 is not considered to have been triggered in terms of significant cultural heritage in the project area.

15.4 Mitigation measures

The documentation (ESIA, 2018) commits to implementing a chance finds procedure for dealing with unplanned tangible cultural heritage. This will be integrated into the Project ESMP which is under preparation.

16 Cumulative impacts

16.1 Introduction

The Project commissioned a rapid cumulative impact assessment (CIA) study to address cumulative impacts associated with the Project (*Jilamito Hydropower Project, Complementary studies, Cumulative Impacts, Project Number 0363579, ERM, November 2016)* (herein referred to as CIA, 2016).

The CIA (2016) followed the *International Finance Corporation's (IFC) Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for Private Sector in Emerging Markets (IFC, 2013)*. The methodology of the IFC 2013 Good Practice Handbook focuses on environmental and social components rated as critical by the Affected Communities and the scientific community, which are cumulatively impacted by the project under evaluation, by other projects, and by natural environmental and social external drivers (IFC, 2013).

16.2 Baseline

Data collection for the CIA included desk top review of information provided by INGELSA, publicly available information and the review of satellite imagery. The site did team also visited the Mezapa hydroelectric plant and performed consultations with stakeholders related specifically to potential for cumulative impacts.

16.3 Impact assessment

The CIA (2016) identified the following factors relevant to the CIA:

- Other Projects: Mezapa (8.8MW) (SEMSA), Mangungo 1 (1.48 MW), Matarras (1.5MW) hydroelectric plant.
- External Drivers: abundant rain and earthquakes.
- VECs
  - Hydrological / water resources VECs: Jilamito and Mezapa sub-basins and the streams associated with them in relation to the Project which may be used for fishing or drinking water.
  - Vegetation cover and forests VECs: Forest lands and the Texiguat nature reserve.

VECs not selected for assessment included air quality and auditory environment primarily associated with the construction phase. In both cases the stakeholders did not raise a concern related to the construction of Mezapa hydroelectric plant and therefore there is unlikely to be a resultant cumulative impact. In addition, most of the construction air quality and noise impacts are short-term, relatively localised and relatively small in magnitude.

Outcomes of the CIA

- Hydrological / water resources
  - None of the stakeholders referred to the Jilamito river as a source for recreational fishing or drinking water noting the El Naciente river located outside the Jilamito sub-basin as the key water resource in the area.
  - Water for recreational uses including an area of natural pools in the Jilamito river (Balneario Los Cocos) was noted however no drinking water quality problems were reported for the Mezapa river where the MEZAPA plant operates and therefore it is unlikely to result in cumulative impacts with the Jilamito plant.
  - Conclusion: no cumulative impacts have been identified for water resources.
- Vegetation cover and biodiversity

- This VEC is centred mainly on the Texiguat wildlife refuge located upstream of the Project and which forms part of the catchment area for the Project and the Mezapa hydroelectric project.
- Both projects could have positive cumulative impacts on the vegetation cover if they are not managed according to the existing agreements with the communities and cooperatives (CALIJINUL) specifically to monitor extraction activities.
- Conclusion: no cumulative impacts have been identified for vegetation cover and biodiversity.

16.4 Mitigation measures

The following mitigation measures are committed to in ESIA (2018) and CIA (2016) to ensure no cumulative impacts are realised for the Project as predicted in the impact assessment:

- Implement strong E&S management system (aligned to the system implemented for the Mezapa hydroelectric project).
- Continue to monitor the Mezapa river for water quality.
- Implement water quality monitoring at the Jilamito project (as per Mezapa project) namely monitoring for temperature, sediment discharges into the rivers and aquatic species monitoring.
- Continue to work with the local municipality and the local NGO Prolansate who are co-managers of the Texiguat reserve.
- Monitor water abstraction (volumes) throughout the construction and operation phase in line with the water use permit (Contrata de Agua).
- Construction and operation impacts on surface water courses should be managed in accordance with GIIP in all cases to minimise potential impacts and cumulative risks.

In addition to the above, the CIA (2016) recommended that the Project work to promote a regional cumulative impacts management initiative enacted under a regional working group which would operate under a memorandum of understanding (MOU). The role of the working group could be numerous and include *inter alia:* work to establish thresholds of VEC conditions; conduct more thorough community-level surveys; to help coordinate a local recruitment and employment strategy, to help coordinate community investment plans (including the possibility of a Joint Community Investment Fund); to coordinate construction schedules and mitigation of associated facilities; to standardise practices and synergies for mitigation and monitoring; to promote land zoning; to monitor local water users and plans and to coordinate security provision and training programs for local community members. The regional working group could also have several sub-committees which would allow for more timely and consistent interaction on day to day topics perhaps via the individual community liaison officers (CLOs) and to support engagement of affected communities.

17 Environmental and social management

17.1 Introduction

Information relating to environmental and social management is primarily contained within the following documents which have been used to prepare this summary:

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)
- Plan de Gestión Ambiental (PGA) *(Environmental Management Plan)* 'Hydroelectric Jilamito', Ambitec (2013) (referred to as PGA, 2013)
- Golder Associates (2017) environmental and social due diligence (ESDD), Jilamito Hydropower project, Honduras (referred to as Golder, 2017)
- INGELSA Plan de Seguridad e Hygiene (Health and Safety plan) (referred to as INGELSA H&S Plan, 2013)
- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)

17.2 General Requirements

The Project will develop an integrated management system for implementation of the environment, social, health and safety aspects 'Manual of management environment, Social and Occupational Safety (MG-MASS)' (ESIA, 2018).

17.3 Environmental polices

The ESIA (2018) presents the INGELSA environmental policy as reproduced in Box 1 below[18] [with some re-phrasing for understanding by Mott MacDonald].

[18] Mott MacDonald has re-phrased the translation copy to aid understanding. The original policy in Spanish may be viewed in ESIA 2018.

BOX 1: INGELESA Environmental Policy

a) INGELSA will maintain its environmental license in compliance with all the requirements stated by the Secretary of State for environment and the environmental requirements of the financial entities of the project
b) INGELSA will present the compliance report on environmental measures (ICMA), in the months of May and November of each year.
c) INGELSA will undertake all audits as required by the government and municipal authorities, on the required dates, and will collaborate with the field inspector and abide by the provisions observed in the issued resolutions
d) INGELSA will respect and complete in a timely manner the requirements of the resolutions and any new outcomes from external visits/inspections. i
e) INGELSA will implement a monitoring program for the equipment or systems that by their nature can produce emissions that affect the environment
f) INGELSA is committed to giving priority to the environment, and will endeavor to create a culture that is environmentally friendly and will provide communications to employees once a week for 6 months and then once a month
g) INGELSA, is committed to implementing a reforestation plan at least 4 times a year
h) INGELSA gives priority to those suppliers offering environmentally friendly alternatives through recyclable, biodegradable materials and/or clean energy sources
i) INGELSA adheres to and complies with the regulations (mitigation measures) and laws of the country to guarantee the responsible management of waste from the production process
j) INGELSA is committed to adhering to the principles dictated by the hierarchy of integrated waste management

17.4 Health and Safety polices

In DAC (2013), INGELSA makes a commitment to prepare a safety policy that establishes the safety and health standards they intend to achieve. It is stated the policy will make provision for appointing a person in charge of applying the rules who is authorised to delegate responsibilities to management and supervisors at all levels for compliance. The safety policy will include commitments in the following areas:

- Devices to provide training at all levels. It is necessary to pay special attention to workers in key positions, such as those who build scaffolding and handle cranes, whose mistakes can be especially dangerous for others.
- Safe working methods or systems for risky operations; the workers who carry out these operations must participate in its preparation.
- Duties and responsibilities of supervisors and workers in key positions.
- Devices to disclose health and safety information.
- Measures to establish security commissions.

17.5 Environmental and social management system

17.5.1 Overview

The Project has committed to develop an environmental and social management system (ESMS) for the implementation of actions from the assessment process (ESIA, 2018). The ESMS will align with the requirements of IFC PS1 for E&S management including setting:

- Objectives, indicators, budgets, execution responsibilities for the internal staff.
- Consolidating activities to be developed in environmental, social, health and safety, and forestry including mitigation and monitoring measures for the construction and operation stages.
- Construction ESMP (including incident response procedure).

- Operational ESMP (including a reforestation plan in line with requirements of ICF, which will document the reforestation activities and compliance with SERNA 1429-2013.

The ESMS will include provisions for the following which are outlined in more detailed below:

- Identification of aspects and impacts.
- Description of E&S roles and responsibilities.
- Requirement to prepare a project specific construction and operation ESMP.
- Supporting thematic management plans.
- Occupational health and safety management plan.
- Security requirements.
- Emergency preparedness and control.
- Monitoring and evaluation.
- EHS training, inspection and auditing.
- Setting to work procedures.

The ESMS may be supported by Contractor specific management plans in key areas as the project progresses through the various phases.

17.5.2 Organisation Responsibility

INGELSA has developed a staffing plan for the Project, which includes some shared administration services with the Mezapa Facility. The shared services include the project accountant (and assistant), the administrative manager and the operations manager. Under the operations manager, there are four supervisors for a) environmental, b) civil works, c) operations and d) maintenance of electromechanical equipment.

It is planned to have a central E&S manger (Gerencia Ambiental y social) overseeing) environment and forestry coordinator (coordinador ambiental / forestal) supported by a reforestation assistant (asistente de viveros y plantacion forestal) social coordinator (coordinador social) supported by a human resource advisor (recursos humanos), community relations officers (relacionamiento comunitario) and a grievance redress coordinator and biodiversity coordinator (coordinador de biodiversidad) with one assistant. The central E&S manager will link with the project health, safety and labour manager (Gerencia de seguridad e higuiene laboral), communications manager (coordinador comunicaciones) and the construction site supervisor (superintendente de construction). The environmental supervisor is responsible for both Mezapa and the Jilamito Facilities.

INGELSA also intend to supplement their in-house team with specialist social, environmental and biodiversity consultants as needed.

The role of the health and safety manager will be (DAC, 2013, section V):

- Oversee supply, construction and maintenance of safety facilities such as access roads, pedestrian paths, barricades and overhead protection.
- Construction and installation of safety posters.
- Safety measures characteristic of each trade.
- Testing of lifting devices such as cranes and load winches and lifting accessories such as ropes and rings.
- Inspection and rectification of access facilities, such as scaffolding and ladders.
- Inspection and cleaning of common welfare facilities, such as toilets, changing rooms and dining rooms.
- Transmission of the relevant portions of the safety plan to each of the working groups.

- Emergency and evacuation plans.

It is also proposed (DAC, 2013) to create a safety committee whose duty it is to raise awareness of safety. The make-up of the commission will be commensurate with the activities and contractors on site and the risks associated with the work underway. Key responsibilities will include:

- Regular and frequent meetings at the construction site to consider the safety and health program and make recommendations to management.
- Study of security staff reports.
- Analysis of reports on accidents and diseases to make preventive recommendations.
- Evaluation of improvements introduced.
- Study of the suggestions presented by the workers, especially by the security representatives.
- Planning of educational and training programs and information sessions, and participation in them

The contractors will each be required to make provisions for EHS implementation. The responsibilities of the contractors in various roles are outlined in Table 33.

During operation the Project operation supervisor will be supported by three powerhouse operators, four operators at the headworks and two security guards. The shifts are based on Honduran code of work articles 321 and 322. The operators' shifts are shared such that one operator will be on site on a 24/7 basis. Other plant staffing consists of a single shift Monday through Friday, plus a one-half day shift on Saturday.

The DAC (2013) notes the following responsibilities to be placed on the contractors. It is expected these will be reflected in the ESMP (to be prepared), refer to section 17.5.4.

Table 33: E&S contractor roles and responsibilities

Role	Responsibility for environment, health and safety management
Construction Contractor	• Appoint one or several qualified people to oversee health and safety matters. • The organization of information that will be transmitted from the management to the workers, including those who work for subcontractors. • The organization and conduct of safety training programs, including basic training of the construction workers. • Research and study of the circumstances and causes of accidents and occupational diseases, in order to advice preventive measures. • Provide consulting service and technical support to the safety commission. • Participate in the preliminary planning of the work.
Contractor Supervisors (e.g. foreman, overseer, manager) (as stated in DAC (2013), section V)	• Working conditions and equipment are safe. • Occupational safety inspections of work sites are carried out regularly. • The workers are adequately trained for the work they must do. • Security measures at work sites are met. • The best solutions are adopted using available resources and skills. • Exist and use the necessary personal protective equipment.
Workers (as stated in DAC (2013), section V)	• Duty to exercise the utmost care for his own safety and that of his colleagues.
Worker Health and safety representatives (as stated in DAC (2013), section V)	• Present complaints to management about matters of importance related to the safety and health of workers. • Attend meetings of the security commission.

Role	Responsibility for environment, health and safety management
	• Perform regular and systematic inspections of the work. • Investigate accidents together with management to establish their causes and propose ways to remedy them. • Investigate the complaints of their peers. • Represent the workers in the deliberations with the government inspectors in their visits to the work.

Source: DAC, 2013

Figure 36: Proposed organisational structure

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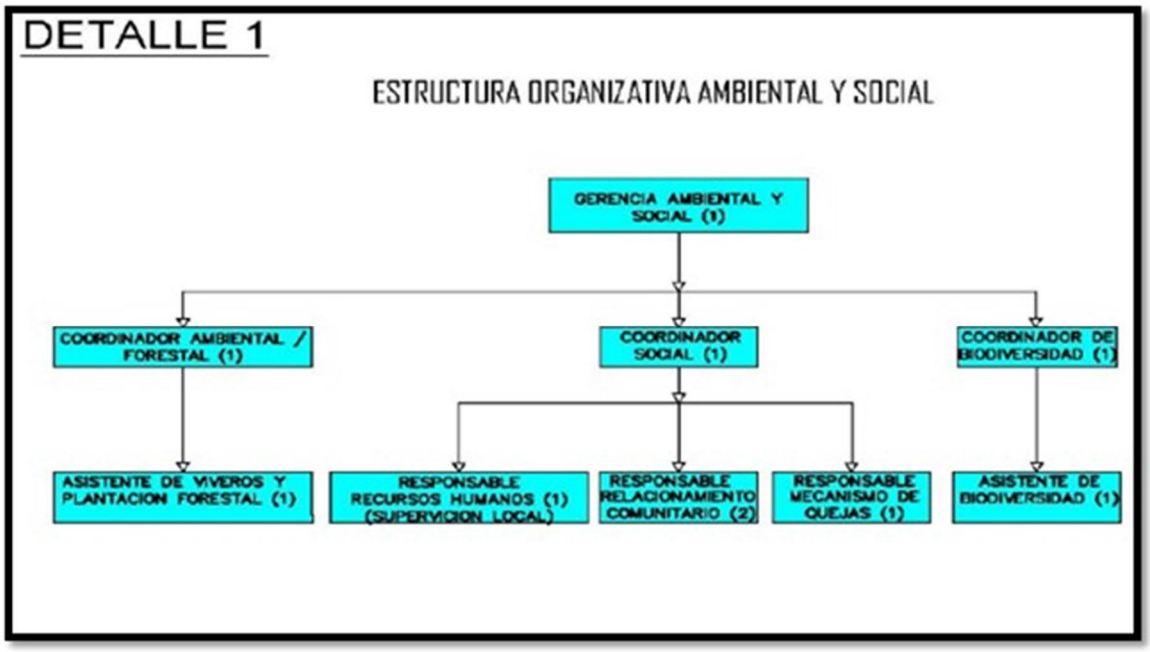
Source: Ingelsa

Figure 37: Proposed E&S team structure



Source: Ingelsa

The contracts for sub-contractors will include penalty clauses for non-compliance with environment, social, health, safety and labour (ESHSL) terms, and requirements for the regular provision of data and information on key ESHSL performance indicators (Golder, 2017).

17.5.3 Environmental and Social Management Plan

The Project has developed an environmental management plan (EMP) (PGA) to meet national requirements and specifically the requirements of Environmental Resolution No. 1429-2013 (issued by SERNA) for the construction and operation phases.

In addition, the Project has committed to develop a pre-construction and construction environmental and social management plan (ESMP) setting out how the Project intends to integrate international Lender requirements and align project activities with IFC PSs 2012. A separate ESMP for the pre-construction, construction (CESMP) and operation (OESMP) phase will be developed.

The CESMP will address *inter alia:*

- Excavations, storage of products and chemicals, fuel transport and storage, waste management, concrete truck washing, air quality and dust control, surface water quality, control of erosion and sedimentation (including stormwater control), emissions of mobile equipment, internal management, ambient noise, mechanical equipment, vibrations and domestic waste, plant layer removal and forest logging, among others.
- Transfer and storage of explosives and excavation procedure. It will also include a specific procedure for use and storage of explosives and procedure of excavations with explosives, which are planned to be used for the excavation of the tunnel and maybe some of the pipeline work.
- Occupational health and safety (refer to section 17.6 below).
- Communication.

- Incident reporting and investigation.
- Inspection, monitoring and enforcement of corrective measures.
- Inductions and training.

As a minimum, the OESMP will focus on the following:

- Methodology for release of ecological flow.
- Domestic solid waste management and special waste handling.
- Domestic wastewater management and rainwater control, including: processes for wastewater treatment, runoff controls, rain water treatment.
- Measures to mitigate and control erosion and dust emissions.
- Monitoring, inspection and reporting.
- Inductions and training.

17.5.4 Supporting thematic management plans

The following thematic management plans and agreements will also be prepared and are under preparation or in place:

- Socialisation agreement between INGELSA and CALIJINUL co-operative *(Agreed).*
- Cooperation agreement between the National Institute of Forest Conservation (ICF) and INGELSA for the Texiguat wildlife reserve *(Agreed).*
- Emergency Preparedness and Response Plan (EPRP): to address disaster risk assessment and climate resilience and define management procedures for the Project in these situations, such as landslides, floods, tropical storms, hurricanes *(to be prepared).*
- Biodiversity action plan *(to be prepared).*
- Watershed management plan (forest management plan) (*developed)*: INGELSA has developed a forest management Plan for the Jilamito River basin, for specific zones in the Jilamito sub-basin based on the current baseline, needs and capacity of land use. This has been produced in collaboration with the community residents. It includes guidelines for defining activities that are envisaged in each program and sub-program. Its implementation will be based on the participation, communication, coordination and joint execution between communities, institutions and related projects that operate in the zones.
- Natural Resource Management program (Which focus on soil and its capacity and includes the reforestation plan) *(to be prepared)*: The program will define activities that lead to the recovery of highly degraded areas from encroachment of agricultural land, cattle ranching and other threats from the unmanaged use of the forest resource.
- Environmental and education training plan *(to be prepared):* The aim will be to focus on issues related to the protection of forest resources, nurseries, reforestation and management of Watersheds in order to improve the level of execution of activities and fulfillment of goals.
- Community development program *(to be prepared).*
- Communication and community relations plan (CRP) (*prepared as discussed in section 12)*: A key part of this plan will be actions to strengthen the local organisational and management capacities of the different communities so that they may take a greater role in the implementation, management and monitoring of the CRP.
- Grievance redress mechanism *(prepared as discussed in section 12).*
- Gender management plan *(to be prepared)*

17.6 Health and safety management plan

INGELSA demonstrates a strong commitment and intention to health and safety practice in accordance with national requirements. The DAC (2013) states that the Project will prepare and implement a health and safety management system (HSMS) and has prepared a Project specific occupational health and safety (OHS) plan (INGELSA H&S Plan, 2013) for all stages of the project to comply with the *General Regulation of Preventive Measures of Work-related Accidents and Occupational Diseases (STSS-053-04 Published in La Gaceta on October 19, 2004)*. An outline of minimum requirements is provided in section seven 16 of the DAC (2013) and covers minimum expectations in relation to the following topics:

- Occupation safety in relation to fire, signalling for high risk areas (section 7.2, DAC, 2013).
- First aid (section 7.3, DAC, 2013).
- Housekeeping rules (section 7.4, DAC, 2013).
- Behaviour rules and code of conduct (section 7.5, DAC, 2013), refer also to section 17.6.1.
- Hurricane preparedness and post storm actions (section 7.6 and 7.7, DAC, 2013).
- Flood control (section 7.8, DAC, 2013).
- Spill prevention (section 7.9, DAC, 2013).
- Minimising traffic accidents (section 7.10, DAC, 2013).
- Protective equipment (section 7.11, DAC, 2013).
- Roles and responsibilities of safety personnel (as set out in Table 33 above).
- Setting to work procedures and requirements (section 7.20 to section 7.XX,DAC, 2013) for: use of ladders, excavations, woodworking machines, manual and portable tools, pneumatic tools, electric tools, vehicles and automatic machinery, trucks and transport machinery, lifting devices, welding and gas cutting, use of acetylene generators, use of pressure cylinders, compressed gasses, compressed air, steam and gas ducts, generators).
- Occupational safety for operating quarries and aggregate banks.
- Drilling operations.

The DAC, 2013 makes the following commitments on behalf of INGELSA and any contractors in the preparation of an HSMS:

- Keep safety and health records that facilitate the identification and resolution of problems of that nature.
- For subcontractors, the contract must establish the responsibilities, duties and safety measures that are expected of the work force of the subcontractor. Such measures may include the supply and use of certain safety equipment, methods for the execution of specific tasks in a safe manner, and the inspection and proper handling of tools. The person in charge of the work must also verify that the materials, equipment and tools brought to it comply with the minimum safety standards.
- Training should be provided at all levels: management, supervisors and workers. It may also be necessary to train subcontractors and their workers in the safety procedures of the work, since different teams of specialised workers can affect their mutual safety.
- There must also be a system for management to receive information quickly about unsafe practices and defective equipment.

The Project also commits to provide staff with the required personal protective equipment (PPE), in accordance with the activity carried out, to prevent damage to workers' health (DAC, 2013, section 9.1).

The Project has committed to elaborating an internal code of conduct for workers that includes general standards of human behaviour, hygiene and health, environmental and health and road

traffic obligations for all employees or workers that work directly for INGELSA or a sub-contractor, in accordance with the Honduran Ministry of Labour. It also states that labour aspects will be aligned to the core conventions of the International Labour Organisation (ILO) (DAC, 2013, section 7.12, page 41).

17.6.1 Worker code of conduct

The project worker code of conduct as outlined in ESIA (2018) is reproduced below. The workers code will define the national and local parameters for the performance of workers in their work spaces according to the profile of each position. The code of conduct will provide general guidelines for the behaviour of personnel inside and outside the organization.

INGELSA worker code of conduct

All contractors must prepare a code of conduct that addresses requirements and expectations in relation to the following topics:

- Restriction of consumption of alcoholic beverages.
- Monitoring of the worker's drunken state during working hours.
- Use of adequate clothing at work.
- Use of assigned personal protective equipment.
- Prohibition of smoking in critical or restricted areas.
- Prohibition of the use of stimulating substances (drugs, narcotics).
- Misuse of communication equipment.
- Fights or pugilism among workers.
- Respect and mutual cooperation.
- Restriction on the use of weapons in the workplace.
- Confidentiality of company information.
- Contribution to the protection of local fauna.
- Adequate disposal of waste.
- Cleaning and order of the work site.
- Section of internal sanctions.

17.6.2 Health and Safety implementation and management

Construction companies of any size must appoint one or several duly qualified persons whose main and special responsibility will be the promotion of safety and health. Whoever is appointed will have direct access to the executive director of the company, and among his duties will be:

- The organisation of information that will be transmitted from the management to the workers, including those who work for subcontractors.
- The organisation and conduct of safety training programs, including basic training of the construction workers.
- Research and investigation of the circumstances and causes of accidents and occupational diseases, to advise preventive measures.
- Provide consulting service and technical support to the safety commission.
- Participate in the preliminary planning of the work.

To fulfil these requirements the DAC (2013) notes the health and safety officer must have experience in the industry and have adequate training, as well as belong to a recognised professional association of safety and health, in countries that have one.

17.7 Gender equality

The project is required to develop a human resources policy regarding gender practices, equal opportunity and fair treatment. A gender management will be used to implement procedure for guiding management and monitoring of gender integration in the project.

INGELSA has a Human Resources Manual compromised of a workers' rights of obligatory implementation for all individuals who work for the company, a code of ethics, a no discrimination policy, no harassment policy, among others.

17.8 Emergency preparedness

INGELSA will be directly responsible for compliance with the emergency preparedness and response plan (EPRP) at the operation stage and will supervise the compliance of the EPRP by the contractor in the construction stage.

The Project does not have a weir structure that would result in a high-consequence of safety in the event of failure (DAC, 2013). DAC (2013) commits INGELSA to prepare, implement and update a contingency plan against accidents that includes the situations of the different stages of the project. DAC (2013) states that the direct responsibility for the execution of the contingency plan will correspond to the contractor in charge of the construction work who will select the person responsible for the implementation of said plan and will also have a construction execution protocol that contemplates both the prevention of accidents, drills, review or inspection of infrastructure conditions and work environment aimed at effective risk management.

The emergency response provision will include provision for the acquisition of health equipment and the training of staff in its use, including the placing of extinguishers in strategic places that will be defined in the OSH Plan.

17.8.1 Monitoring and evaluation

ESIA (2018) commits the Project to preparing a monitoring program that covers the following topics as a minimum:

- Status of the project.
- Status of permits and compliance with national legislation.
- Status of environmental management, social and health and safety.
- Status of compliance of the ESAP.
- Submission of a declaration of compliance to SERNA on an annual basis.

  The project will prepare an environmental and social compliance report for reporting during the construction phase. It will provide a summary of work done to address environmental, safety and social issues. If appropriate supporting documentation is required to be provided in the appendix (Golder, 2017)

17.8.2 Training, Inspection and Auditing

To do the work responsibly will require regular inspections and the provision of means to take corrective measures (DAC, 2013). DAC (2013) goes on to say, *'the training of the workers allows them to recognise the risks and know how to overcome them. They should be shown the safest way to do their job'*. There are several ways to achieve the direct participation of workers in the preparation of the work, such as:

- Pre-instructional sessions: meetings of five to ten minutes with the supervisors before beginning the task, which give these and the workers the opportunity to consider the security problems that may arise, and their possible solution. It is a simple activity that can prevent serious accidents.
- Maintaining records of EHS documentation: proof, that workers have the necessary qualifications to perform the work before starting an operation and allow them to take preventive measures to correct situations of risk that could later endanger them or other workers.

17.9 Summary

A cohesive ESMP that incorporates the management obligations set out in this section as well as other actions recommended in this document and the other project documentation is planned.

18 Summary of impacts and mitigation measures

The following tables present a summary of the impacts assessed and the mitigation measures proposed.

18.1 Water

Table 34: Water and hydrology

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
Erosion and sedimentation	Adverse	Construction activities can cause local erosion impacts, potentially leading to sedimentation impacts for water quality	Unvegetated slopes. Receiving water bodies.	- Yes	• Slope stabilization and revegetation • Install sediment traps and ditches • Well managed spoil disposal areas • Storm drainage • Sediment barriers or curtains in locations where high sediment water may enter river • Quarterly monitoring of the quality of the water	- No
Increased storm water runoff	Adverse	Increased runoff and erosion and sedimentation into waterbodies.	Soils Waterbodies	- Yes	• Planting of local vegetation • Storm drainage • Quarterly monitoring	- Moderate
Contamination by accidental spills	Adverse	The risk of contamination of water bodies as a result of accidental releases of hazardous substances.	Receiving water bodies Groundwater Soil Aquatic ecosystems	- Yes	• Appropriate containment • Bunding around sites with potential for spillage. • Areas near water and areas identified as unstable avoided for hazardous material storage.	- No

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
					• The dumping of fuels and waste of oil on the soil or bodies of water prohibited. • Construction of sand filters or drains. • Construction equipment, leftover material, waste and temporary installations cleaned and removed • Quarterly monitoring	
Wastewater generation	Adverse	Sewage from the camp and the portable latrines.	Receiving water bodies/ land	- Yes	• Portable latrines located away from water bodies • Quarterly monitoring	- No
Water resource availability	Adverse	Availability for camp services	Superficial water resource	- Yes	• Provision of a water storage tank • Implementation of water management plan as part of ESMMP.	- No
Impacts to ground water and local flow from springs due to tunneling	Adverse	Minimum to none ground water expected to be found during tunneling.	Ground water resources	- No	• Gravity drainage or pumping • install sediment traps and diches	- No
Operation						
Changes in downstream flow regime	Adverse	Changes to the flow regime in the dewatered section of the river.	River level	- Yes	• Ecological flow greater than 0.21 m3/s at the proposed water intake no.1, and 0.03 m3/s at the proposed water intake no.2.	- No
Changes to erosion and sedimentation dynamic	Adverse	The weirs and diversion of water will change the erosion and sediment dynamic. Erosion is not anticipated to be significant due to river bed topography.	River level	- No	• Continuous environmental maintenance of the project structures by tree planting and vegetation of slopes; inter-institutional forest protection activities. (PROLANSATE,	- No

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
					UMA, CALIJINUL, INGELSA, Public Ministry)	
Contamination by accidental spills	Adverse	Improper handling of oils, fuels, chemicals and lubricants required during operations and maintenance could cause spills directly to soil, groundwater and surface water.	Soil Groundwater Surface water Receiving bodies	- No	• Suitable and safe management, containment and disposal of chemicals and oils. • The use of herbicides should be avoided • Monitoring water quality (dissolved oxygen, temperature, turbidity, pH, suspended solids, heavy metals and colour) • Report results to Natural Resources & Environmental Office (SERNA) to agreed frequency	- No
Waste water generation	Adverse	During the operation phase wastewater will be produced by approximately 25 workers, estimated at approximately 75 litres per day (Ingelsa, 2018), which if incorrectly managed could have impacts upon water quality.	Receiving water bodies/ land	- No	• Design, construct and operate septic tank.	- No
Changes to hydrogeomorphology and water quality in the dewatered stretch		Does not apply	-	-	-	-
Change to sediment dynamic associated with desander and desander purging	Adverse	During the operation, 12 purges per year are expected, mostly in the winter period. On average the volume for each purge will be 10 m^3.	River	- No	• Use adequate purging procedures as defined by the detail engineering.	- No

Source: ESIA, 2018

18.2 Soil

Table 35 summarises the findings for the assessment of soils and seismic risk.

Table 35: Summary of impacts – seismic / soil

Potential Impact	Adverse / Beneficial	Description of potential impact	Description of Receptor	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
Soil erosion	Adverse	Slope instability leading to landslides or aggressive soil erosion (short-term)	Surface water Workers	- Yes	• Buried pipelines, revegetation in a timely fashion.	- No
Seismic event	Adverse	Impact to project infrastructure that may cause harm to workers	Workers	- Yes	• Build to recommended building codes.	- No

Source: Summarised by Mott MacDonald from project documentation (December 2018)

18.3 Biodiversity

The table below provides a summary of the impacts, receptors, and mitigation for biodiversity reported in the reviewed documents.

Table 36: Summary of biodiversity impacts and mitigation measures

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant? (pre-mitigation)	Proposed Mitigation	Significant after mitigation?
Construction						
Water contamination	Adverse	Hazardous material spillages can get into the waterways which can affect the aquatic ecosystem, including riparian environments	The Jilamito river is considered to be of good quality and ecological potential. No migratory species of fish were noted	- No	• Correct storage of materials on site.	- No
Construction noise	Adverse	Some species (mammals and birds) will emigrate temporally outside of the impacted zone during the constructing stage, but would return once construction is completed, as demonstrated in the nearby Mezapa project.	Threatened species, for whom noise may be an impact	- Yes	• Reduce noise based on the construction management plan. • Avoid using machinery concentrated in one spot at the same time. • Avoid interrupting the ecological free path of fauna in the site. • Use of sound barriers. • Use of machinery and equipment properly maintained and in good working condition.	- Moderate
Vegetation removal during construction of the different structures of the project.	Adverse	Removal of vegetation cover which can result in: reduced soil changes to natural drainage, landscape alterations, increased runoff resulting in soil loss and erosion, reduction in available habitat for wildlife, including protected and endangered species.	Tropical rainforest. No protected flora were noted in the studies that would require removal. The habitat is shown to host rare fauna species. Areas of farmland and pasture have been created by human activity.	- Yes	• Implement of the reforestation plan. • Revegetation where possible. • Follow trees cutting and planting plan. • Mulching to avoid destroying areas of habitat that are clearly used by wildlife. • Development and implementation of the *Hapthantus hazletti* conservation plan (SGAS)	- Moderate

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant? (pre-mitigation)	Proposed Mitigation	Significant after mitigation?
Habitat fragmentation	Adverse	Reduced connectivity for fauna, including protected and threatened species	Tier 1 critical habitat, including presence of endangered (EN) and critically endangered (CR) species	- Moderate	• Consideration of installing infrastructure that allows free mobilisation of terrestrial and aquatic species. • Clearance of trees in the protection strip should be avoided.	- Low
Mortality of individuals of threatened species through construction activities	Adverse	Direct mortality on individuals through collision with vehicles and machinery, damage to nesting sites, tree felling, or direct killing by project staff.	Tier 1 critical habitat, including presence of endangered (EN) and critically endangered (CR) species	- Moderate	• Prohibit project staff from hunting. • By law, the sale, marketing or exchange of wild animals for any reason is an illegal action punished with jail. • The project will be a permanent promotion of conservation to prevent illegal wild animals hunting. • Introduction of fauna species of any kind to the project area is prohibited. • Train construction personnel on the diversity of amphibians and reptiles in general; to avoid and reduce the mortality of the species at the project site. • Rescue and relocation of amphibian species of relatively low mobility (before and during construction activities) • Amphibian and reptile monitoring plan • The above will be considered in the BAP (Biodiversity Action Plan)	- Low
Disturbance of aquatic environment	Adverse	Barriers in river. Changes in water quality. Runoff from construction activities and spillages of liquids can affect	Eight species of fish and three species of other aquatic fauna (mollusc and shrimp) were noted in field surveys. Their sensitivity to	- No	• Consideration of installing structures that allows free movement of terrestrial and aquatic species.	- No

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant? (pre-mitigation)	Proposed Mitigation	Significant after mitigation?
		water quality, potentially reducing their biodiversity	waterflow changes is not impacted. The local population is not considered dependent on river fishing for livelihoods.		• The construction and waste management plan shall be implemented to prevent dumping of fuels and oils on the soils or in the waterways • The construction of sand filters and drains will mitigate against contamination of watercourses with construction material waste. • Correct storage of materials should be observed, making trenches around areas of potential spillage.	
					•	
Changes to forest soils and agro-forestry resulting from introduction of permanent infrastructure	Adverse	Loss of soil profile and fertility resulting from the construction of temporary and permanent infrastructure (roads, the weir, etc) comprising: - Loss of soil resistance to the penetration of plant roots; - Reduction of natural soil percolation; - Problems of aeration and stagnation in soils; and	Forest soils that have limited disturbance currently in the project site, though adjacent ones have been subject to forest and vegetation removal, and replacement with agriculture.	- No	• Implementation of the Reforestation Plan • Stabilisation of ground slopes • Installation of sediment traps • Disposition of sterile material should be done on low slope surfaces, away from water sources and in a way to enable re-vegetation	- No
Operation						
Water contamination	Adverse	Deterioration of water quality that would harm the aquatic and riparian ecosystems	Waterways and riparian environment	- No	• Implementation of the contingency or emergency plan for spill management. • Proper storage of liquids and chemicals (dielectric oil) • Monitoring of water quality measures:	- No

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant? (pre-mitigation)	Proposed Mitigation	Significant after mitigation?
					• - dissolved oxygen; • - temperature; • - turbidity; • - pH; • - suspended solids; • - heavy metals; and • - colour.	
Collisions and electrocutions of birds and bats with transmission line	Adverse	Potential collision with transmission line by flying birds and bats. Potential electrocution from connecting two wires / a wire and earthed material.	Area not known for being a site of importance for migrating or congregating birds. There is the protected birds species (EN, UCIN list): *Setophaga chrysoparia* (formerly Dendroica chrysoparia) that is known to live in dense forests.	- No	• Use 34.5 kV electrical transmission line, that represent a low magnetism • Ensure that the transmission line is not placed in dense forest.	- No
Reduced flow in the River Jilamito in section below diversion	Adverse	Some species are sensitive to water flow changes. The reduction in water flow in the section of river that will be bypassed by the project could be problematic to species which are sensitive to changes in water flow.	Eight species of fish and three species of other aquatic fauna (mollusc and shrimp) were noted in field surveys. Their sensitivity to waterflow changes as the result of the project is not impacted. The local population is not considered dependent on river fishing for livelihoods.	- No	• Maintain a minimum flow of 10% annual average through this section of river all year round. • Follow the monitoring plan of river water flow. • The impact of the minimum flow on aquatic species (amphibians, reptiles and aquatic invertebrates) should be follow-up through consecutive years of monitoring the flow, water quality, inventory of aquatic fauna and the presence of healthy communities of frogs both upstream and downstream of the water intake(according to the experience of the Mezapa	- No

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant? (pre-mitigation)	Proposed Mitigation	Significant after mitigation?
					hydroelectric plant -basin parallel to the Jilamito basin)	
Change of land use from the human population	Adverse	Continued use of neighbouring land from agriculture, with potential increased pressure from incoming workers associated with the scheme.	Terrestrial forest habitat already under increasing pressure from agriculture	- No	• Revegetation of degraded areas by anthropic human activities. • Follow the reforestation plan using native species.	- No
Changes to forest soils and agro-forestry resulting from introduction of permanent infrastructure	Adverse	During operation stage, inadequate maintenance and lack of protection of constructed structures can lead to damage to the civil works	Soil and vegetation around the civil work affected.	- No	• Implement the Reforestation Plan and planting of vegetation native of the area. • Stabilisation of ground slopes • Installation of sediment traps • Follow the contingency or emergency plan as appropriate.	- No

Source: Summarised by Mott MacDonald from project documentation (December 2018)

18.4 Noise

Table 37 summarises the findings for the assessment of noise impact.

Table 37: Summary of impacts – noise

Potential Impact	Adverse / Beneficial	Description of potential impact	Description of Receptor	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
General site works	Adverse	Short-term continuous noise with periods of high impact	Workers Ecology[19]	- Moderate	• Use ear protection devices for noise protection. • Avoid using excessive machinery concentrated in one spot at the same time. • Use of machinery and equipment in good working conditions. • Using of sound barriers.	- Moderate
Traffic noise	Adverse	Short-term continuous noise with periods of high impact (exceed 75db (A)	Workers Ecology	- Yes	• Reduce speed, no idling, and use equipment with appropriate noise device controls.	- No

Source: Summarised by Mott MacDonald from project documentation (December 2018)

[19] A more detailed assessment of impacts to ecological features is presented in chapter 8

18.5 Air

Table 38 summarises the findings for the assessment of emissions to air.

Table 38: Summary of impacts – air quality

Potential Impact	Adverse / Beneficial	Description of potential impact	Description of Receptor	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
Dust from site works	Adverse	Short-term, localised impact that is temporary and reversible	Worker' health Local air quality	- Moderate	• Cable car and GIIP • Use mouth mask to avoid dust from the air	- No
Dust from other construction works (installation / commissioning	Adverse	Short-term, localised impact that is temporary and reversible	Worker' health Local air quality	- Moderate	• Cable car and GIIP	- No
Dust from vehicle movements on unpaved roads	Adverse	Short-term, localised impact that is temporary and reversible	Worker' health Local air quality	- Moderate	• Cable car and GIIP • nearby to the ground.	- No
Fugitive gas emissions (stationary generators)	Adverse	Short-term, localised impact that is temporary and reversible	Worker' health Local air quality	- Moderate	• Cable car and GIIP • No idling from heavy machinery	- No
Point source emissions (diesel)	Adverse	Short-term, localised impact that is temporary and reversible	Worker' health Local air quality	- No	• Cable car and GIIP	- No
Greenhouse gas emissions (CO_2) during construction	Adverse	Short-term contribution to global climate change	Atmosphere	- No	• Cable car and GIIP • Reforestation plan • Forests Conservation and protection • Watershed protection and conservation.	- No
SO_2 from vehicle emissions	Adverse	Short-term, temporary contribution to acid rain	Atmosphere	- No	• Cable car and GIIP • Reforestation plan • Forests Conservation and protection	- No

Dust from vehicle movements on unpaved roads	Adverse	Short-term, localised impact that is temporary and reversible	Worker' health Local air quality	- Moderate	• Cable car and GIIP • nearby to the ground.	- No
					• Watershed protection and conservation.	
Operation						
Avoided GHG emissions	Beneficial	Permanent	Global climate change	- Yes	• GHG emission offset compared to thermal generation	- Yes
Increased CO_2	Adverse	Short-term contribution to global climate change	Global climate change	- No	• Cable car and GIIP • Reforestation Plan • Forests Conservation and protection	- No
SO_2 from vehicle emissions	Adverse	Short-term, temporary contribution to acid rain	Acid rain	- Moderate	• Cable car • Reforestation Plan • Forests Conservation and protection	- No

Source: Summarised by Mott MacDonald from relevant documentation

18.6 Landscape

Table 39 summarises the findings for the assessment of landscape and visual impact.

Table 39: Summary of impacts – landscape and visual impact

Potential Impact	Adverse / Beneficial	Description of potential impact	Description of Receptor	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
Impact to landscape character	Adverse	Short-term, temporary, moderate, reversible impact	Local communities	- No	• Site is screened by dense forest	- No
Impact to visual amenity	Adverse	Short-term moderate, reversible impact	Local communities No tourism or recreational receptors are identified.	- No	• Site is screened by dense forest.	- No
Operation						
Impact to landscape character	Adverse	Permanent, moderate impact connected with the weir and new infrastructure	Local communities	- No	• Site is screened by dense forest	- No
Impact to visual amenity	Adverse	Permeant, moderate impact	Local communities No tourism or recreational receptors are identified.	- No	• Site is screened by dense forest	- No

Source: Summarised by Mott MacDonald from relevant documentation.

18.7 Social

Table 40 summarises the findings for the assessment of the social component of the project.

Table 40: Summary of socio-economic impacts and management measures

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
Land Acquisition	Adverse	The land necessary for project construction can cause economic displacement (This potential impact is not anticipated as land has already being purchased or signed)	Existing land users	- No	• Communication and Community Relations Plan (SGAS) • Most land purchased from the State with no inhabitant or economic activity displacement. Low lands purchased from local villagers generate financial income as well as infrastructure improvements as a result of the Project access roads at no cost to neighbours	- No
Nuisance during construction	Adverse	Transportation of machinery and excavations can cause disruption of traffic, dust, noise.	Communities Traffic Air	- Yes	• Develop and implement Communication and Community Relations Plan (GGAS) • Internal Policies for field employees on nuisance related matters during the	- No

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
					construction and O&M process. • Project vehicles to be driven at low speeds • Install and use GPS systems to ensure and monitor the activity of vehicles and drivers. • Apply procedures for cleaning tyres.	
New roads	Beneficial / Adverse	Road construction will benefit the communities that currently do not have access to an existing public road. Increased traffic could generate dust and noise, with the potential to affect the public health of the communities and also represents a potential risk of traffic accidents	Communities Workers	- Yes	• Communication and Community Relations Plan (GGAS) • Regulation for Field Employees (GGAS) • Contingency Plan (GGAS)	- No
Influx of workers leading to pressure on services and conflict with communities	Adverse / Beneficial	Incoming workers could cause conflict but also increased demand for goods and services sparking economic activity.	Communities	- Adverse: No - Beneficial: Yes	• Communication and community Relation Plan. (SGAS) • Improvement of Local Infrastructure. • Increased economic activity	- Adverse: No - Beneficial: Yes
Accidents and Incidents	Adverse	Construction activities and access to the	Communities	- Yes	• Provide workers with the required	- No

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
		construction can result in accidents.	Workers		personal protective equipment • Occupational Health and Safety Plan (SGAS)	
Community Safety	Adverse	Construction areas will be dangerous for local people	Communities	- Yes	• Safe design slopes. Good engineering • - Slopes stabilization. • Use of appropriate safety signals and located in strategic locations.	- No
National economic development	Beneficial	Effect on domestic demand and gross domestic product (GDP). This effect will be reflected primarily in a increased in demand for goods and services.	Communities National and local economy	- Yes	-	- Yes
Supply of goods and services in the area	Beneficial	Stimulation of the local economy and generation of indirect employment opportunities	Communities Local economy	- Yes	-	- Yes
Social investment activities in community projects	Beneficial	Social investment activities in community projects such as water, communications, and educational infrastructure, among others	Communities	- Yes	• Communication and Community Relations Plan	- Yes

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
Jobs	Beneficial / Adverse	Improvement of domestic incomes and the dynamism of the local economy through recruitment of labour. Associated with this benefit, influx of foreign population stimulated by job opportunities could have a negative effect in the culture and have a (low) risk for social conflicts	Communities Local economy	- Adverse: Moderate to Low - Beneficial: Yes	• Develop and implement the Communication and Community Relations Plan • Develop and implement a Program for handling calls about jobs and selection and hiring criteria (SGAS) • Mostly local recruitment (SGAS)	- Adverse: No - Beneficial: Yes
Temporary and permanent economic displacement	N/A	No displacement expected.	Communities	- N/A	-	- N/A
Detailed consideration of vector borne disease and sexually transmitted infections	Adverse	Sexual transmission deceases	People of the communities	- Yes	• Follow the communication and community relation plan. (SGAS)	- Yes
Labour issues and more detailed consideration of occupational health and safety	Beneficial	Improved skills in health, safety and good health habits at home.	Communities	- Yes	• Follow the communication and community relation plan. (SGAS)	- Yes
Impacts relating to blasting	Adverse	Dangerous for health and personal security	Workers	- Yes	• Follow the communication and community relation plan. (SGAS)	- No
Risks and impacts relating to provision of security for the project	Adverse	Dangerous for workers safety and neighbours of the communities	Workers and community neighbours	- Yes	• Follow the communication and community relation plan. (SGAS)	- Yes

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
Community conflict with the project	Adverse	Possible interruption or delay of the project.	Project and community	- Yes	• Full implementation of the Social Action Plan consistent with the ESAP, including the community relations and communication plan. • Creating local jobs opportunities to cover community needs of work. • Improving special services agreed with the direct influence communities (i. e. Agreement signed with CALIJINUL) • Improved skills of workers which increases the chances of a higher level of life quality. • Comply with all the agreements with the communities and respect for human and labour rights.	- No
Ecosystem services impacts	Beneficial / Adverse	Direct Impacts by construction of structures project. Restore area impacted by stakeholders for crop	Natural Ecosystem	- Yes	• Conserve, compensate, mitigate contract (SERNA • Restoration of exiting degraded	- Adverse: No - Beneficial: Yes

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
		production and reforestation programs			areas (CALIJINUL agreement; INGELSA, PROLANSATE and ICF agreement)	
Operation						
Effects on local roads	Adverse	The local roads will be affected by the increase and load of traffic.	Local Roads	- No	• Only a few, all light non-commercial vehicles, will be used by the Project during O&M.	- No
Drinking water	Beneficial	The project don´t use the drinking water source. The project contributes to the preservation of the watersheds The project will improve the drinkable water system (see CALIJINUL agreement)	Water Public services Communities	- Yes	• Comply with the Reforestation Plan. • Comply with the CALIJINUL agreement • Comply with the PROLANSATE/ICF Agreement.	- Yes
Water use conflicts	Adverse	Some people have the perception of loss of drinking water in communities	Communities Water	- No	• Apply the communication and community relations plan. • The project don´t use the drinking water source.	- No

Accidents and incidents	Adverse	During maintenance activities for the workers, and to the communities because of access to high voltage towers and other infrastructure.	Communities Workers	- No	• Develop and implement the Communication and Community Relations Plan • Provide workers with the required personal protective equipment • Label the towers of the transmission line when they are 69kV or more, considering the literacy level of the residents of the area • All areas should be properly demarcated and marked according to the local literacy rate • Develop and implement an Occupational Health Plan • Disclose and socialise a Risk Management Manual aimed at project employees and residents in directly and indirectly affected communities	- No
National economic development	Beneficial	Income from the connection to the grid and stimulation of new investments in the complementary sectors of Jilamito Increased the energy offer in the national grid system.	Communities National and local economy	- Yes	• Increased local income • Better access to electricity • Sustainable and low price of electricity. • Reduction on imported fossil fuel power generation	- Yes
Social investment activities in community projects	Beneficial	Social investment activities in community projects such as water, communications, and educational	Communities	- Yes	• Develop and implement the Communication and Community Relations Plan • Comply with all agreements signed with	- Yes

Accidents and incidents	Adverse	During maintenance activities for the workers, and to the communities because of access to high voltage towers and other infrastructure.	Communities Workers	- No	• Develop and implement the Communication and Community Relations Plan • Provide workers with the required personal protective equipment • Label the towers of the transmission line when they are 69kV or more, considering the literacy level of the residents of the area • All areas should be properly demarcated and marked according to the local literacy rate • Develop and implement an Occupational Health Plan • Disclose and socialise a Risk Management Manual aimed at project employees and residents in directly and indirectly affected communities	- No
		infrastructure, among others			the communities, cooperatives, and conservations institutions.	
Jobs	Beneficial	Improvement of domestic incomes and the dynamism of the local economy through recruitment of labour	Communities Local economy	- Yes	• Develop and implement the Communication and Community Relations Plan	- Yes

Source: Ambitec, 2013, ERM 2016 and Ingelsa, 2018

18.8 Waste

Table 41 summarises the findings for the assessment of hazardous material use and waste.

Table 41: Summary of impacts – waste and hazardous material use

Potential Impact	Adverse / Beneficial	Description of potential impact	Description of Receptor	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
Poor hazardous material handling results in spills and contamination of receiving environment	Adverse	Short-term (possible pollution from mismanagement of oil spills and other liquids and solids)	Ecological and water features	- Yes	• GIIP • Implementation of waste and construction management plans, as well as manufacturers recommendations.	- No
Water contamination from liquid wastes	Adverse	Short-term, domestic, oily sediment laden water	Surface water and groundwater	- Yes	• GIIP • Implementation of waste and construction management plans, as well as manufacturers recommendations. •	- No
Solid waste accumulation	Adverse	Short-term, decrease in landfill capacity from operational personnel on site	Ecological and water features Landfill capacity	- Yes	• GIIP • Implementation of waste and construction management plans.	- No
Releases from site landfill (solid, liquid and gas)	No landfill on site					
Operation						
Poor handling of hazardous materials leads to contamination of environment	Adverse	Long-term mainly connected with maintenance works in the power house and maintenance of the OHL right of way	Ecological and water features	- Yes	• ISWMP • IPMS Implementation of waste and management plans, as well as manufacturers recommendations.	- No

Operation						
Liquid waste from operation (sewage, oily waste)	Adverse	Oily waste and sewage waste from maintenance works (remotely occurrence event)	Surface and groundwater	- No	• GIIP	- No
Solid waste accumulation	Adverse	Long-term mainly connected with maintenance works in the power house and maintenance of the OHL right of way	Ecological and water features Landfill capacity	- No	• ISWMP • IPMS • To follow and apply actions to prevent bad waste accumulation by using a proper construction plan.	- No
Pollutant releases from site landfill	No landfill on site					

18.9 Transport

Table 42 summarises the findings for the assessment of traffic and transportation.

Table 42: Summary of impacts – traffic and transportation

Potential Impact	Adverse / Beneficial	Description of potential impact	Description of Receptor	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
Construction impact upon local roads	Adverse	Local impact on rural roads from traffic movements (mainly connected with heavy trucks)	Local communities along access road	- Yes	• Compliance with national regulations and GIIP • Follow and apply the communication community relation plan.	- No
Impact on road users and traffic flow	Adverse	Local impact on rural roads from traffic movements (mainly connected with heavy trucks) in the direct AOI	Local communities along access road	- Yes	• Compliance with national regulations and GIIP	- No
Construction traffic impact to local community (indirect AOI)	Adverse	CA-13 5% increase in traffic movements (mainly connected with heavy trucks) which may result in more crashes	National highway road users	- Yes	• Compliance with national regulations and GIIP	- No
Construction traffic impact to local road infrastructure (wear and tear)	Adverse	Local impact on rural roads from traffic movements (mainly connected with heavy trucks)	Local roads	- Yes	• Compliance with national regulations and GIIP	- No
Operation						
Operation traffic impact	Adverse	Intermittent, low with small peaks during maintenance works	Local communities along access road	- No	• Compliance with national regulations and GIIP	- No

18.10 Cultural heritage

Table 43 summarises the findings for the assessment of cultural heritage.

Table 43: Summary of findings – cultural heritage

Potential Impact	Adverse / Beneficial	Description of potential impact	Description of Receptor	Significant?	Proposed Mitigation	Significant after mitigation?
Construction						
Impact on above ground features of archaeological importance	Adverse	During earthworks and infrastructure development project has the potential to disturb tangible heritage.	No above ground features of interest were identified by IHAH, nor history of the communities related to indigenous inhabitants.	- No	• Chance finds procedure	- No
Impact on tangible heritage	Adverse	Religious believers, special costumes	No above ground features of interest were identified by IHAH nor history of the communities related to indigenous inhabitants.	- No	• Chance finds procedure	- No
Operation						
Not Relevant						

18.11 Cumulative

Table 44: Summary of cumulative impacts - environment

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
Competition for water resources (recreational fishing, recreational swimming)	Adverse	Changes in hydrology resulting in changes to fishing stock and/ or interference with recreational activities at the Balneario Los Cocos natural pools.	Jilamito river Balneario Los Cocos natural pools	- No	• Continue to monitor water quality for Jilamito river. • Apply the community relation plan. Power house located at a much higher elevation (several hundred meters) and very distant (several kilometres) from other river users.	- No
Vegetation cover and biodiversity	Adverse	Impact to biodiversity (deforestation) and habitat at the Texiguat Wildlife Refuge	Biodiversity (vegetation cover) Texiguat refuge	- Yes	• Community / co-operative management agreements • Recover areas by forest trees planting through the reforestation and forestation plan. • Applied the mitigation environmental contract By	- No

Potential Impact	Adverse / Beneficial	Description of potential impact (based on what is in the existing documentation)	Description of Receptor (based on existing information)	Significant?	Proposed Mitigation	Significant after mitigation?
					INGELSA and SERNA, Mi Ambiente. • Tree cutting reduction through the implementation of the cable way instead of roads opening.	

Source: Synthesized by Mott MacDonald from Project documentation (December 2018)

18.12 Ongoing work

As per Golder (2017) ESDD report, the key remaining action is to consolidate all the proposed mitigation actions and corrective actions into a comprehensive environmental and social management plan (ESMP) for the Project. An ESMP for the pre-construction, construction and operation phase of the project is required (Golder, 2017). The ESMP (s) will incorporate all the various measure and activities required by SERNA, ICF, and other local entities as well as the Lenders environmental and social requirements, the project specific mitigation outlined in the project assessment documentation and GIIP.

19 Conclusions

Golder (2017) concludes that that Sponsor and operator of the Project, in association with its consulting partners, has the means and the competencies to adequately manage the environmental and social risks associated with this project, and comply with the environmental and social requirements of the loan agreement that incorporates by reference the fulfillment of the policies of the IFC Performance Standards 2012.

INGELSA can leverage knowledge and expertise, including tools, programs and management systems, associated with the development and operation of the nearby hydroelectric project Mezapa in the execution of this current project.

Golder (2017) indicate that an international standard ESMP to collate the management and mitigation measures into a stand-alone management and monitoring plan for implementing the findings of the assessments and GIIP should go a long way to protecting E&S aspects during the implementation phase and that the production of this document is ongoing, scheduled for completion prior to start of construction.

20 Bibliography

- ERM (2016) Jilamito Hydropower project complementary studies, 2016 (referred to as ERM, 2016) including:

  – Critical Habitat Assessment (CHA, 2016)

  – ERM 2016 Jilamito hydropower project, Complementary Studies, Cumulative Impacts Assessment (CIA 2016)

  – ERM 2016 Jilamito hydropower project, Complementary Studies, Ecological Flow (EF, 2016)

  – ERM 2016 Jilamito hydropower project, Complementary Studies, Transmission line impacts (TLI 2016)

  – Social Impact Assessment (SIA 2016)

  – Traffic and Transportation impact assessment (TIA, 2016)

- Baseline aquatic fauna survey of the area of influence of the Jilamito Hydroelectric project, Ambitec (2017) (referred to in this chapter as the “Aquatic fauna study”)

- Baseline Studies for amphibians, reptiles and *Haptanthus hazlettii* for the Jilamito Hydroelectric project, Ambitec (2018) (referred to in this chapter as the “Herpetofauna baseline study”)

- Diagnóstico Ambiental Cualitativo (DAC): a qualitative environmental assessment, completed by Ambitec, S.A., dated February 2013 (referred to as DAC, 2013)

- Environmental License Application Form for Projects Category 2 and 3 - SINEIA F-02 ‘Hydroelectric JILAMITO’, Ambitec (2013)

- Golder Associates (2017) environmental and social due diligence (ESDD), Jilamito Hydropower project, Honduras (referred to as Golder 2017)

- Hatch Independent Engineering Report, August 2018 (referred to Hatch, 2018)

- INGELSA Plan de Seguridad e Hygiene (Health and Safety plan) (referred to as INGELSA H&S Plan, 2013)

- Mitchell Aide, Campos-Cerqueira and Nieves, 2018. Identification of presence and absence of six anuran species in audio recordings from Jilamito, Honduras Final Report for INGELSA

- Jilamito Hydroelectric Project Environmental and Social Impact Study ESIA (2018) (synthesis document of the process), Jilamito Hydroelectric project, Inversiones de Generación Eléctrica (2018), Environmental and Social Impact Assessment (ESIA), Karla Maria Ramos Andino September 2018 (referred to as ESIA, 2018)

- Listado Especies Fauna Jilamito, Matamoros Flores Ricardo (2015) (referred to in this chapter as the “Fauna Species List”)

- Plan de Gestión Ambiental (PGA) *(Environmental Management Plan)* ‘Hydroelectric Jilamito’, Ambitec (2013) (referred to as PGA 2013)

- Plan de Reforestación, Ingelsa (n.d) (referred to in this chapter as the “Reforestation Plan”)

- Report of the socialisation process, Ingelsa (2015)

- Report of visits to the Mezapa Hydroelectric Power Station by communities and Educational Centres, Ingelsa (2018)

- Resolution 1429 of 2013, SERNA (2013)

- SERM-04 Form (Social and Environmental Risk Management Report), HREFF (3 August 2018)

- Sieve Analytics 2018. Six Anuran Species Audio Recording Final Report

- Social baseline for the Jilamito Hydroelectric project, Ingelsa (November 2018 & December 2018)

- Summary of the Socialisation Process of the Jilamito Hydroelectric project, Executive Document, Ingelsa (n.d)

- Townsend, J. H., L. D. Wilson, C. A. Cerrato-M., B. K. At¬kinson, L. A. Herrera-B. & M. M. Mejia (2011): Discovery of an extant population of the critically endangered treefrog Plectrohyla chrysopleura (Anura, Hylidae) in Refugio de Vida Silvestre Texiguat, Honduras. – Herpetological Bulletin, 115: 22–25.

Appendices

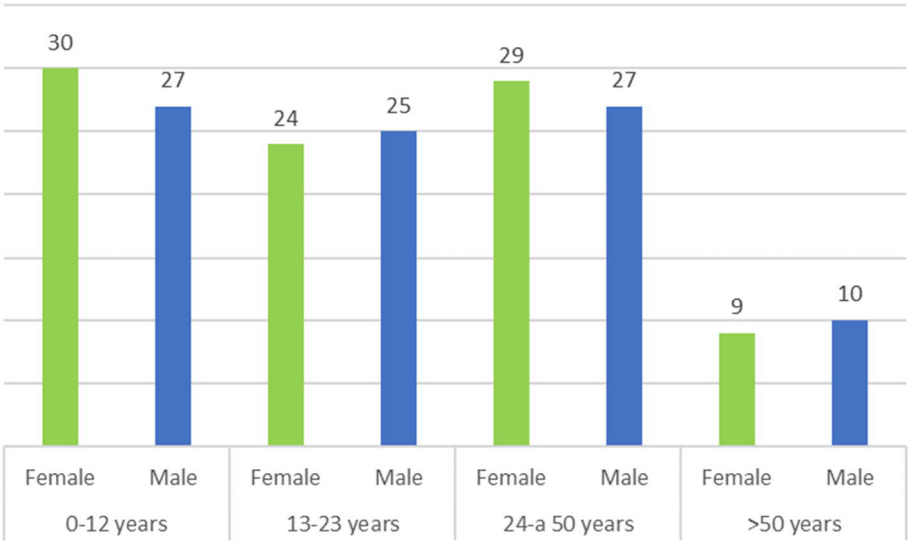
A. Additional social information 180

A. Additional social information

20.1 Jilamito Viejo

One hundred and eighty-one people are registered in the community of Jilamito Viejo. Of the total population, 51% are women and 49% are men (Ingelsa, 2018). The distribution by age range and sex is shown in Figure 38.

Figure 38: Distribution of the population of Jilamito Viejo by age range and sex



Source: Ingelsa, 2018

Thirty-seven houses were registered, of which 57% have one inhabitant family, 38% have two inhabitant families and five percent have three or more inhabitant families (Ingelsa, 2018).

For the period 2017 - 2018, in the community were registered 30 births. No deaths of mothers, new-borns and/or children under five years are reported for this period (Ingelsa, 2018).

According to the information collected, six people have migrated to other countries. According to the comments of the interviewees, there is a high expectation of the population to migrate to the United States, especially young people, for work and development opportunities (Ingelsa, 2018).

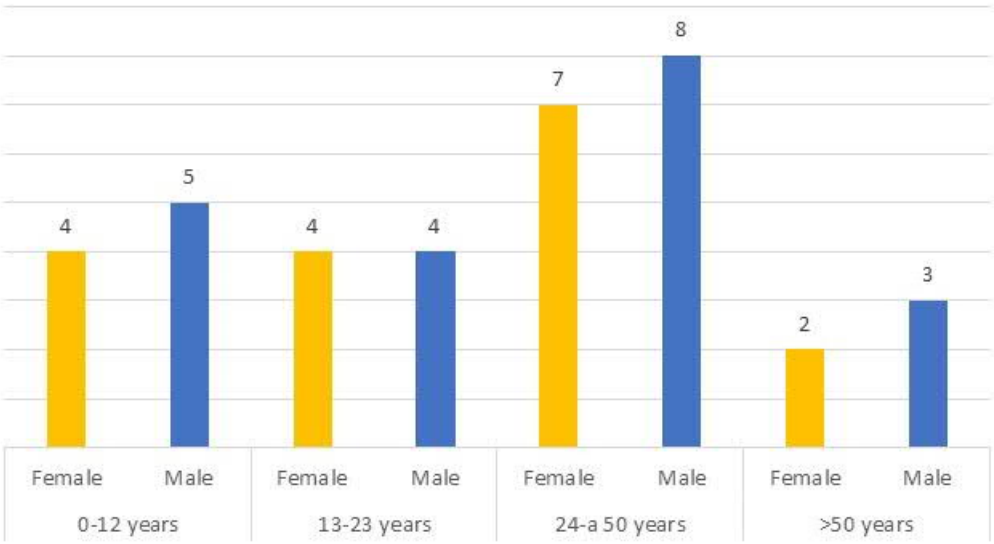
As for the type of land tenure, 94% of the reference population own tenure, three percent rented and three percent borrowed. Seventy percent of the land owners are men and 30% are women (Ingelsa, 2018).

Regarding the employment situation, 60% of the population is unemployed and the remaining 40% is employed. Likewise, 14% of the employed population are women and 86% are men (Ingelsa, 2018).

20.2 San Rafael

For the community of San Rafael, 37 people were registered. Of the total population, 46% are women and 54% are men (Ingelsa, 2018). The distribution by age range and sex is shown in Figure 39.

Figure 39: Distribution of the population of San Rafael by age range and sex



Source: Ingelsa, 2018

Nine houses were registered, of which 78% have one inhabitant family and 22% have two inhabitant families (Ingelsa, 2018).

For the period 2017 - 2018, in the community five births were registered. No deaths of mothers, new-borns and/or children under five years are reported for this period (Ingelsa, 2018).

According to the information collected, only one person emigrated to other countries (Ingelsa, 2018).

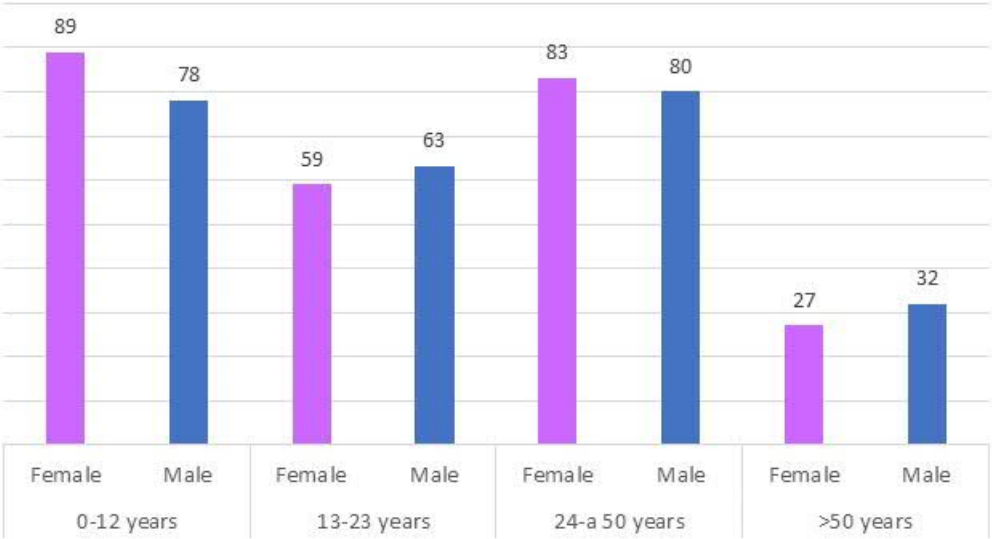
As for the type of land tenure, 78% of the reference population own tenure and 22% borrowed. Forty-four percent of the land owners are men and 56% are women (Ingelsa, 2018).

Regarding the employment situation, 54.1% of the population is unemployed and the remaining 45.9% is employed. Likewise, 6% of the employed population are women and 94% are men (Ingelsa, 2018).

20.3 Jilamito Nuevo

For the community of Jilamito Nuevo, 511 people were registered. Of the total population, 50% are women and 50% are men (Ingelsa, 2018). The distribution by age range and sex is shown in Figure 40.

Figure 40: Distribution of the population of Jilamito Nuevo by age range and sex



Source: Ingelsa, 2018

In Jilamito Nuevo 112 houses were registered, of which 86% have one inhabitant family, nine percent have two inhabitant families and five percent have three or more inhabitant families (Ingelsa, 2018).

For the period 2017 - 2018, in the community were registered 52 births. No deaths of mothers were reported for this period, although one still birth was registered (Ingelsa, 2018).

According to the information collected, 10 people have migrated to other countries, mainly due to the working conditions of the community (Ingelsa, 2018).

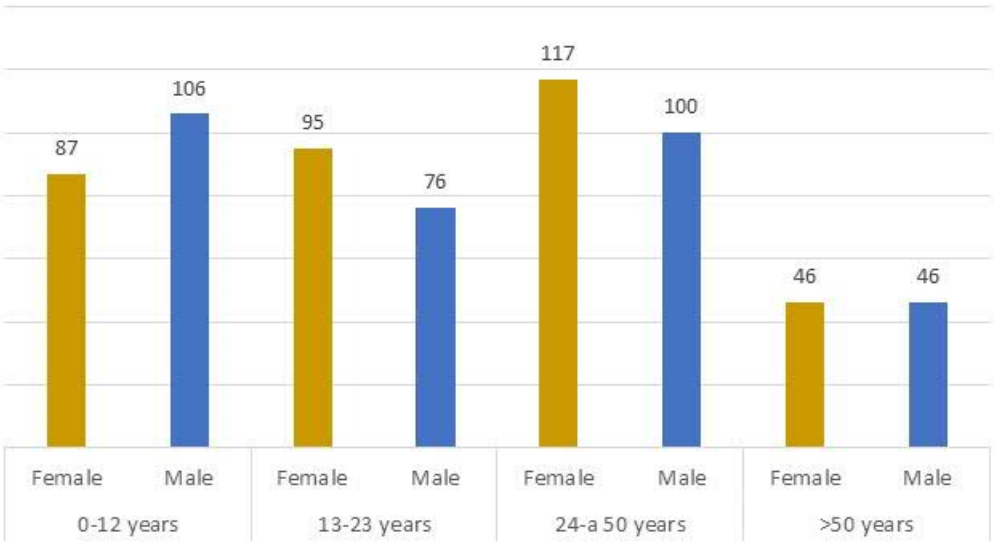
As for the type of land tenure, 64% of the reference population own tenure, 10% rented and 26% borrowed. Forty-eight percent of the land owners are men and 52% are women (Ingelsa, 2018).

Regarding the employment situation, 63% of the population is unemployed and the remaining 37% is employed. Likewise, 16% of the employed population are women and 84% are men (Ingelsa, 2018).

20.4 Hilamo Nuevo

For the community of Hilamo Nuevo, 673 people were registered. Of the total population, 51% are women and 49% are men (Ingelsa, 2018). The distribution by age range and sex is shown in Figure 41.

Figure 41: Distribution of the population of Hilamo Nuevo by age range and sex



Source: Ingelsa, 2018

A total of 75 houses were registered, of which 89% are inhabited by one family, eight percent are inhabited by two families and the remaining three percent are inhabited by three or more families (Ingelsa, 2018).

For the period 2017 - 2018, in the community were registered 14 births (Ingelsa, 2018).

According to the information collected, four people have migrated to other countries, mainly due to the economic conditions of the community (Ingelsa, 2018).

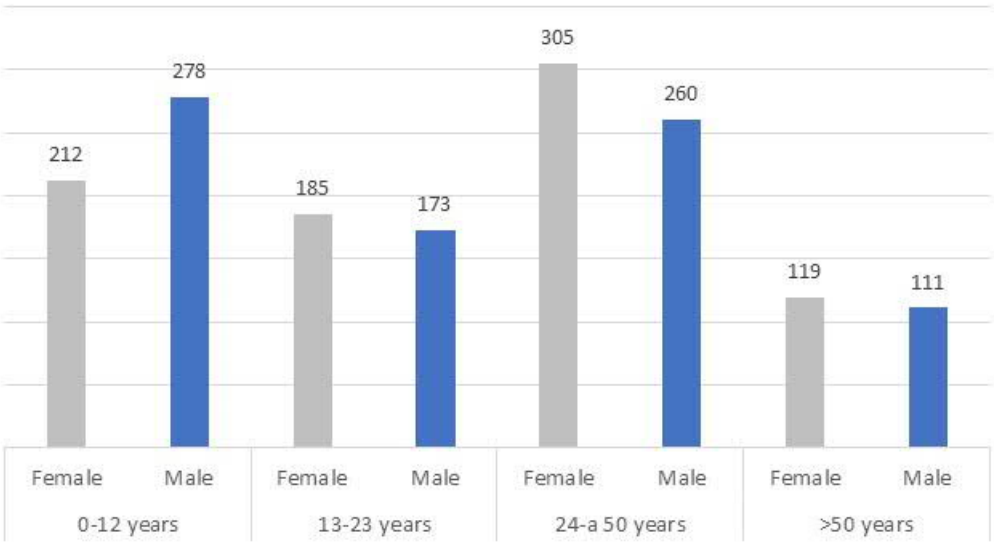
As for the type of land tenure, 33% of the reference population own tenure, 36% rented and 31% borrowed. Fifty-six percent of the land owners are men and 44% are women (Ingelsa, 2018).

Regarding the employment situation, 92% of the population is unemployed and the remaining eight percent is employed. Likewise, 51% of the employed population are women and 49% are men (Ingelsa, 2018).

20.5 Mezapita

For the community of Mezapita, 1643 people were registered. Of the total population, 50% are women and 50% are men (Ingelsa, 2018). The distribution by age range and sex is shown in Figure 42.

Figure 42: Distribution of the population of Mezapita by age range and sex



Source: Ingelsa, 2018

A total of 390 houses were registered, of which 88% are inhabited by one family, 10% are inhabited by two families and the remaining two percent are inhabited by three or more families (Ingelsa, 2018).

For the period 2017 - 2018, in the community were registered 154 births (Ingelsa, 2018).

According to the information collected, 15 people have migrated to other countries, mainly due to the economic conditions of the community (Ingelsa, 2018).

As for the type of land tenure, 83% of the reference population own tenure, nine percent rented and eight percent borrowed. Fifty-one percent of the land owners are men and 49% are women (Ingelsa, 2018).

Regarding the employment situation, 56.7% of the population is unemployed and the remaining 43.3% is employed. Likewise, 46% of the employed population are women and 54% are men (Ingelsa, 2018).

Table 45: Infrastructure provision within the AoI villages

Aspect	Total for AoI villages[20]	Jilamito Viejo	San Rafael	Jilamito Nuevo	Hilamo Nuevo	Mezapita
Light and power						
Public lighting	71.7% of the houses have public lighting.	No public lighting	No public lighting	64.3% of the houses have public lighting	82.7% of the houses have public lighting	74.6% of the houses have public lighting
Domestic electricity	71.7% of the houses have electric power at home.	81.1% of the houses have home electricity lines	No electricity	47.3% of the houses have home electricity lines	76% of the houses have home electricity lines	78.7% of the houses have home electricity lines
Water supply						
Houses with water supply	100% of communities have access to water					
Houses that carry water from a stream or creek	1.2% of the houses	3% of the houses carry water	-	-	-	1% of the houses carry water
Houses that receive water through pipes	90.7% of houses	97%	-	86%	92%	94%
Houses that use hoses	8.1% of the houses	-	100%	14%	8%	5%
Sanitation						
Toilet or sanitary service in house	87.1%	58%	11%	80%	97%	91%
Single pit latrine use	12.9%	42%	89%	20%	2%	9%
Septic tank use	10%	0%	0%	0%	10.3%	No data
Garbage collection	Only Mezapita has a garbage collection service and a community dump	No	No	No	No	Yes

[20] The numbers presented to cover all five AoI villages do not correspond with the individual village data.

Aspect	Total for AoI villages[20]	Jilamito Viejo	San Rafael	Jilamito Nuevo	Hilamo Nuevo	Mezapita
Garbage disposal by burning, landfill and burial	58.9%; 40.3%; 0.7%	89%; 11%; 0%	56%; 44%; 0%	87%; 10%; 3%	92%; 8%; 0%	42%; 58%; 0%
Regular street maintenance	38.8% of the houses said that is evident in the community some street cleaning and maintenance	No street maintenance	No street maintenance	50% of the total houses report regular street maintenance	77.3% of the total houses report regular street maintenance	24.6% of the total houses report regular street maintenance
Social infrastructure	All communities have some sort of communal infrastructure	The community has a kindergarten and an elementary school	No social infrastructure	The community has a soccer field, kindergarten, elementary school and religious temples	The community has a soccer field, kindergarten, elementary school, social centre, health centre and religious temples	The community has two soccer fields, kindergarten, elementary school, high school, social centre and religious temples
Housing						
Houses in good, regular, and bad condition	39.6% good 44.6% regular 15.7% bad	24%; 57%; 19%	33%; 56%; 11%	23%; 64%; 13%	11%; 11%; 53%	51%; 32%; 17%
Houses with a bathroom	All of the houses have a bathroom					
Sun-dried brick/ Bahareque , cement brick, wood	2.2% Sun-dried brick, 74.9% cement, 22.8% wood	3% Sun-dried brick, 38% cement, 59% wood	22% cement, 78% wood	10% Sun-dried brick, 64% cement, 26% wood	83% cement, 17.8% wood	1% Sun-dried brick, 81% cement, 18% wood
Communications	All the communities use TIGO or CLARO for telephone and communication services	94.6% of the households have a cell phone	88.9% of the households have a cell phone	88.4% of the households have a cell phone	76% of the households have a cell phone	94.9% of the households have a cell phone
Productive infrastructure (Crops monthly production * **	The communities have a productive infrastructure like lychee, oil palm, beans, corn, as well as	Corn 50qq; beans 20qq; coffee 20qq; African palm 20ton	Corn 100qq; beans 1qq; coffee 8qq; milk 10l	Corn 379qq; beans 8qq; coffee 90qq; African palm 25ton; lychee 3600 baskets; milk 900l	Corn 500qq; beans 50qq; African palm 100ton; milk 900l	Corn 9009qq; beans 300qq; coffee 20qq; African palm 1200ton; lychee 1500 baskets; milk 25,000l

Aspect	Total for AoI villages[20]	Jilamito Viejo	San Rafael	Jilamito Nuevo	Hilamo Nuevo	Mezapita
	cattle for milk and meat production					
*qq (quintal): 1qq = 100 pounds ** 1 basket = 500 lychees						

Source: Ingelsa, 2018

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