

# Hydropower Sustainability Environmental, Social and Governance Gap Analysis Tool

Version May 2020

## Preparation Stage



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# Hydropower Sustainability Environmental, Social and Governance Gap Analysis Tool



About the HESG	The Hydropower Sustainability Environmental, Social and Governance Gap Analysis Tool (HESG) enables hydropower project proponents and investors to identify and address gaps against good international industry practice. The HESG is based on the assessment framework of the Hydropower Sustainability Assessment Protocol (HSAP) and draws from the definitions of good international industry practice of the Hydropower Sustainability Guidelines on Good International Industry Practice (HGIIIP).
Intended users and uses	<p>The HESG includes three separate stage tools: Preparation, Implementation and Operation. These reflect the different stages of hydropower development and have been designed to be used as standalone documents. Each tool provides an action plan to help project teams address any gaps against good practice.</p> <p>Official HESG assessments are carried out by accredited assessors, who take an evidence-based approach. All findings are supported by objective evidence, which is factual, reproducible, objective and verifiable. The HESG is most effective when operators and developers commit to implement the recommendations provided and resolve identified significant gaps. In addition, the tool is aligned with the safeguards and standards of international financial institutions and can be used to attract climate-aligned investment.</p> <p>Hydropower development and operation may involve public entities, private companies or combined partnerships, and responsibilities may change as the project progresses through its life cycle. It is intended that the organisation with the primary responsibility for a project at its particular life-cycle stage will have a central role in any HESG assessment.</p>
Structure of the tool	The HESG comprises 12 sections that cover the environmental, social, governance and climate change topics of the HSAP and HGIIIP. A summary at the beginning of the report presents any significant gaps against basic good practice and outlines an action plan for improved performance. Within each section, requirements for good international industry practice are presented and project findings are provided. For each finding, a key indicates whether the requirement is met. A summary section analyses significant gaps and identifies each one with the symbol ●.
Supporting resources	Additional guidance on the structure, content and history of the HESG can be found online at: <a href="http://www.hydrosustainability.org">www.hydrosustainability.org</a>
Version date	May 2020

## A. Assessment Details

Project sponsor	Energo-Pro Colombia
Assessor(s)	Joerg Hartmann (Sustainable Water & Energy LLC), Juan Quintero (Environmental Engineering Consultants)
Assessment objective	<ul style="list-style-type: none"> <li>• Position ourselves as a company that promotes and aligns itself with internationally established good sustainability practices, demonstrating the best environmental and social performance from the planning to the execution of our projects.</li> <li>• Enable a better analysis of risks and opportunities in the medium and long term as a project and as a company, in the exercise of planning and managing the project portfolio.</li> <li>• Design projects that can access financing from international entities in compliance with the best social, environmental and governance management practices aligned with the IHA and Good International Practices (GIIP).</li> </ul>
Assessment dates	February 14-21, 2022
Assessment report date	Final for publication April 23rd, 2022
Observers	Joao Costa, Alain Kilajian, Amira Abdalla (IHA Sustainability Ltd)
Prepared for	Energo-Pro Colombia
Limitations of the assessment	Some interviews could not be held in person because of Covid-19 protocols; however this did not affect the results.

## B. Project Details

Project name	Pequeña Central Hidroeléctrica (PCH) Chorreritas
Country	Colombia
Location	Department of Antioquia, on the San Andrés River, a right-bank tributary to the Cauca
Purpose	Power Generation
Developer / Owner	Energo-Pro Colombia, through a special purpose company Generadora Chorreritas S.A.S. E.S.P.
Financer(s)	Financing arranged within Energo-Pro Group
Installed capacity (MW)	19.9 MW
Construction start date (planned or actual)	April 2022
Commercial operations date (planned or actual)	2025
Annual average generation (GWh / year)	114.68 GWh (source: EIA)
Associated infrastructure: road(s) (length)	Very short access roads from main San Andres-Ituango highway (25AN)
Transmission lines and sub-stations (names, lengths and capacities)	17 km transmission line running south to new EPM substation near San Jose de la Montaña
Total cost (USD m)	USD 39.7 million (source: EIA)
Annual operating costs (USD m)	O&M USD 796,000, insurance USD 234,000, royalties USD 273,000, grid access fees USD 70,000 (source: EIA)
Project development cost not including transmission (USD m)	(not available)
Transmission costs for project development (USD m)	(not available)
Specific investment cost (USD m / MW)	USD 2 million
Levelized energy cost (USD / kWh)	(not available)
Dam type	Concrete diversion weir
Dam height (m)	5.2 m
Dam length at crest (m)	35 m
Units (number, type, MW)	2 x 9.95 MW Francis
Reservoir area at Full Supply Level (FSL) (km <sup>2</sup> )	not available; surface area will be minimally larger than current river surface
Average net head at FSL (m)	182.8 m
Average flow (m <sup>3</sup> / s)	12 m <sup>3</sup> /s
Design flow (m <sup>3</sup> / s)	13.1 m <sup>3</sup> /s
Load factor	66%
Number of physically displaced households	1
Power density (MW / m <sup>2</sup> )	(not available)

Emissions intensity (gCO <sub>2</sub> e / kWh)	(not available)
Contacts / website	<a href="http://www.energo-pro.com/en">http://www.energo-pro.com/en</a>

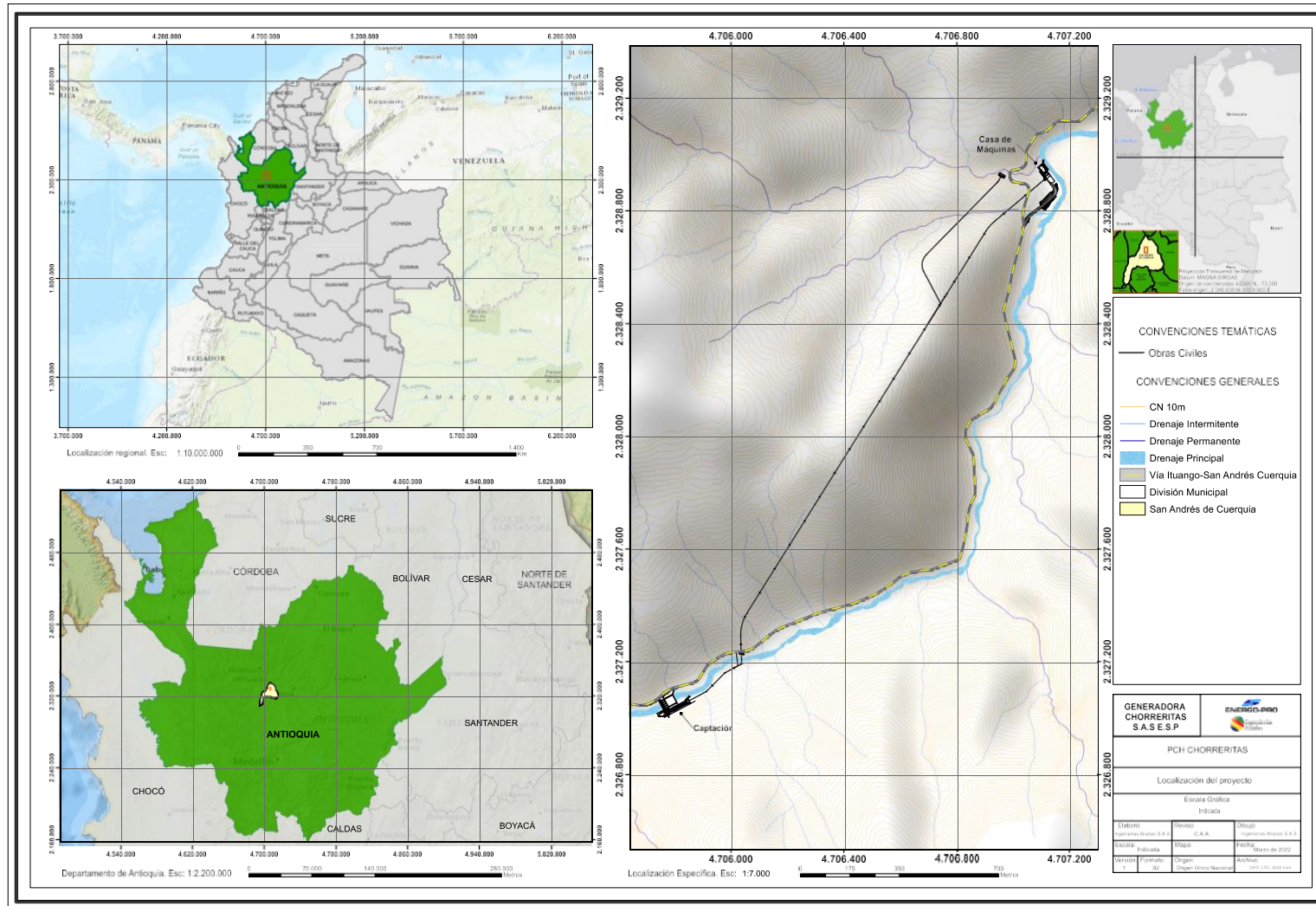
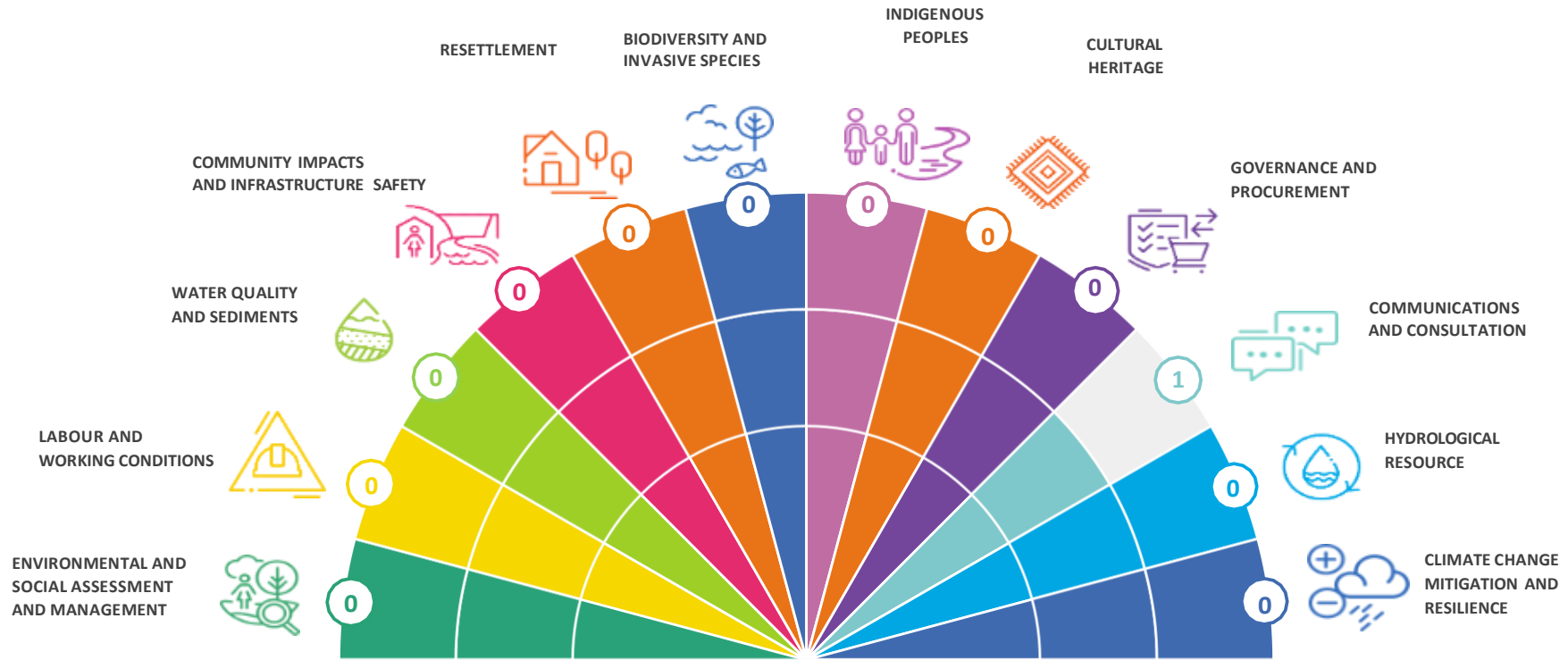


Figure 1 – Map of project location in the Department of Antioquia, Municipality of San Andrés. Project map with intake on right bank, pipe crossing the San Andrés River, and tunnel and powerhouse on left bank. Main road from Medellín to Ituango (25AN) follows river on left bank.



*Figure 2 – San Andrés valley, view upstream. The town of San Andrés is located to the left, halfway up the valley. In the foreground on the left, the penstock of the La Chorrera hydropower plant is visible. The Chorreritas project intake is located a short distance downstream of La Chorrera.*

### C. HESG Gap Analysis Diagram





### D. Significant gaps

List of significant gaps:		Sections											
		1. Environmental and Social Assessment and Management	2. Labour and Working Conditions	3. Water Quality and Sediments	4. Community Impacts and Infrastructure Safety	5. Resettlement	6. Biodiversity and Invasive Species	7. Indigenous Peoples	8. Cultural Heritage	9. Governance and Procurement	10. Communications and Consultation	11. Hydrological Resource	12. Climate Change Mitigation and Resilience
1.	Communication with local communities has been delayed, which has led to a lack of information and some misunderstandings.										x		
NUMBER OF SIGNIFICANT GAPS BY SECTION:											1		
TOTAL NUMBER OF SIGNIFICANT GAPS:		1											

### E. Environmental and Social Action Plan (ESAP)

The following actions are recommended to address and resolve the significant gaps.							
Section	Significant gaps	Action(s)	Responsibility	Indicator of achievement	Timeframe		
					<12 months	12-24 months	>24 months
10	Communication with local communities has been delayed, which has led to a lack of information and some misunderstandings.	Establish a permanent community liaison presence and step up communication efforts.	Energo-Pro team	Before start of construction: 1) Systematic grievance mechanism established 2) Meetings held in all affected communities and with affected families, relevant departments of the municipality, and other hydropower developers in the San Andrés valley 3) First communication materials disseminated	x		



# 1 Environmental and Social Assessment and Management

<b>Scope and Intent</b>	
This section addresses the assessment and planning processes for environmental and social impacts associated with project implementation and operation throughout the area of impact of the project, the contribution of the project in meeting demonstrated needs for water and energy services, and the evaluation and determination of project siting and design options. The intent is that environmental and social impacts are identified and assessed, and that avoidance, minimisation and mitigation measures are designed and implemented.	

<b>Background</b>	
Identify the main environmental and social issues during implementation	Main issues are associated with loss of riparian forest (2 ha) for the construction of the intake/headpond, pressure pipe and powerhouse; workforce – community interactions; employment opportunities for local communities; erosion and slope stability for the construction of tunnel. The project area has been previously disturbed by farming and infrastructure development such as, other hydropower projects and the 25AM road which passes directly along the San Andrés River. The powerhouse is located at the bottom of a spoil deposit from the construction of the road.
Identify the main environmental and social issues during operation	Reduced flow between intake and powerhouse discharge, loss of aquatic habitats; some permanent income for local communities
Identify the environmental regulator	Corantioquia, the <i>Corporación Autónoma Regional del Centro de Antioquia</i> (Regional Autonomous Corporation of Central Antioquia) is the licensing agency, and also in charge of monitoring and supervision.
Identify other regulators (e.g. on land, water use, Indigenous Peoples)	A number of other central government agencies are involved in issuing permits and non-objections (see for example, sections 7 and 8). The Municipality of San Andrés is responsible for local permits.
Summarise the ESIA regulatory requirements	A full EIA was required.
List the key license conditions/voluntary commitments	Compensatory areas for biodiversity of 28 ha; fish restocking in the San Andrés River; fauna and flora rescue; monitoring
Total environmental and social costs in project development, including resettlement costs	USD 790,000
Description of the non-physical cultural heritage in the project area	The project area has been settled by farmers over many decades. Outmigration over the last decades because of significant disruptions from armed groups (related to coca cultivation and guerrilla warfare) has turned to net immigration because of hydroelectric

	development, especially the Ituango Project downstream. Because of population movements, local traditions are limited.
Other relevant information	

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>1.1 Assessment</b>		
Assessments of project environmental and social impacts	✓	An environmental assessment of alternatives was submitted to Corantioquia in 2014, a first full environmental impact assessment in 2017, and a second one in 2019. On that basis, Corantioquia granted an environmental license in 2019.
Assessments address:		
• project implementation	✓	The ESIA covers the implementation stage.
• project operation	✓	The ESIA covers the operation stage.
• associated facilities	✓	The ESIA covers an access road (subject to a license modification), borrow pits and disposal areas, and industrial areas. The transmission line will be subject to a separate ESIA.
• cumulative impacts	✓	Cumulative impacts are important because there are several other hydropower projects operating and under preparation in the San Andrés valley, as well as the major hydropower project Ituango downstream (the San Andrés River feeds into the Ituango reservoir). An assessment is not required by Corantioquia and no systematic review has been undertaken, but this is not a significant gap because 1) the EIA went beyond standard prescribed ToR by including a section on cumulative impacts (albeit incomplete and without mitigation measures identified), 2) Energo-Pro has started engaging with other hydropower developers in the valley, initially on social initiatives, 3) Energo-Pro is in negotiations to acquire and merge other projects in valley, with the intention to reduce cumulative impacts and coordinate operations.
• role and capacity of third parties	✓	The ESIA addresses roles and responsibilities for public agencies, but not their capacity. Project management is fully aware of capacity limitations that could cause delays in decision making.
• impacts associated with primary suppliers	✓	Aggregates will be supplied by the project's own borrow areas. Electromechanical equipment will be supplied by Energo-Pro from their own factories in Europe.
Assessments have been prepared using appropriate expertise	✓	The ESIA was prepared by a well-qualified Colombian consulting firm. It has been updated to address design changes in access road and a new bridge.
A baseline has been established and well-documented for the pre-project condition	✓	The ESIA contains adequate information on the physical, biological and socio-economic baseline situation.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
against which post-project changes can be compared		
Assessment of needs for water and energy services	✓	The project will not entail any significant water storage, and there is no significant demand for water downstream of the project. The ESIA does not address energy needs and only makes generic references to clean power generation. However, the project clearly contributes to Colombia's renewable energy and climate policies, and to increasing medium- and long-term power demand.
Assessment of options to meet water and energy needs	✓	Options to satisfy increasing power demand are evaluated in the government's periodic system expansion plan ( <i>Plan de Expansión de Referencia Generación Transmisión</i> ). Small hydropower projects such as Chorreritas are not assessed individually, but are generally considered compatible with these plans. The developer also submitted an environmental evaluation of alternative technical options for Chorreritas to the environmental regulator, and the current option was selected by the regulator for further preparation. The planning unit of the Ministry of Energy (UPME) also evaluated the project, declared it to be in the public interest, included it in the official register of projects under preparation, compared different transmission options, and provided a favourable opinion on the currently selected option (connection to Guárcama substation).
Assessment of national and regional policies and plans relevant to those needs	✓	See above. While the project documentation provides only superficial references to policies and plans, the project is clearly compatible with these.
Social and environmental considerations, including regulatory considerations, have been analysed at an early stage in preliminary project designs and options	✓	Environmental and social considerations have been taken into account for the location of the weir and powerhouse, the alignment and type of pressure pipe through a tunnel, the alignment of the access road, and the location of infrastructure such as camps, crushing plants and concrete plant.
<b>1.2 Management</b>		
Environmental and social management plans and processes have been developed	✓	Chapter 10 of the ESIA is dedicated to environmental and social management plans. More detailed management plans for construction will be required to be presented by contractors.  Environmental and social management is imbedded in Energo-Pro's organizational chart. An E&S team is being conformed. Energo-Pro will carry out environmental and social supervision directly thorough a permanent team on site, while implementation of the ESMP will be outsourced to a contractor.
Plans address project implementation	✓	Plans cover the implementation stage.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
Plans address project operation	✓	Plans cover the operation stage.
Plans have been prepared using appropriate expertise (internal and external)	✓	Plans are included in the ESIA and as mentioned above, the ESIA was prepared by qualified consultants.
Plans address all key social and environmental issues	✓	Plans cover all key environmental and social issues. Some minor gaps are covered in relevant sections of this report.
Plans address construction-related waste, noise, air quality, land disturbance and rehabilitation	✓	Management of construction activities is well addressed in the ESIA.
Environmental and social impact assessment and key associated management plans are publicly disclosed	✓	The environmental license is disclosed via Corantioquia’s webpage. See also section 10.
<b>1.3 Outcomes</b>		
Environmental and social plans avoid, minimise and mitigate negative impacts with no significant gaps	✓	Management plans cover all E&S issues, and mitigation measures are adequate. Some minor gaps are identified in this report. The project will be closely monitored by Corantioquia, including 6-monthly environmental compliance reporting during construction and annual reporting during operation, which will allow for adaptive management.
The strategic fit of the project with needs for water and energy services, and relevant policies and plans can be demonstrated	✓	The documentation does not specifically address the alignment of the project with national renewable energy needs, but it clearly fits into relevant policies and plans.
The final project siting and design has responded to environmental and social considerations	✓	There are several examples for E&S considerations having influenced siting and design decisions, such as (i) pressure pipe through a tunnel to minimize slope disturbances; (ii) the location of access road and bridge to minimize impacts on riparian vegetation and provide benefits to local communities; (iii) the location of work camp and crushing/concrete plants.
The project can pay for social and environmental plans and commitments	✓	There are no concerns of the ability of Energo-Pro to fund the E&S expenditures for a project of this size, with minor impacts (e.g. only one family to be resettled, and small land area disturbed).

**Summary of Findings**

Summary and other notable issues	List of significant gaps
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<p>The environmental and social impact assessment process has followed standard Colombian regulations and practices. Baseline information, impacts and management plans are adequately described for a project of this size and type of impacts.</p>	
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## 2 Labour and Working Conditions

Scope and Intent
This section addresses labour and working conditions, including employee and contractor opportunity, equity, diversity, health and safety. The intent is that workers are treated fairly and protected.

Background	
Labour requirements during implementation (full-time equivalent)	Approximately 200 low-skilled and 100 high-skilled workers
Labour requirements during operation (full-time equivalent)	Not yet estimated
Applicable key human resources regulations	The key legislation is the <i>Código Sustantivo de Trabajo</i> , which has undergone multiple modifications since its introduction in 1950.
Applicable key occupational health and safety (OH&S) regulations	A series of laws and decrees, most recently with the requirement for all companies to maintain a OH&S Management System ( <i>Sistema de Gestión de la Seguridad y Salud en el Trabajo, SG-SST</i> ) including an OH&S Committee between staff and management ( <i>Comité Paritario en Seguridad y Salud en el Trabajo, COPASST</i> )
Identify the regulator for labour law and OH&S	Ministry of Labour
Other relevant information	--

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
<b>2.1 Assessment</b>		
Assessment of human resource and labour management requirements	✓	<p>Energopro Colombia is run by a small but rapidly expanding team, including engineering and E&amp;S units. A new organization chart has recently been developed, in cooperation with the Human Resources unit of the holding company in the Czech Republic, and positions are being filled in expectation of the Chorreritas project entering the construction stage, and other projects in the pipeline.</p> <p>For construction, a rough estimate of labour requirements has been made, which will have to be detailed by contractors. Plans have been made to accommodate workers and Energopro staff in the nearby town of San Andrés de Cuerquia, following the successful example of the neighbouring hydropower project La Chorrera, which is close to entering into operation. It can be expected that a relatively large proportion of skilled and unskilled</p>



Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
		workers may be hired locally, who have previously worked on other hydropower projects in the area which are winding down, including the large Ituango project.
The assessment includes project occupational health and safety issues, risks, and management measures	✓	OH&S risks, working conditions, and other issues related to construction are also partially covered in the ESIA/ESMP. Issues such as safe transport of workers between the town and work sites have been discussed. More detailed assessments, down to the level of individual worksites (e.g. work in tunnels) will be prepared with contractors in due course.
<b>2.2 Management</b>		
Human resource and labour management policies, plans and processes have been developed for project implementation	✓	Energopro has a series of corporate policies at the group level that apply to labour issues, including a Human Resources Policy, OH&S Policy, a Whistle-blower Policy, Code of Conduct, and Human Rights Policy. All are available in Spanish, including the corporate website. All labour contracts with Energopro staff are permanent and direct, without intermediaries. There is an induction process for new staff. An OH&S Management System as required by regulations will be introduced shortly. Staff are covered by collective health insurance, and labour risk insurance (ARL). Other insurance policies (All Risk, Third Party Liability) will be taken out and among other risks, will also cover labour-related incidents (including those potentially related to public safety issues in the project area). This is particularly relevant, as there have been incidents with armed groups threatening workers at hydropower projects in the San Andrés valley.
Human resource and labour management policies, plans and processes have been developed for project operation	✓	Similar processes will be maintained during operations.
These plans cover all labour management planning components, including those of contractors, subcontractors, and intermediaries	✓	Energopro will take labour practices into account in the selection of and in the contractual requirements for contractors and in the supply chain, and will supervise correct labour contracts and payments to workers and social security by contractors. Contractors will have to present labour-related plans to Energopro and have these approved. Every contractor is also required to have its own OH&S lead and management system (and these will be harmonized to allow exchange of data and analysis of risks and trends), and medical evacuation plan. Worker health exams will be required at hiring, annually, and at termination. Contractors will be required to maintain insurance, including ARL. The Ministry of Labour's regional offices and the ARL insurer may undertake inspections of documentation and of work sites, respectively.

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>2.3 Outcomes</b>		
There are no identified inconsistencies of labour management policies, plans and practices with internationally recognised labour rights	✓	Colombia has ratified all 8 fundamental ILO Conventions, and the Colombian regulations as well as Energo-Pro’s policies and plans are protective of workers. Workers have the right to collective bargaining although in practice, trade unions have been relatively weak in Colombia’s construction sector.

**Summary of Findings**

Summary and other notable issues	List of significant gaps
There are no indications for any gaps regarding labour and working conditions. While Energo-Pro Colombia is a new company with no previous experience of managing large labour forces, it will benefit from the group’s experience and policies, backed up by a relatively robust regulatory system.	



### 3 Water Quality and Sediments

<b>Scope and Intent</b>	
This section addresses the management of water quality, erosion and sedimentation issues associated with the project. The intent is that water quality in the vicinity of the project is not adversely impacted by project activities, and that erosion and sedimentation caused by the project are managed responsibly and do not present problems with respect to other social, environmental and economic objectives.	
<b>Background</b>	
<b>Sedimentology</b>	
Key sediment issues	Very steep watershed but with vegetation cover in steepest parts. Steep slopes prone to landslides. Aggregates will be extracted from the project’s own quarries which have been licensed by Corantioquia.
Sediment load (tonnes/year)	Sediment loads have been estimated at 35 kT/year.
Catchment area at the dam	The catchment above the intake has an area of 261.6 km <sup>2</sup> , with a mean slope of 12.12%, from 3100 masl to 1000 masl at the intake.
<b>Water Quality</b>	
Description of water quality	Generally good water quality.
Key water quality issues	Wastewater discharges from San Andrés town and run-off from cattle ranching upstream are the main sources of pollution.
Main influences on water quality	The San Andrés River is a mountain river with good assimilation capacity due to high velocities and aeration.
<b>Other information</b>	
The weir in front of the intake does not create enough retention time to trap suspended sediments. Only around 0.51 Kt/year are expected to be retained in the headpond, and need to be removed by flushing or mechanically.	

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>3.1 Assessment</b>		
Erosion and sedimentation issues assessment	✓	The ESIA includes an extensive, yet empirical assessment of sediments, erosion and geohazards.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
An understanding of the sediment load and dynamics for the affected river system	✓	A preliminary understanding has been achieved through some measurements and the application of empirical models. Sediment loads are likely to be highly variable, related to upstream floods and landslides. The fact that measurements have been limited is not considered a significant gap as these might in any case, not be representative. There is no significant pondage and sediment trapping at the weir will be very low. Sediments can be flushed and some mechanical removal might be necessary in case of accumulation of rocks near the weir.
Identification of erosion/ sedimentation impacts that may be caused by the project	✓	Moderate erosion and sedimentation impacts are expected from construction of the project, especially from construction sites associated with the access road, the tunnel for the pressure pipe, the weir across the river, and the powerhouse. While the transmission line will be built on steep slopes, there is no need for access roads.
Identification of erosion/ sedimentation issues that may impact on the project	✓	The feasibility study and the ESIA include assessments of geohazards for the headworks, pressure pipe and powerhouse. There are no relevant risks of creating rockfall and landslides during the construction of the project.
Water quality issues assessment	✓	Baseline studies in the ESIA include water quality sampling, with different parameters, and biological water quality surveys. Data has not been analysed for seasonal variations, trends, etc. but this is acceptable as: (i) there are limited pollution sources in the catchment area; (ii) most water from domestic sources is not taken from the river but from tributaries; (iii) the reduced flows in the bypass reach will not increase the concentration of pollutants and there are no identified water users in that reach; (iv) the pondage created by the weir will not modify water quality; and (v) the river has an excellent self-cleaning capacity.
<b>3.2 Management</b>		
Plans and processes to address identified erosion and sedimentation issues have been developed for project implementation	✓	Adequate mitigation measures such as sediment traps to reduce run-off from construction areas are proposed in the ESIA. Spoil materials from excavations (tunnels, slopes) will be re-used or disposed in licensed and well-engineered disposal sites. The portals of the tunnel will be stabilized through structural and non-structural measures.
Plans and processes to address identified erosion and sedimentation issues have been developed for project operation	✓	The desander will be flushed regularly depending on actual accumulation of materials. Some mechanical removal is expected to be implemented for the removal of rocks and debris above the weir.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
Plans and processes to address identified water quality issues have been developed for project implementation	✓	Adequate mitigation measures will be implemented during construction of the project components that are located within and close to the river, including the headworks, bridge, and powerhouse. The ESMP also covers adequate management of the work camp, crushing plants and concrete mixing plant, including handling of oils and other hazardous materials.
Plans and processes to address identified water quality issues have been developed for project operation	✓	Other than standard mitigation measures (appropriate handling and storage of chemicals for instance), no specific pollution control measures are necessary. No water quality measures are required for the pondage area.
<b>3.3 Outcomes</b>		
Plans avoid, minimise and mitigate erosion and sedimentation issues arising from project activities with no significant gaps	✓	Given the small footprint (5.5 ha) of the project, standard measures to reduce erosion impacts during construction are considered adequate. Some sediments will be temporarily trapped in the pondage and the desanding basin and therefore, some delay of sediment transport can be expected in the bypass stretch. Sediment concentrations during flushing will be higher than under natural conditions, but not higher than during some natural events. These changes are also unlikely to have significant impacts downstream as there are practically no river and water uses.
Plans avoid, minimise and mitigate erosion and sedimentation issues that may impact on the project with no significant gaps	✓	Slope stability at the portals of the tunnel and for the spoil deposits has been taken into consideration in the design. Sediment accumulation in the pondage will be very limited but regular flushing and mechanical removal will be necessary.
Plans avoid, minimise and mitigate negative water quality impacts arising from project activities with no significant gaps	✓	The project design – with limited pondage and retention time in the reservoir, adequate minimum flows in the by-pass reach, and mitigation measures for construction activities – minimizes potential water quality impacts.

**Summary of Findings**

Summary and other notable issues	List of significant gaps
The negative impacts of the project on erosion, sedimentation and water quality will be minor. The project will protect some land as part of its 1% investment plan and its compensation measures, and make transfers of funds during operation to government agencies for environmental improvements (see section 4), all of which should have positive impacts on erosion and water quality.	



## 4 Community Impacts and Infrastructure Safety

<b>Scope and Intent</b>	
<p>This section addresses impacts of the project on project-affected communities, including economic displacement, impacts on livelihoods and living standards, public health impacts, and impacts to rights, risks and opportunities of those affected by the project. This section also addresses project benefits and infrastructure safety during project preparation, implementation and operation. The intent is that livelihoods and living standards impacted by the project are improved relative to pre-project conditions for project-affected communities, and that life, property and community assets and resources are protected from the consequences of dam failure and other infrastructure safety risks. This section does not address particular subsets of the community, which are addressed in Sections 5 and 7. Other interested parties and groups are addressed in Section 10.</p>	
<b>Background</b>	
<b>Project-affected communities</b>	
<p>Description of project-affected communities and how they are affected (distinguish between directly affected vs economically displaced vs other affected communities and include number of people and households)</p>	<p>According to the 2018 census, the municipality of San Andrés de Cuerquia with an area of 177 km<sup>2</sup> in northern Antioquia had a total population of 7,235 inhabitants, with approximately 2,500 in the main town and the rest spread across a number of villages. In the ESIA, the area of influence of the Chorreritas project was defined as the urban area of San Andrés as well as the villages (<i>veredas</i>) of Santa Gertrudis, Lomagrande, Alto Seco, Cañaduzales, and El Roble. 190 people live close to project components. Parts of the population have been subject to previous displacement from armed conflicts and insecurity, and other infrastructure projects. The principal impacts are the loss of farmland, construction impacts, impacts on river uses, and additional employment and other economic activity.</p>
<p>Description of key public health issues</p>	<p>Most of the population in the area lives close to the paved main road 25AN, which has been significantly improved due to the construction of the Ituango hydropower project and allows access to public health facilities locally (in particular, the level 1 hospital in San Andrés) as well as in Medellín. There are no active health posts in the villages. Most of the 190 project neighbours are covered by the publicly subsidized health system.</p>
<p>Agencies relevant to land acquisition</p>	<p>The project has been declared to be in the public interest by the Ministry of Mines and Energy, which allows expropriation if a sales agreement cannot be negotiated. In projects of public interest, the value of the property is to be determined by specified entities; typically this is done by so-called '<i>lonjas</i>', which are non-profit associations of qualified real estate professionals.</p>

Agencies relevant to livelihood restoration and project benefits	Livelihood restoration for the few property owners affected by the project, will be done through the project directly (specifically, through the contractor for the ESMP). Project benefits will be managed by the project in conjunction with local authorities such as the municipality and the village development committees ( <i>'juntas de acción comunal'</i> ).
Agencies relevant to public health	The municipality administration includes a public health department.
<b>Infrastructure safety</b>	
Type of dam	Diversion weir
Dam height (m)	5.2 m
Probable maximum flood (m <sup>3</sup> /s)	Not estimated
Design flood (expressed as estimated flood with return period)	585.1 m <sup>3</sup> /s for 1-100-year flood
Spillway capacity (m <sup>3</sup> /s)	Weir with free overflow
Spillway height (masl)	Weir with free overflow
Headrace length (m)	Total (aboveground, upper tunnel, pressure shaft, lower tunnel) 2.6 km
Headrace width (m)	2.4-2.5 m
Headrace capacity (m <sup>3</sup> /s)	13.1 m <sup>3</sup> /s
Seismicity	Colombia is seismically active, and major earthquakes have occurred in Antioquia. While earthquake hazards in the region are considered intermediate/moderate, several fault lines have been identified close to the project.
Geology	Local geology is dominated by schists. The terrain is steep with some instable zones and landslides. There are few alluvial deposits in the narrow reach of the San Andrés River affected by the project. The valley opens up and sediments are deposited further downstream, before the river enters the Ituango reservoir.
Dam safety regulatory authorities	There are no specialised dam safety authorities in Colombia; project designs are part of the documents submitted to and approved by environmental authorities, such as Corantioquia.
Local presence/capacity of emergency services	Small volunteer fire department and police station in San Andrés de Cuerquia. The next larger and well-equipped emergency services are located at the Ituango dam, at a distance of 37 km.
Potential safety risks in this context	There are minor public safety risks of floods and geohazards related to the small headpond, the tunnel and other components of the Chorreritas project.
Degree of risk of dam failure and in what way	A failure of the weir is very unlikely; a flood that could not be handled by the free overflow weir would likely erode the riverbanks and damage the weir, but not lead to a complete and rapid failure.
Population at risk of dam break (locations, numbers)	There is no specific information on population exposure downstream. A review on Google Earth shows no buildings next to the river for the next ~ 10km.
Dam safety standards followed	Not available

Agencies relevant to dam safety	Local emergency services
Other infrastructure safety issues	Stability of slopes, traffic safety; electrical safety

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
<b>4.1 Assessment</b>		
An assessment of issues relating to project-affected communities	✓	<p>The ESIA provides a socio-economic baseline, evaluation of impacts, and mitigation programs. The main impacts discussed in this section include:</p> <ul style="list-style-type: none"> <li>• Loss of farmland: The project has to acquire approximately 10 ha for project components (i.e. within the area declared of public interest), consisting of (parts of) 7 properties. It also has to acquire additional land: through market transactions, for source water protection (1% investment plan, see below, approximately 80 ha) and for environmental compensation (28 ha). It also has to acquire rights-of-way across approximately 70 properties for the 16.9 km transmission line. Most of this land was previously used for agricultural purposes.</li> <li>• Construction impacts: The project will be built within a narrow corridor of ~ 4 km, including transport to spoil deposits. Much of the work will be underground and not noticeable from above. Construction will add to existing impacts (e.g. noise, air pollution) from the 25AN road.</li> <li>• Impacts on river uses: Along the bypass reach, there is occasional fishing and gold extraction (traditional gold panning by '<i>barequeros</i>'). There is likely to be some reduction in fish populations (see sections 6 and 11). Short sections directly at the intake and tailrace will be closed to public access for safety and security purposes, but the rest of the bypass reach should see improved access for <i>barequeros</i>, because of reduced flows. No impacts are expected downstream of the tailrace.</li> <li>• Additional employment and other economic activity: The project will provide some 300 jobs over the construction period, with preferential access for local people, and will inject additional funding into the local economy through purchases of land, goods and services.</li> <li>• Additional benefits: The project will fund some community development initiatives and during the operations period, a significant share of the municipal budget through royalties.</li> </ul>
This assessment utilised local knowledge	✓	The assessment is based on detailed surveys of local conditions.



Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
Public health issues assessment	✓	Public health issues are adequately assessed. No significant public health impacts are expected. There will be no camp but workers will continue to live in their homes or in rented accommodations in the town of San Andrés.
This assessment includes public health system capacities and access to health services	✓	While the assessment has not considered public health facilities in any detail, this is not considered a significant gap because the project is unlikely to lead to a net increase in use of public services, as (1) other hydropower projects in the area are winding down and workers will leave the area, (2) a significant share of workers in the project are going to be from the community, (3) the project will offer its own medical services to workers. Also, access to health services will be part of periodic surveys and tracked over time.
This assessment has considered health needs, issues and risks for different community groups	✓	These have been considered at an appropriate level of detail.
An assessment of opportunities to increase the development contribution of the project through additional benefits and/or benefit sharing strategies	✓	<p>As for any hydropower project in Colombia, there are significant regulatory benefit sharing requirements. Chorreritas will be required to invest 1% of its capital costs (approximately USD 397,000) in catchment protection measures. The plan was submitted and approved with the ESIA. 58% of the funds will be used to acquire ~ 80 ha of land strategically located to protect water sources; 36% for enrichment planting; and 6% for a hydrological station. Once in operation, Chorreritas will also be required to transfer 6% of its annual revenues to Corantioquia and to the municipality, for use in environmental improvements including water and sanitation investments.</p> <p>A number of options for additional benefits have been considered during the elaboration of the ESIA/ESMP and afterwards, by Energo-Pro (see below under Management). The project infrastructure will also provide some benefits to those families who live on the right bank of the river near the intake, and will be able to use the new vehicle bridge over the San Andrés River.</p>
The pre-project baseline against which delivery of benefits can be evaluated post-project is well-documented	✓	The baseline has been well documented, and some of the monitoring plans described in the ESMP will start with additional baseline surveys.
An assessment of dam and other infrastructure safety risks during project preparation, construction, and operation	✓	The stability of slopes (natural and of spoil deposits) in case of earthquakes and heavy rains was the main safety concern of the Feasibility Study. Construction traffic will use public roads, in particular the 25AN, but will be minor compared to construction traffic caused by previous project and to general traffic. Risks associated with the cofferdam, diversion weir and headpond are not assessed in the ESIA, but have been considered during design and

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
		<p>found to be negligible. The headpond volume at FSL is 15,200 m<sup>3</sup>. The weir has an inherently safe design even in case of substantial floods, and there are no significant buildings or infrastructure near the river for several km downstream.</p> <p>The project’s risk management plan (see below under Management) addresses a number of exogenous risks (earthquake, floods, mass movements, disturbances of public order) and endogenous risks (work accidents, spills, fire/explosion, operational or structural failure of weir and spillway, flood caused by construction stage failure, tunnel collapse, failure of spoil deposits). Several of these are primarily assessed in terms of their impact on project workers and project infrastructure, and would have little impact on public safety.</p>
This assessment was conducted using appropriate expertise	✓	The project used engineering expertise appropriate for this type of infrastructure. Designers are registered with the <i>Consejo Profesional Nacional de Ingeniería</i> .
<b>4.2 Management</b>		
Management plans and processes for issues that affect project-affected communities have been developed	✓	<p>Land acquisition for properties needed for construction of the hydropower project follows the principle of market value, established through an independent entity. Compensation can be in cash or kind, following the preferences of the seller. In-kind compensation can be for the land and buildings itself (in some cases, see e.g., section 5), and for other improvements (such as driveways, crops, etc) in all other cases. There have been some disagreements with landowners about the criteria used, as they did not follow the example of the previous large infrastructure project affecting the same area (the improvement of the 25AN road to Ituango), which did not differentiate as much by the specific value of individual properties (e.g. on steep slopes) and paid more in some cases. However, the process followed by the property assessors for Chorreritas appears reasonable.</p> <p>None of the areas that will be required for construction is used intensively for agriculture or for other purposes, and all of them will affect only a part of the properties, hence livelihood restoration is not required (with the exception of the family to be resettled, see section 5).</p> <p>Land acquisition for other components has not been concluded, because (1) the alignment of the transmission line is yet to be decided and approved, (2) the cost of the project and hence the value under the 1% plan is not yet known, and (3) appropriate land for the compensation plan is yet to be identified.</p> <p>Public and private assets that are damaged by construction will be repaired or replaced.</p>

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
		<p>Multiple other plans and processes to mitigate other impacts from construction and operation will be relevant for communities, and are described in other sections.</p> <p>Residual impacts that are diffuse, uncertain and/or small will generally be compensated through project benefits (see below).</p>
These plans and processes include monitoring procedures, utilising local expertise when available	✓	There are monitoring protocols associated with every management plan, often in association with local public entities and communities.
If there are formal agreements with project-affected communities, these are publicly disclosed	✓	General commitments to community impact management and compensation are disclosed through the ESIA/ESMP. Contracts to purchase land with individuals will remain private.
Plans and processes to address identified public health issues have been developed for project implementation	✓	A number of plans with relevance for public health are described in the ESIA/ESMP, including (1) hazardous waste handling, (2) availability of snake bite treatments, (3) health education for local young people, with a focus on sexuality and drugs, (4) signage and barriers around construction sites. In addition, occupational health measures will have positive public health impacts because many workers will be part of the community and health exams, protocols (e.g. against the spread of diseases such as Covid-19) and a Code of Conduct will be implemented.
Plans and processes to address identified public health issues have been developed for project operation	✓	Some of the measures will extend into the operation stage. At this point in time, there is no need to anticipate specific public health measures for that stage.
Project benefit plans and processes have been developed for project implementation that incorporate additional benefit or benefit sharing commitments	✓	Plans include (1) the 1% investment plan and land compensation plan, which will benefit sellers of land and improve local land protection, (2) initiatives for institutional strengthening of the municipality (in preparation for receiving significant additional funds during operation) and other local actors, (3) local employment preferences (with a target of 80% of semi-skilled and non-skilled labour), training (with a target of 70% of local young people) and productive projects, (4) a program of social infrastructure to be defined with and for each of the <i>veredas</i> around the project, (5) construction of vehicle bridge and access road, which will significantly simplify access for some local families, including disabled people.
Project benefit plans and processes have been developed for project operation that	✓	Local employment and other benefits will continue on a minor scale during operation. The main benefit will be the transfer of 6% of revenues, the use of which will be decided by recipient agencies, as part of their regular planning and budgeting process. San Andrés

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
incorporate additional benefit or benefit sharing commitments		municipality will benefit significantly, as it will receive transfers from several hydropower projects, including a share of the transfers from the large Ituango project downstream.
Commitments to project benefits are publicly disclosed	✓	These commitments are publicly disclosed through the ESIA/ESMP, general knowledge about benefits provided as regulatory requirements, and the specific planning for use of funds by public agencies. Additionally, there will be individual agreements with communities for specific projects.
Dam and other infrastructure safety management plans and processes have been developed for project implementation	✓	All works including spoil deposits have been designed to comply with Colombian norms for earthquake resistance ( <i>'Reglamento Colombiano de Construcción Sismo Resistente'</i> ). The weir has been designed
Dam and other infrastructure safety management plans and processes have been developed for project operation	✓	Instrumentation will be installed to monitor the weir and the slopes around it and in other sensitive areas. Any erosion around the headpond and downstream will also be monitored and repaired where necessary. The ESMP contains a Risk Management Plan.
These plans have been developed in conjunction with relevant regulatory and local authorities	✓	The project designers and owners are technically and legally responsible. Corantioquia approved the plans, and there has been initial coordination with local emergency services.
Plans provide for communication of public safety measures	✓	Signage and fencing will be provided, e.g. to maintain an appropriate distance from the headworks. The emergency response plan includes coordination with public emergency services.
Emergency response plans include awareness and training programs and emergency response simulations	✓	An emergency committee is responsible to coordinate evacuation, first aid and fire units before, during and after emergencies. At least one simulation is planned per year.
Dam safety is independently reviewed	✓	Project design, operations, and emergency preparedness and response plans were reviewed by Corantioquia.
<b>4.3 Outcomes</b>		
Plans provide for livelihoods and living standards impacted by the project to be improved	✓	No significant negative impacts on livelihoods and living standards have been identified. It is highly likely that almost all project neighbours will see some improvements in livelihoods and living standards.
Plans provide for economic displacement to be fairly compensated, preferably through provision of comparable goods, property or services	✓	A large majority if not all acquisition of land will follow the principle of willing seller-willing buyer. Only in case of (1) properties designated as required for this public interest project, (2) disagreements regarding compensation values, and (3) special cases such as death of a landowner and unresolved title issues, is there a fallback process of forced acquisition.

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
		Even in these cases, there is very limited displacement of livelihood activities, and compensation criteria have been fairly designed and applied.
Plans avoid, minimise and mitigate negative public health impacts arising from project activities with no significant gaps	✓	Plans for public health are comprehensive and adequate for a project of this size.
Plans deliver benefits for communities affected by the project	✓	Plans will deliver significant and sustained benefits for local communities.
Plans avoid, minimise and mitigate safety risks with no significant gaps	✓	Project for public safety plans are comprehensive and adequate for a project of this size.

**Summary of Findings**

Summary and other notable issues	List of significant gaps
<p>The project will affect fewer than 200 neighbours across all its components, as well as other residents in the San Andrés valley who may sell land, goods or services to the project, work in the project, or benefit from various community development initiatives as well as royalty payments. Many impacts will be transitory. No major community health and safety impacts are expected. All social management plans are adequate for a project of this size and level of impacts.</p>	



## 5 Resettlement

<b>Scope and Intent</b>
This section addresses physical displacement arising from the hydropower project development. The intent is that the dignity and human rights of those physically displaced are respected; that these matters are dealt with in a fair and equitable manner; and that livelihoods and standards of living for resettles and host communities are improved. This section does not address those that are only economically displaced, who are addressed in Section 4.

<b>Background</b>	
Does the project require or result in any physical displacement of people? Please state the evidence on which this determination is made.	
Yes, this section is relevant	One family will need to be resettled as the land where their home is located, is the only available flat area that can be used as an industrial zone for offices, workshops, concrete plant etc., near the intake.
No, this section is not relevant	

Description of physically displaced communities and how they are displaced (distinguish between permanently vs temporarily and include number of people and households)	The property to be acquired belongs to a larger family, with most members residing in Medellín. One of the co-owners and his family (a total of 5 people) was displaced from the area because of a lack of public order and security, and later returned from Medellín to farm and live permanently in one of the two homes on the property. Other family members visit only temporarily. The total property has 24 ha, but only the flat area where the homes are located (~10%) needs to be acquired. Resettlement within the property is difficult because of a lack of access to water and flat areas to build on.
Name and number of settlements	See above
Agencies relevant to land acquisition	See section 4
Agencies relevant to livelihood restoration	See section 4
Other relevant information	There has been previous displacement in the area, both from violent conflict and from other infrastructure projects such as the improvement of the 25AN road to Ituango, by EPM.

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>5.1 Assessment</b>		

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
An assessment of the resettlement implications of the project has been undertaken early in the project preparation stage	✓	The technical design of the project has considered various alternatives for the placement of the industrial area. The resettlement implications were identified early, and are addressed in detail in the ESIA.
This has established the socio-economic baseline for resettlement for potential resettles and host communities	✓	The family's socio-economic conditions have been documented.
This has included an economic assessment of required resettlement including ongoing costs for improvement in living standards	✓	According to the current state of negotiations, the family will receive approximately 5% (or USD 2,600) of the compensation value for the part of the property to be acquired, in line with their ownership share. Additionally, the value of the replacement house will be approximately USD 26,000, and there will be assistance for livelihood restoration.
<b>5.2 Management</b>		
A Resettlement Action Plan and associated processes have been developed for project implementation	✓	A resettlement plan is included in the ESIA/ESMP (PMA-SOC-08). It is the family's decision where they want to resettle; the project will then support the implementation of that decision. The municipality and in particular, its ombudsman are involved. The family has been offered legal assistance. It will be accompanied and supported in its process of re-establishing its livelihoods in a new location.
A Resettlement Action Plan and associated processes have been developed for project operation	✓	There is no need to develop a plan for the operation stage. No further need for resettlement is anticipated.
The RAP and associated processes have been developed in a timely manner	✓	The ESIA/ESMP has been available for several years, but the detailed consultations and negotiations have not yet been concluded (see the significant gap listed under section 10), as the head of the household is reluctant to move from his ancestral land.
The RAP or associated processes include:		
• up-to-date socio-economic baseline	✓	Yes, as described above.
• compensation framework	✓	The same framework as for other real estate acquisitions will be applied (see section 4).
• grievance mechanisms	✓	The family is in direct communication with project representatives, and also has the option of raising formal grievances with the project or through other channels.
• monitoring procedures	✓	Monitoring will be undertaken to check that livelihoods and living conditions are improved.
Formal agreements with resettles and host communities are publicly disclosed	✓	While the ESIA/ESMP (which includes resettlement objectives and eligibility for compensation) is disclosed, the terms of the individual agreement with the family will be private, and only known to their advisors and the project.

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>5.3 Stakeholder Engagement</b>		
Engagement has been culturally appropriate	✓	There are no indications otherwise.
Resettlees and host communities have been involved in the decision-making around relevant options and issues	✓	The family will be able to decide for themselves, which resettlement option they prefer.
<b>5.4 Stakeholder Support</b>		
Resettlees and host communities generally support or have no major on-going opposition to the Resettlement Action Plan	✓	The family appears to generally accept the level of compensation and other support but is reluctant to leave because of attachment to the land.
<b>5.5 Outcomes</b>		
Plans provide for resettlement to be treated in a fair and equitable manner	✓	The family has been treated in a fair and equitable manner.
Resettlees and host communities will experience a timely improvement in livelihoods and living standards	✓	The move out of the current, more than 60 years old home into a new home will likely improve the material quality of life. Given the project's commitments and ability to support the family one-on-one, it is very likely that livelihoods and living standards will improve.

**Summary of Findings**

Summary and other notable issues	List of significant gaps
Only one family has to be resettled, which is not without issues as they have been previously displaced and are reluctant to move. However, there is an expectation that there will eventually be a willing buyer-willing seller resolution, and close support to the family during the resettlement and livelihoods restoration process.	





## 6 Biodiversity and Invasive Species

<b>Scope and Intent</b>	
<p>This section addresses ecosystem values, habitat and specific issues such as threatened species and fish passage in the catchment, reservoir and downstream areas, as well as potential impacts arising from pest and invasive species associated with the project. The intent is that there are healthy, functional and viable aquatic and terrestrial ecosystems in the project-affected area that are sustainable over the long-term, and that biodiversity impacts arising from project activities are managed responsibly.</p>	

<b>Background</b>	
Short description of the ecological region in the project area	The project is located in the western part of the Central Andes mountain range, around 1,200 masl in a transition zone between tropical dry forest to pre-mountain rain forest. Hillsides and mountain plateaus have been mainly converted to pastures for cattle ranching, but patches of native vegetation can be seen in deep ravines and on mountain peaks. Riverine forests along the San Andrés riverbanks are well preserved, especially in the Chorreritas area, and provide habitat for some native species that are protected in Colombia (epiphytes).
Protected areas (national parks and reserves etc) and their distance from the project	There are no national or regional protected areas near the project.
Critical habitats in the project area, including important bird areas, hotspots of endemism etc.	There are no critical habitats in the area of influence of the project. Some endemic species (both terrestrial and aquatic) are present in and along most streams of the Andes.
# threatened species in the directly affected area: terrestrial	Several species that occur in the area are included in CITES I such as the otter ( <i>Lutra longicaudus</i> ) and some felines such as the ocelot ( <i>Leopardus pardalis</i> ).
# threatened species: aquatic	The fish species identified in the San Andrés River are typical for Andean streams and are widely reported for the Magdalena and Cauca River watersheds. There are no endangered aquatic fauna species in the area.
Any other species of conservation importance	None
Migratory pathways	Andean fish species can move upstream the steep rivers, however the project does not appear to interfere with any migratory paths. Although the entire region is known as a migratory corridor for the jaguar and other felines, reports on sightings are very sporadic.
Invasive species: terrestrial	No known invasive species in the areas
Invasive species: aquatic	Trout has been introduced in the area (as well all throughout the Andean region of Colombia). Some trout and tilapia aquaculture ponds are located downstream from Chorreritas.

Key threats to biodiversity	Expansion of cattle ranching and uncontrolled deforestation for logging. There is a sawmill in the watershed.
Agencies involved in biodiversity conservation	Corantioquia
Other relevant information	

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>6.1 Assessment</b>		
Assessment of terrestrial biodiversity	✓	Terrestrial biodiversity has been assessed in the ESIA with extensive surveys and sampling by specialized biodiversity experts.
Assessment of aquatic biodiversity including passage of aquatic species and loss of connectivity to significant habitat	✓	Sampling and surveys also included aquatic biodiversity. Although no fish habitat assessment has been carried out, this is not considered a significant gap because of the wide distribution of the identified fish species in the watersheds of the Andean mountain ranges. Ecological flows will be maintained in the bypass stretch of the river. Although occasional fishing activities are reported by some local communities, there is no evidence of any large-scale captures. Most fish are caught for immediate consumption.
Assessment of risks of invasive species	✓	There is no assessment of invasive species. This is not considered significant given (i) the small footprint of the project, (ii) standard environmental management measures during construction, and (iii) the absence of known invasive species of concern in the area.
<b>6.2 Management</b>		
Plans and processes to address identified biodiversity issues have been developed for project implementation	✓	Many project components will be underground or on previously disturbed land, e.g. by the 25AN road. Standard mitigation measures will be applied for biodiversity, including fauna and flora rescue, relocation, and repopulation. Corantioquia’s license conditions have included additional measures, such as monitoring of bats, amphibians and reptiles; hatcheries for some aquatic species; and wildlife crossings. A biodiversity compensation program is required by Colombian law. For Chorreritas, this entails the preservation of about 30 ha of land that represent the types of vegetation that will be affected by the project. The purchase of this land is still ongoing.
Plans and processes to address identified biodiversity issues have been developed for project operation	✓	The main biodiversity issue during operation is related to the effectiveness of the minimum flows. However, the affected stretch is only ~3 km long, and flows downstream the powerhouse will be similar to natural flows.
<b>6.3 Outcomes</b>		

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
Plans avoid, minimise, mitigate and compensate negative biodiversity impacts arising from project activities with no significant gaps	✓	Adequate plans are in place for the implementation and operation phases of the project, and the overall impact on biodiversity will be limited. The environmental license also requires a series of biodiversity compensation programs that, if well implemented, will provide a value added or positive impact for biodiversity conservation in the watershed of the San Andrés River.

**Summary of Findings**

Summary and other notable issues	List of significant gaps
<p>Although the Andean mountains generally present high biodiversity values, the biodiversity of the San Andrés valley has been reduced by intensive human use (cattle ranching and agriculture), as well as legal and illegal logging. The project’s footprint and the loss of terrestrial biodiversity will be minimal, and impacts on aquatic species are also limited. The compensation programs required by the environmental license will provide some positive impacts on biodiversity.</p>	

## 7 Indigenous Peoples



Scope and Intent
<p>This section addresses the rights at risk and opportunities of Indigenous Peoples with respect to the project, recognising that as social groups with identities distinct from dominant groups in national societies, they are often the most marginalized and vulnerable segments of the population. The intent is that the project respects the dignity, human rights, aspirations, culture, lands, knowledge, practices and natural resource-based livelihoods of Indigenous Peoples in an ongoing manner throughout the project life.</p>

Background	
<p>Are any of the affected people Indigenous Peoples? Please state the evidence on which this determination is made.</p>	
Yes, this section is relevant	
No, this section is not relevant	<p>As one of the first countries in the world, Colombia ratified the ILO Convention 169 and implemented it into its national constitutional framework in 1991. The rights to free, prior and informed consultation and consent are legally protected. Indigenous, Afro-Colombian and other ethnic minority territories are recognized and registered in official databases. The Ministry of Interior confirmed in 2019 that no such territories are affected by the Chorreritas project.</p>



## 8 Cultural Heritage

Scope and Intent
<p>This section addresses cultural heritage, with specific reference to physical cultural resources, at risk of damage or loss by the hydropower project and associated infrastructure impacts (e.g. new roads, transmission lines). The intent is that physical cultural resources are identified, their importance is understood, and measures are in place to address those identified to be of high importance. This section does not address non-physical cultural resources, which are addressed in Section 1 and/or in Sections 5 and 7 when relevant.</p>

Background	
Does the project affect any physical cultural resources? Please state the evidence on which this determination is made.	
Yes, this section is relevant	
No, this section is not relevant	<p>The project area has no significant historic buildings or sites that are protected for their cultural heritage value; some historic buildings are located in the nearest town San Andrés but would not be affected.</p> <p>Some sections in the project area could have been settled by pre-historic populations, and the construction of other hydropower plants in the valley has yielded some ceramics and other archaeological remains. Such remains are typical for many construction projects in Colombia.</p> <p>In the case of Chorreritas, the <i>Instituto Colombiano de Antropología e Historia</i> (ICANH) authorized preventative archaeological surveys (which are a precondition for environmental licensing) in 2016 and approved the report in 2017. The surveys covered approximately 10 hectares, including potential spoil deposits and access roads, and were documented in great detail. Further communication with the ICANH occurred in 2021, when the project design had further advanced. A number of small ceramic fragments were recorded. A generic archaeological management plan is in place that includes access to archaeological expertise in case it is required, a chance find procedure with further excavation and rescue if archaeological material is identified, and awareness building for workers and local communities.</p>



## 9 Governance and Procurement

Scope and Intent
This section addresses corporate and external governance considerations for the project, and all project-related procurement including works, goods and services. The intent is that the developer has sound corporate business structures, policies and practices, and that procurement processes are equitable, transparent and accountable.

Background	
Key information on political context and public sector risks	On the World Bank's WGI indicators ( <a href="http://info.worldbank.org/governance/wgi/">http://info.worldbank.org/governance/wgi/</a> ) Colombia shows above-average scores, compared to the rest of Latin America, for Government Effectiveness and Regulatory Quality, but below-average (and partially declining) scores for other indicators. On Transparency International's CPI index, Colombia is ranked 87th. Colombia has suffered from many years of political instability and armed conflict.
Key information on corporate ownership and governance	Energo-Pro is a 28-year old, privately owned, independent power producer group with hydropower and distribution assets across Eastern Europe. The Colombian subsidiary is the first in Latin America, and Chorreritas will be the first project in Colombia. It will be structured as a special-purpose vehicle (Generadora Chorreritas SAS ESP).
Details of the concession, if applicable	The Chorreritas project obtained its environmental licence in 2019. Projects under 20 MW enjoy preferential market access. Connection to the grid has to be provided by the regional grid operator, in this case EPM, after technical and commercial analysis by the grid operator and UPME.
Key licensing or permitting requirements	Corantioquia issued the environmental licence with multiple additional conditions.
Key information on expected procurement strategy for this project (EPC, BOOT, etc)	The contracting strategy includes contracts for (1) tunnels and roads, (2) intake and powerhouse, (3) electromechanical equipment (from Litostroj, a subsidiary of the Energo-Pro group), (4) ESMP, and (5) the transmission line.
Other relevant information	The project region (northern Antioquia) has been among the most instable regions in Colombia, with significant coca production and trafficking, and competing armed groups.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
<b>9.1 Assessment</b>		
Assessments have been undertaken of the following through the project development cycle:		
• political and public sector governance issues	✓	Energo-Pro Colombia staff and consultants have a good understanding of the political and public sector governance situation in Colombia in general, and in the project region. The project has been able to obtain all required permits and approvals.
• corporate governance requirements and issues	✓	Corporate governance requirements are established by the Energo-Pro group, in combination with and partially customized for the specific regulatory context in Colombia.
• major supply needs, supply sources, relevant legislation and guidelines, supply chain risks and corruption risks	✓	A procurement strategy has been developed and tender documents are under preparation.
<b>9.2 Management</b>		
Processes are in place to manage the following:		
• corporate, political and public sector risks	✓	Energo-Pro has a total of 10 corporate policies, addressing a range of potential risks.
• compliance	✓	Compliance with license conditions and other regulatory requirements is ensured through the E&S team and external legal and other advisers, e.g. on land acquisition.
• social and environmental responsibility	✓	One of the corporate policies of Energo-Pro is an environmental, social and governance policy, and there is a group-level ESG committee and head of ESG. There is also a sustainability policy and a human rights policy, which recognizes the rights of resettlees, indigenous peoples and workers, environmental rights, and the right to a peaceful resolution of conflicts.
• grievance mechanisms	✓	The Code of Conduct requires all Energo-Pro staff to report community grievances. According to the Human Resources Policy, all sites must have an internal grievance mechanism in place.
• ethical business practices	✓	One of the corporate policies of Energo-Pro is a Code of Conduct, which emphasises ethical business practices. A specific anti-corruption and anti-money laundering policy is in place. There is also a whistleblower policy, to protect staff who report any violations.
• transparency	✓	A commitment to transparency is mentioned in several of the corporate policies. However, more could be done
Policies and processes are communicated internally and externally as appropriate	✓	Corporate policies are available for the general public in Spanish, through the website.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
Independent review mechanisms are utilised to address sustainability issues in cases of project capacity shortfalls, high sensitivity of particular issues, or the need for enhanced credibility	✓	No significant issues have been encountered in the project that would have required the use of independent review mechanisms. This sustainability assessment is seen by the Energo-Pro group as an opportunity to benchmark its performance both in Colombia and globally, to assist in building a sustainable project pipeline.
Procurement plans and processes have been developed for project implementation	✓	One of Energo-Pro's corporate policies is a procurement policy, which emphasizes alignment with ESG policies and the objective of maximizing local content, and is to be used in contractor selection (e.g. previous sustainability record) and contracting (e.g. confirmation of compliance with Energo-Pro policies). Procurement processes have been developed within the group, and are already being applied to the selection of the first contractors.
Procurement plans and processes have been developed for project operation	✓	While procurement processes will be the same as during implementation, there are no specific plans yet, which is normal at this stage of preparation.
<b>9.3 Conformance and Compliance</b>		
The project has no major non-compliances	✓	No non-compliances were raised by government agencies or apparent from the documentation.
Processes and objectives relating to procurement have been and are on track to be met with:		
• no major non-compliances	✓	There are no indications for non-compliances.
• no major non-conformances	✓	There are no indications for non-conformances.
Any procurement related commitments have been or are on track to be met	✓	There are no indications for commitments that are not on track.
<b>9.4 Outcomes</b>		
There are no significant unresolved corporate and external governance issues identified	✓	There are no indications for any unresolved corporate governance issues. Energo-Pro has raised a number of external governance issues, in some cases through business associations such as the <i>Cámara Colombiana de la Infraestructura</i> , among them (1) the 20 MW cut-off for generation projects with preferential market access, and (2) the responsibilities for grid interconnections. The first issue provides an incentive for developers to limit their project size to under 20 MW, which may represent an inefficient use of natural resources. This is apparent in the San Andrés valley, where a cascade of small projects probably has larger cumulative impacts and costs than fewer, integrated projects would. The second issue is related to the sharing of incentives and risks between



Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
		an IPP and a grid company. Energo-Pro depends on the regional grid company EPM to ensure a timely completion of transmission lines and substations on EPM’s side. While these are wider concerns, they are not currently considered to be significant gaps for the Chorreritas project.
Procurement of works, goods and services across major project components is:		
• equitable	✓	There are no indications otherwise.
• efficient	✓	There are no indications otherwise.
• transparent	✓	There are no indications otherwise.
• accountable	✓	There are no indications otherwise.
• ethical	✓	There are no indications otherwise.
• timely	✓	There are no indications otherwise.
Contracts are progressing or have been concluded within budget or changes on contracts are clearly justifiable	✓	There are no indications otherwise.

**Summary of Findings**

Summary and other notable issues	List of significant gaps
Energo-Pro has a modern corporate governance framework and to date, has not encountered any major external governance issues in the development of the Chorreritas project.	



## 10 Communications and Consultation

<b>Scope and Intent</b>
This section addresses the identification and engagement with project stakeholders, both within the company as well as between the company and external stakeholders (e.g. affected communities, governments, key institutions, partners, contractors, catchment residents, etc). The intent is that stakeholders are identified and engaged in the issues of interest to them, and communication and consultation processes establish a foundation for good stakeholder relations throughout the project life. Communications and consultation requirements unique to physically displaced communities and Indigenous Peoples are found in Sections 5 and 7, respectively.

<b>Background</b>	
Directly affected community-level stakeholders	See section 4. There are 190 direct neighbours of different project components, as well as other residents of the San Andrés de Cuerquia municipality who will be affected negatively or positively by the project, and their grassroots groups such as <i>juntas de acción comunal</i> .
Directly affected institutional-level stakeholders	Government agencies with different roles, including the municipality, Corantioquia, UPME; consulting companies that were contracted during preparation; EPM as the public company that improved the 25AN road next to the project and will have to provide the transmission connection; other hydropower developers in the San Andrés valley
Other relevant information	--

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>10.1 Assessment</b>		
Stakeholder mapping has been undertaken to identify and analyse stakeholders	✓	The ESIA contains a detailed description of stakeholders, and project staff have maintained a register of contacts. As a relatively small project, there are a limited number of stakeholders, and these are well known to project staff.
It establishes those that are directly affected	✓	See section 4
It establishes communication requirements and priorities	✓	A stakeholder database is planned that will cover such priorities.
<b>10.2 Management</b>		

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
Communications and consultation plans and processes have been developed at an early stage	✓	Plans and processes were implemented and further developed as part of the ESMP, and updated in 2021. They are primarily organized into a Communication and Participation Management Program, and an Environmental Education Program, as well as monitoring programs. They will include information on public safety, and management of the community impacts and benefits listed in section 4, through a variety of communication channels.
They outline communication and consultation needs and approaches for various stakeholder groups and topics	✓	The stakeholder database will contain communication approaches for each entry.
They are applicable to project preparation, implementation and operation	✓	While there were informal plans during preparation, these will be more formalized and systematic, and led by Energo-Pro's own staff during implementation and operation.
They include an appropriate grievance mechanism	✓	A grievance mechanism is described in the ESMP, and will be formalized before construction starts.
<b>10.3 Stakeholder Engagement</b>		
There has been engagement with the following groups, or on the following topics, or through the following processes, with directly affected stakeholders:		
<ul style="list-style-type: none"> <li>Project preparation, on topics of interest and relevance to directly affected stakeholders</li> </ul>	✓	The project has been prepared since approximately 2011 and in 2014, the Environmental Alternatives Analysis was submitted to Corantioquia. During this time, local stakeholders and government authorities have been engaged on multiple occasions.
<ul style="list-style-type: none"> <li>The business interacts with a range of directly affected stakeholders to understand issues of interest to them</li> </ul>	✓	See above
<ul style="list-style-type: none"> <li>Environmental and social impact assessment and management planning</li> </ul>	✓	See above
<ul style="list-style-type: none"> <li>Siting and design optimisation</li> </ul>	✓	See above
<ul style="list-style-type: none"> <li>Project benefits</li> </ul>	✓	See above, as well as section 4
<ul style="list-style-type: none"> <li>Project-affected communities</li> </ul>	✓	See above, as well as section 4
<ul style="list-style-type: none"> <li>Resettlees and host communities</li> </ul>	✓	There has been a direct and personal engagement with the family that is to be resettled.
<ul style="list-style-type: none"> <li>Assessment and planning for cultural heritage issues</li> </ul>		Not relevant
<ul style="list-style-type: none"> <li>Assessment and planning for public health, including health officials</li> </ul>	✓	See above, as well as section 4

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
• Downstream flow regimes	✓	See above, as well as section 11
• Plans for the management of climate risks	✓	See section 12
Engagement with directly affected stakeholders has been appropriately timed:		
• Project preparation, on topics of interest and relevance to them	✗	Engagement during the preparation of the project by the previous owner appears to have been as required by regulations (including formal public hearings during the environmental licensing process) and has included several, well documented meetings. However, engagement was not very proactive, and may have also been further reduced during the acquisition of the project by Energo-Pro. As a result, some communication that could have eased relationships with stakeholders and enabled the timely start of mitigation measures, has been delayed. This is a <b>significant gap</b> against good practice, which also affects the criteria below. For example, closer communication could have ensured that workers and the municipality are better prepared for employment opportunities. The project is now hiring a community liaison representative and establishing a permanent local presence to establish closer relations and catch up with the information requirements from local stakeholders, for example through a series of public meeting in early April. However, there is only a short window of time before construction is set to start.
• Environmental and social impact assessment and management planning	✗	See above
• Siting and design optimisation	✗	See above
• Project benefits	✗	See above
• Project-affected communities	✗	See above
• Resettlees and host communities	✗	The family that is to be resettled to make space for the industrial area near the intake, is still living in its home and the acquisition and resettlement terms are not finalized, although the beginning of construction is scheduled within the next months.
• Assessment and planning for cultural heritage issues		Not relevant
• Assessment and planning for public health	✗	See above
• Downstream flow regimes	✗	See above
Engagement with directly affected stakeholders has often been two-way:		
• Project preparation, on topics of interest and relevance to them	✓	There are no indications otherwise. Stakeholders mentioned that Energo-Pro was receptive to their inquiries and suggestions.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
• Environmental and social impact assessment and management planning	✓	There are no indications otherwise.
• Siting and design optimisation	✓	There are no indications otherwise.
• Project benefits	✓	There are no indications otherwise.
• Project-affected communities	✓	There are no indications otherwise. While there are complaints regarding compensation levels, the developer has aimed to be generous within the limits of the official valuation procedures.
• Resettlees and host communities	✓	There are no indications otherwise. There have been some accommodations, to ease the burden on the family that is to be resettled.
• Assessment and planning for cultural heritage issues		Not relevant
• Assessment and planning for public health	✓	There are no indications otherwise.
• Downstream flow regimes	✓	There are no indications otherwise.
Engagement is undertaken in good faith:		
• In general	✓	There are no indications otherwise.
Ongoing processes are in place for stakeholders to raise issues and get feedback:		
• In general	✓	Stakeholders reported that they have the contact information of Energo-Pro or consultant representatives and that they have had no problem getting feedback (although as stated above, this would have been easier with a stronger or earlier presence on site).
• Environmental and social impact assessment and management planning	✓	See above
• Siting and design optimisation	✓	See above
• Project benefits	✓	See above
• Project-affected communities	✓	See above
• Resettlees and host communities	✓	See above
• Indigenous Peoples		Not relevant
• Employees and contractors on human resources and labour management issues	✓	See section 2.
• Assessment and planning for cultural heritage issues		Not relevant
• Assessment and planning for public health	✓	See above
• Downstream flow regimes	✓	See above

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
Public disclosure:		
<ul style="list-style-type: none"> <li>the business makes significant project reports publicly available</li> </ul>	✓	The environmental license is published by Corantioquia. The underlying ESIA (which also contains a project description) and other official documents are available through government agencies or through Energo-Pro, upon request. Other information materials (printed and audio-visual) will be prepared for publication.
<ul style="list-style-type: none"> <li>the business publicly reports on project performance, in some sustainability areas</li> </ul>	✓	Information materials on project progress and compliance with the environmental and social obligations will be prepared for publication. There could be more substantive information provided e.g. through the corporate website, but this is not considered a significant gap, given the low level of public interest in this small, low-impact project.
<ul style="list-style-type: none"> <li>results of the assessment of strategic fit are publicly disclosed</li> </ul>	✓	The publicly available ESIA contains a very basic justification for the project (clean energy generation), and documents that it does not interfere with land use restrictions and municipal development plans. For a project such as Chorreritas, that is sufficient.
<ul style="list-style-type: none"> <li>power density calculations, estimated GHG emissions, and / or the results of a site-specific assessment have been publicly disclosed</li> </ul>	✓	While the power density has not been publicly disclosed, it is very high (see section 12) and could easily be calculated from the data in the publicly available ESIA, by any interested party.
<b>10.4 Stakeholder Support</b>		
Affected communities generally support or have no major ongoing opposition to the plans for the issues that specifically affect their community	✓	Affected communities generally have a good understanding of hydropower in general, from several other projects in the region. There is general support for the Chorreritas project, although other projects like the La Chorrera project directly upstream are seen critically by the community and have generated some scepticism, and some landowners disagree with the level of compensation payments offered by Energo-Pro (see section 4).
Directly affected stakeholder groups generally support or have no major ongoing opposition to the cultural heritage assessment, planning or implementation measures		Not relevant
<b>10.5 Conformance and Compliance</b>		
Processes and objectives relating to communications and consultation have been and are on track to be met with:		
<ul style="list-style-type: none"> <li>no major non-compliances</li> </ul>	✓	There are no indications for non-compliances.
<ul style="list-style-type: none"> <li>no major non-conformances</li> </ul>	✓	There are no indications for non-conformances.

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Any communications related commitments have been or are on track to be met	✓	There are no indications for any commitments that have not been met.

**Summary of Findings**

Summary and other notable issues	List of significant gaps
<p>There has been generally adequate engagement with stakeholders over the years. However, there was no permanent presence of project staff, or only indirect presence through consultants, which has resulted in intermittent communications. Some local stakeholders have developed grievances (e.g. over compensation payments) or have not been able to prepare for opportunities (e.g. employment and procurement) due to a lack of information.</p>	<ul style="list-style-type: none"> <li>● Communication with local communities has been delayed, which has led to a lack of information and some misunderstandings.</li> </ul>



## 11 Hydrological Resource

<b>Scope and Intent</b>	
This section addresses the hydrological resource availability and reliability to the project, reservoir planning and downstream flow regimes in relation to environmental, social and economic impacts and benefits. The intent is that the project's planned power generation takes into account hydrological resource availability and reliability in the short- and long-term, and that the reservoir and downstream flow regimes are planned and managed with an awareness of environmental, social and economic objectives.	

<b>Background</b>	
<b>Hydrology and flows</b>	
Average flow at dam (m <sup>3</sup> /s)	11.97 m <sup>3</sup> /s
Minimum monthly average flow (m <sup>3</sup> /s)	6.42 m <sup>3</sup> /s
Maximum monthly average flow (m <sup>3</sup> /s)	304.5 m <sup>3</sup> /s (for a 10-year return period)
Lowest observed flow (m <sup>3</sup> /s)	Not known
Highest observed flow (m <sup>3</sup> /s)	Not known
Design flow (m <sup>3</sup> /s)	13 m <sup>3</sup> /s
Affected river reaches (start/end and how affected)	~3 km between intake and powerhouse discharge, with no tributaries within that reach
Proposed downstream flow regimes for environmental or social objectives	Ecological flows will range from 1.74 m <sup>3</sup> /s in April to 2.78 m <sup>3</sup> /s in November
<b>Reservoir</b>	
Reservoir length (km)	Not known
Minimum operating level MOL (masl)	Level of minimum flow release canal at 1,025.20 masl
Normal operating level (masl)	Not known
Full supply level FSL (masl)	Spillway crest at 1,029.20 masl
Reservoir area at FSL (km <sup>2</sup> )	Not known (rough estimate at average depth of 2.5m: 0.6 ha)
Reservoir area at MOL (km <sup>2</sup> )	Not known
Volume at FSL (million m <sup>3</sup> )	15,200 m <sup>3</sup>
Volume at MOL (million m <sup>3</sup> )	Not known
Average retention time in days	20 minutes at average flows
Number of days for filling	20 minutes at average flows
<b>Other relevant information</b>	



Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>11.1 Assessment</b>		
Assessment of important considerations prior to and during reservoir filling	✓	The surface area of the headpond will be slightly larger than the previous river surface, which will affect some riparian vegetation; this has been taken into account in the assessment of impacts on terrestrial biodiversity.
Assessment of important considerations during reservoir operations	✓	The headpond will not be actively regulated except during sediment flushing when the radial gate of the bottom outlet is opened.
Assessment of flow regimes downstream of project infrastructure	✓	The impacts of flow regime changes in the ~3 km bypass reach have been assessed. No hydrological changes are expected downstream from the powerhouse discharge.
Flow regimes assessment includes all potentially affected river reaches	✓	The assessment covers the bypass reach of the river.
Flow regimes assessment includes identification of the flow ranges and variability to achieve different environmental, social and economic objectives	✓	The proposed environmental flows were determined based on methodologies accepted by the environmental agency Corantioquia. No important social uses of water are present on the bypass stretch of the river. Some sporadic fishing has been reported along the entire length of the river, but significant impacts on fish populations are not expected. The impacts of flow changes on artisanal gold mining ( <i>barequeo</i> ), in the last segments of the river before the Hidroituango Reservoir, have not been assessed but would be positive, since accessibility of river sediments is slightly increased.
Flow regimes assessment is based on relevant scientific and other information	✓	The proposed environmental flows were determined using quantitative information on 10 parameters including the length of the affected reach, chemical and biological water quality, pollution sources in the affected reach, biological integrity of fish and riparian vegetation, endangered or migratory species, periphyton diversity, modification of landscape, and water uses.
Assessment of hydrological resource availability	✓	Hydrological availability has been estimated.
Hydrological resource assessment has been undertaken utilising:		
• available data	✓	Sophisticated simulations of flows were carried out based on a series of rainfall data and transposition of flow measurements from 1982 to 2013, from the existing gauge on the San Andrés River.
• field measurements	✓	Some field measurements of river hydrological and hydraulic characteristics were carried out during the ESIA.
• appropriate statistical indicators	✓	A range of statistical parameters were calculated.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
<ul style="list-style-type: none"> <li>a hydrological model</li> </ul>	✓	Rainfall-runoff and transposition models were applied estimating concentration times based on vegetation cover in the watershed.
Issues which may impact on water availability or reliability have been identified and factored into the modelling	✓	There is no significant water abstraction upstream from the Chorreritas project. Future upstream hydroelectric projects will be run-of-river.
Hydrological resource assessment includes evaluation of scenarios, uncertainties and risks	✓	The hydrology section in the feasibility study did not include a systematic evaluation of risks. Corantioquia prepared a watershed plan for 2019-2029 ( <i>Plan de Ordenamiento del recurso Hídrico 2019 – 2029 para el Río San Andrés</i> ) that includes water availability assessment, water quality and the influence of El Niño and La Niña phenomena, concluding that these phenomena have no significant influence on flows in the San Andrés River.
<b>11.2 Management</b>		
Plans and processes for generation operations have been developed to ensure efficiency of water use	✓	Plans and processes for generation are very simple, as there is no active storage capacity. The plant has an estimated load factor of 66%. Per the Colombian regulatory framework, energy sales are assured as the installed capacity is less than 20 MW.
Plans and processes for generation operations are based on:		
<ul style="list-style-type: none"> <li>analysis of the hydrological resource availability</li> </ul>	✓	Chorreritas is a pure run-of-river project, directly based on expected inflows (see above).
<ul style="list-style-type: none"> <li>a range of technical considerations</li> </ul>	✓	The technical complexity of operations is very low, as the headpond is not actively managed and all inflows above the design flow of 13 m <sup>3</sup> /s are released into the bypass reach.
<ul style="list-style-type: none"> <li>an understanding of power system opportunities and constraints</li> </ul>	✓	The project developers have a good understanding of the power system in Colombia.
<ul style="list-style-type: none"> <li>social and environmental considerations including downstream flow regimes</li> </ul>	✓	An environmental flow regime has been defined for the bypass reach of the river. There are no significant social uses of water downstream of the intake.
Plans and processes to manage reservoir preparation and filling have been developed	✓	As no significant pondage is formed, there is no need for reservoir area preparation.
Plans and processes to manage reservoir operations have been developed	✓	There is no need for plans and processes, besides periodic reservoir flushing (see section 3).
Plans and processes for delivery of downstream flow regimes have been developed	✓	The minimum discharges will be released through a dedicated gate in the weir. There will be additional contributions in the bypass reach from seepage, the spillway, and flushing of the desander.
Downstream flow plans include:		

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
• flow objectives	✓	Flow objectives are focused on the wet perimeter in the bypass reach.
• magnitude, range and variability of the flow regimes	✓	The variation of the environmental flows between months has been defined. Additional variability will be provided by spills.
• locations at which flows will be verified	✓	The environmental license requires the measurement of flows of the San Andrés River at the intake and discharge. The project will have to install these gauges before initiation of operation.
• ongoing monitoring	✓	Two environmental flow objectives (fish populations and water quality) will be monitored during construction and operation.
Downstream flow plans, where formal commitments have been made, are publicly disclosed	✓	Plans for the minimum flow releases are included in the publicly available ESIA.
<b>11.3 Outcomes</b>		
Plans for downstream flows take into account environmental, social and economic objectives	✓	Minimum flows were determined by a multi-criteria methodology accepted by the environmental agency (Corantioqia) and are likely to provide an acceptable balance between objectives.
Where relevant, downstream flows take into account agreed transboundary objectives		Not relevant

### Summary of Findings

Summary and other notable issues	List of significant gaps
The Chorreritas project is a pure run-of river project, with no effective water storage and no hydrological variations downstream from the discharge of the powerhouse. The bypass reach will be maintained with an environmental flow regime.	



## 12 Climate Change Mitigation and Resilience

<b>Scope and Intent</b>	
<p>This section addresses the estimation and management of the project’s greenhouse gas (GHG) emissions, analysis and management of the risks of climate change for the project, and the project’s role in climate change adaptation. The intent is that the project’s GHG emissions are consistent with low carbon power generation, the project is resilient to the effects of climate change, and the project contributes to wider adaptation to climate change.</p>	
<b>Background</b>	
<b>Climate Change Mitigation</b>	
Capacity (MW) (or additional capacity in case of expansion/rehabilitation projects)	19.9 MW
Average reservoir area (representing area of flooded land, net of pre-impoundment water body) (km <sup>2</sup> ) (or additional reservoir area if any, for expansion/rehabilitation projects)	A small headpond with a (roughly estimated) area of 0.6 ha is formed by the project (see section 11).
Power density (W / m <sup>2</sup> )	Given the very small headpond, the power density would be very high (based on a surface area of 0.6 ha, more than 3,300).
Emissions intensity (gCO <sub>2</sub> e / kWh)	Not relevant
National and regional policies, plans and commitments relevant to mitigation	Colombia has low per capita CO <sub>2</sub> emissions of 1.61 tons/capita/year. A National Climate Change Policy was issued by the Environmental Ministry in 2020. Colombia has committed to reduce its greenhouse gas emissions by 20% by 2030, while another 10% cut could be achieved with international support.
<b>Climate Change Resilience</b>	
Hydrological data available for the project site and the basin, and observed climate trends	Flow data was generated by rainfall models and watershed transposition of flows based on adequate historic series. Flow data are available from one IDEAM gauge on the San Andrés River. No statistically significant trend for runoff was identified.
Regional and basin-level climate models relevant to the project location, if any	Predictions from global climate models for large watersheds such as the Magdalena-Cauca are available, for example, through the World Bank portal: <a href="https://climateknowledgeportal.worldbank.org">https://climateknowledgeportal.worldbank.org</a> . According to the latest assessment report from the International Panel on Climate Change (IPCC), precipitation is likely to increase for northwestern South America but to decrease over the Caribbean.
Any climate change predictions for the project location, and degree of consistency	Corantioquia has assessed the historic influence of El Niño and La Niña phenomena as not significant for the San Andrés River. Specific climate predictions for a mountain watershed of this small size are difficult and uncertain.

National policies, plans and commitments relevant to adaptation and resilience	A National Adaptation Plan of Colombia (PNACC) was established in 2014. A National Climate Change Policy was issued by the Environmental Ministry in 2020.
<b>Other relevant information</b>	

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<b>12.1 Assessment</b>		
<b>Climate Change Mitigation</b>		
For projects with a power density below 5 W/m <sup>2</sup> , net GHG emissions (gCO <sub>2</sub> e) of electricity generation have been estimated and independently verified	✓	Not applicable
For projects with a power density below 5 W/m <sup>2</sup> and estimated emissions are above 100 gCO <sub>2</sub> e/kWh, a site-specific assessment of GHG emissions has been undertaken	✓	Not applicable
An assessment of the project’s fit with national and/or regional policies and plans on mitigation has been undertaken	✓	There is no such assessment, similar to the lack of the assessment of strategic fit in section 1. However, given the negligible contribution from Chorreritas to GHG emissions, this is not considered a significant gap. The project will make a positive contribution through the displacement of more GHG-intensive sources of power.
<b>Climate Change Resilience</b>		
An assessment of the project’s resilience to climate change has been undertaken	✓	The ESIA or Feasibility Study do not contain any discussions of climate related impacts and risks. This is a gap, but it is not considered significant because (i) downscaling climate change models to mountain watersheds is particularly difficult, and there is little confidence in results; (ii) because of this, projects in such environments have to focus on being robust, i.e. being able to handle different, highly uncertain climate futures, and (iii) the design and operations of the Chorreritas project can be considered robust: the project has a high capacity factor, and only the weir/spillway will be exposed to floods.
The assessment:		
<ul style="list-style-type: none"> <li>incorporates an assessment of plausible climate change at the project site</li> </ul>	✓	See above
<ul style="list-style-type: none"> <li>identifies a range of climatological and hydrological conditions at the project site</li> </ul>	✓	See above

Requirement	Requirement is met: yes (✓) or no (✗)	Findings and Observations
<ul style="list-style-type: none"> <li>applies these conditions in a documented risk assessment or stress test</li> </ul>	✓	See above
The risk assessment or stress test encompasses:		
<ul style="list-style-type: none"> <li>dam safety</li> </ul>	✓	Not assessed, although climate change could lead to increase of peak flows and increase the risk of weir failure. However, as discussed in section 4, the weir is inherently safe, the amount of water stored is minimal, and the downstream exposure is also minimal.
<ul style="list-style-type: none"> <li>other infrastructural resilience</li> </ul>	✓	While the 25AN road, bridge over San Andrés River, powerhouse and other infrastructure components are located close to the river and could in principle be affected by increased floods, it is considered unlikely that such floods will be significantly outside the range of historic variability already considered in the design. If such floods would nevertheless occur, infrastructure could be repaired and/or adapted.
<ul style="list-style-type: none"> <li>environmental and social risks</li> </ul>	✓	Environmental and social impacts of the project are low and are unlikely to be significantly increased by climate change.
<ul style="list-style-type: none"> <li>power generation availability</li> </ul>	✓	Variations in availability have only been assessed in sensitivity analyses for the financial modelling. However, the project has a relatively high load factor and has no specific delivery obligations under the Colombian market regulations.
An assessment of the project’s potential adaptation services and fit with national and/or regional policies and plans for adaptation has been undertaken	✓	The project does not provide water storage and is not intended to provide adaptation services. The absence of such an assessment is not considered as a gap.
<b>12.2 Management</b>		
<b>Climate Change Mitigation</b>		
If GHG emissions estimates assume design and management measures, there are plans to put these measures in place	✓	Not applicable
<b>Climate Change Resilience</b>		
The project design is based on plausible climate change scenarios	✓	The project design is based on flows generated from precipitation data and transposition of flows from the existing gauge on the San Andrés River. No significant trends were detected. The project design can handle a plausible range of climate change scenarios. As determined by Corantioquia, El Niño and La Niña phenomena have limited influence on the San Andrés watershed.

Requirement	Requirement is met: yes (✓) or no (X)	Findings and Observations
Structural and operational measures are planned for design, implementation and operation phases to avoid or reduce the identified climate risks	✓	No specific climate risks have been identified and hence no measures are planned.
<b>12.3 Outcomes</b>		
<b>Climate Change Mitigation</b>		
The project's GHG emissions are demonstrated to be consistent with low carbon power generation	✓	Emissions from the small headpond will be negligible and quantities of carbon emitted during the construction stage will be very small, when compared to power generated over the lifetime of the project.
The fit of the project with national and regional policies and plans for mitigation can be demonstrated	✓	Although small, the project will make a significant contribution to reducing Colombia's GHG emissions.
<b>Climate Change Resilience</b>		
Plans will deliver a project that is resilient to climate change under a range of scenarios	✓	While resilience has not been formally documented, the project design with a relatively high load factor and low safety risks leaves a considerable margin for adaptation to changing climate and hydrological conditions.
The fit of the project with national and regional policies and plans for adaptation can be demonstrated	✓	The project makes no specific contributions to adaptation.

**Summary of Findings**

Summary and other notable issues	List of significant gaps
The Chorreritas project will make a significant positive impact to climate change mitigation by providing a very low-carbon source of power and displacing high-carbon energy sources such as firewood, diesel, gas and coal. There has been no systematic effort to understand the exposure, vulnerability and resilience of the project to future climate change, but the design of the project makes it fairly robust.	

## Appendix 1 – Interviews

Ref	Interviewee	Organisation	Date	Location
1	Jóse Antonio Hurtado	Corpoantioquia Regional Tahamies	2/17/22	Virtual meeting
2	Henry Saldarriaga			
3	Esneider Poveda			
4	Adriana Vanegas			
5	Francisco Naranjo			
6	Carolina Osorio Gómez	Endemica - Environmental Consultants	2/17/22	Energo-Pro Medellín
7	Sergio Gómez Echeverri	E&C Global - Environmental Consultants	2/18/22	Energo-Pro Medellín
8	Esteban Echeverry			
9	David Giraldo			
10	Anderson Laverde			
11	Mariana Zapata			
12	Robinson Muñoz	Landowners and neighbours of the project	2/18/22	Energo-Pro Medellín
13	Paula Cristina Atehortua Bran			
14	Juan Pablo Atehortua Bran	Espacio Geográfico- Legal and catastral engineer consultants	2/18/22	Virtual meeting
15	Maria Alejandra Gómez			
16	Luz Dary Rodriguez	Mayor and Municipal Administration	2/19/22	Town Hall San Andres de Cuerquí
17	Ana Carolina Carvajal Arroyave			
18	Alex Bernardo Morales			
19	Mariela Chavarria Mazo			
20	Juan Sebastian Sierra			
21	Gabriel Jaime Tamayo			
22	Marinela Chavarria			
23	Humberto Carmona			
24	Paulo Andrés López			
25	Monica Lopera	Junta de Acción Comunal (JAC) - Alto Seco	2/19/22	Alto Seco School
26	Luisa Chavarria	JAC - Santa Gertrudis		
27	Eliecer Arroyabe	JAC - Altoseco		
28	Gilberto Antonio Marin	JAC - Loma Grande		
29	Jhon Fredy Hernández	JAC - El Roble		
30	Fanny Gil	JAC - Cañaduzales		
31	Mario Fernández	Neighbour of the project from Santa Gertrudis	2/19/22	Alto Seco School



PCH Chorreritas

32	Julio Ernesto Fernández	Neighbour of the project from Santa Gertrudis		
33	Cesar Monsalve	Neighbour of the project from La Vega		
34	Juan Sebastián Velasquez	Construction Director Energo-Pro		Energo-Pro Medellín
35	Leonardo Perez	Country Manager Energo-Pro		Energo-Pro Medellín
36	Andrea Molina	Social Supervisor Energo-Pro	2/17/22	Energo-Pro Medellín
37	David Rave	Environmental Supervisor Energo-Pro	2/17/22	Energo-Pro Medellín
38	Carolina Serrano Gómez	Environmental and Social Manager Energo-Pro		Energo-Pro Medellín

## Appendix 2 – Documents

Ref	Author	Year	Title
1	Banco de Iniciativas Regionales para el Desarrollo de Antioquia-BIRD Antioquia	2011	Potencial Hidroeléctrico de Antioquia - Inventario, perspectivas y estrategias
2	Ingenierías Aliadas	2014	DIAGNÓSTICO AMBIENTAL DE ALTERNATIVAS - PROYECTO HIDROELECTRICO CHORRERITAS
3	Pi Epsilon	2018	PEQUEÑA CENTRAL HIDROELÉCTRICA CHORRERITAS: ESTUDIO DE FACTIBILIDAD
4	EYC GLOBAL S.A.S.	2019	ESTUDIO DE IMPACTO AMBIENTAL - HIDROELÉCTRICA CHORRERITAS
5	EYC GLOBAL S.A.S.	2019	RESPUESTA REQUERIMEINTOS CORANTIOQUIA ACTA No. 160TH-ACT-1908-3551 PARA EL ESTUDIO DE IMPACTO AMBIENTAL DE LA PEQUEÑA CENTRAL HIDROELÉCTRICA CHORRERITAS
6	MinInterior	2019	Certificado de Presencia o No de Comunidades Étnicas
7	Endémica	2021	Ajuste de PMA y PMS. PEQUEÑA CENTRAL HIDROELÉCTRICA CHORRERITAS
8	AUTORIDAD NACIONAL DE LICENCIAS AMBIENTALES - ANLA	2017	RESOLUCIÓN N° 01163 - "Por la cual se otorga Permiso de Estudio para la Recolección de Especímenes de Especies Silvestres de la Diversidad Biológica con Fines de Elaboración de Estudios Ambientales, y se toman otras determinaciones"
9	MinAgricultura – Unidad de Restitución de Tierras	2019	Respuesta a petición
10	Ingenierías Aliadas	2017	Solicitud de levantamiento parcial de veda de especies
11	MinAmbiente	2019	Resolución No 1299 – Levantamiento veda nacional
12	EYC GLOBAL S.A.S.	2019	Solicitud de levantamiento de veda regional
13	Corantioquia	2019	Resolución No 5914 – Levantamiento veda regional
14	EYC GLOBAL S.A.S.	2017	RESULTADOS PROSPECCIÓN ARQUEOLÓGICA
15	INSTITUTO COLOMBIANO DE ANTROPOLOGÍA E HISTORIA	2021	RESOLUCIÓN No. 1701 "Por la cual se aprueba y autoriza la implementación del Plan de Manejo Arqueológico para cuatro (4) polígonos específicos denominados Portal entrada ventana de construcción, Portal salida ventana de construcción, Vía de acceso captación y Vía de acceso casa de máquinas, del Proyecto PCH Chorreritas"
16	Corantioquia	2019	Resolución 160TH-RES1911- 6665 – Licencia ambiental
17	Endémica	2021	MODIFICACIÓN DE LICENCIA AMBIENTAL - PEQUEÑA CENTRAL HIDROELÉCTRICA CHORRERITAS
18	PHC SERVICIOS INTEGRADOS	2020	Estudio de conexión PCH Cañaduzal 19.9 MW y PCH Chorreritas 19.9 MW
19	UPME	2020	Concepto de Conexión - PCH's Cañaduzal 19.9 MW y Chorreritas 19.9 MW. Concepto de conexión de la subestación Guárcama 110 kV. Respuesta a radicado UPME No. 20201110022512 Cartas a EPM

20	UPME	2021	REGISTRO DE PROYECTOS DE GENERACIÓN. CESIÓN Y RENOVACIÓN REGISTRO FASE 2. PROYECTO PEQUEÑA CENTRAL HIDROELÉCTRICA CHORRERITAS. Carta a Energo-Pro
21	Ministerio de Minas e Energía	2020	Resolución 40313 “Por la cual se declara de utilidad pública e interés social el PROYECTO HIDROELÉCTRICO PCH CHORRERITAS, así como los terrenos necesarios para su construcción y protección y se dictan otras disposiciones.”
22	Energo-Pro	2021	Expediente Compra Predio Familia Fernandez Velez
23	Alcaldía Municipal de San Andrés de Cuerquia	2020	Plan de Desarrollo Territorial 2020-2023
24	Alcaldía Municipal de San Andrés de Cuerquia	2021	PLAN DE DESARROLLO 2020 – 2023 “YO AMO A CUERQUIA” INVERSIONES CON CARGO AL SISTEMA GENERAL DE REGALIAS
25	Corantioquia / Consorcio Tecniscain	2018	FORMULACIÓN DE PLANES DE ORDENAMIENTO DEL RECURSO HÍDRICO – PORH EN LOS RÍOS SAN ANDRÉS, ANORÍ Y TARAZÁ Contrato CN-1705-39 INFORME No. 2 FASE II DIAGNÓSTICO RÍO SAN ANDRÉS
26	Corantioquia / Consorcio Tecniscain	n.d.	PLAN DE ORDENAMIENTO DEL RECURSO HÍDRICO 2019 – 2029 PARA EL RÍO SAN ANDRÉS: RESUMEN EJECUTIVO
27	Esneider Ardila Poveda y Liseth Yamilt Garavito Rendón / Universidad de Antioquia	2020	Impactos acumulativos por la implementación de PCH's sobre la cuenca del rio San Andrés en el municipio de San Andrés de Cuerquia
28	Energo-Pro	n.d.	Políticas Corporativas en <a href="http://www.energo-pro.com/en/policies">http://www.energo-pro.com/en/policies</a>
29	ANLA	2017	Términos de Referencia para la Elaboración del Estudio de Impacto Ambiental – EIA – en Proyectos de Construcción y Operación de Centrales Generadoras de Energía Hidroeléctrica
30	UPME	2021	INFORME DE SEGUIMIENTO A LA EVALUACIÓN DEL POTENCIAL HIDROENERGÉTICO SUBDIRECCIÓN DE ENERGÍA ELÉCTRICA – GRUPO DE GENERACIÓN

### Appendix 3 – Photographs



Photo 1: San Andrés River upstream of San Andrés town



Photo 2: San Andrés de Cuerquia town plaza



Photo 3: San Andrés town hall



Photo 3: Meeting with San Andres mayor and municipal administration



Photo 5: EPM bulletin board in town hall

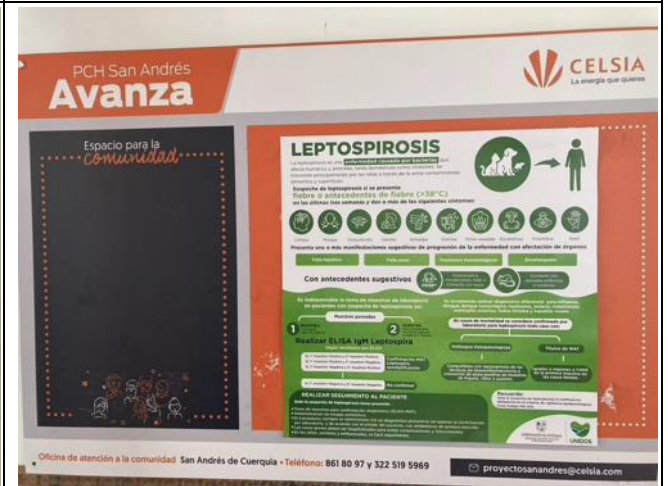


Photo 6: Celsia bulletin board in town hall



Photo 7: View from town down the San Andrés valley



Photo 8: Existing power lines 1



Photo 9: Existing power lines 2



Photo 10: Existing power lines 3



Photo 11: Hillsides on left bank with transmission lines



Photo 12: 25AN road bridge over San Andrés River at Alto Seco



Photo 13: Alto Seco school near 25AN bridge



Photo 14: Meeting with community representatives in Alto Seco school



Photo 15: Junction of 25AN with access road to La Chorrera powerhouse, upstream of Chorreritas



Photo 16: La Chorrera penstock and powerhouse



Photo 17: Cattle pastures on left bank 1

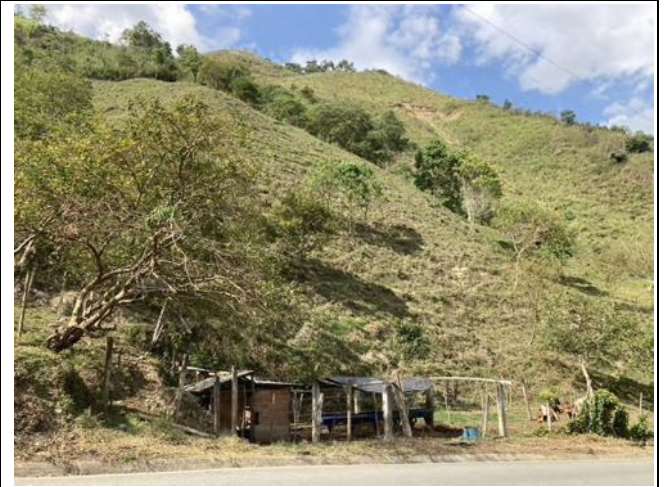


Photo 18: Cattle pastures on left bank 2



Photo 19: Upstream tributary at La Chorrera powerhouse



Photo 20: Path from La Chorrera powerhouse to Chorreritas intake site



Photo 21: Riparian vegetation near intake 1



Photo 22: Riparian vegetation near intake 2



Photo 23: Riparian vegetation near intake 3



Photo 24: Future site of desanding basin



Photo 25: San Andrés River near future intake



Photo 26: Sediment in San Andrés River



Photo 27: Meeting with direct neighbours on hillside above future bridges



Photo 28: Acquired house above future bridges



Photo 29: House of family to be resettled 1- left side



Photo 30: House of family to be resettled 2- right side





Photo 31: Riparian vegetation near intake 4



Photo 32: Fish tanks next to house of family to be resettled

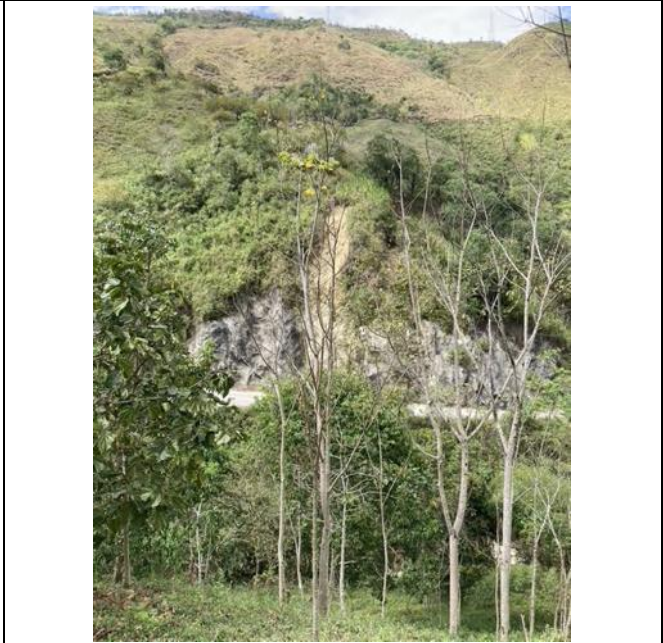


Photo 33: View from acquired house across river and road to future tunnel entrance



Photo 34: Slope above future tunnel entrance on left bank



Photo 35: 25AN road on left bank near future powerhouse



Photo 36: Storage sheds above future powerhouse, with unstable slopes above 25AN road

		
<p>Photo 37: View downstream from acquired house</p>	<p>Photo 38: Tributary Quebrada Honda with future powerhouse on right and tunnel access on left</p>	<p>Photo 39: Cattle ramp near future tunnel entrance; property to be acquired</p>
		
<p>Photo 40: Future powerhouse site, to the left of spoil deposit from road construction</p>	<p>Photo 41: San Andrés River downstream, between Chorreritas project and Ituango reservoir</p>	<p>Photo 42: Ituango reservoir downstream</p>