



**Hydropower
Sustainability
Standard**



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Sustainability
Standard**

GOLD

Project: **Jirau Hydropower Plant**

Stage: **Operation**

Date: **October 2023**

Assessment Report

Project Name: Jirau Hydropower Plant

Project Sponsor: Energia Sustentável Do Brasil S.A.

Report Authors: Joerg Hartmann, Antonio Fonseca, Margaret Trias, Vito Mandilovich

Report Date: June 20, 2023



Cover page photo: Aerial view of Jirau HPP (source: <https://www.jirauenergia.com.br/en/conheca-a-uhe/>)

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One Canada Square
Canary Wharf
London E14 5AA
United Kingdom
Email: sustainability@hydropower.org

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The findings in this report are based on an independent assessment conducted in compliance with the processes set out in the Hydropower Sustainability Assurance System.



A. Assessment Details

Project sponsor	Energia Sustentável Do Brasil S.A.
Assessor(s)	Joerg Hartmann (Sustainable Water & Energy LLC), Antonio Fonseca dos Santos (Kelowna Consultoria Ambiental e Sustentabilidade LTDA), Margaret Trias (M. Trias Consulting Inc.), Vito Mandilovich (EXP Consulting Consultoria)
Assessment objective	Assessing the ESG performance of Jirau Hydropower Plant through the Hydropower Sustainability Standard
Assessment dates	January 25 to February 3, 2023
Assessment report date	Final for publication: June 20, 2023
Prepared for	Energia Sustentável Do Brasil S.A.
Limitations of the assessment	<p>Because of logistical constraints, a number of relevant sites and stakeholders could not be visited and interviewed by the assessment team. Downstream of the Jirau hydropower plant to the city of Porto Velho, is the Santo Antônio hydropower plant and reservoir, and further downstream is the lower Madeira River. There were no interviews with Santo Antônio representatives or other downstream stakeholders, such as the communities receiving support from ESBR, see section 4. (However, the Santo Antonio project was previously assessed with the Hydropower Sustainability Assessment Protocol, see https://www.hydrosustainability.org/published-assessments/santo-antonio). There were also no direct interviews or site visits with indigenous communities receiving support from ESBR, only with FUNAI representatives. The transmission line between the Jirau plant and the Porto Velho substation, which runs alongside the BR 364 highway and crosses mostly agricultural land such as large cattle ranches, was not a focus of this assessment and subject of one only interview, with the environmental licensing agency, and none with landowners.</p> <p>However, the assessment team is confident that it received enough evidence on relations with these stakeholders.</p>

B. Project Details

Project name	Jirau Hydropower Plant
Country	Brazil
Location	Madeira River in the state of Rondônia, 120 km upstream of the capital Porto Velho
Purpose	Single-purpose power generation
Developer / Owner	Energia Sustentável Do Brasil S.A. (trading as Jirau Energia), owned by ENGIE (40%), Eletrobrás CGT Eletrosul (20%), Eletrobras Chesf (20%) and Mizha Participações S.A. (20%), a subsidiary of Mitsui & Co.
Financer(s)	BNDES (Brazilian national development bank) leading a consortium of Brazilian private and public banks; equity from joint venture partners
Installed capacity (MW)	3,750 MW (fourth-largest power plant in Brazil)
Construction start date (planned or actual)	2008
Commercial operations date (planned or actual)	2013 (first unit) – 2016 (last unit)
Annual average generation (GWh / year)	19,136 GWh
Associated infrastructure: road(s) (length)	About 12 km
Transmission lines and sub-stations (names, lengths and capacities)	Three 94 km 500 kV transmission lines to the Porto Velho substation
Total cost (USD m)	USD 8 billion
Annual operating costs (USD m)	N/A – not available
Project development cost not including transmission (USD m)	N/A – not available
Transmission costs for project development (USD m)	N/A – not available
Specific investment cost (USD m / MW)	N/A – not available
Levelised energy cost (USD / kWh)	N/A – not available
Dam type	Rock-fill embankment dam with an asphalt-concrete core, with concrete sections for the 2 power stations and spillway
Dam height (m)	62 m from foundation (53.5 m from river bed)
Dam length at crest (m)	Total length 6,400 m
Units (number, type, MW)	50 bulb Kaplan turbines, 75 MW each
Reservoir area at Full Supply Level (FSL) (km ²)	The reservoir is operated between 82.5 - 90 masl, with a maximum area of 361.6 km ²
Average net head at FSL (m)	15.2 m
Average flow (m ³ / s)	18,501 m ³ /s
Design flow (m ³ / s)	Power plants 27,500 m ³ /s; Dam 82,000 m ³ /s
Load factor	58%
Number of physically displaced households	488 households

Power density (W / m ²)	10.4
Emissions intensity (gCO ₂ e / kWh)	2.31 gCO ₂ e / kWh without reservoir emissions but including illegal land use change in the reservoir buffer zone. See section 12.
Contacts / website	https://www.jirauenergia.com.br



Figure 1 – Tail end of reservoir and upstream area (Google Earth image)



Figure 2 – Upper part of reservoir with National Park on left bank and Buffer Zone on right bank, with BR 364 highway running parallel to reservoir (Google Earth image)



Figure 3 – Lower part of reservoir with dam, Nova Mutum Paraná and Jaci-Paraná (Google Earth image)

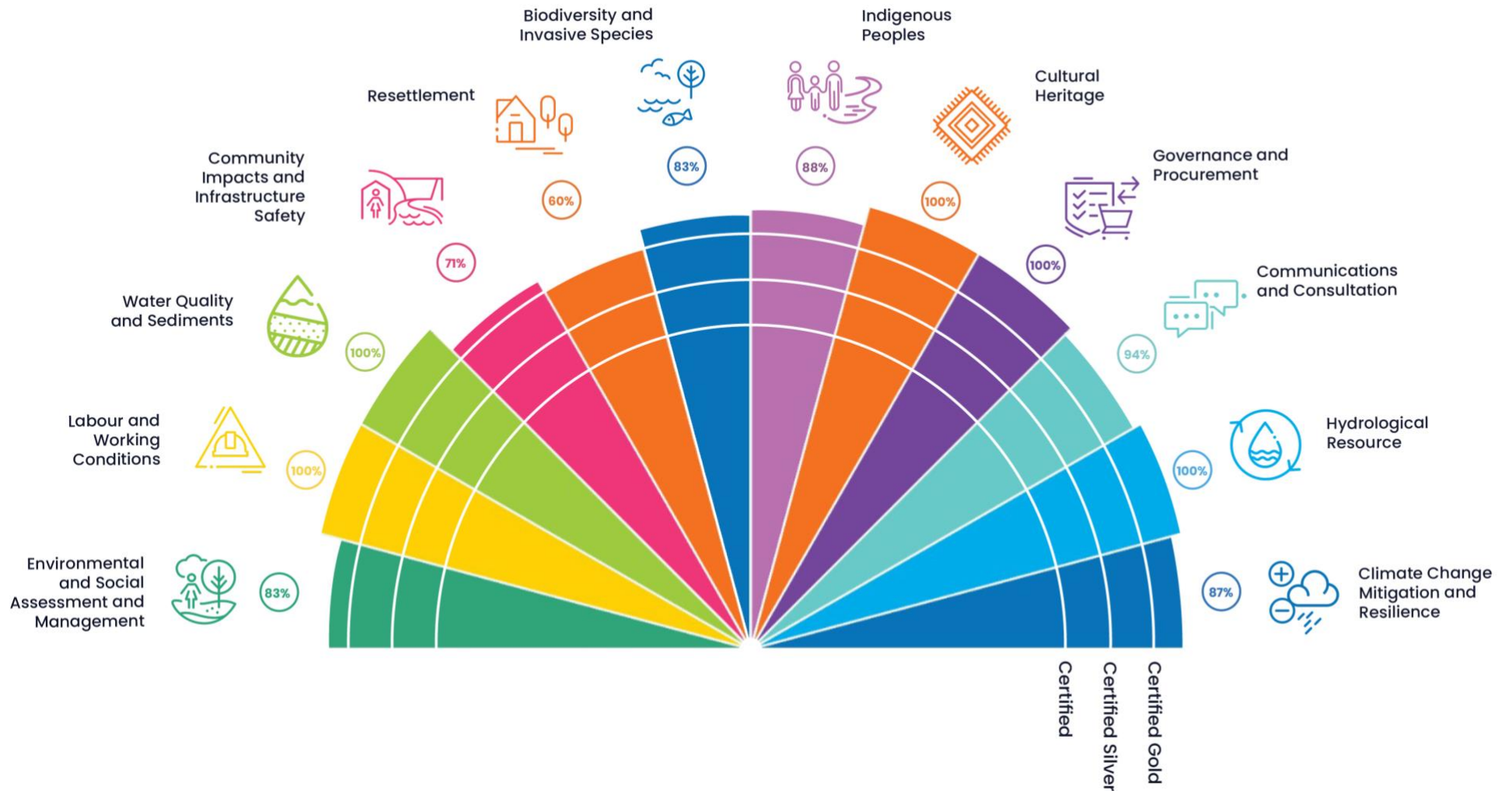


Figure 4 – Santo Antonio HPP and city of Porto Velho (Google Earth image)



Figure 5 – Aerial view of Nova Mutum Paraná, with BR 364 in foreground. Commercial and community areas in front, with 1,600 residential homes in back (source: <https://www.diariodaamazonia.com.br/quarta-maior-hidreletrica-do-pais-jirau-energia-se-destaque-pelas-iniciativas-sustentaveis/>)

C. Results diagram



D. Minimum Requirements

(Not included since there are no gaps against minimum requirements.)

E. Advanced Requirements

	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
TOTAL NUMBER OF REQUIREMENTS	6	5	11	21	5	6	8	5	6	16	16	15
NUMBER OF REQUIREMENTS MET	5	5	11	15	3	5	7	5	6	15	16	13
PERCENTAGE OF REQUIREMENTS MET	83%	100%	100%	71%	60%	83%	88%	100%	100%	94%	100%	87%
PROPOSED CERTIFICATION LEVEL	Gold											

Note:

- A project must meet all Minimum Requirements on all relevant sections to achieve HS Certified label.
- To receive the HS Silver label, projects must meet at least 30% of the Advanced Requirements on each relevant section.
- To receive the HS Gold label, projects must meet at least 60% of the Advanced Requirements on each relevant section.

1 Environmental and Social Assessment and Management



Scope and Principle	
<p>This section addresses the plans and processes for environmental and social issues management. The principle is that negative environmental and social impacts associated with the hydropower facility are managed; avoidance, minimisation, mitigation, compensation and enhancement measures are implemented; and environmental and social commitments are fulfilled.</p>	
Background	
Identify the main environmental and social issues during operation	<p>The main issues during operation relate to ongoing monitoring of E&S impacts in the project affected areas in line with the project’s operations license, rehabilitation of surrounding areas previously used during the construction phase, aquatic biodiversity impacts of operations and fish passage, upstream communities affected by flooding events, ongoing implementation of management, mitigation and compensation measures related to cultural heritage (archaeology and industrial railway), and cumulative impacts with the downstream Santo Antônio project..</p>
Identify the environmental regulator	<p>IBAMA - Brazilian Institute for Environment and Natural Resources: main regulator that issues the Operations Licences SEDAM - State Secretariat of Environmental Development of Rondônia: has recently taken over regulation of the transmission line portion of the project from SEMA (Municipal Secretariat of Environment, Porto Velho)</p>
Identify other regulators (e.g. on land, water use, Indigenous Peoples)	<p>ANA - National Water and Sanitation Agency FUNAI - National Foundation for Indigenous Peoples Regulators involved in land acquisition: IBAMA, Ministério Público, INCRA</p>
Summarise the ESIA regulatory requirements	<p>One EIA for both the Jirau HPP and Santo Antônio HPP was submitted to IBAMA in 2005 and two separate tenders were issued for the development of the projects. In 2007, a Preliminary License was issued for the project which included 33 E&S requirements. A Preliminary Installation License for the construction of the project was issued in 2008 and eventually the PBA included 33 programmes. In 2012, the project was granted an Operational License by IBAMA. The current Operational PBA has 29 E&S programmes with their respective sub-programmes.</p>
Describe the non-physical cultural heritage in the project area	<p>The project area has a long tradition of riverine settlements, with a history of resource extraction including rubber tapping; artisanal fishing and gold mining (<i>garimpo</i>) is still practiced in the river/reservoir upstream and downstream from the project.</p>
Other relevant information	<p>The financing consortium, led by BNDES provided a technical assistance loan for voluntary social investments not included in the Jirau’s PBA or license conditions, in the amount of R\$50 million (approx. US\$10 million). These funds were used for the following 7 programs:</p> <ul style="list-style-type: none"> • services and infrastructure in Nova Mutum Paraná (school, landfill and shopping centre) • education activities • creation of employment and income • support to indigenous communities

	<ul style="list-style-type: none"> • activities in partnership with the municipality of Porto Velho • activities in partnership with the State of Rondônia • other projects approved in 2018. <p>The latest annual report for the period 2021-2022 indicates that programs 1, 2, and 4 have been concluded and some activities in programs 3, 5, 6 and 7 are ongoing or pending verification, and that approx. \$R45.5 million were spent to date with \$R4.5 million pending verification.</p>
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Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Systematic processes are in place to identify any ongoing or emerging environmental and social issues associated with the operating hydropower facility	<p style="text-align: center;">✓</p> <p>The systematic processes that are in place to identify ongoing and emerging issues are captured in the following 29 E&S programmes which continue to be in place after 10 years of operation. Each programme and associated subprogrammes allow the project to identify issues in the following areas:</p> <ol style="list-style-type: none"> 1. Environmental Management System 2. Groundwater Monitoring Program 3. Seismic Monitoring Program 4. Climate Monitoring Program 5. Hydrosedimentological Monitoring Program 6. Hydrobiogeochemical Monitoring Program 7. Limnological Monitoring Program 8. Monitoring and Control Program for Aquatic Macrophytes 9. Flora Conservation Program 10. Degraded Area Restoration Program 11. Reservoir Deforestation Program 	<p style="text-align: center;">✓</p> <p>Processes to identify ongoing and emerging environmental and social issues take into account broad considerations, and both risks and opportunities</p>	<p style="text-align: center;">✓</p> <p>Examples of the project identifying ongoing and emerging E&S issues while taking broad considerations, risks and opportunities into account include:</p> <ul style="list-style-type: none"> • innovative solutions to prevent fish entrapment in turbines and gates (see section 6), • adapting to the needs of resettles in Nova Mutum Parana over the years by using different structures to engage with community members such as Sustainability Committees and Information Centres (now closed), Technical and Social Assistance Office (that will be closing in the near future), and the <i>Associação do Observatório Socioambiental</i> (see sections 4 and 10), • collaborating with ICMBio in conservation activities in the nearby National Mapinguari Park (see section 6), and

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	12. Wildlife Conservation Program 13. Wildlife Monitoring Program around the reservoir 14. Wildlife Rescue Programme 15. Ichthyofauna Conservation Program 16. Ichthyofauna Rescue Program 17. Environmental Compensation Program 18. Social Communication Program 19. Environmental Education Program 20. Public Health Program 21. Support Program for Indigenous Communities 22. Archeological Heritage Prospection and Recovery Program 23. Program for Resettlement of Affected Populations 24. Downstream Activities Program 25. Affected Infrastructure Recovery Program 26. PACUERA – Environmental Conservation Plan for the Area around the Reservoir 27. Support and Monitoring of Fishing Program 28. Floating and Submerged Debris Management Program 29. Monitoring Program for Instability Prone Hillside and Slope Areas The transmission line operation license also includes a number of conditions, monitoring and quarterly		<ul style="list-style-type: none"> voluntarily broadening the cultural heritage scope to include the industrial railway (see section 8).

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		reporting requirements that were previously regulated by SEMA and are now regulated by SEDAM and include an environmental management programme, an erosion monitoring and a social communication programme.			
The processes utilise appropriate expertise	✓	The E&S management and monitoring programmes use an appropriate and wide range of experts including experienced E&S consultants, collaborations with ICMBio, and universities.			
Monitoring programmes are in place for identified issues	✓	The ongoing suite of monitoring programmes in the operational PBA covers the range of issues identified during the ESIA studies and implementation stage of the project (with one exception, see section 6). The combined monitoring programmes of both the Jirau and the Santo Antônio HPPs allows IBAMA to assess how cumulative impacts are being managed, mitigated and compensated; some of these programmes are described in more detail in other sections (e.g. section 6 for fish passage and other biodiversity impacts).			
Management					
Environmental and social management system is in place to manage measures to address identified	✓	The first programme in the Jirau Operational PBA is an EMS that aims to support management of the PBA programmes by integrating and	Processes are in place to anticipate and respond to emerging risks and opportunities	✓	The comprehensive suite of monitoring programmes allows the project to anticipate and respond to emerging risks and opportunities. For

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
environmental and social issues		centralising all the information generated by the PBA on a spatially explicit, accessible and user-protected on-line platform.			<p>example, the project was able to propose a more effective wildlife conservation programme in areas surrounding the project. IBAMA accepted their proposal to work with ICMBio to monitor indicator species of environmental quality in Mapinguari National Park.</p> <p>The 2014 flood event presented unanticipated effects on upstream communities and road infrastructure and required additional backwater studies and compensations to affected community members in Abunã (see sections 4 and 5).</p>
This management system is implemented utilising appropriate expertise (internal and external)	✓	The EMS is managed by an internal and multidisciplinary management group with the necessary qualifications and training to execute the work and activities of verification and continuous improvement, and focussing on compliance with the Operational License PBA requirements and the transmission line operational license requirements.	Plans and processes are embedded within an internationally recognised environmental management system which is third party verified, such as ISO 14001	✗	Jirau's EMS follows ISO 14001:2015 and the project is currently aiming at obtaining ISO certification. The fact that certification has not yet been achieved is a significant gap against advanced requirements.
Conformance and Compliance					
Processes and objectives in environmental and social management plans have been and are on track to be met with:			There are no non-compliances	✓	There are currently no non-compliance issues although there have been some delays in compliance that have since been resolved, and are explained in the respective sections of this report.
• no major non-compliances	✓	There are no major non-compliances.			
• no major non-conformances	✓	There are no major non-conformances			

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
Environmental and social commitments have been or are on track to be met	✓	Environmental and social commitments have been or are on track to be met; for example the restoration of degraded areas that were used during the construction phase is ongoing.			
Environmental and social funding commitments have been or are on track to be met	✓	<p>Environmental and social funding commitments have been met. A total of approx. R\$1 billion has been spent on environmental and social programs to date. As part of this sum,</p> <ul style="list-style-type: none"> In line with Brazilian legislation and as determined by the respective governmental entities, the project was required to transfer resources to Federal and State conservation units or parks. The compensation funds towards the State of Rondonia's conservation units have totalled over R\$14.9 million (approx. USD 2.9 million), and for Federal conservation units over R\$38 million (approx. USD 7.5 million) (see section 6 for more details); the project has also implemented voluntary community investment projects not included in their licensing requirements with a cost of approx. R\$50 million. 	There are no non-conformances	✓	There are no non-conformances.
Outcomes					
Negative environmental and social impacts associated with hydropower facility	✓	Negative environmental and social impacts associated with the operations stage of the project have	Negative environmental and social impacts associated with hydropower facility	✓	Monitoring results in annual reports to the regulator indicate that negative environmental and social impacts

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
operations are avoided, minimised and mitigated		been avoided, minimised and mitigated.	operations are avoided, minimised, mitigated and compensated		have been avoided or are minimised, mitigated and compensated. The project, of their own initiative, organises annual workshops with IBAMA to present monitoring and activity results, discuss outcomes and propose modifications and improvements to meet established objectives, in line with adaptive management processes. Preliminary results from the project's collaboration with ICMBio in Mapinguari Park indicate that the three main pressures on the park are decreasing. Other positive outcomes include the malaria programme which decreased the incidence of malaria in the region significantly while it was in place (see section 4), and others discussed in the respective sections of this report.
Land disturbance associated with development of the hydropower project is rehabilitated or mitigated	✓	Lands disturbed during the construction phase of the project on both sides of the river have or are being progressively rehabilitated and restored. Some parcels of rehabilitated land are set to be transferred to national or state-owned parks.			
The operating hydropower facility or the corporate entity to which it belongs can pay for social and environmental commitments	✓	The Jirau project and its owners are able to pay for and fulfil the social and environmental commitments of the project.			In addition, voluntary projects funded with a technical assistance loan from BNDES have provided additional needed services and facilities to neighbouring communities.

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	5

Summary of findings and other notable issues
During operations, the project's significant impacts and associated management activities relate to impacts on river users such as fishermen and gold miners; the needs of resettles and of upstream infrastructure and communities that may be affected by flooding (for example in 2014); fish passage, rescue and release of

stranded fish in hydraulic conduits and gates; and other ongoing E&S monitoring and mitigation programmes in line with their operational license. The project has been able to apply adaptive management to improve and modify monitoring programmes and management measures over the last decade of operations and continues to rehabilitate degraded land parcels for hand over to State or Federal Parks. It has invested significant resources beyond those required under the environmental licenses.

Relevant evidence	
Interview	6, 7, 16, 17, 27
Document	1-14
Photo	7, 21, 27, 61-64, 93, 94, 103, 104

2 Labour and Working Conditions



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

Background	
Labour requirements during operation (full-time equivalent)	Total FTE approved for the operational phase were initially 315, however after a better understanding of their processes it was realized that only 298 FTEs would be necessary on a regular basis. Headcount by the time of this assessment is 296 FTEs and there are 2 vacant positions to be filled. There were also 737 third-party employees rendering services to the plant. Depending on the need and timing for maintenance, total headcount may reach around 1,300 workers, including third parties.
Applicable key human resources regulations	Brazilian Consolidation of Labour Law: Decree-Law 5452 as of May 1 st , 1943 and subsequent amendments
Applicable key occupational health and safety (OH&S) regulations	Regulatory Standards (NR's) of the Ministry of Labor and Social Security
Identify the regulator for labour law and OH&S	Ministry of Labour and Social Security
Other relevant information	<ol style="list-style-type: none"> 1) The operation and maintenance of the Jirau HPP and the Relay Facility at the Porto Velho Collector Substation obtained ISO 45001:2018 certification in September 2022, with only one minor non-conformance. The certification must be renewed every year. 2) Workers located both in ESBR's Rio de Janeiro office and at the plant are covered by the same Union of Urban Workers of the State of Rondônia - SINDUR

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
A periodically updated assessment has been undertaken of human resource and labour management requirements for the operating facility	✓	An initial assessment was made in 2009, at the beginning of operations, which indicated a requirement for 442 FTEs. A new assessment was made in 2015 indicating 315 FTEs for long term operations, since many activities would be no longer necessary. This	Identification of ongoing or emerging labour management issues takes broad considerations into account, and both risks and opportunities
			✓
			The company's Strategic Plan, developed to meet all needs up to 5 years in advance, incorporates labor requirements and considers risks and opportunities, therefore actions are triggered in advance. Actions also consider the interrelationships among

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		maximum number was approved by the Board of Directors. In practice, only around 298 FTEs have been proven necessary. Every year a Strategic Plan is developed considering 2 and 5 years in advance. This Strategic Planning includes the needs for recruitment and training.			areas. An example is the prior intensive internal training to prepare for ISO 45000 and ISO 14000 certifications.
The assessment included project occupational health and safety issues, risks, and management measures	✓	An integrated health and safety management system is in place. A series of Work Instructions (IT) are in place for the operational phase of the plant to address hazard analysis and risk classification, safe work process, change management, identification of legal requirements, investigation and analysis of accidents and incidents, monitoring, measurement and analysis of the management system, and risks and opportunities.			The assessment of OH&S issues considers risks and opportunities, and a specific Work Instruction is in place for this purpose. Roles, responsibilities and authorities are defined, as well as the Risk and Opportunities matrix. All managers are encouraged to carry out PSV - Preventive Safety Visits. In 2022, around 360 PSVs were held. In addition, all safety technicians make at least one Safety Inspection Report per week, to monitor the safety conditions of the work and identify areas for improvement.
Monitoring is being undertaken to assess if management measures are effective	✓	Introduced in 2017, there have been 3 so-called Dialog Cycles per year between managers and their respective teams, to identify any management constraints and propose improvements. Every 2 years beginning 2020 a 360-degree assessment has been conducted for all direct employees. This indicates if communications are effective from top to bottom as well as management competences.			Every Tuesday, the OH&S team meets to assess trends, whether there have been any incidents, etc. Every Thursday, a similar meeting is held with external service providers. All incidents and accidents trigger a specific investigation to assess whether there are risks that may exist in other areas, and what improvements should be introduced in the processes.

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>In April 2023 the first internal work climate assessment will be conducted, including the assessment of management effectiveness.</p> <p>With regard to OH&S, an “<i>Avaliação de Eficácia</i>” (Effectiveness Assessment) is carried out for all actions. There is an OH&S Management Committee comprised of all managers, which meets once a month to discuss KPIs and propose improvement actions.</p> <p>Processes to identify emerging or ongoing OH&S issues are integrated within the health and safety management system. Processes for issues identification and monitoring include safety officers, a system of audits and inspections, regular meetings on site to allow issues to be raised, a safety issues box for submission of potential or actual hazards, and reporting mechanisms evaluating performance against targets. There is a system of daily OH&S inspections, and campaigns for specific inspections, across the site.</p> <p>Grievance mechanisms are also in place through the ethics channel called Integro, email, toll-free telephone and boxes called “<i>Poste Aqui</i>” (Post it Here).</p>		<p>During the Covid-19 pandemic (2020-2021) a specific assessment was made to evaluate the emotional conditions of all employees.</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Ongoing or emerging labour management issues have been identified	<p>✓</p> <p>Recurring OH&S problems are usually identified during the Dialog Cycles (for instance, one problem with the internal elevator inside the left bank powerhouse, studied in 2022 and budgeted for 2023).</p> <p>The region where the plant is located lacks specialized labour, therefore Jirau attaches great importance to training programs and people retention. Monthly voluntary and involuntary turnover KPIs are calculated. Aggregated KPIs for 2022 were 8.23% and 4.29%, leading to a total 10.87% overall turnover, considered below market by Jirau's HR. According with HR this is a result of their investment on training and technical capacitation. In 2013, 22.4% of all employees originated from the North Region of Brazil. Presently this number is 47.4%.</p> <p>Diversity KPIs are also tracked. Presently 23% of the employees are women, occupying 26% of the leadership positions, one of which is self-declared black. There are 16 women technicians and engineers presently working in the powerhouse. Jirau does not have fixed equity and inclusion goals but adopts specific action plans to foster gender equality in the workplace. According to</p>		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
		information provided by Jirau, the company is not obliged to adopt HR policies of any of its shareholders.			
Management					
Human resource and labour management policies, plans and processes are in place to address all labour management planning components	✓	<p>There is a human resources policy in place, which covers 13 guidelines: Attracting People, Training and Development, Management of the Organizational Climate, Compensation, Career and Succession Plan, Assessment of Skills and Knowledge, Sharing of Profits and Results, Work Collective Agreement, Prevention Against Harassment, Child Labor, Occupational Health and Safety, Social Support and Quality of Life, and Code of Ethics. ESBR also maintains a specific policy for Human Rights, to be followed not only internally but also by its contractors.</p> <p>There is a Training Program for all employees, which is operationalized through an Annual Training Plan.</p> <p>There is a corporate health plan including dental and mental care, covering needs of the employees and their legal dependents (in accordance with the national rules) with no financial contributions from them.</p> <p>The employees' families are offered the so-called "<i>Programa Conte Comigo</i>" (Count on Me, an employee support program), which is an</p>	Processes are in place to anticipate and respond to emerging risks and opportunities	✓	<p>The risk of not being able to hire or to losing employees (attraction and retention risk) has been identified in the Risk Matrix and actions are under evaluation. Trainee programs are already in place (for 9 technicians and 8 engineers, starting every July and January, respectively) to prepare technical workforce in the region.</p> <p>Workers have the right to refuse to carry out any field work if they notice that there is an unsafe condition that needs to be reassessed. Good OH&S practices are encouraged, and results are published on the intranet. The R&D team has prepared an Innovation Program to encourage continuous improvement actions in all areas of the company, which is expected to start in 2023. Besides, the "<i>Normas de Contratação para Prestadores de Serviço</i>" include the existence of incentives for OH&S innovation programs for screening during the procurement process.</p> <p>ESBR keeps track of OH&S risks and opportunities by means of a detailed risk matrix and heat map.</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>external contracted program providing a 24-hour legal, financial, social, and psychological support through telephone. If needed, Programa Conte Comigo will direct the employee or family member to a specialized local company for specific assistance.</p> <p>ESBR provides round-trip transportation for all employees of the powerplant from Nova Mutum Paraná to the plant. For the employees in the office in Rio de Janeiro, transportation tickets are offered at low cost.</p> <p>Since 2019 ESBR has given preference for existing internal employees when hiring. When external hiring is needed, preference is given to those who already reside in the region.</p> <p>All employees at the plant are given lunch for free, and also dinner and breakfast for shift workers. On top of that, all employees are given (free of charge) food stamps worth R\$ 1,085 per month. Employees in the Rio office are given (free of charge) R\$ 1,316 worth of food stamps per month.</p> <p>All employees are given a 30-salary life insurance for free.</p>		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>ESBR built a town called Nova Mutum Paraná, to accommodate not only the workers at the plant but also the families that were resettled. All employees at the plant are given the right to use a 2-bedroom house in Nova Mutum Paraná at a symbolic cost to them (around US\$ 10/month), for their personal and close family's use. Employees may also ask for an additional similar house for additional family members under the same conditions and ESBR will consent provided there are enough houses available. ESBR may eventually transfer the title of the house to the employee after 6 years of continuous employment.</p> <p>ESBR also built a recreation club for employees in Nova Mutum Paraná to practice sports and socialize, which all residents can use. An Elementary School and a Health Center were also built, whose administration was handed over to the local municipality and is available to all residents at no cost.</p>			
Human resource and labour management policies, plans and processes of contractors, subcontractors and intermediaries are in place	✓	Procurement processes include the obligation for contractors to follow the Occupational Health and Safety Manual for Contractors, the Obligations Relating to the Protection of Personal Data, the Code of Ethics, and the Policy on Conflict of Interest.			

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>With each invoice, the contracted company must deliver documentation proving compliance with its labour obligations along with the payroll of all workers. Payment for services is subject to delivery of documents in order.</p> <p>OH&S requirements apply to contractors, subcontractors and intermediaries. Purchasing processes include OH&S specifications based on a document called the Occupational Health and Safety, Environment and Socio-Economics Manual for Contractors.</p> <p>Anyone can use the grievance mechanisms made available by ESBR, whether employees, contractors or the general public.</p>			
Conformance and Compliance					
Processes and objectives relating to human resource and labour management have been and are on track to be met with:					There are no indications for current non-compliances.
<ul style="list-style-type: none"> no major non-compliances 	✓	There are no indications for major non-compliances.	There are no non-compliances	✓	<p>As per ESBR's HR database there are currently 54 direct labour-related outstanding lawsuits in place, mostly due to the misrecognition of transit hours. In 2022 2 new direct labour-related lawsuits were filed against ESBR. There are also 8 outstanding labour-related lawsuits against contractors, in which ESBR is co-participant. All lawsuits follow the normal legal process.</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
• no major non-conformances	✓	There are no indications for major non-conformances.			
Any labour related commitments have been or are on track to be met	✓	All labour-related commitments are on track, as confirmed during interview with the Union president. Both plant and Rio de Janeiro office workers are covered by the same Union. There have been no recent official labour audits since 2015, when an accident took place with one of the contractor's employees.	There are no non-conformances	✓	There are no indications for non-conformances.
Outcomes					
There are no identified inconsistencies of labour management policies, plans and practices with internationally recognised labour rights	✓	<p>ESBR's Human Rights policy, Human Resources policy, Code of Ethics and Selection and Hiring Procedure incorporate all internationally recognized labour rights.</p> <p>ESBR hires and practices equal compensation for all employees at the same level, with no discrimination as per race, gender, sexual orientation, religion, origin, social origin, age or political opinion.</p> <p>A salary table is used to determine all employees' compensations, with no discrimination.</p> <p>Good turnover and OH&S KPIs indicate that labour policies, plans and practices are robust and lead to a safe and harmonious work environment.</p>	Labour management policies, plans and practices are demonstrated to be consistent with internationally recognised labour rights.	✓	<p>Brazil is a signatory to 7 of the 8 International Labour Organisation (ILO) core conventions, and Brazilian legislation can be considered consistent with internationally recognised labour rights. Although Brazil has not ratified the convention concerning Freedom of Association and Protection of the Right to Organise, Brazil's constitution safeguards the Freedom of Association the Right to Organise, and evidence indicates that these rights are being recognized.</p> <p>ESBR's individual labour contracts incorporate several human rights, which are consistent with internationally recognized labour rights.</p> <p>There is no child employment in ESBR.</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
			<p>10 handicapped employees are currently working for ESBR, which exceeds the minimum required number by regulation. Those employees occupy regular positions in the company and follow the natural career progress with no discrimination.</p> <p>ESBR is indifferent if any employee desires to be or not a member of the trade union, but asks to be informed of the employee's decision.</p>

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	5

Summary of findings and other notable issues
<p>ESBR has an inclusive and non-discriminatory human resources policy, allied with a good retention program. The relationship with the trade union is amicable. OH&S practices are good, which can be confirmed with their ISO 45001-2018 certification. Although their ISO 45001 certification does not include the Rio de Janeiro office, the same OH&S rules apply to them as well. An area for improvement could be including the Rio Office into the Jirau ISO 45001 certification sometime in the future.</p>

Relevant evidence	
Interview	4, 24
Document	15-54
Photo	31-33, 40, 43, 46-67

3 Water Quality and Sediments



Scope and Principle	
<p>This section addresses the management of water quality, erosion and sedimentation issues associated with the operating hydropower facility. The principle is that water quality in the vicinity of the operating hydropower facility is not adversely impacted by activities of the operator, 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, and that commitments to address water quality, erosion and sedimentation issues are fulfilled.</p>	

Background	
Water Quality	
Description of water quality	As one of the largest rivers in the world, the Madeira carries runoff with pollutants and sediments from a large catchment. The monitoring campaigns after filling of the reservoir have shown 'good' water quality in the majority of samples, with less than 10% of the results with 'acceptable' quality (one level below good).
Key water quality issues	Prior to the implementation of the Jirau project there was particular concern due to extensive mining upstream, especially gold mining using mercury, and the potential impact on reservoir water quality. Data show that concentrations of total mercury, organic mercury and reactive mercury in reservoir surface water samples align with the literature for the Amazon region, and the observed total mercury concentration is below the levels recommended by CONAMA Resolution 430/2011 and Ministry of Health Ordinance 2914/20011. Concentrations in soil samples from drawdown areas, in macrophytes and in fish are also in line with background values for the Amazon region and below applicable recommendations such as CONAMA Resolution 420/2009, CONAMA Resolution 454/2012, and Technical Regulation of Mercosur, RDC 42/2013.
Main influences on water quality	Monitoring shows that seasonal variation is responsible for a large part of the observed temporal variation in water quality, due to increased dilution and sediment transport in the wet season. There is no evidence of impacts from the impoundment, mainly due to the short retention time and low level of human activities on and around the reservoir.
Sedimentology	
Key sediment issues	The Madeira River is the largest sediment contributor to the Amazon with approximately 50% of the total sediment load. Key sediment issues are the transport of sediment through the reservoir reach, the quality of the sediments (see above regarding mercury contamination), and the stability of riverbanks.
Sediment load (tonnes/year)	594 million tonnes/year (period 2014 to 2021)
Catchment area at the dam	972,000 km ²
Other information	The average retention of sediments in the reservoir is around 20% (period 2014 to 2021). Physical and numerical model predictions of accumulation of sediment are consistent with observations in recent years. (During the large 2014 flood, transport rates were atypical, with about 6 million tonnes/day on average between January and May 2014.) Monitoring

	<p>of control sections for bathymetric changes shows 2 sections with accumulation in the reservoir, and 1 section with erosion downstream; the other 11 control sections show stable bathymetry or inconclusive changes.</p> <p>Sedimentation and erosion downstream of the Jirau dam reflects the joint influence of the reservoirs of the Jirau HPP and the Santo Antonio HPP. The downstream reach is intensively evaluated through bathymetric survey campaigns and through the granulometric analysis of suspended and bed material, at 4 control sections. While there is a good relationship between the operators of the Jirau and Santo Antonio HPPs, there is no direct exchange of sediments monitoring results, but these are accessible through IBAMA.</p>
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Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Ongoing or emerging issues have been identified in the following areas:			
<ul style="list-style-type: none"> • water quality 	<p>✓</p> <p>As described above, mercury concentrations in surface water are the main issue of concern, due to its impacts on the ichthyofauna and the local population with fish being an important food source and economic resource for the region.</p> <p>The project has performed 73 water quality monitoring campaigns covering physical, chemical and biological parameters since construction; quarterly before reservoir filling - 12 campaigns at 32 stations (2009 to 2012), monthly during filling - 20 campaigns at 32 stations (2012 to 2014) and quarterly after filling - 41 campaigns at 18 stations (2014 to 2022). Physical, chemical and biological variables are currently monitored in 6 stations located on the Madeira River (2 of which provide automatic hourly</p>	<p>Identification of ongoing or emerging water quality issues takes into account both risks and opportunities</p>	<p>✓</p> <p>The monitoring is designed to be of an inter-disciplinary nature. It focuses on risk avoidance for the operational phases of the project, and also considers inter-relationships with public health and mining activities.</p> <p>The hydro-biogeochemical monitoring program quantifies total mercury (HgT) and methylmercury (MethylHg) levels in environmental human matrices in order to select and evaluate riverside communities regarding the epidemiological profile, risk factors, dietary survey and assessment of exposure to mercury.</p> <p>The groundwater program continuously evaluates risks and opportunities in relation to vegetation and land use. The sampling frequency for limnological and hydro-biogeochemical elements as well as aquatic macrophytes was increased during and immediately after the</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		readings of water quality parameters), 11 in tributaries of the Madeira River and 1 in the flooded area of the Mutum-Paraná River.			reservoir filling, providing an appropriate risk identification tool.
• erosion and sedimentation	✓	<p>The 14 sedimentological control sections are defined in the Basic Environmental Plan, with surveys conducted since 2010. These sections are used to track erosion and deposition sediments processes in a reach of about 200 km of the Madeira River, from upstream of the reservoir to downstream the dam. Periodic bathymetric surveys are combined with sampling of the bottom sediment, to carry out granulometric analyses.</p> <p>The monitoring program is motivated by the large sediment load and the need to track and understand backwater, reservoir sedimentation and downstream effects of sediment trapping.</p>			<p>The monitoring of mercury level in sediments is ongoing. A monitoring subprogram also quantifies trace contents of arsenic, cadmium, lead, chromium, manganese, nickel, selenium and zinc in the biotic and abiotic environment.</p> <p>The Marginal Riverbank/Reservoir Shore Erosion Monitoring Program has been ongoing continuously for the 10th year, along the Jirau reservoir and in a stretch of 10 km downstream of the dam and has confirmed that all erosion processes induced by fluvial action and by mining/anthropic activities are stabilized.</p>
If management measures are required, then monitoring is being undertaken to assess if management measures are effective for:					
• water quality	✓	The monitoring program addresses general water quality concerns, as no specific management requirements for reservoir water quality have been identified. ESBR evaluates activities in its reservoir using satellite images, and when identifying any irregular activity makes complaints to the competent agencies. Gold mining	Identification of ongoing or emerging erosion and sedimentation issues takes into account both risks and opportunities	✓	The sedimentological and bathymetric changes in the reservoir are being monitored, showing in general that over the past 5 years, the sections located in the reservoir have been stab. The expectation is that the trapping efficiency will drop over time until a new balance is reached when all sediment is passed through the reservoir. ESBR has proposed to IBAMA the conclusion of the Marginal

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		barges, for example, have to remain within certain zones, and have to use adequate equipment and processes. Jirau's powerhouses and administrative buildings are served by a sewage treatment system installed and operated by the company.			Riverbank/Reservoir Shore Erosion Monitoring Program with the presentation of a Final Evaluation Report; in the meantime, Jirau will continue to carry out the monitoring as well as the inspection of any new mining or other activities in the reservoir area. Components of this monitoring are 1) quarterly measurement campaigns with technically defined points to represent the quality of the entire operating environment, followed by 2) monthly collection of defined parameters if issues are identified. Additionally, there is 3) a real-time monitoring network, with a multiparametric probe installed upstream of the dam which transmits information remotely every 15 minutes.
• erosion and sedimentation	✓	No specific management requirements for sediments have been identified. The hydro-sedimentological monitoring makes it possible to assess potential environmental impacts and guide the operation of the reservoir in order to minimize effects on the reservoir and on the downstream reach. One of the objectives defined in the Operations License is to maintain the concentration of solids downstream of the Jirau dam at below 3,500 mg/L, which may be reassessed according to monitoring results. Monthly measurements and daily estimates have indicated compliance with this condition, showing that outflow concentrations are less than 3,500 mg/l and directly related to the natural inflow concentrations. Lowering the operational level of reservoir for the purpose of sediment flushing is not currently required or allowed and would require an impact study approved by IBAMA. Also, according to ANA Resolution nº.			

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>555/2006, the normal water level of the reservoir should vary according to the natural conditions of the Madeira River. As part of the sediment monitoring program, some dredging during drought conditions was undertaken for experimental purposes.</p> <p>There are four cross sections to monitor a stretch of 10 km downstream of the dam. The results for the first cross section (just downstream of the dam) show erosion on the riverbed, probably due to the velocity of the water being released at the power plant tailrace, but no erosion of the banks. The monitoring of the other 3 cross sections inside Santo Antonio reservoir show some siltation on the riverbed, but also no erosion on the banks.</p>			
Management					
Measures are in place to manage the following identified issues:			Processes are in place to anticipate and respond to emerging risks and opportunities relating to:		
<ul style="list-style-type: none"> • water quality 	✓	<p>The operational phase PBA, approved in 2021, defined a new water quality management model for the reservoir. For this model a protocol for decision-making composed of 5 stages is defined, depending on the results of the quarterly limnological monitoring campaigns, considering two points upstream of the dam, P6-MAD 2</p>	<ul style="list-style-type: none"> • water quality 	✓	<p>While there is an active monitoring program, realistically the ability of the Jirau project to respond to changes in its very large catchment will be limited. On a local scale, the results of this monitoring are disclosed to the authorities and to local communities through the Social Communication and Environmental Education</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		(reservoir tail) and P18-MAD 5 (reservoir close to the dam), and one point downstream, the P19-MAD 6 (reservoir outlet).			programs, allowing some adaptation to risks and opportunities.
• erosion and sedimentation	✓	Technical Opinions 56/2017 and 23/2019-COHID/CGTEF/DILIC, in their analysis of Jirau’s PBA, concluded that the Hydro-sedimentological Monitoring Program should be carried out throughout the life of project and incorporated into regular operations. Semi-annual monitoring reports from ESBR to IBAMA demonstrate that the following measures are in place, as required by the regulator: 1) liquid and solid discharge measurement campaigns at monitoring network stations; 2) monitoring of water level variations in the reservoir and in stretches of the Madeira River, upstream and downstream of the project; 3) bathymetry campaigns, bottom sediment sampling and granulometric analyses of samples in cross-sections of the river; 4) consistency analysis of the data produced and database updates; 5) analysis of the data set and consolidation of information on the sedimentological behaviour of the Madeira River.	• erosion and sedimentation	✓	Similar to the situation described above regarding water quality, while the ability of the project to respond to changes in sediment load is limited, these issues are actively monitored and results are disclosed, allowing some adaptation to risks and opportunities.
Conformance and Compliance					
Processes and objectives in place to manage each of the following have been and are on track to be met:			There are no non-compliances relating to:		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
• water quality, with no major non-compliances	✓	The monitoring campaigns after the reservoir filling showed that water quality was in compliance. Also, the values of concentrations of total mercury, organic mercury and reactive mercury in surface water samples are in accordance with the literature for the Amazon region, and the observed total mercury value is below the levels recommended by CONAMA Resolution nº 430/2011 and Ordinance MS nº 2914/20011.	• water quality	✓	All water quality results comply with the resolution CONAMA nº 357/2005 which defines the IQA (Water Quality Index) for all rivers and reservoirs in Brazil.
• water quality, with no major non-conformances	✓	See comment above.			
• erosion and sedimentation, with no major non-compliances	✓	As described above, the maximum solids concentration values downstream of the Jirau dam have been below 3,500 mg/L and thus compliant with requirements.	• erosion and sedimentation	✓	There are no non-compliances.
• erosion and sedimentation, with no major non-conformances	✓	See comment above.			
Commitments related to the following have been or are on track to be met:			There are no non-conformances relating to:		
• water quality	✓	There were no water quality related commitments.	• water quality	✓	The IQA (water quality index) has consistently remained 'good' at the intake point for the water supply to Nova Mutum Paraná.
• erosion and sedimentation	✓	There were no erosion and sedimentation related commitments.	• erosion and sedimentation	✓	There are no non-conformances.
Outcomes					
Negative water quality impacts arising from activities	✓	Monitoring results demonstrate that there were no impacts on water	Water quality in the area affected by the operating	✓	Less than 10% of the water quality samples are below the good quality

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
of the operating hydropower facility are avoided, minimized and mitigated		quality arising from operations, since there is no detectable difference of water quality between upstream and downstream of the reservoir.	level, but still within the acceptable quality range.
		<p>hydropower facility is of a high quality</p> <p>The facility has contributed or is on track to contribute to addressing water quality issues beyond those impacts caused by the operating hydropower facility</p>	<p>✓</p> <p>The Jirau project addresses water quality issues beyond the possible impacts caused by the operation, principally by identifying possible contamination by mercury, heavy metals and other pollutants, and by improving water supply and sanitation standards in resettled and indigenous communities. The disclosure and discussion of results with local communities through the Environmental Education Program helps to address any other water quality issue.</p>
Erosion and sedimentation issues are avoided, minimized and mitigated	✓	<p>Average retention of sediments is around 20% (period 2014 to 2021) with an expectation of declines in the future. Bathymetric changes in the reservoir are consistent with model predictions (physical model for the vicinity of the dam and hydrodynamic model for other sections of the reservoir) and appear to be stabilizing. There are no significant known issues related to erosion and sedimentation. The loss of some of the storage volume was expected and does not have a significant impact on generation, since the storage is not actively used for regulation.</p>	<p>✓</p> <p>Erosion and sedimentation associated with operating facility do not present ongoing problems for environmental, social and economic objectives of the facility or the project-affected areas</p> <p>There is an ongoing discussion with owners of gold mining barges who have been complaining that sediment deposition (finer silt depositing over sand) is making extraction more difficult and requires upgrading of equipment and increased expenses to fuel the pumps. ESBR's position is that the area available for gold mining has increased and new equipment provided by the project should be sufficient to overcome these difficulties. This appears plausible as the reservoir has improved access and safety conditions for miners, the number of barges has gradually increased, and the activity appears to remain profitable.</p>

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	11

Summary of findings and other notable issues

Before the Jirau project was initiated there were concerns about a number of water quality and sedimentation issues, including the very high sediment load in the Madeira River and the history of mining with mercury in the catchment, and how these would interact with the reservoir. However, extensive monitoring results over the first years of operation show that water quality and mercury levels have been satisfactory and not affected by the reservoir, and that the reservoir is passing through most of the sediment, with no unexpected accumulations. There are some discussions with miners who claim to be facing operational difficulties as a result of siltation.

Relevant evidence	
Interview	6, 7, 15, 29
Document	55-85
Photo	17, 18, 41, 59, 65

4 Community Impacts and Infrastructure Safety



Scope and Principle
<p>This section addresses how impacts of development of the hydropower facility on project-affected communities have been addressed, in cases where these commitments are well-documented against a pre-project baseline. These impacts include economic displacement, impacts on livelihoods and living standards, public health impacts, impacts to rights, risks and opportunities of those affected by the project, infrastructure safety risks and additional benefits that can arise from a hydropower facility. The principle is that livelihoods and living standards impacted by the project have been improved relative to pre-project conditions for project-affected communities, that commitments to project-affected communities have been fulfilled, 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 requirements that relate to physical displacement or to Indigenous Peoples, which are addressed in Section 5 and 7. Other interested parties and groups are addressed in Section 10.</p>

Background	
<p>In the case of older projects, are there well-documented commitments in relation to project-affected communities and/or projects benefits made at the time of project approval and/or data on the pre-project baseline against which to compare post-project?</p>	
<p>Yes, all scoring statements are relevant</p>	<p>Commitments to project-affected communities and benefits as well as baseline data are well documented.</p>
<p>No, scoring statements on project-affected communities and/or project benefits are not relevant (in this case, issues in relation to these topics should be taken into consideration under Section 1 – Environmental and Social Issues Management)</p>	<p>Click here to enter text.</p>

Community Impacts and Benefits	
<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>All project-affected communities are within the municipality of Porto Velho, with an area of 34,100 km² and a population of 549,000 (IGBE 2021 estimate). By far the largest share of this population lives in the city of Porto Velho, the capital of the state of Rondônia, approximately 120 km downstream of the Jirau dam. Several small towns and villages are located along the BR 364 highway which parallels the Madeira River (and the two reservoirs of Santo Antonio and Jirau) and links the city of Porto Velho with the state of Acre in the far west of Brazil, and the Bolivian border.</p> <p>Key groups of affected people are:</p> <ul style="list-style-type: none"> • Users of the Madeira River, principally fishermen and gold miners (<i>garimpeiros</i>), affected by changes in the river, • Farmers and other residents affected by land acquisition (note that physically displaced people are covered in section 5), • People otherwise affected by construction and operation of the Jirau HPP (in terms of community health and safety, infrastructure quality, employment and procurement, benefit sharing etc.)

Agencies relevant to land acquisition	IBAMA, Ministério Público, <i>Comitê de Sustentabilidade</i> (with a working group specifically on resettlement, the <i>Grupo de Acompanhamento Social</i>), INCRA
Agencies relevant to livelihood restoration and project benefits	See above, as well as EMBRAPA (Brazilian Agricultural Research Corporation)
Infrastructure Safety and Public Health	
Type of dam	Earth fill dam, 2 concrete powerhouses (1,200 m and 800 m incorporated into the dam) and spillway dams, and rockfill dam with asphalt core
Dam height (m)	53.5 m to foundation
Probable maximum flood (m ³ / s)	85,747 m ³ /s (updated value after 2014 floods)
Design flood (expressed as estimated flood with return period)	76,636 m ³ /s for return period of 10,000 years (updated value after 2014 floods)
Spillway capacity (m ³ / s)	81,899 m ³ /s + 400 m ³ /s log passage spillway
Spillway height (masl)	69 m
Headrace length (m)	The concrete powerhouses and water intakes for the 50 turbines are part of the dam structure.
Headrace width (m)	n/a
Headrace capacity (m ³ / s)	27,500 m ³ /s
Seismicity	The power plant is in a region of very low seismic activity. A Seismological Monitoring Program is being implemented, which has not detected seismic events within a radius of 50 km from the dam.
Geology	Geological mapping showed no geological faults. The studies of natural and induced seismic activity associated with local geological and topographic conditions identified no characteristics or evidence of anomalies that point to the possibility of foundation failures.
Dam safety regulatory authorities	ANEEL – Brazilian Electric Energy National Agency
Local presence/capacity of emergency services	The Jirau HPP is located in the district of Nova Mutum Paraná, upstream of the district of Jaci-Paraná, in the municipality of Porto Velho, capital of the state of Rondônia, at a distance of 124 km from the city. Although there are emergency crews and a clinic inside the power plant, specialized health and emergency services such as fire department, rescue emergency services, and medical emergencies services (such as for surgeries, laboratory tests and hospitalization) are only available in Porto Velho. The districts of Jaci-Paraná and Nova Mutum Paraná have a health post each, with daily medical care.
Potential safety risks in this context	The Dam Break Study carried out by Jirau demonstrated that the Santo Antonio reservoir (directly downstream of Jirau) has the capacity to absorb a flood wave resulting from a breach of the Jirau dam.
Degree of risk of dam failure and in what way	According to Federal Law nº 12.334/2010 and ANEEL Resolution 696/2015, the risk category and the potential associated damage risk are: <ul style="list-style-type: none"> • LOW Risk – regarding the technical characteristics (including the fact that Jirau is a run-of-river reservoir with a relatively low dam) and condition of the dam, HIGH Risk – regarding potential damage, such as downstream flooding caused by natural floods (hydrological risk) or accidents in the dam (structural risk), following the example of other large dams in Brazil.

Population at risk of dam break (locations, numbers)	Around 14,000 people live at a distance of 30 km downstream of the Jirau dam in the district of Jaci-Paraná, and in the federal government Land Reform National Program Agricultural Settlements Projects of Joana D’Arc I, II, III and Nilson Campos. Downstream of the Santo Antonio dam is the city of Porto Velho. While neither of these settlements are within the dam break inundation zone, parts of the population could be at risk through rapidly rising water levels and flows.
Dam safety standards followed	<ul style="list-style-type: none"> • <i>“Projeto Civil de Usinas Hidrelétricas da Eletrobrás”</i> - Hydroelectric Power Plants Civil Engineering Criteria, Eletrobrás 2003 • <i>“Guia Básico de Segurança de Barragens”</i> - Dam Safety Basic Guide issued by Comissão Regional de Segurança de Barragens de São Paulo, and Núcleo Regional de São Paulo do Comitê Brasileiro de Grandes Barragens (Brazilian Committee on Large Dams) • <i>“Guia de Segurança e Inspeção de Barragens”</i> - Dam Safety and Safety Inspection Guide issued by Secretaria de Infraestrutura Hídrica do Ministério da Integração Nacional, 2002 • <i>“Política Nacional de Segurança de Barragens”</i> Regulations defined by Federal Law 2.334, 2010 Resolution 696 de 15 December 2015 issued by SFG ANEEL
Agencies relevant to dam safety	ANEEL – Brazilian Electric Energy National Agency ANA – Brazilian Water Authority COEPDEC – Coordenadoria Estadual de Proteção e Defesa Civil de Rondônia COMPDEC – Coordenadoria Municipal de Proteção e Defesa Civil de Porto Velho Corpo de Bombeiros da Polícia Militar Polícia Rodoviária Federal Polícia Federal Superintendência Regional de Rondônia Polícia Civil do Estado de Rondônia Marinha do Brasil (Brazilian Navy) Exército Brasileiro (Brazilian Army) IBAMA – Superintendência de Rondônia CRH/RO – Conselho Estadual de Recursos Hídricos SEDAM – Secretaria de Estado de Desenvolvimento Ambiental CAERD – Companhia de Água e Esgoto de Rondônia CERON – Eletrobrás Distribuição Rondônia - Centrais Elétricas de Rondônia S.A Secretaria Municipal de Saúde de Porto Velho Polícia Militar – Secretaria de Segurança e Defesa da Cidadania
Other infrastructure safety issues	Backwater inundation during natural floods in the village of Abunã, located upstream near the tail of the reservoir on the border with Bolivia. Minor safety issues on public roads related to traffic attributable to the project, on the reservoir due to limited public use of the reservoir (gold mining barges, fishermen), and along the transmission corridors.
Description of key public health issues	Key background public health issues in the region included a historically high incidence of malaria, poor sanitation conditions including in the city of Porto Velho, and new diseases such as Covid-19. Construction of the Jirau and Santo Antonio HPPs led to a large population influx, with a peak workforce at Jirau of 24,000 in 2011, and displacement of populations, with potential health impacts through contagious diseases, sanitation issues, pressure on public health

	system capacities, and mental health and violence. During operations, while there are some ongoing issues, the public health situation has stabilized.
Agencies relevant to public health	Municipal Health Secretariat of Porto Velho (SEMUSA)

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Community Impacts and Benefits			
Monitoring is being undertaken to assess if the following commitments have been delivered and if management measures are effective:			
<ul style="list-style-type: none"> commitments to project-affected communities 	✓	<p>Key commitments to affected communities were related to land acquisition and other forms of economic displacement. There are or have been specific mitigation and compensation programs for affected groups such as fishermen, gold miners, and downstream communities, that all included some monitoring, reporting and review mechanisms. There has also been continuous monitoring of community activities, with consistent indicators and methodologies and in some cases since before the start of construction, e.g. of artisanal and commercial mining activities in the reservoir area, land use/land invasions in the reservoir buffer zone, and effort and landings by subsistence/artisanal and commercial fishermen, including upstream and downstream.</p>	<p>Identification of ongoing or emerging issues for project-affected communities takes into consideration both risks and opportunities, and interrelationships among issues</p>
<ul style="list-style-type: none"> commitments to project benefits 	✓	<p>Project benefits are being or were delivered to</p>	<p>✓</p> <p>The final reports for the closed PBA programs provided detailed information on activities and results. For example, compensation measures for displacement of informal manual gold miners from the reservoir area (organized in the COOPREMI cooperative) were fully implemented despite a number of administrative and technical problems, and so were the measures for larger mining barges in the reservoir area (organized in the COOGARIMA cooperative), whose number has increased over time. An example of interrelationships is the regularization of mining rights and the spatial monitoring, ensuring that miners remain within the permitted mining zones, and do not enter areas of the National Park on the left bank or the safety exclusion zone close to the dam.</p> <p>All ongoing PBA programs also have monitoring components and reporting requirements, and there are a number of examples where risks and opportunities were identified and</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<ul style="list-style-type: none"> residents of resettlement areas, primarily Nova Mutum Paraná (many of which had not actually been displaced but moved to the town because of better infrastructure and services); beneficiaries of local employment and procurement; all residents of Porto Velho municipality, Rondônia state and the nation (in the form of royalties, taxes etc.); and to some other communities not directly affected (for example, four Indigenous Peoples, as described in section 7). <p>These also include some monitoring, reporting and review mechanisms.</p>			programs were adapted (for example, regarding changing management guidelines for <i>pirarucu</i> fish).
Ongoing or emerging issues relating to the following have been identified:					
<ul style="list-style-type: none"> issues that affect project-affected communities 	✓	Many issues have been identified over the years in cooperation with authorities and community organizations. Mechanisms such as the required reporting to IBAMA and the various working groups, some of them under coordination by IBAMA, and the <i>Observatorio Socio-Ambiental</i> have served to bring up issues and identify solutions.	Identification of ongoing or emerging issues relating to project benefits takes into account both risks and opportunities	✗	Opportunities for benefits for local people have been planned from early in the project (e.g. through a study by the Getulio Vargas Foundation in 2012) and are still being identified. For example, the reforestation program around the reservoir and HPP is implemented by a cooperative of local farmers (COOPROJIRAU), from whom the project also buys fresh produce for the staff canteens.
<ul style="list-style-type: none"> delivery of project benefits 	✓	Some project benefits are part of PBA programs or funded from the BNDES sub-credit and are hence subject to formal monitoring and reporting			Some of the monitoring of project benefits has been less effective, thus making adaptive management difficult. A number of programs are

Minimum Requirements			Advanced Requirements			
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations	
		requirements, during implementation of activities and in some cases, for a certain amount of time afterwards. Local procurement and employment have been monitored through Jirau’s HR and procurement departments. The calculation and transfer of royalties, taxes, fees and other regulated payments is monitored, but not their use by recipients. (However, the recipients such as municipalities are accountable for the use of these resources, and related information is published as required by Brazilian regulations.)			closed, and the use of infrastructure is no longer monitored by ESBR or IBAMA after projects are handed over to recipients, so that ongoing or emerging issues may not be known. This is a concern because there are several examples of underused infrastructure (see also sections 5 and 7). While ESBR regularly and publicly reports on what is paid, the ongoing use of royalties and other financial payments by the recipient jurisdictions specifically for project-affected communities is not reported and monitored, other than in a broad sense through general public financial management systems. There are concerns, for example, that only a small share of the royalties paid to Porto Velho municipality is spent in the Mutum Paraná district, and that most of the municipality’s budget is spent on staff, leaving little for tangible investments. The fact that monitoring systems are not set up to track issues related to project benefits is a significant gap against advanced requirements.	
Infrastructure Safety and Public Health						
Ongoing or emerging issues relating to the following have been identified:			Identification of ongoing or emerging safety issues takes into account a broad range of	✓	The risk assessment and monitoring has taken and is taking into account: <ul style="list-style-type: none"> • Hydrological Risk, • Risk of Structural Collapse, 	
• dam and other infrastructure safety	✓	Dam safety risks and issues are being monitored (see routine monitoring of dam below) and there have been no				

Minimum Requirements			Advanced Requirements			
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations	
		emerging issues related with dam safety to date. Ongoing potential issues related to the flooding of the highway BR-364, and the possible flooding of Abunã district have been identified and addressed by carrying out new backwater studies.	scenarios and both risks and opportunities		<ul style="list-style-type: none"> • Risk related to Operating Difficulties, • Risk of Seismic Events, • Risks due to Failure in Concrete Structures and Sudden Rupture, • Risks due to Device Failures, • Risk due to Vandalism, Attacks or Terrorist Action. 	
<ul style="list-style-type: none"> • public health issues associated with the operating hydropower facility 	✓	During the operations stage of the Jirau project, while some of the background issues and some of the construction stage impacts are still notable, the population has stabilized, and benefits of investments e.g. in sanitation, vector control and health facilities are taking effect. Key remaining public health issues are access to health services for affected communities, and maintenance of a healthy environment, in particular the progress made on malaria control.			<p>Backwater studies carried out in 2010 by Jirau, as well as updates of other studies, e.g. new flood study due to the 2014 flood (2015) , and another in 2017 with a new survey of sections that incorporates sedimentation effects of the reservoir, resulted in new parameters for reservoir management (for example, for inflows higher than 23,000 m³/s) to prevent flooding problems on the BR-364, in the village of Abunã, and so that the backwater does not affect the border with Bolivia.</p> <p>During emergencies related to public safety outside the plant, Jirau provides support mainly with the provision of accommodation in Nova Mutum Paraná, and if necessary, support with equipment and personnel.</p>	
Routine monitoring of dam and infrastructure safety is being undertaken to identify risks and assess the effectiveness of management measures	✓	The “Plano de Inspeção, Auscultação, Conservação das barragens e Estruturas Civas da UHE Jirau” – (Inspection, Instrumentation and Maintenance Plan for Jirau HPP Dam and Civil Structures) defines the periodicity of inspections and issuance of technical reports according to Federal Law 12.334/2010 and ANEEL Resolution 696/2015.				
If public health issues require management measures then monitoring is being	✓	Current monitoring focuses on tropical diseases and their vectors, and can therefore track the	Identification of ongoing or emerging public health issues takes into account public	✓	Investments by ESBR have increased public health system capacities in those areas where the population has	

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
undertaken to assess if management measures are effective		effectiveness of ongoing vector control and health education measures.	health system capacities, access to health services, and health needs, risks and opportunities for different community groups		also increased as a consequence of the project. Emerging issues such as the Covid-19 pandemic have been managed with the objectives of protecting the workforce and continuity of generation, while also following public guidelines and protecting communities. In other areas, for example in indigenous or upstream communities, ESBR has funded capacity expansions as benefit sharing measures, under the guidance of public health authorities who have the expertise to define health needs, risks and opportunities.
Management					
Community Impacts and Benefits					
Measures are in place to deliver commitments:					
• to project-affected communities	✓	The original social management plans (components of the PBA, see section 1) included 34 programs, with 14 related to social impacts. Most commitments to affected communities have already been delivered, and programs closed after approval by IBAMA. Closed programs addressed here in section 4 include those for miners, social compensation, and tourism. Land acquisition (other than physical resettlement) was also fully delivered	Processes are in place to anticipate and respond to emerging risks and opportunities relating to project-affected communities and project benefits	✗	There is ongoing communication with most affected groups, both those compensated for negative impacts and those benefitting from positive impacts. Monitoring results have been regularly discussed with target groups such as miners and fishermen. This includes groups with whom the requirement to cooperate, under the license and the PBA programs, has ended and formal coordination mechanisms are no longer operational. In general, most social programs have narrowed their

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		for the initial phase and is currently limited to additional cases due to the 2014 floods (see section 5 for details). The current PBA for the operating period includes 29 programs, with 10 related to social impacts. These include the following programs addressed here in section 4: public health, downstream communities, infrastructure recovery, and fisheries support. (There is only a small amount of funds remaining in the social compensation program funded by BNDES). Other social programs are covered in sections 5 (Resettlement), 7 (Indigenous People), 8 (Cultural Heritage) and 10 (Communications).			activities over time as objectives were reached and support was deemed no longer necessary. Not all affected groups are satisfied with the mitigation and compensation measures. For example, there is a potential lawsuit with the miners' cooperative COOGARIMA, there are ongoing disagreements with fishermen in Abunã, and there have been disputes over which properties are affected by backwater effects (with ANA requesting from ESBR a resettlement of parts of Abunã village, which ESBR believes is not justified on technical terms). The <i>Ministério Público</i> (Public Prosecutor), the <i>Conselho Nacional dos Direitos Humanos</i> (National Council for Human Rights) and other institutions have become involved in disputes over impacts and compensation. However, even in those cases there appears to be functional mutual communication (through a number of channels including a formal grievance mechanism) and cooperation in other areas, which allows adaptive management. There is a large number of examples for adjustments over time in the social programs, responding to diverse issues such as
• to project benefits	✓	See above under Assessment; many of the PBA programs can be interpreted as benefit sharing. The social compensation program went far beyond the measures prescribed by license (R\$ 45 million), with an additional R\$ 164 million spent under MoUs with the state and the municipality as well as through a BNDES sub-credit, for infrastructure, education, health, tourism, security, among others. Additionally, benefits have been and are being delivered through local employment and procurement, royalties and taxes, multiple voluntary ad-hoc agreements to support government agencies,			

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		cooperatives and other recipients on smaller-scale initiatives, and sponsorships from the annual administrative budget of ESBR.			<p>the 2014 floods, the Covid-19 pandemic, or changes in regulations.</p> <p>There have been several public opinion surveys sponsored by ESBR, however the final one was in 2015 near the end of the construction period and may not reflect the current status. At the time, favourable and negative opinions about the project were about equal, with the most frequently cited positive impacts related to economic opportunities, and the most frequently cited negative impacts related to environmental impacts, loss of employment at the end of construction, increase in violence and crime, population influx, and inflation. In popular opinion, the impacts of the two projects Jirau and Santo Antônio are often conflated. There have been a number of protests against the project, some of them linked to the <i>Movimento dos Atingidos por Barragens</i> (MAB), but it is not possible to state with any certainty how much public support these have in the community. ESBR responds to all complaints, but opposes claims for compensation that it considers outside its responsibility.</p> <p>The fact that some of these issues have been disputed for years (for</p>
Measures are in place to manage any identified issues relating to these commitments:					
• to project-affected communities	✓	Commitments to affected communities have been extended and/or revised a number of times, reflecting issues identified or new opportunities.			
• to project benefits	✓	See above.			
If there are any formal agreements with project-affected communities, these are publicly disclosed	✓	Formal commitments have been disclosed through the formal licensing process and the associated documents such as the PBAs, as well as grant agreements with the municipality and other agencies, and minutes of meetings of community meetings and a number of dedicated working groups on specific issues. Many of the cooperating organisations such as the <i>Observatorio Socio-Ambiental</i> and COOPPROJRAU also have their own websites and issue their own public reports. Royalty payments are also regularly disclosed.			
Commitments to project benefits are publicly disclosed	✓	See above.			

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
			<p>example, in the case of backwater effects, since 2014), and divergent opinions are upheld by the parties without resolution, is a significant gap against advanced requirements. Without assigning responsibility to any one party, it appears that the dialogue, administrative and legal processes are somewhat dysfunctional.</p> <p>A number of initiatives to support cooperatives to develop small-scale businesses have run into problems, often related to institutional or marketing issues. This has been the case for small-scale miners, the resettlement community of Nova Vida (agro-industries), downstream communities on the Lower Madeira (agro-industries) and some of the upstream communities (fishing). The issues are well known to ESBR's team and have been discussed in a transparent manner with partners supporting these initiatives, such as BNDES, but in some cases, there has been limited flexibility on the part of stakeholders to recognize the risks and find alternative ways to support the community groups. This is a gap but it is not considered significant, given that there are few alternatives to promote rural development and the problems with cooperatives are</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
					not unique to Jirau's livelihoods programs, and in some cases linked to macro-level problems, such as Brazil's deep economic recession in recent years.
Infrastructure Safety and Public Health					
Dam and other infrastructure safety management plans and processes have been developed in conjunction with relevant regulatory and local authorities	✓	<p>The Inspection, Instrumentation and Maintenance Plan for the Dam and Civil Structures is based on 752 instruments for the permanent structures and, together with the instrumentation of the drainage system, totals 1,348 monitoring points, which provides high reliability in the monitoring of civil structures.</p> <p>There is a computerized management system (SIBar) for the Inspection, Instrumentation and Maintenance Plan, which manages the databases and the results of the structural analyses, and analyses the data to compare them with the relevant safety criteria. The system is permanently verified by the Jirau dam safety team and external consultants.</p> <p>The Emergency Action Plan (PAE) contains detailed procedures for monitoring activities, communication plans, information flowcharts and decision-making trees with defined responsibilities), and was developed and approved with ANEEL and other</p>	Processes are in place to anticipate and respond to emerging infrastructure safety risks and opportunities	✓	<p>In the Inspection, Instrumentation and Maintenance Plan for Jirau HPP Dam and Civil Structures there is a flowchart of information regarding inspections of civil structures and the forwarding and processing of data. This flowchart shows the activities carried out by the civil structures' inspection and maintenance team, the interface with the plant management, and the triggers for activating the PAE, in the event of an emergency.</p> <p>The following activities are carried out regularly: a) monthly Instrumentation Reviews (by the dam's own safety team); b) semi-annual Regular Safety Inspections that generate a detailed technical inspection report on the civil structures and also present the analysis of the instrumentation data for the monitoring period; c) annual Regular Safety Inspections, with similar, expanded results; and d) Special Safety Inspections that must be carried out soon after incidents such as floods, torrential rains,</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		relevant agencies (IBAMA and Rondônia state agencies).			earthquakes and unusual observations such as cracks, settlements, water surges and signs of instability of slopes.
These plans and processes provide for communication of public safety measures	✓	The Emergency Action Plan – PAE defines processes for communication of public safety measures. The PACUERA of Jirau reservoir defines safety measures, communication and signage around the reservoir. Safety zones upstream and downstream of the dam are fenced and signposted.			As requested by IBAMA, several Technical Opinions related to the licensing process, safety measures and PAE are disclosed through the Environmental Education Program and the Social Communication Program. In addition to internal training for the PAE, Jirau maintains dialogue via regular meetings with the Municipal Civil Defense of Porto Velho on the integration of the PAE and their Plano de Contingência (PLANCON), resulting in a calendar of activities, including the contracting of a specialized company by Jirau to carry out population surveys of the downstream communities within the self-rescue zone. Any simulations with the resident population downstream of the Self-Rescue Zone (ZAS) and in the Secondary Security Zone (ZSS, ANEEL definitions No. 1.064/23 Art. 2, item X) would be the responsibility of the Municipal Civil Defense according to Federal Law No. 12.608/2012. It is uncertain how widely safety measures are communicated and simulations are undertaken by the Municipality, which is a significant gap against advanced requirements.
Emergency response plans and processes include awareness and training programmes and emergency response simulations	✓	Emergency response plans and processes include awareness and training programs and emergency response simulations for internal staff. Training and simulation for external stakeholders and communities is a governmental responsibility, and Jirau HPP is coordinating with local agencies so training and simulations can be done with the communities.	Public safety measures are widely communicated in a timely and accessible manner	✗	

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
Measures are in place to manage identified public health issues	✓	<p>Primary responsibility for public health is with the public sector, through the <i>Sistema Único de Saúde (SUS)</i>, and in particular the municipality's health service. The key public health contributions of the project have been: 1) epidemiological and vector surveillance and control, and 2) public health infrastructure, equipment, and training. Measures were implemented in a flexible manner, e.g. by implementing a short-term program with the municipality to protect minors in Jaci-Paraná from sexual exploitation, and by using residual funds for Covid-19 control. Additional measures, outside the public health program of the PBA, that contribute to a healthy environment included solid waste disposal, water and sanitation investments. For the current operational phase, the emphasis will be on continued vector monitoring (malaria, dengue, yellow fever, zika, chikungunya), vector control, and health education in the work areas and residential areas of the plant, to protect both workers and the general population.</p>	Processes are in place to anticipate and respond to emerging public health risks and opportunities	✓	<p>While the public sector health system is responsible for general monitoring of health and health services, ESBR will provide continued vector monitoring. There will also be complementary mechanisms that contribute to anticipating and responding to public health issues, including the grievance mechanism and the tracking of the health status of employees, who are an integral part of the community.</p>
Conformance and Compliance					
Community Impacts and Benefits					
Processes and objectives in place to manage the following have been and are on track to be met:			There are no non-compliances relating to:		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
• delivery of commitments to project-affected communities, with no major non-compliances	✓	No major non-compliances have been identified.	• project-affected communities	✓	No non-compliances have been identified.
• delivery of commitments to project-affected communities, with no major non-conformances	✓	No major non-conformances have been identified.			
• project benefits, with no major non-compliances	✓	No major non-compliances have been identified.	• project benefits	✓	No non-compliances have been identified.
• project benefits, with no major non-conformances	✓	No major non-conformances have been identified.			
Commitments have been or are on track to be met relating to:			There are no non-conformances relating to:		
• project-affected communities	✓	There are no indications otherwise.	• project-affected communities	✓	No non-conformances have been identified.
• project benefits	✓	There are no indications otherwise.	• project benefits	✓	No non-conformances have been identified.
Infrastructure Safety and Public Health					
Processes and objectives in place to manage the following have been and are on track to be met:			There are no non-compliances relating to:		
• dam and other infrastructure safety, with no major non-compliances	✓	No major no-compliances have been identified.	• dam and other infrastructure safety	✓	No non-compliances have been identified. As per regulations, ESBR annually provides a self-declaration regarding dam safety management and maintains all technical documentation available in the power plant for external supervision.
• dam and other infrastructure safety, with no major non-conformances	✓	No major non-conformances have been identified.			
• public health issues, with no major non-compliances	✓	No major no-compliances have been identified.	• public health	✓	No non-compliances have been identified.
• public health issues, with no major non-conformances	✓	No major non-conformances have been identified.			
Commitments have been or are on track to be met relating to:			There are no non-conformances relating to:		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
• dam and other infrastructure safety	✓	<p>After the 2014 floods, additional flood studies with updated hydrological data and backwater studies were carried out. These studies concluded that there is no increased risk in terms of dam safety.</p> <p>They also demonstrated the need to raise the level of some sections of the BR-364 road running parallel to the reservoir. The works to raise the level of the highway are ongoing as per an agreement with the regulatory agencies (IBAMA and DNIT) and are being carried out according to the planned schedule.</p>	• dam and other infrastructure safety	✓	No non-conformances have been identified.
• public health	✓	There are no indications otherwise. Commitments have been delivered, and infrastructure and equipment has been accepted by recipients.	• public health	✓	There are no indications otherwise.
Outcomes					
Community Impacts and Benefits					
Livelihoods and living standards impacted by the project have been or are on track to be improved	✓	Most project-affected groups have experienced improvements through a combination of improved infrastructure, services, housing, general economic activity, and specific economic compensation and support measures. A large part of the population in the area has been quite mobile, making the best use of opportunities and leaving activities with lower potential behind.	The measures put in place to improve livelihoods and living standards are on track to become self-sustaining in the long-term	✗	The results of livelihoods and living standards measures differ by location and community groups. Living standards have been improved sustainably in almost all locations, and livelihoods for most groups. However, monitoring results for people affected by displacement and receiving compensation and/or participating in livelihood development activities, have shown that for a significant

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
Economic displacement has been fairly compensated, preferably through provision of comparable goods, property or services	✓	The compensation rates for land acquisition and other economic impacts have generally been accepted by recipients, and only in a minority of cases had to be resolved through mediation or legal processes. Some displacement has not been directly compensated but affected groups have been supported to adapt; e.g. fishermen have been and are being trained, their cooperatives and fisheries management strengthened, infrastructure such as landing, processing and marketing locations improved, ice production facilities built etc. Fishing success has varied across different years, locations and target species but there is no clear causal attribution of declines or increases to the Jirau project. Registered fishermen receive financial support during the official seasonal closure (spawning season) of the fishery.			minority, the livelihood status has worsened over time (see also section 5). It is too early to confirm the long-term sustainability of the fishery, which is likely to continue to change over time (see also section 6). A number of livelihood development initiatives for cooperatives have also not delivered the desired results (see above). (Some but not all of these issues are likely related to individual circumstances of households, such as reduced incomes due to deaths or retirements.) Although inconclusive, the indications for problems with the medium- and longer-term sustainability of livelihoods measures are a significant gap against advanced requirements.
Communities directly affected by the development of the hydropower facility and any other identified beneficiary of the facility have received or are on track to receive benefits	✓	There have been and continue to be a variety of benefit sharing measures for different project phases and target groups, most of which have already resulted in documented improvements.	Benefits are significant and sustained for communities affected by the project	✗	The benefits are overall very significant, with the Jirau HPP (together with the Santo Antonio HPP) as probably the largest source of public investments in the project region since the beginning of construction. Some of the benefits are sustained by definition, such as the royalties. Others will be sustained because ESBR is required to

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
					<p>contribute under the current operational license or will continue to contribute voluntarily, e.g. to public services in Nova Mutum Paraná where ESBR has an interest in maintaining good community relations and where its own workers are residing.</p> <p>However, there is a risk that some of the initiatives handed over to a variety of government agencies and other organizations will not be sustained. There are already a number of examples where agencies have received and then not used buildings, equipment and other donations properly. These donations had been requested and agreed upon with those same agencies, but were then not used because of a lack of resources or changes in priorities. This is a significant gap against advanced requirements because it represents a waste of resources that could have been avoided with better planning by government agencies.</p>
Infrastructure Safety and Public Health					
Safety risks have been avoided, minimised and mitigated with no significant gaps	✓	No notable public safety incidents have occurred in relation with the Jirau project to date.	Safety risks have been avoided, minimised and mitigated with no identified gaps	✓	See under Minimum Requirements. No gaps have been identified.
		After the 2014 flood, new flood studies with flow updates and	Safety issues have been addressed beyond those risks	✓	Jirau has funded the raising of some sections of the BR-364 road and the

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>backwater studies were carried out. These studies concluded that:</p> <ul style="list-style-type: none"> the inflow design flood (for the 10,000-year recurrence interval) needed to be increased from around 71,000 m³/s to around 76,000 m³/s; since the total spill capacity of the dam is over 82,000 m³/s (spillway) and with the design flow through the 50 turbines over 100,000 m³/s, there are no increased risks in terms of dam safety, the level of sections of the BR-364 road needed to be raised, and the flooding in the Abunã district was not caused by backwater effects from the Jirau reservoir. 	<p>caused by the operating facility itself</p>	<p>access works to the new bridge over the Madeira River at the tail end of the reservoir (replacing ferries); both of these works result in improved road safety conditions.</p> <p>On occasion Jirau assists the federal and/or local police force during operations related to land invasion or smuggling, and operations in case of road accidents, forest fires or similar emergencies outside the plant.</p>
<p>Negative public health impacts arising from activities of the operating hydropower facility are avoided, minimised and mitigated</p>	<p>✓</p> <p>The concern about population growth and mobility contributing to a significantly increased disease burden in the project area has not materialized. While there was a temporary increase of some health problems such as cases of HIV/AIDS and dengue during construction, other diseases such as malaria and leishmaniasis actually decreased, and there are no current indications for impacts of the operating project. The public health program during construction and the initial years of operation was comprehensive and successfully implemented, and the</p>	<p>Where opportunities have been identified, measures to address public health issues beyond those impacts caused by the operating hydropower facility have been or are on track to be achieved</p>	<p>✓</p> <p>The two main contributions of the project to the health status in the area have been 1) the significant upgrade of the living conditions for local communities, including access to modern health services, and 2) vector control, in particular for malaria. Both programs were well coordinated with the Santo Antonio HPP and IBAMA. The municipality of Porto Velho went from a high-risk status before construction (2007) to medium risk in 2012 and low risk by 2015, when it received the 'Malaria Champions of the Americas Award'. One of the most valuable investments is the hospital</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	narrowing of measures during the current phase is well justified.		<p>ship 'Walter Bartolo' serving upstream riparian communities, based in Guajar-Mirim.</p> <p>Now that most health programs have been handed over to the public sector, however, there are some challenges in maintaining the status. The malaria risk has increased slightly since 2015, and the municipality has reallocated resources and reduced the service levels at the health centre in Nova Mutum Paran.</p>

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	15

Summary of findings and other notable issues
<p>A wide range of negative and positive community impacts is associated with the Jirau project. Over the years since before construction, these have been monitored and managed largely through programs under the environmental and social management plans (PBAs), which are license conditions, as well as voluntary initiatives by ESBR, some of which were financed through a dedicated sub-credit from BNDES. There have been significant improvements in the standard of living for most local residents, and livelihood improvements for many residents, but there have also been a number of problems regarding livelihoods restoration programs and a number of disputes over impacts and compensation claims, some of which are unresolved. However, no current non-compliances or non-conformances were identified.</p> <p>After considerable public health issues associated with the large influx of labour during construction, the public health situation is now much improved, both in terms of access to health services and in terms of the burden of tropical diseases, particularly malaria.</p> <p>Jirau's dam safety risk is categorized as low (regarding technical characteristics) and high (regarding potential damage); dam height and reservoir volume are relatively low, and in case of a dam break the flood wave could be absorbed by the downstream Santo Antonio reservoir. New studies after the 2014 flood (which peaked at about 56,000 m³/s) increased the design flood to around 77,000 m³/s, which can still be accommodated by the total spill capacity of about 110,000 m³/s (spillways + 50 turbines), and provided other updates on flood mitigation. The project has a detailed and comprehensive Emergency Action Plan.</p>

Relevant evidence

Interview	1, 3, 7, 8, 9, 10, 11, 14, 16, 17, 23, 29
Document	86-178
Photo	1, 4, 5, 6, 9, 11-14, 18, 19, 23-27, 30, 54, 67-92, 99, 100, 104

5 Resettlement



Scope and Principle	
<p>This section addresses how the physical displacement arising from development of the hydropower facility has been addressed, in cases where resettlement occurred and commitments are well-documented against a pre-project baseline. The principle is that the dignity and human rights of those physically displaced have been respected; that these matters have been dealt with in a fair and equitable manner; that livelihoods and standards of living for resettles and host communities have been improved; and that commitments made to resettles and host communities have been fully fulfilled. This section does not address those that are only economically displaced, who are addressed in Section 4.</p>	

Background	
<p>Did the project require or result in any physical displacement of people? Please state the evidence on which this determination is made.</p>	
<p>Yes, this section is relevant (for older projects, move on to the next question)</p>	<p>Yes, the project required physical displacement of people, and the resettlement program is still active.</p>
<p>No, this section is not relevant</p>	<p>Click here to enter text.</p>
<p>In the case of older projects, are there well-documented commitments in relation to resettlement made at the time of project approval and/or data on the pre-project baseline against which to compare post-project?</p>	
<p>Yes, this section is relevant</p>	
<p>No, this section is not relevant (in this case, issues in relation to resettlement should be taken into consideration under Section 1 – Environmental and Social Issues Management)</p>	

<p>Description of physically displaced communities and how they are displaced (distinguish between permanently vs temporarily and include number of people and households)</p>	<p>The resettlement program had two phases:</p> <ol style="list-style-type: none"> 1. Construction and impoundment of reservoir. This was the main program, which is now closed. 239 urban and 84 rural families who owned their properties were physically displaced, and 150 urban and 46 rural families who were non-owners (such as tenants and squatters). Out of these 519 families, 196 chose to be resettled by the project (including provision of a new home and land, mostly in the new town of Nova Mutum Paraná and some in Nova Vida, a rural area close by), 164 chose the option of a 'letter of credit' towards the cost of a new property, 144 chose the option of 'indemnification' (cash compensation), 13 were expropriated and compensated after various judicial processes, and 2 could not be found. 2. Additional resettlement following the new backwater study after the 2014 flood. This program is still ongoing. 10 families opted for urban resettlement in Nova Mutum Paraná, 5 for cash compensation.
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Name and number of settlements	'Urban' families came from the former town of Mutum Paraná, while 'rural' families came from small villages and isolated farms mostly along the right bank of the Madeira River (as the left bank is almost entirely within the Matinguari National Park).
Agencies relevant to land acquisition	IBAMA, Ministério Público, Comitê de Sustentabilidade (with a working group specifically on resettlement, the <i>Grupo de Acompanhamento Social</i>), INCRA
Agencies relevant to livelihood restoration	See above, as well as EMBRAPA (Brazilian Agricultural Research Corporation)
Other relevant information	The resettlement program did not distinguish clearly between physically and economically displaced families, but rather between rural and urban origin, ownership status, and compensation option chosen. Some of the information in this section overlaps with section 4 on economically displaced people.

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Monitoring is being undertaken to assess if commitments made to resettles and host communities have been delivered and if management measures are effective	<p>✓</p> <p>Both phases of the resettlement program had two monitoring sub-programs, namely 'Monitoring of Social Reinsertion and Assessment of Quality of Life Restoration', to track the progress of the physical resettlement, and 'Monitoring the Economic Viability of Reorganized Activities', to track the progress of the livelihood restoration. Monitoring for Phase 1 is terminated while that for Phase 2 will continue until 2024.</p> <p>Monitoring was detailed and well-designed, tracking the affected families from T0 (baseline situation before resettlement) through T1, T2 and T3 monitoring campaigns, through the consulting company Assist. Monitoring focused on those families opting to be resettled by the project, with less coverage of other groups, particularly those opting for</p>	<p>Identification of ongoing or emerging resettlement issues takes into account both risks and opportunities</p>	<p>✓</p> <p>The monitoring program has been comprehensive, tracking a large number of indicators related to the well-being of resettled populations. The liaison offices, grievance mechanisms and dialogue mechanisms, especially the multi-stakeholder <i>Grupo de Acompanhamento Social</i> coordinated by IBAMA, have given stakeholders including affected people and NGOs opportunities to raise issues.</p> <p>The issues are generally well-known, but complex to resolve. There are disagreements and lawsuits over technical issues (such as the extent of backwater effects, often confused with rainy season flooding) and issues of expectation management, as landowners tend to make ESBR responsible for issues outside of ESBR's control, e.g. regarding lands</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>cash compensation. Coverage also dropped with each monitoring campaign, reflecting a dynamic demography in this recently settled region. For example, only 9 of the original 39 rural resettlement properties in Nova Vida are still occupied by the original resettled families.</p>		<p>inside the Mapiunguari National Park administered by ICMBio; compensation amounts following guidance from the <i>Associação Brasileira de Normas Técnicas</i> (ABNT); road access to properties under responsibility of the municipality; or access to the rural electrification program (<i>Luz para Todos</i>) under local utilities.</p>
<p>Ongoing or emerging issues relating to resettlement have been identified</p>	<p>✓</p> <p>The 2014 floods led to additional displacement, which was identified through studies and surveys finalized in 2016.</p> <p>Ongoing and emerging issues have been identified through the formal monitoring and through community liaison workers, the <i>Observatório Socioambiental</i>, the <i>Grupo de Acompanhamento Social</i> and other channels. Interactions and agreements with resettled families are well documented. The most complex issue over the past years has been the responsibility for compensation and resettlement in flooded areas, i.e. reaching agreement on the exact boundaries of areas affected by the reservoir. This includes an unresolved lawsuit between ESBR and ANA over impacts in the Abunã area.</p> <p>There have been long delays in issuing land titles for resettled families,</p>		<p>Another complex issue is the organization of Nova Mutum Paraná town, where resettles, ESBR and contractor workers, and third parties reside. A number of empty homes left behind by the main contractor were invaded, and there is still a lot of turnover in the population. However, living together in one town is also seen as an opportunity to overcome typical divisions between the workforce of a hydropower project on the one hand, and affected people on the other hand.</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		caused by a lack of resources at INCRA. ESBR has lent extensive support to families in this process, and due to a change of regulations there may be a chance to conclude this process more rapidly than anticipated.			
Management					
Measures to address resettlement are documented in a Resettlement Action Plan	✓	Formal resettlement plans were developed for both phases, as part of the PBAs, approved by IBAMA and implemented in a participatory manner with affected populations, government agencies and specialised consulting firms.			The closure of most resettlement-related activities was agreed with IBAMA. The resettlement working group is no longer active, and for most resettled people, the monitoring program is no longer operational. Some of them live in Nova Mutum Paraná and can communicate directly with ESBR staff (and ESBR staff are likely to be aware of any issues affecting residents of the town), but such informal relationships cannot replace systematic dialogue and monitoring mechanism. Regarding resettled people who live in other locations, there are even fewer options to detect risks and opportunities. The latest livelihood monitoring data show that a significant minority of resettled people may have seen declines in incomes (see below under Outcomes) and could be at risk of impoverishment, if additional risks are not anticipated and responded to.
Measures are in place to deliver commitments to resettlees and host communities	✓	Commitments to resettlees have been delivered through compensation, social assistance, and livelihood restoration. These support measures were delivered through specialized staff, meeting each family at least monthly. Targeted (often one-on-one) support was offered, e.g. through technical training and employment, for health (including mental health and family conflicts), applications for government social programs, and formalization of paperwork such as IDs and land titles. Community infrastructure was provided in Nova Mutum Paraná and Nova Vida. While most measures are finalized, a small number of families from Phase 2 still receive assistance. The information	Processes are in place to anticipate and respond to emerging risks and opportunities	✗	

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>centre in Nova Mutum Paraná has closed, and the social assistance centre operated by Oikos consultants is scheduled to close this year, as demand for services has declined. Programs, initiatives and institutions have been turned over to agencies, become independent or have closed.</p> <p>Host communities are not relevant as most people either resettled in Nova Mutum Paraná, a completely new town, or moved to Porto Velho, a city with more than 500,000 people where the influx from the project area would not be notable.</p>			The absence of an ongoing process to track all resettled people and to provide targeted assistance in case of difficulties is a significant gap against advanced requirements, because it is not clear that the objectives of the resettlement program (maintain or improve living standards and livelihoods) have been fully met.
Measures are in place to manage any issues relating to resettlement, including provision of grievance mechanisms	✓	Measures have been in place since the first surveys of people affected by physical displacement but are gradually coming to an end. The grievance mechanism will remain in place (see section 10).			
Formal agreements with resettles and host communities are publicly disclosed	✓	Information on resettlement options and programs has been easily available for affected people and the general public. Formal agreements with individual families are private. Minutes of Meetings of the resettlement working group are public. The Nova Mutum Paraná newspaper produced by ESBR is also an important source of information for resettles.			
Conformance and Compliance					

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
Processes and objectives in the Resettlement Action Plan have been and are on track to be met with:			There are no non-compliances	✓	There are no indications for non-compliances.
• no major non-compliances	✓	✓			
• no major non-conformances	✓	✓	There are no non-conformances.	✓	There are no indications for non-conformances. The 2013 HSAP assessment raised a potential non-conformance since the original PBA stated that all resettled families should be monitored, and the original Terms of Reference for the monitoring consultants (Assist) did not include all groups. However, Assist was subsequently asked to make efforts to reach all groups.
Any resettlement related commitments have been or are on track to be met	✓	There are no indications of commitments that have not been kept.			
Outcomes					
Resettlement has been and is being treated in a fair and equitable manner	✓	Those covered by the resettlement program are generally positive about the treatment they received; disagreements are more frequent for those affected by, or claiming to be affected by economic displacement (see section 4). The resettlement community in Nova Mutum Paraná is considered to have some of the best housing, infrastructure and services in the state of Rondônia.	The measures put in place to improve livelihoods and living standards are on track to become self-sustaining in the long-term	✗	Approximately 10 years after resettlement, a majority of resettled families has received continuous assistance and enjoys a higher standard of living, according to feedback from the community and visual observations. However, formal tracking of living standards ended in 2015 for most families, and even then a significant proportion of families were not covered, so there are insufficient data to confirm these impressions. Also, reportedly there are still cases of socio-cultural and mental health problems including domestic violence and depression, that may be associated with the lifestyle after resettlement.
Resettles and host communities have experienced or are on track to experience a timely improvement in livelihoods and living standards relative to the pre-project baseline	✓	Those resettled families whose perceptions of living standards could be tracked through the T0-T3 (2015) monitoring campaigns experienced improvements in average values, particularly with regards to quality of infrastructure, services and health			

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>status. This was particularly notable for previous non-owners.</p> <p>The performance for livelihoods is more mixed, with significant minorities experiencing a decline in incomes between T0 and T3 (2018). This may be explained by individual circumstances, the drop-off in economic activity towards the end of construction (e.g. the end of opportunities to rent out homes to workers), the general economic crisis in Brazil, followed by the Covid-19 pandemic. Two groups in which a small majority actually perceived a decline in livelihoods were urban self-employed (e.g. small traders) and inactive families (mostly retired). Some of the new livelihood projects chosen by families and supported by ESBR were unsuccessful.</p> <p>Not all families could be tracked; in the view of ESBR and some external stakeholders this most likely implies that they are doing well economically, have moved to Porto Velho or other places with better opportunities, are no longer dependent on the resettlement program, and did not wish to be tracked. However, there are no data to confirm this view.</p> <p>The 2013 HSAP assessment raised the 'risk of a decline in living standards</p>		<p>Some of the community infrastructure in Nova Mutum Paraná is not operational (e.g. the cultural centre) or not fully operational (e.g. the health centre) because of public budget constraints or disagreements over responsibility for O&M costs. The municipality downgraded the health centre and removed equipment, arguing that it was oversized for a community of this size. Only a limited number of businesses not related to Jirau HPP have established themselves in the town, despite incentives offered by ESBR (such as free land). Some of the businesses established with ESBR's direct support (e.g. the rural cooperative's manioc flour processing plant) are also not operational. ESBR still provides significant voluntary support to the town (partly in its own interest, because its workers also live there) on issues that would be handled by the municipality in other towns (e.g. sponsoring of events, mosquito spraying, repairs of infrastructure, providing homes to work crews and public service employees such as police). In general, the economy and administration of Nova Mutum Paraná remain partially dependent on the Jirau plant.</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	and livelihoods to sub-groups of the relocated population, and the absence of monitoring data to establish this' as a significant gap against basic good practice. ESBR and their consultants have since made major and repeated efforts to reach families who were initially left out of the monitoring program. Because of this, because the livelihood restoration program was well implemented, and because there are too many individual and external factors influencing livelihoods over a period of ten years to attribute livelihood declines to resettlement, this is no longer considered a significant gap at the minimum requirements level.		Overall, this dependency and the documented livelihoods issues for a significant minority of the resettled population are a significant gap against advanced requirements, because they imply that resettlement investments may not become self-sustaining without continued ESBR support, despite the best efforts of the project.

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	3

Summary of findings and other notable issues
The resettlement program was delivered as planned and generally successful, and the main destination of resettlees, the new town of Nova Mutum Paraná, has some of the best quality of housing and public services in the state of Rondônia. However, not all community investments are still operational, monitoring of resettlees has been incomplete, and results of livelihoods monitoring have been mixed, so that there is some uncertainty over the long-term sustainability of the standard of living of resettlees.

Relevant evidence	
Interview	7, 9, 10, 11
Document	180-208
Photo	27, 28, 67-89

6 Biodiversity and Invasive Species



Scope and Principle	
<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 operating hydropower facility. The principle is that there are healthy, functional and viable aquatic and terrestrial ecosystems in the area that are sustainable over the long-term; that biodiversity impacts arising from the operating hydropower facility are managed responsibly; that ongoing or emerging biodiversity issues are identified and addressed as required; and that commitments to implement biodiversity and invasive species measures are fulfilled.</p>	

Background	
Short description of the ecological region in the project area	The Madeira River catchment is the largest of the tributaries of the Amazon with its headwaters in the Andes (Bolivia and Peru). It has one of the highest species richnesses in the world, and 920 species of fish have been identified in the Madeira River.
Protected areas (national parks and reserves etc) and their distance from the project	<p>Adjacent to the left bank of the Jirau Reservoir: Matinguari National Park and the State Conservation Unit of Serra dos Três Irmãos (part of a series of conservation units that include national forest reserves and extractivist reserves).</p> <p>Approx. 30 km south-southeast of the dam site (right bank): Jaci Paraná State Extractivist Reserve and Bom Futuro National Forest Reserve.</p>
Critical habitats in the project area, including important bird areas, hotspots of endemism etc.	<p>The Abunã IBA BR087 (listed in 2009) is located upstream in the upper reaches of the Jirau reservoir, broadly between the communities of Mutum Paraná and Abunã and between the Madeira River and the BR364 road.</p> <p>A limited number of endemic fish species have been observed during monitoring activities (6 species).</p> <p>Matinguari National Park: conservation work carried out by the project in collaboration with ICMBio in the Park involves monitoring/studying specific species groups, during which 8 threatened species have been observed.</p> <p>In total, 168 new species for science have been identified during the fauna monitoring programme around the reservoir (most of them arthropods).</p>
# threatened species in the directly affected area: terrestrial	The following threatened species have been observed during monitoring activities in and outside the Matinguari Park: critically endangered primate <i>Cebus kaapori</i> , endangered avian species <i>Crax globulosa</i> and primate <i>Lagothrix cana</i> , and a number of vulnerable avian, primate and mammal species: <i>Aburria kujubi</i> , <i>Ateles chamek</i> , <i>Saimiri vanzolinii</i> , <i>Tayassu pecari</i> , <i>Tinamus tao</i> , <i>Saguinus niger</i> .
# threatened species: aquatic	<p>Amazon river dolphin (<i>Inia geoffrensis</i>).</p> <p>Between 2010 and 2022 the project's ichthyofauna conservation inventory campaign registered observations of 622 taxonomically confirmed species of which 6 are endemic, 55 were exclusively registered by Jirau HPP, 93 species are pending taxonomic confirmation and 17 new species were identified for the Madeira river basin.</p>

Any other species of conservation importance	The Abunã IBA lists a number of LC avian species.
Migratory pathways	The rapids at the Jirau dam location (and the Santo Antônio project location) were previously a barrier to migration of some aquatic species. The Santo Antônio fish passage system is non-discriminate and allows all fish the possibility to migrate upstream, Jirau's system is discriminate as it is a fish passage that includes a manual step where fish are identified and selected to either migrate upstream or returned downstream (for example: <i>Brachyplatystoma vaillantii</i> (piramutaba).
Invasive species: terrestrial	n/a
Invasive species: aquatic	The fish passage at the Jirau dam cannot allow <i>Brachyplatystoma vaillantii</i> (piramutaba) to go upstream. This species could previously not pass the Santo Antônio and Jirau rapids. The selective release of captured fish at Jirau prevents this species from swimming upstream.
Key threats to biodiversity	Habitat destruction due to deforestation for cattle farming and agriculture; artisanal/informal gold mining activities ("garimpo") in the river, reservoir, national park and surrounding areas; human settlements; illegal fishing, hunting and logging; hydropower, roads and other infrastructure.
Agencies involved in biodiversity conservation	At the federal level, IBAMA (environmental regulator) and ICMBio (responsible for conservation, administers national parks). Conservation areas in the region also include some that are administered by the state of Rondônia and by indigenous groups in cooperation with FUNAI.

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Ongoing or emerging biodiversity issues have been identified	✓ An assessment of biodiversity issues was undertaken during the development phase and ESIA stage of the project, and it took into consideration sustainable alternatives and opportunities including "fish friendly turbines", options for fish passage and implemented activities for capture and release of fish, fish tagging, and selective fish transposition; revegetation/ reforestation activities with a variety of local species through the collection of germplasm; as well as a robust fauna capture and relocation programme.	✗ Identification of ongoing or emerging biodiversity issues takes into account both risks and opportunities	An example of emerging risks and opportunities includes measures to rescue fish confined and stranded in the turbines and hydraulic conduits and structures when turbines are shut down, and/or mechanical and physical barriers are closed (e.g. spillway gates, stop-logs). When the project was commissioned, the project noticed a number of fish were caught in these spaces and conduits during shut-downs. To avoid fish mortality, Jirau implemented a number of measures including underwater cameras to detect the presence of fish before dewatering,

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
If management measures are required, then monitoring is being undertaken to assess if management measures are effective	<p>Detailed monitoring programmes continue to be in place as a condition of the project’s licencing process and include the following sub-programmes:</p> <p>Under the Ichthyofauna Conservation Programme:</p> <ul style="list-style-type: none"> • Ecology and Biology Sub-programme which monitors structure and function of fish communities (22 sampling locations over an area of 677 km, 91 campaigns from 2010-2022. • Taxonomic Inventory Sub-programme (to date 622 species have been confirmed, including 6 endemic species, 55 species registered exclusively by Jirau, 17 new species registered for the Madeira River catchment. • Ichthyoplankton Sub-programme: monitors larvae, eggs and juveniles. • Fish Transposition System (“STP”) Monitoring Sub-programme: the project operates two STP systems, STP1 on the right bank of the river downstream from the dam, and STP2, located on an embankment/septum that separates the powerhouse 1 tailrace from the gated spillway. The systems are functional between July and December of 		<p>not dewatering completely to allow for stranded fish to be rescued, and short quick spinning of non-energized turbines to “scare” fish out of the turbine area and draft tubes prior to closing conduits. Results indicate that this method decreases the number of stranded fish in the draft tubes by approximately 87% and therefore the fish rescue teams’ workloads are more manageable.</p> <p>The project also saw an opportunity to work with ICMBio in the adjacent Matinguari National Park to more effectively contribute to conservation efforts compared to their previous fauna monitoring programme. Their proposal was subsequently accepted by IBAMA and results are positive.</p> <p>While many of the assessments and studies and monitoring programmes target specific species including endangered and migratory species, the Amazon river dolphin (<i>Inia geoffrensis</i>), that was a target species during the implementation phase of the project, is no longer being monitored by the project despite its “endangered” status. This is considered a significant gap against advanced requirements.</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>each year which correspond to the dry season and parts of the flood and ebb seasons, while they undergo preventative maintenance during the remainder of the year. 8 target migratory fish species were defined for monitoring purposes, one of which cannot be released upstream (<i>piramutaba</i>).</p> <ul style="list-style-type: none"> • Fish tagging and telemetry study sub-programme. A total of 1,167 fish were tagged between 2015-2022 and 12 receiver stations were installed between Búfalo Island downstream from the dam and Vila Iata on the Mamoré River. One of the objectives of the fish tagging programme is to assess and monitor the effectiveness and attraction of target species to the STPs, in particular the long-range migratory catfish species (<i>Brachyplatystoma Spp.</i>) • Fish Rescue and Release Sub-programme. <p>The Fauna Monitoring Programme also includes several sub-activities or programmes including Fauna Capture and Release in areas within the project activities, Monitoring of Fauna (prior to filling, during filling and post-reservoir filling), Conservation</p>		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>Monitoring of 8 threatened fauna species in Mapinguari Park in collaboration with ICMBio.</p> <p>The current/ongoing Flora Programme includes flora monitoring (conducted from 2011 to 2021), ongoing revegetation activities in the APP area (Permanent Protection Area surrounding the reservoir), rehabilitation of degraded areas that were used during construction and that have been demobilised, and monitoring of carbon sequestration and carbon stocks.</p> <p>Use of the reservoir and the land around the reservoir is also monitored through a variety of measures including remote sensing.</p>			
Management					
Measures are in place to manage identified biodiversity issues	✓	<p>A number of measures are in place to manage biodiversity issues, and are described in the various plans that are part of the project's operational phase PBA, and include:</p> <ul style="list-style-type: none"> the Ichthyofauna Conservation Programme, as described above. Flora Conservation Programme in the APP (permanent preservation area surrounding the reservoir). Macrophyte monitoring and control programme. PACUERA (the conservation and use of surrounding areas of the 	Processes are in place to anticipate and respond to emerging risks and opportunities	✓	<p>A number of processes are in place to anticipate and respond to emerging risk and opportunities and include fish friendly turbines, a fish passage which allows for capture and selective release upstream or downstream species (e.g. the piramutabas that travel upstream through the Santo Antonio fish passage are returned downstream. This species is known to migrate long distances from the Amazon delta upstream but did not previously travel upstream from the</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>reservoir plan): is a planning tool that includes environmental education and awareness.</p> <p>In addition, the project has an environmental compensation plan which involves allocating resources to Federal and State conservation units or parks, in line with Brazilian legislation and as determined by the respective governmental entities. Compensation activities and funds towards the State of Rondonia’s conservation units totalled over R\$14.9 M (approx. 2.9 M USD), and for Federal conservation units over R\$38 M (approx. 7.5 M USD).</p>			<p>rapids at Jirau and Santo Antônio in the Madeira River).</p> <p>Because the Jirau HPP operates as a run-of-river project, the reservoir is not considered to be susceptible to invasive macrophyte blooms (e.g. water hyacinth). Nonetheless, a detailed macrophyte monitoring programme is carried out to assess the changes in biomass and species composition of the areas that have been influenced by the reservoir, including new shallow shoreline wetlands and tributary areas. These new areas have provided increased habitat for aquatic birds.</p>
Conformance and Compliance					
Processes and objectives in place to manage biodiversity issues have been and are on track to be met with:			There are no non-compliances	✓	There are no non-compliances.
• no major non-compliances	✓	There are no major non-compliances.			
• no major non-conformances	✓	There are no major non-conformances.	There are no non-conformances	✓	There are no non-conformances.
Biodiversity related commitments have been or are on track to be met	✓	Biodiversity commitments are being met on an ongoing basis through conformance and compliance with the operations phase “PBA” (environmental management plans).			
Outcomes					
Negative biodiversity impacts arising from activities of the operating facility are avoided,	✓	The project’s plans and programmes embodied in the operations phase PBA contribute to the avoidance, minimisation, and mitigation of	There are healthy, functional and viable aquatic and terrestrial ecosystems in the area affected by the	✓	ICMBio indicated that the results of the biodiversity monitoring in the Matinguari National Park has demonstrated that the three main

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
minimised, mitigated, and compensated	<p>biodiversity impacts. They also contribute to regional conservation efforts through financial contributions, technical support and the donation of land to State and Federal protected areas. (As mentioned above, compensation of biodiversity impacts in Brazil is carried out through contributions to State and Federal conservation units.)</p> <p>The purpose of the fish transposition system is to allow selective upstream fish passage at the dam site. The aim of the Fish Transposition System Monitoring Sub-programme is to assess the transposition system's effectiveness. The Fish Transposition System is considered successful, after having undergone some early design modifications to improve its effectiveness and rehabilitation works following the damages from the 2014 flood event. It has captured over 1.628 million individual fish (approx. 811,000 from STP 1 and 816,000 from STP2). The sub-programme identified 8 target migratory species to be able to assess the effectiveness of the system, which has an important relationship with the conservation of migratory fish, and in particular the identified target species. The integrity of the large catfish stocks of the of the Madeira River depends on the</p>	hydropower facility that are sustained over the long-term	pressures on the park (settlement/ invasions, illegal hunting, and land conversion/deforestation) have decreased over time. Aquatic ecosystems also appear to be healthy, functional and viable, primarily based on fish monitoring results.
		<p>The facility has contributed or is on track to contribute to addressing biodiversity issues beyond those impacts caused by the operating hydropower facility</p>	<p>Many conservation areas in the Brazilian Amazon face significant human pressures and have limited resources to enforce regulations. The conservation areas on both banks of the Madeira River are better protected than most, partly because of the barrier effect of the Jirau reservoir, the remote sensing and other monitoring activities supported by the project, and some logistical support to law enforcement against invasions.</p> <p>The project currently owns about 2,800 ha on the left bank of the reservoir that will be handed over to the Serra dos Três Irmãos State Park, and the project will donate another 8,000 ha to the Matinguari National Park. These areas, previously used during the construction phase of the project, are currently undergoing rehabilitation/reforestation.</p> <p>The results of the monitoring program carried out in collaboration with ICMBio in the Matinguari National</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>maintenance of the habitat of these species which has been fragmented by the two hydropower facilities. Results indicate that 7 of the 8 target species have been registered between 2012 and 2022 with a greater abundance, indicating that the STPs are functioning as intended. Fish migration is a function of water level in the river and is concentrated towards the end of the dry season and the beginning of the flood season. <i>Brachyplatystoma vaillantii</i> (N=65) was the most representative species of STP1 and <i>B. rousseauxii</i> (N=70) the most representative of STP2, and all of the species studied, with the exception of the <i>B. vaillantii</i>, showed displacements of over 200 km spanning downstream and upstream reaches from the damsite.</p>		<p>Park indicate that the park currently has good levels of conservation and biodiversity; 4 endangered fauna species were observed during the last monitoring campaign which highlights the importance of conservation in these areas.</p> <p>Work carried out with fishing and mining groups also contribute to positive outcomes on aquatic biodiversity and conservation (e.g. new fishing and fish conservation methods for abundant species, better marketing of fishermen’s catches to conserve fish and reduce waste, awareness campaigns with dredging/mining communities).</p>

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	5

Summary of findings and other notable issues
<p>The biodiversity studies and monitoring activities carried out by the project and that are ongoing are extensive and allow for the knowledge base to be continuously updated. In addition, the project has developed innovative methods to reduce fish mortality at the plant level during operations. The project has developed a partnership with ICMBio to conduct monitoring in the neighbouring Mapinguari National Park and contribute to improve the conservation status of nearby protected areas. The Amazon river dolphin (<i>Inia geoffrensis</i>) is not one of the identified target species being monitored by the project.</p>

Relevant evidence	
Interview	7, 8, 12, 16, 17, 23, 26

Document	209-232
Photo	4, 6, 8, 11, 17, 18, 21, 22, 23, 34, 36, 89

7 Indigenous Peoples



Scope and Principle	
<p>This section addresses the rights at risk and opportunities of Indigenous Peoples with respect to the hydropower facility, 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 principle is that the operating facility 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>	
<p>Yes, this section is relevant</p>	<p>During the preparation of the Jirau project, there were concerns that indigenous peoples (IPs) in the area could be affected by an influx of people. This concern did not materialize, as there are no indications for demographic pressure and invasions of indigenous territories (ITs) related to the project. However, the project was required by license to support a number of indigenous communities.</p>
<p>No, this section is not relevant</p>	<p>Click here to enter text.</p>

Add columns for each Indigenous People	
<p>Brief description of the peoples and their culture, lands, and representation</p>	<p>The risk of indirect or induced impacts (intensified encroachment of ITs) was identified early in project preparation. FUNAI allocated responsibilities for the nearest indigenous communities between the two projects Jirau and Santo Antonio based roughly by geographical proximity. Jirau was allocated 4 ITs at a distance of ~108 km to ~165 km from the dam:</p> <ul style="list-style-type: none"> • TI Igarapé Lage: 107,321 ha, ~1,449 Wari or Oro Wari people • TI Igarapé Ribeirão: 47,863 ha, ~412 Wari' or Oro Wari people • TI Kaxarari: 145,889 ha, ~639 Kaxarari people • TI Uru Eu Wau Wau: 1,867,118 ha, ~656 people from various IPs, including Jupaú, Amondawa, Oro Win or Oro Towati, and at least three groups of isolated IPs of unknown language.
<p>Directly affected communities and how they are affected</p>	<p>None</p>
<p>Other affected indigenous communities</p>	<p>No other IP groups outside the 4 ITs are known to have been affected.</p>
<p># households physically displaced</p>	<p>None</p>
<p># households economically displaced</p>	<p>None</p>

Agencies relevant to Indigenous Peoples	The 1988 Brazilian Constitution (Article 231) recognises indigenous peoples' (IP's) right to pursue their traditional ways of life and to the permanent and exclusive possession of Indigenous Territories (ITs). Fundação Nacional do Índio (FUNAI) is the government agency responsible for Brazilian IPs. FUNAI places restrictions on the interaction of third parties with IPs, and particularly isolated IPs, and has to approve all support measures by the Jirau project.
Other relevant information	ITs in the Brazilian Amazon have been at risk of illegal encroachment from logging, ranching/farming, mining, and other interests. These risks increased under the previous Brazilian federal administration, when deforestation rates in ITs and Protected Areas were systematically higher than in non-protected areas. An increase in encroachment has also been documented in the ITs supported by the Jirau project.

Minimum Requirements		Advanced Requirements			
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment					
Ongoing or emerging issues relating to the operating hydropower facility that may affect Indigenous Peoples' rights have been identified	✓	The 4 ITs identified for support measures are all outside the indirect area of influence (Municipality of Porto Velho), as defined in the ESIA, but were covered in the ESMPs after consultation with the responsible agency FUNAI and IPs. Support priorities for the ITs were identified in more detail on the basis of an 'ethno-environmental' analysis in 2012. Due to the time gap of 9 years between the presentation of the first and second version of the CI-PBA (see below), the analysis had to be updated. FUNAI and the Jirau project have a good understanding of socio-economic and socio-cultural conditions, as well as ongoing and emerging issues regarding the ITs.	✓	Identification of issues that may affect Indigenous Peoples' rights is undertaken with the free, prior and informed participation of Indigenous Peoples	Indigenous peoples are consulted and, in most cases, directly involved in all phases of the support programs, from the selection and planning of measures to their implementation and final acceptance. The measures directly address the key rights of IPs, self-determination and access to land and resources on their territories.
If management measures are required, then monitoring is being undertaken to assess if management measures are effective	✓	Monitoring of implementation was undertaken for all measures of Phase I (emergency measures) and for the health and education components of Phase II. All of these measures have	✓	Identification of issues that may affect Indigenous Peoples' rights takes into account both risks and opportunities	Risks (in particular the risk of encroachment) and opportunities (for social, economic and institutional development) have been taken into account.

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>been finalized and accepted by recipients and FUNAI. Monitoring is also included in the upcoming components.</p> <p>Monitoring of the actual utilization of infrastructure and equipment provided, and its effectiveness in achieving objectives such as improvements in health or reduction in encroachment has been very limited, partly due to a lack of response from responsible government agencies and to the Covid-19 pandemic.</p>			
Management					
Measures are in place to address the Indigenous Peoples' rights at risk	✓	<p>3 packages of measures have been or will be implemented in the 4 ITs:</p> <ul style="list-style-type: none"> As a Phase I, emergency programs designed by FUNAI early on during project construction with a focus on demarcation and control of access to the ITs; some follow-up measures were completed in 2021-2022. As part of Phase II, health and education programs with specialized government agencies (2015-2022). Also as part of Phase II, sustainable development programs under the heading <i>Componente Indígena-Projeto</i> 	Measures to address ongoing or emerging issues that may affect Indigenous Peoples' rights at risk have been developed with the free, prior and informed participation of Indigenous Peoples	✓	IPs participated freely in the selection and design of measures, through a number of 'validation' meetings prior to approval (that resulted in changes to programs, with additional emphasis on capacity building) and through ongoing engagement. The only exceptions are a number of uncontacted IPs (which by definition, can only benefit from measures against encroachment) and a number of Oro Wari villages which are particularly remote and have yet to be visited for 'validation' of their support measures.

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<i>Básico Ambiental</i> (CI-PBA), following standard guidelines issued by FUNAI. These programs were substantially delayed due to a lack of response from FUNAI, and had to be re-designed in the context of the extension of the Operating License. They now include subprograms on Preservation of Indigenous Culture; Territorial and Environmental Management; Strengthening of the Indigenous Economy; and Strengthening of Indigenous Associations, and are ready to start once approved by FUNAI.			
Formal agreements are publicly disclosed	✓	The CI-PBA is available to the IPs in the 4 ITs. IPs are provided with appropriate information materials, including in their languages, and are encouraged to contact the project.	Processes are in place to anticipate and respond to emerging risks and opportunities	✓	There are ongoing communication channels between FUNAI and its regional offices, IPs, NGOs working in the ITs, and the Jirau project team. Different formats of coordination or management committees have been used throughout the implementation of the support measures, and are planned again for the upcoming phase of the CI-PBA.
Conformance and Compliance					
Processes and objectives relating to Indigenous Peoples' rights at risk have been and are on track to be met with:			There are no non-compliances	✓	No non-compliances have been identified.
• no major non-compliances	✓	There are no indications for major non-compliances.			

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
• no major non-conformances	✓	There are no indications for major non-conformances.			
Commitments made to Indigenous Peoples have been or are on track to be met	✓	<p>Commitments made to IPs under the agreements with FUNAI have been met or are now on track to be met, although with major delays (see under Advanced Requirements).</p> <p>The Jirau project also provided additional, voluntary measures to indigenous communities such as equipment against malaria (treated mosquito nets), Covid-19 (masks, hygiene kits) and waterborne diseases (chlorination equipment).</p>	There are no non-conformances	✗	Despite ESBR's repeated efforts to advance the program for IPs, FUNAI's lack of resources has resulted in ineffective use of some of the emergency measures (such as control posts) and in major delays in the implementation of the support measures. This is a significant gap against advanced requirements because it resulted in increased risk of encroachment, waste of some resources, and loss of opportunities to improve social and economic conditions earlier. Some further delays were caused by the Covid-19 pandemic, when contacts with IPs were suspended.
Outcomes					
Processes provide for negative impacts of the project to Indigenous Peoples' rights to be avoided, minimised, mitigated or compensated	✓	Negative impacts of the project on ITs, in particular through encroachment, have not been identified; demographic monitoring in the project region has only shown some urban growth. However, encroachment through activities unrelated to the project has continued. The effectiveness of the Phase I emergency programs is unclear. Due to lack of resources FUNAI was unable to use some of the infrastructure provided, and some items such as control posts provided by the project had to be dismantled again, and replaced by more mobile	Opportunities for positive impacts have been identified and maximised as far as practicable	✓	Considering that no negative impacts of the project on the ITs have been identified, the support measures are aimed at positive impacts and should deliver substantial and sustained benefits. Strengthening of the indigenous culture, economy and institutions combined with the implementation of Territorial and Environmental Management Plans should help protect the ITs from encroachment.

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		infrastructure for access control (such as trucks, mobile barriers, tents, drones). It remains to be seen how effectively FUNAI can implement the new strategy.			
Processes provide some practicable opportunities for positive impacts to be achieved	✓	The processes have been able to identify and achieve some positive impacts.	Opportunities for positive impacts have been or are on track to be achieved	✓	A number of positive opportunities have been achieved through investments in health and education, and additional ones are on track to be achieved, responding to needs identified jointly with IPs.

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	7

Summary of findings and other notable issues
Although the Jirau project has no documented negative impacts on indigenous peoples, it is required by license to support IP communities in nearby territories through measures to protect against encroachment and to strengthen their health and education programs, culture, economy and institutions. These measures can be considered additional benefits or benefit sharing measures, directed at a specific population group. There have been a number of delays in implementation, largely attributable to FUNAI, and in some cases a lack of responses from the specialised health and education agencies. While the selection of measures appears plausible, their effectiveness is difficult to evaluate.

Relevant evidence	
Interview	1, 7, 22
Document	233-259
Photo	3, 5, 102

8 Cultural Heritage



Scope and Principle
This section addresses cultural heritage, with specific reference to physical cultural resources, associated with the hydropower facility. The principle 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.

Background	
Does the project affect any physical cultural resources? Please state the evidence on which this determination is made.	
Yes, this section is relevant	The project affects physical cultural resources including pre-Columbian archaeological and historical resources.
No, this section is not relevant	Click here to enter text.

Sites of physical cultural heritage affected by or in proximity to the project-affected areas	How they are affected
The project's reservoir affects the historic Madeira-Mamoré railway between Porto Velho and Guajará-Mirim, built between 1907 and 1912 to avoid waterfalls on the Madeira River. Its main purpose was the transportation of rubber, and the railway played an important role in developing this part of the Amazon basin. It was later replaced by highways in the 1970s. The highway uses some of the historic railway bridges. In addition, archaeological surveys carried out in the reservoir footprint prior to filling and other project areas near the Madeira River found petroglyphs and significant pre-Columbian archaeological remains. The cemetery of Mutum Paraná, the community that was resettled by the project, was also affected.	Some sections of the railway were inundated by the reservoir footprint and some of the railway bridges had to be raised above reservoir water levels. The petroglyphs and archaeological artefacts that were discovered during archaeological surveys and prospections have been salvaged. The petroglyphs are currently located at the Jirau site and the pre-Columbian archaeological remains, mostly ceramic vessels and some remains from the railway company, have been transferred to the Federal University of Rondônia in Porto Velho. The cemetery of Mutum Paraná was relocated to Nova Mutum Paraná.
Agencies responsible for cultural heritage	IPHAN – National Institute for Historic and Artistic heritage

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Ongoing or emerging cultural heritage issues with respect	✓	Ongoing and emerging issues regarding the restoration of the railway have been identified and identification of ongoing or emerging cultural heritage issues takes broad	✓
			Initially, the project was only required to focus on measures to conserve the physical archaeological resources

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
to physical cultural resources have been identified	<p>include a number of issues related to the pending creation, by the municipality, of a historical heritage railway site at the railway station in Porto Velho where many of the historical artefacts will be on display. Some of these historic railway items are currently stored in Nova Mutum Paraná waiting for the exhibition area to be finished.</p> <p>Exhibition rooms has been furnished by the project at the Department of Archaeology at the Federal University of Rondônia in Porto Velho to exhibit the pre-Columbian and historic artefacts discovered at the Jirau and Santo Antônio sites and other archaeological artefacts.</p>	<p>considerations into account, and both risks and opportunities</p>	<p>discovered by the project, and license requirements did not include aspects related to the historic industrial railway. The Madeira-Mamoré railway was not protected under federal law, but Jirau HPP began discussions with the State of Rondônia regarding measures to preserve the railway heritage. This led to the opportunity to negotiate changes in requirements with IPHAN that would include measures to conserve some of the railway's physical resources such as bridges and the railway station in Abuña, that the project restored and converted to a community center that is used by the senior citizens in the community.</p> <p>One of the compensatory measures that Jirau was required to implement was to contribute to the new Archaeology Department at the University, which includes a climate-controlled storage room for the recovered pre-Columbian artefacts, and archaeology laboratories that are unique in Brazil and attract archaeology students from around the country. This has led to discussions between Jirau HPP and IPHAN about opportunities to hold international archaeology conferences in Porto Velho, given the importance of the department and its collection of pre-</p>
<p>If management measures are required, then monitoring is being undertaken to assess if management measures are effective.</p>	<p>✓</p> <p>The original archaeological heritage management programme started in 2009 and was finalised in 2012 with submission of final reports to IPHAN. Since that time, Jirau HPP continues to attend and maintain aspects related to the complementary measures including compensation measures established by IPHAN. These include maintenance and periodic cleaning of the recovered artefacts stored in a climate-controlled room at the University.</p>		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
					Columbian artefacts recovered by the Jirau and Santo Antônio projects.
Management					
Measures are in place to manage identified cultural heritage issues	✓	Management measures included the restoration and conservation of 6 railway bridges (4 on highway BR 364 and two on BR 425). Salvage operations included 2,035 railway pieces, 16 blocks with petroglyphs, and countless archaeological remains. Maintenance, cleaning and monitoring activities related to the petroglyphs, archaeological and historic resources continue to be carried out and supported by Jirau. These activities include the resources temporarily located at Jirau HPP (petroglyph blocks), artefacts, items in storage, exhibition rooms and laboratories at the University, monitoring the temperature and humidity in the artefact storage room (at the University) and railway items and original railway water tank stored at the Cultural Centre and warehouse in Nova Mutum Paraná.	Processes are in place to anticipate and respond to emerging risks and opportunities	✓	The project included a Visitor Centre at the Cultural Centre in Nova Mutum Paraná to allow visitors to see the historic and archaeological artefacts that were recovered by the project. The newly created archaeology department at the University in Porto Velho has allowed many students from different parts of Brazil to study the archaeological artefacts recovered from the vicinity of the Madeira River; it is one of the only programmes in Brazil to have fully equipped laboratories. Partnerships that have been developed with the Municipality, IPHAN and the University allow the project to respond to emerging risks and opportunities and contribute to activities that disseminate local and traditional knowledge and cultural heritage of the region.
Conformance and Compliance					
Processes and objectives in place to manage cultural heritage issues have been and are on track to be met with:					There were issues surrounding delays in implementations of some compensation measures which led to a complaint being filed against the project, however, these issues have since been resolved and there are currently no non-compliances.
• no major non-compliances	✓	There are currently no non-compliances.	There are no non-compliances	✓	

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
• no major non-conformances	✓	There are currently no non-conformances.	There are no non-conformances	✓	There are currently no non-conformances.
Cultural heritage related commitments have been or are on track to be met	✓	Commitments have been or are on track to be met, as maintenance activities are ongoing.			
Outcomes					
Negative cultural heritage impacts arising from activities of the operating hydropower facility are avoided, minimised, mitigated and compensated	✓	The project implemented a comprehensive cultural heritage program to preserve historical and archaeological resources. Ongoing maintenance activities relate to the collections stored at the University and in Nova Mutum Paraná. Some of the recovered assets such as petroglyph blocks and railway equipment still need to be moved to their final destinations where they can be displayed.	Where opportunities have been identified, measures to address cultural heritage issues beyond those impacts caused by the facility have been or are on track to be achieved	✓	<p>The project has contributed to the creation of a historical and archaeological knowledge base that has been made accessible to the public through workshops, presentations, physical and virtual museums, and the new Archaeology Department at the Federal University of Rondônia in Porto Velho.</p> <p>During the period 2016-2020, prior to transferring the collections of artefacts to the new University facilities, over 1,800 visitors from many regions of Brazil and 7 other countries visited the Cultural Centre of Nova Mutum Paraná where the artefacts were stored and exhibited. Over 2,000 people participated in the activities related to the project's cultural heritage programme which includes capacity building and employment generation aspects.</p> <p>Ongoing opportunities include collaborations with the municipalities for ongoing work on the restoration of the Porto Velho and Guajará-Mirim train stations, the implementation of</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
			<p>the railway museum/visitor centre at the Porto Velho train station, and collaboration with entities such as FUNCULTURAL (Cultural Foundation of the State of Rondônia) and IPHAN related to future opportunities such as international archaeology conferences and maintenance work at the University.</p> <p>The restoration of railway infrastructure has allowed conversion to other uses, such as the station in Abunã which is now a community centre for senior citizens.</p>

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	5

Summary of findings and other notable issues
The project has implemented a cultural heritage management programme that has been successful in salvaging significant physical cultural heritage and historical industrial features that have shaped the region. It has contributed to the dissemination of cultural knowledge through various activities, exhibits and publications, and the creation of the archaeology department at the university in Porto Velho where the archaeological artefacts are kept. This allows for the long term benefits to be shared with the larger community, and contributes to educational activities for generations to come.

Relevant evidence	
Interview	2, 7
Document	260-272
Photo	1, 2, 9, 19, 22, 44, 45, 77, 81-83, 95-98, 101

9 Governance and Procurement



Scope and Principle	
<p>This section addresses corporate and external governance considerations for the operating hydropower facility. The principle is that the owner/operator has sound corporate business structures, policies and practices; addresses transparency, integrity and accountability issues; can manage external governance issues (e.g. institutional capacity shortfalls, political risks including transboundary issues, public sector corruption risks); and can ensure compliance.</p>	

Background	
Key information on political context and public sector risks	<p>According to the World Bank’s Worldwide Governance Indicators for 2021, on a scale from 0 to 100 Brazil ranked 56 on Voice and Accountability, 29 on Political Stability and Absence of Violence/Terrorism, 35 on Government Effectiveness, 48 on Regulatory Quality, 42 on Rule of Law and 35 on Control of Corruption. Those figures place the country on a lower level when compared with the region Latin America & Caribbean (59, 60, 50, 53, 49 and 50 respectively). In general terms there has been a downward trend over the last 10 years:</p> <p>ESBR operates in a highly regulated environment. Key federal government institutions with respect to the overall project are ANEEL, IBAMA, ONS and ANA. Other agencies with responsibilities for particular aspects of the project include FUNAI (for indigenous peoples) and IPHAN (for cultural heritage). An important Brazilian institution is the Ministério Público (public prosecutor), which is authorised to bring action against individuals, businesses, and the federal, state and municipal governments, in the defence of minorities, the environment, consumers and the civil society in general. The project is within the governing jurisdictions of the Federal Government, the State of Rondônia, and the Municipality of Porto Velho.</p>
Key information on corporate ownership and governance	<p>Jirau Energia is the trade name for Energia Sustentavel do Brasil S.A. (ESBR). It is a Special Purpose Company only for the Jirau HPP, whose shareholders are Engie Brasil Participações Ltda (40%), Mizha Participações S.A., a subsidiary of Mitsui & Co. Ltd (20%), Companhia de Geração e Transmissão de Energia Elétrica do Sul do Brasil - Eletrosul (20%) and Companhia Hidro Elétrica do São Francisco - CHESF (20%). The last two shareholders are 99% owned by Centrais Elétricas Brasileiras SA – Eletrobras.</p> <p>ESBR is headed by the CEO, who works with three other Officers who form the executive management team: Operation, Finance & Administrative and Corporate. The Corporate Officer is appointed by Mitsui and has no designated responsibilities, nor staff. There are also three Managers who report directly to the CEO: Legal, Audit & Internal Controls and Regulatory & Commercial. Oversight is provided by a Board of Directors appointed by the shareholders, comprised of 10 members and substitutes, and a Fiscal Board, comprised of 3 members and substitutes. ESBR is structured as a “<i>Sociedade Anonima de Capital Fechado</i>” according to Brazilian regulations, and as such is mandated to issue public annual financial reports, even though it is a closed company with no shares traded in the market (no free float). The annual financial statement is audited by an Independent External Auditor.</p>
Details of the concession, if applicable	<p>The installed capacity of the plant was increased from 3,300 MW under the initial concession contract (2008-2043) to 3,750 MW during construction, allowing for the installation of 6 additional 75-MW turbines. The term of the concession has since been extended from 2043 to 2045, to compensate for financial losses attributable to the government. Jirau’s concession follows the</p>

	typical Brazilian hydropower BOOT model: the company Built, Owns and Operates the asset and will, by the end of the present concession, transfer it back to the government, to be auctioned again to the bidder that offers the lowest energy tariff among all competitors.
Key licenses or permits	Concession Contract 002/2008-MME-UHE Jirau; Operating License No 1097 from IBAMA (extension for 10 years from 2019) for the hydropower plant and No 94/DLA from SEMA/SEDAM for the transmission line to the Porto Velho substation (extension process ongoing).

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Ongoing or emerging political and public sector governance issues have been identified	<p>✓</p> <p>ESBR's shareholders have substantial experience with political and public sector governance issues and appropriate strategic responses, when needed. ESBR's CEO participates in the Strategic Committee of the shareholder Engie, where eventual regulatory and governmental changes that affect the company are evaluated.</p> <p>ESBR analyses its governance context considering political, economic, technological, environmental and legal factors (PESTEL analysis). A Risk Matrix captures risks associated with the outcomes from the judiciary sector. Additionally, a SWAT analysis conducted every two years identifies political and public sector risks.</p> <p>Regular participation in public hearings and sectorial representation groups also contributes to the assessments on political and public sector risks. Jirau is a member of APINE - Association of Independent</p>	<p>There are no significant opportunities for improvement in the assessment of political and public sector governance issues and corporate governance requirements and issues</p>	<p>✓</p> <p>The annually updated Risk Matrix table includes a specific column to identify opportunities for improvements. All opportunities identified trigger feasibility studies and, if feasible, are transformed into actions. Internal Controls also assess opportunities on corporate governance and compliance during the revision of processes. Internal Audits may also identify opportunities for improvements. Risks associated with the public sector are assessed in a timely manner, and actions are proposed when necessary.</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>Energy Producers, and receives their weekly reports containing the main information from the energy sector that may affect the company.</p> <p>There is a defined workflow for internal analysis of possible sectoral changes and associated risks, resulting, when necessary, in recommendations to senior management.</p>			
Corporate governance requirements and issues have been identified	✓	A Risk Matrix addresses risks associated with corporate governance requirements, as well as active and passive corruption risks.			
Monitoring is being undertaken to assess if corporate governance measures are effective	✓	ESBR has an Internal Controls system to provide assurance of the control of operations with respect to compliance with laws and regulations in force, reliability of accounting and financial information, and implementation and optimization of operations. To evaluate the results of internal controls, internal audits are carried out according to the annual Internal Audit Plan.			
Management					
Processes are in place to manage the following:					
<ul style="list-style-type: none"> • corporate, political and public sector risks 	✓	An annual Risk Matrix is prepared, mostly for operational and corporate risks. A SWAT analysis made every two years covers political and public sector risks.	Processes are in place to anticipate and respond to emerging risks and opportunities	✓	An Integrated Risk Management Process is in place, prescribing actions to be followed whenever a risk is anticipated or assessed, following a plan-do-check-act structure.

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
• compliance	✓	The Internal Controls system addresses compliance with laws and regulations, and is subject to subsequent audit. A total of 23 processes are mapped and updated every year. Their status is presented to the monthly Management Meetings. A total of 50 compliance obligations are monitored in the SE Suite system, which controls and warns every obligation owner to take actions in order to remain compliant.			
• social and environmental responsibility	✓	ESBR has an efficient and operative Environmental Management System (see also Section 1), including Programs for Social Responsibility. A Sponsorship Policy is available on its website. Services from a contractor are retained to follow and inform of any changes in applicable environmental regulations.			
• procurement of goods and services	✓	ESBR has a structured process for procurement of goods and services in a transparent and competitive way. It provides tracking of the procurement processes from demand to delivery. When applicable, procurement needs are tracked and started well in advance. Webinars are held with participants to clarify the scope of supply and answer any questions before the submission of proposals.	Contractors are required to meet or have consistent policies as the developer	✓	The 'General Conditions of Contract for the Provision of Services' incorporate policies for ethical behaviour, the OH&S Manual for Contractors, obligations relating to the Protection of Personal Data, the Conflict of Interest Policy, and an express statement that the contractor is fully aware of the entire Code of Ethics.
• grievance mechanisms	✓	ESBR provides a channel for anonymous reports via website, in			

Minimum Requirements			Advanced Requirements			
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations	
		addition to a tollfree phone to all those who become aware of an incident or suspected ethical deviation. This channel is highlighted in the RFP documents and presented to proponents during webinars and kick-off meetings. Anyone can also send emails to the Compliance area, which can be anonymous or not.				
• ethical business practices	✓	ESBR has a Code of Ethics that is available on its website and is a contractual condition for service providers. ESBR also has a specific policy aimed at conflicts of interest, and a Standard for Management of Gifts, Invitations and Hospitality, also available on the website.				
• transparency	✓	<p>Procurement processes are published on the NIMBI portal, a supply chain management platform, open to all participants. Proponents are scored against specific parameters: Commercial, technical, OH&S, financial, compliance and ethics. In case of emergency requests, there is a process for direct negotiation with participants and subsequent approval by upper management. Many other activities and processes relevant to Governance and Procurement are also published on ESBR’s website.</p> <p>Transparency could be further improved by providing easier access to key sustainability documents</p>	Procurement processes include anti-corruption measures as well as sustainability and anti-corruption criteria specified in pre-qualification screening	✓	The Code of Ethics is included in the purchasing processes. ESBR screens all proponents using information provided by <i>Ibracem - Instituto Brasileiro de Certificação e Monitoramento</i> (a public interest company which supervises the good standing status of Brazilian companies), which includes sustainability, compliance, and anti-corruption criteria. Proponents must provide a declaration that they are fully compliant.	

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		including the ESIA, ESMP (PBA), licenses, ISO certificates, regular reports; this is addressed in section 10.			
Policies and processes are communicated internally and externally as appropriate	✓	Internally: All norms, instructions and processes are made available to all concerned, and staff responsible for processes need to formally register in the management system that they are aware. There are also training sessions year-round covering the important policies and processes. Whenever an occurrence or gap is detected, the subject is brought to the training sessions. The training sessions are organized by HR and the business areas involved. Externally: RFPs contain instructions on policies and processes. Contractors must acknowledge that they are aware. Relevant policies are also made available on the website.			
In case of capacity shortfalls, appropriate external expertise is contracted for additional support	✓	The current workforce meets the normal needs of the plant's operation. Occasionally there is a need to hire specialized services, and these hiring processes need to be approved by Senior Management.			
Conformance and Compliance					
The project has no major non-compliances	✓	No major non-compliances have been identified.	The project has no non-compliances	✓	No non-compliances have been identified.
Outcomes					

Minimum Requirements		Advanced Requirements			
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations		
There are no significant unresolved corporate and external governance issues identified	✓	There are no indications for any significant unresolved issues.	There are no unresolved corporate and external governance issues identified	✓	There are no indications for any unresolved issues.

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	6

Summary of findings and other notable issues
ESBR has well-structured corporate governance structures and processes, including internal controls, auditing, and risk management procedures, aligned with best practices of the industry. Grievance mechanisms are in place and transparent processes in place, notably in procurement. Audited annual financial reports are issued, in line with the company's obligations by law.

Relevant evidence	
Interview	5, 6, 10, 22, 25, 28
Document	273-301
Photo	-

10 Communications and Consultation



Scope and Principle	
This section addresses ongoing 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 principle is that stakeholders are identified and engaged in the issues of interest to them, and communication and consultation processes maintain good stakeholder relations throughout the project life.	

Background	
Directly affected community-level stakeholders	Directly affected community stakeholders include resettles, fishermen and garimpeiros (miners that dredge the river for gold), farmers, and other residents affected by land acquisition or affected by construction and operation of the Jirau HPP.
Directly affected institutional-level stakeholders	IBAMA, SEMA, ANEEL, ANA, IPHAN, Ministry of Transport, ICMBio, FUNAI, SEDAM (Municipal Environment Agency), INCRA (National Colonization and Land Institute)
Other relevant information	Other entities with whom the project needs to engage and communicate includes the financing consortium (led by BNDES) and the downstream project of Santo Antônio (IBAMA requires some coordination between both projects).

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Ongoing or emerging issues relating to hydropower facility communications and consultation have been identified	✓ The project's Communication Plan is updated annually, and communication and consultation needs are adjusted accordingly. Currently, the project has an ATS office (social and technical assistance) in Nova Mutum Paraná to attend to community concerns and issues that is managed by a subconsultant (Oikos). Due to decreased demand for services this office is scheduled to close by end of 2023. Stakeholders and employees can voice their concerns	The stakeholder mapping takes broad considerations into account	✓ The stakeholder mapping includes communications and engagement actions that are implemented by the project and their frequency with an annual implementation schedule, and includes a broad range of stakeholders in the affected and neighbouring communities, including elected leaders and officials/administrators, school principals and teachers, doctors and nurses, small business owners, community associations (agribusiness, fishermen, women's groups, cooperatives etc.), religious leaders and community members. It allows for increased frequency of engagement and

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	and issues via email, toll-free telephone number or through suggestion boxes installed at multiple locations (at the ATS and clinic in Nova Mutum Paraná, the health care centre in Abunã, the school and health care centre in Fortaleza do Abunã and at the Jirau HPP). A whatsapp group is set up for stakeholders in the transmission line corridor. Jirau HPP regularly carries out campaigns around the communications and grievance mechanisms that can be used to reach the company. The Communication Plan defines activities and their frequency and includes an annual implementation schedule.		communications activities for those stakeholders that have had specific emerging concerns (for example, weekly and bi-weekly engagement activities in the community of Abunã, affected by the backwater effect of the 2014 flood which led to additional displacement – see Sections 4 and 5).
Requirements and approaches are determined through a periodically updated assessment process involving stakeholder mapping	✓ The project keeps an up-to-date stakeholder mapping spreadsheet that identifies the various relevant stakeholders and their contact information. Stakeholders include community groups and individuals and government/institutional stakeholders at the Federal, State (Rondônia) and Municipal level (Porto Velho). The matrices are updated annually and for some stakeholders, in particular the directly affected communities, includes their position with respect		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		to the project, their involvement and level of impact.			
Effectiveness is monitored	✓	Satisfaction and opinion surveys of random community members were carried out in Porto Velho, Jaci Paraná, Jirau HPP and Nova Mutum Paraná in 2010, 2011, 2012 and 2015 to monitor effectiveness of communication efforts. Grievances continue to be addressed and monitored as per the internal and external communication standard (<i>norma</i>).			
Management					
Communications and consultation plans and processes are in place to manage communications and engagement with stakeholders	✓	In addition to having an internal and external communication standard that requires monitoring of indicators such as response time to queries, Jirau HPP keeps an annual calendar of communications activities related to the 29 ongoing PBA Programmes under the environmental license. These include for example the dissemination of annual results for specific programmes (e.g. hydrobiogeochemical monitoring results, area of restored land), communications around activities planned for specific days of the year (e.g. international day of biodiversity, national environment day, national day of the Amazon,	Communication and consultation plans and processes show a high level of sensitivity to communication and consultation needs and approaches for various stakeholder groups and topics	✓	A broad range of communication approaches has been used to provide stakeholders with information about the project and respond to their concerns and grievances. Some of these processes have changed over time and adapted to the circumstances, for example: (i) the project used to run an Information Centre (run by the resettlement working group) to attend to community requests and grievances in Nova Mutum Paraná, this office is no longer open, and it has been replaced with the ATS that is run by a social worker and an agricultural technician; (ii) the monthly newspaper that was distributed prior to the Covid-19 pandemic became digital and continues to be delivered to stakeholders in Nova Mutum Paraná; (iii) activities in other communities vary from bi-monthly/quarterly school visits and meetings and dissemination

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	international day of Indigenous people and more), campaigns on activities carried out under the Environmental Education Programme (courses, campaigns against slash and burn/forest fires, international water day etc.). The calendar also includes communication or reporting requirements towards the financing consortium such as results/project progress, campaigns (diversity, international women's day etc.).		of information campaigns in Jaci Paraná to weekly visits to verify the suggestion boxes and bi-weekly meetings with specific stakeholders in Abunã, and monthly visits in Fortaleza de Abunã, depending on the needs of the community and history of issues related to flooding or other specific issues that may have affected one community more than another.
They include an appropriate grievance mechanism	✓ As mentioned above, the grievance mechanism includes a number of channels to communicate concerns and grievances, including suggestion boxes, an email and a toll-free number. The internal and external communication standard describes the process and timelines that must be met in responding to grievances.	Processes are in place to anticipate and respond to emerging risks and opportunities	✓ The annual updates to the communication plan allow the ESBR team to adapt, increase and decrease frequency of engagement with specific groups to focus on needs of specific communities (e.g. groups affected by the 2014 flood). While community liaison offices are being closed due to declining demand, the grievance mechanism will remain in place for residents of Nova Mutum Paraná and other parts of the project region, to anticipate and respond to emerging risks and opportunities of resettles and community members.
They outline communication and consultation needs and approaches for various stakeholder groups and topics	✓ The Communication Plan outlines consultation and engagement needs of the various stakeholder groups in affected communities and for different levels of governmental agencies. The plan is updated annually according to specific group needs (e.g. increased frequency of formal engagement activities in Abunã following the 2014 flood),		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		and requirements under the license and of the financing consortium.			
Stakeholder Engagement					
The project operation stage involves engagement with directly affected stakeholders	✓	The communication plan includes a schedule of engagement activities with directly affected stakeholders.	Engagement is inclusive and participatory	✓	Engagement activities include participatory meetings, communications campaigns and presentations where monitoring results are presented.
Engagement is:					
• appropriately timed and scoped	✓	The communication plan and stakeholder mapping are updated annually, and timing and scope of communication activities are adjusted according to stakeholder needs.	Negotiations are undertaken in good faith	✓	Negotiations with stakeholders is open and transparent. ESBR readily shares information and monitoring results with other entities including regulators and the Santo Antônio HPP to improve effectiveness of mitigation measures.
• often two-way	✓	Engagement activities allows for two-way communication.			
• undertaken in good faith	✓	Engagement activities are transparent and carried out in good faith.			
The business interacts with a range of directly affected stakeholders to understand issues of interest to them	✓	Project staff interact with a range of directly affected stakeholders on a regular basis and implement activities related to their needs.	The assessment and management process for downstream flow regimes has involved appropriately timed and two-way engagement with directly affected stakeholders	✓	The project operates as a run-of-river facility and interacts with downstream communities and stakeholders regarding management of operations and other activities as per the Communication Plan. Normal operations of the Jirau and Santo Antônio HPPs are coordinated and dispatched by the national system operator and within the constraints of their operating licenses (see Section 11). There is a good relationship between the operators of the Jirau and Santo Antonio HPPs and Jirau has been proactive in sharing information with Santo Antonio. Regarding emergency preparedness and response, Jirau

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
			maintains a dialogue and regular meetings with the Municipal Civil Defense of Porto Velho related to the integration of the PAE and the PLANCON (refer to section 4.)
Ongoing processes are in place for stakeholders to raise issues and get feedback	✓ As mentioned under the grievance mechanism, a number of channels are available for stakeholders to raise issues and get feedback.	Ongoing processes are in place for stakeholders to raise issues with downstream flow regimes and get feedback	✓ The same processes in place to raise issues in general can be used to raise issues regarding downstream flow regimes, however it should be noted that the flood of 2014 caused significant impacts to the upstream community of Abunã, and increased frequency of communication and engagement activities in upstream areas have been implemented as a result of the event. There is a formal Communication Plan and Integrated Operation System between Jirau and Santo Antonio HPPs to exchange information, monitor flows and identify any risks and opportunities. One of the main downstream issues is avoiding flooding of the BR 364 highway, downstream of Jirau. In practice, this integration is limited to operations and although Jirau has made efforts to share information and improve coordination of E&S aspects, opportunities to collaborate with Santo Antonio have not materialised in a significant way.
Ongoing processes are in place for:			
• environmental and social issues	✓ Other than the communication channels described under the grievance mechanism, ongoing processes include the following: <ul style="list-style-type: none"> • The Environmental Education Program (PBA Programme #19) 	Feedback on how issues raised have been taken into consideration has been thorough and timely	✓ Issues raised by the public are typically addressed openly, transparently and in a timely manner through the project's grievance mechanism or during engagement and consultation activities in the communities described in the various Programmes of the PBA and in the Communication Plan.

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>is intended to be continuous throughout operations.</p> <ul style="list-style-type: none"> • Ongoing PBA programmes include the dissemination of data, monitoring results and updates to published scientific data and publications on the project. • The weekly Nova Mutum e-newspaper distributed to stakeholders often includes features on environmental and social issues of interest to stakeholders. • The <i>Associação do Observatório Socioambiental</i>, an association created by the project to address sustainable development and capacity building activities within Nova Mutum Parana, has been autonomous since 2012 but continues to work in close partnership with the project. • The discontinued Sustainability Committee was another tool used and created by Jirau as a mechanism to promote dialogue between communities and stakeholders during the implementation of the project and included a number of working groups that addressed environmental and social 		

Minimum Requirements		Advanced Requirements			
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		aspects that were of interest to community stakeholders.			
<ul style="list-style-type: none"> project-affected communities 	✓	The project's Communication Plan describes engagement and consultation activities for project affected communities, including upstream communities affected by the 2014 flooding.	Project-affected communities have been involved in decision-making around relevant issues and options	✓	In Nova Mutum Paraná, the <i>Associação do Observatório Socioambiental</i> , COOPPROJIRAU, the Information Centre (now closed) and the ATS (to be closed soon), and engagement activities in other communities provide the opportunity for communities and individuals to be involved in decision-making around issues that are relevant to them. In addition, Jirau HPP's sponsorship policy allows communities and community groups to seek sponsorships and donations for events or activities they wish to implement. Jirau HPP prepares an annual sponsorship plan to determine the financial resources required for the following year.
<ul style="list-style-type: none"> resettles and host communities 	✓	Nova Mutum Paraná is a new town where resettles, ESRB staff, contractor workers, and third parties reside. Therefore there is no "host community" and this model provides equal opportunities to all community members. Mechanisms to attend to concerns and requests from resettles and other community members in Nova Mutum Paraná included the now closed information office and the soon to close ATS. The main communication channels mentioned under the grievance	Resettles and host communities have been involved in decision-making around relevant issues and options	✓	Formal resettlement plans were developed for the Mutum Parana community and the upstream affected people from the 2014 flood in Abunã as part of the PBAs, approved by IBAMA and implemented in a participatory manner with affected populations, government agencies and specialised consulting firms.

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		mechanism section will continue to be available to these groups.			
• Indigenous Peoples	✓	The Social Communication Programme included in the PBA includes Indigenous Peoples. A monthly newsletter is translated to the Indigenous language and distributed to Indigenous communities on a monthly basis. Indigenous communities apply and participate in Jirau HPP's sponsorship programme and contact the project via the same channels other groups do (e-mail, toll-free number etc.).			
• employees and contractors on human resources and labour management issues	✓	Processes to identify emerging or ongoing OH&S issues are integrated within the health and safety management system. A workers grievance mechanism is also in place and includes various communication processes including an ethics channel called Integro, email, toll-free telephone number and boxes called "Poste Aqui" (Post it Here) (see Section 2).			
• management of climate risks	✓	In 2019 Jirau contracted Tractebel/Leme Engenharia for a Climate Risk Assessment study to assess climate change resilience of the project. A follow-up risk/opportunity scoring study was prepared for Engie in 2022. Studies follow Steps 1 and 2 of IHA's			

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		Resilience Guide (2019) but have not yet completed Step 3 (see Section 12). Information on GHG emissions was communicated in the December 2022 journal “Nova Mutum”, and Jirau’s GHG Inventory is updated annually. In addition, Jirau HPP is considered the world’s largest CDM-registered renewable energy project. The project website reports on annual GHG emissions reductions which have averaged 6 million tonnes of CO ₂ eq./year.			
Channels of communication with Indigenous Peoples are maintained	✓	Engagement and consultation activities continue with Indigenous Communities and will be maintained in the long term.	Directly affected Indigenous Peoples have been involved in decision-making around relevant issues and options	✓	Although Indigenous Peoples have not been directly affected by the project, the project’s license required that the project support a number of Indigenous communities due to a potential risk of being affected by worker influx (this impact did not materialise). Indigenous peoples are consulted and, in most cases, directly involved in all phases of the support programs which are coordinated by and meet FUNAI’s requirements, from the selection and planning of measures to their implementation and final acceptance.
These channels are:					
• appropriately timed	✓	Yes			
• culturally appropriate	✓	Yes			
• two-way	✓	Yes			
A mutually-agreed disputes procedure is in place with Indigenous Peoples	✓	The ongoing communication channels between FUNAI and its regional offices, IPs, NGOs working in the ITs, and the Jirau project team provide for procedures to resolve disputes. FUNAI with its formal role acts as a de-facto mediator between IPs and third parties such as HPP companies.			

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
Public disclosure:			The business makes significant project reports publicly available	✓	Significant project reports including monitoring reports are made publicly available.
• the business makes significant project reports publicly available	✓	Significant project reports including monitoring reports are made publicly available.			
• the business publicly reports on project performance, in some sustainability areas	✓	A project-specific Draft Sustainability Report is currently under review for public disclosure.	The business publicly reports on project performance in sustainability areas of high interest to its stakeholders	✓	ENGIE Brazil's publishes an annual Sustainability Report which includes information on Jirau HPP. A project-specific Draft Sustainability Report is currently under review for public disclosure.
• power density calculations, estimated GHG emissions, and / or the results of a site-specific assessment are publicly disclosed	✓	General information on GHG emissions were communicated in the December 2022 journal "Nova Mutum", and Jirau's GHG Inventory is updated annually. (ENGIE's Annual Sustainability Report includes a section on air emissions and climate change with a link to the ENGIE Brasil Energia's GHG inventory but this document does not include Jirau).	The assessment of project resilience is publicly disclosed	✗	An initial resilience analysis was carried out but was limited in scope, and this information has not been publicly disclosed. This is a significant gap against advanced requirements.
Conformance and Compliance					
Processes and objectives relating to communications and consultation have been and are on track to be met with:			There are no non-compliances	✓	No non-compliances have been identified.
• no major non-compliances	✓	No major non-compliances have been identified.			
• no major non-conformances	✓	No major non-conformances have been identified.	There are no non-conformances	✓	No non-conformances have been identified.
Communications related commitments have been or are on track to be met	✓	Communication commitments have been met and are ongoing as per the ongoing programmes in the project's PBAs.			

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
	15

Summary of findings and other notable issues
<p>The project has had a number of communications strategies throughout the different phases and for different target stakeholder groups including resettles, affected upstream and downstream communities and river users, Indigenous Peoples, government entities and research and academic institutions. While the project could benefit from improved communications and coordination of efforts with the downstream Santo Antônio HPP, during the operational phase, Jirau’s communication strategies and approaches have evolved and adapted to the circumstances (e.g. flood event of 2014). The resettled families now require less support than a decade ago and continue to have access to the project’s grievance mechanism and sponsorship opportunities. The project has a constructive relationship with regulators, and communication efforts have allowed the project to apply adaptive management measures to improve E&S management programmes under their Operational License.</p>

Relevant evidence	
Interview	6, 9, 10, 13
Document	302-311
Photo	18, 74

11 Hydrological Resource



Scope and Principle

This section addresses hydrological resource availability and reliability, reservoir management, and downstream flow regimes in relation to the operating hydropower facility. The principle is that power generation planning and operations take into account hydrological resource availability and reliability in the short- and long-term, that the reservoir is well managed taking into account power generation operations, environmental and social management requirements, and multi-purpose uses where relevant, and that issues with respect to downstream flow regimes are identified and addressed.

Background

Hydrology and flows

Average flow at dam (m ³ / s)	18,501 m ³ /s
Minimum monthly average flow (m ³ / s)	3,591 m ³ /s
Maximum monthly average flow (m ³ / s)	46,710 m ³ /s
Lowest observed flow (m ³ / s)	2,219 m ³ /s
Highest observed flow (m ³ / s)	56,095 m ³ /s
Design flow (m ³ / s)	76,636 m ³ /s
Affected river reaches (start/end and how affected)	Rio Mutum-Paraná (5 km) and smaller tributaries (igarapés) in the reservoir reach (Jirau, São Lourenço, Caiçara, Castanho, São Simão and Simãozinho; only near the confluence with the Madeira River)
Proposed downstream flow regimes for environmental or social objectives	3,240 m ³ /s

Reservoir

Reservoir length (km)	137 km
Minimum operating level MOL (masl)	82.5 masl
Normal operating level (masl)	90.0 masl
Full supply level FSL (masl)	90.0 masl
Reservoir area at FSL (km ²)	362 km ²
Reservoir area at MOL (km ²)	175 km ²
Volume at FSL (million m ³)	2,7467 hm ³
Volume at MOL (million m ³)	1,249 hm ³
Average retention time in days	The Jirau reservoir is a run-of river reservoir with relatively fast flow velocity. The average retention time (total volume divided by average flow) is 41 hours.
Number of days for filling	The Jirau reservoir was filled in 4 phases between October 2012 and May 2014.

Other relevant information	<p>ANA Resolution No. 269/2009 granted a water use permit to Jirau HPP. The conditions of this permit (outflows and water levels in the reservoir) define operating constraints, taking into account that the operations of the Jirau and Santo Antonio HPPs need to be integrated for flood protection.</p> <p>During the dry season, Jirau HPP operates as a run-of-river plant at the maximum operating level of 90 masl, with an inflow of 23,900 m³/s as a limit. During the rainy season, starting from an inflow of approximately 30,000 m³/s, reservoir levels are lowered to an elevation of 85.6 masl, thus protecting the upstream Abunã district and BR-364 federal highway that connects the state of Acre to the rest of the country, and providing enough buffer so that the outflows to the Santo Antonio reservoir are compatible with downstream objectives, primarily protecting the Jaci-Paraná district, downstream stretches of the BR-364 and the city of Porto Velho.</p> <p>The Jirau reservoir does not have significant dead storage, as the power houses are excavated and the spillway level is close to the former riverbed.</p>
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Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
Assessment			
Ongoing or emerging issues in the following areas have been identified:			
<ul style="list-style-type: none"> hydrological resource availability and reliability 	<p>✓</p> <p>Operations of Jirau HPP and the downstream hydropower facility (Santo Antonio HPP) are managed and dispatched by the national system operator (ONS) on a daily basis within the constraints of the HPP's Operating License.</p> <p>Daily production plans are prepared by ONS for the hydropower plants in a river system based on hydrometric data provided to the ONS by the various plant owners.</p> <p>A hydrometric network with 6 telemetry stations (Porto R4, Jusante Rio Beni, Guajará Mirim, Príncipe da Beira, Morada Nova Jusante and Nova California) and one automatic</p>	<p>Issues that may impact on water availability or reliability have been comprehensively identified</p>	<p>✓</p> <p>The installation of the telemetric network was defined after identifying the different runoff scenarios that could be considered for the rivers in the Madeira River watershed, two of which come from a region with low slopes (Guaporé and Mamoré) and the other two from the slopes of the Andes Mountains (Beni and Madre de Dios). The telemetric network helps forecast water availability and/or reliability, and feeds into the management of the reservoir through flow models (daily, weekly and monthly), applied and updated daily.</p>

Minimum Requirements		Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)
	station on the dam (Barramento) monitors the inflows and outflows of the reservoir.			
• reservoir management	<p>For the operational phase, flow requirements determined by ANA are based on a thorough analyses of an array of sustainability criteria. The reservoir has a total area of 362 km² during the wet season and the area can be as small as 207 km² during the dry season, including 154 km² of original riverbed, depending on the rainfall in the Madeira River catchment.</p> <p>The area surrounding the reservoir has a very low population density, especially on the left bank which is largely covered by a national park. The main transboundary objective defined by Government is that there can be no flow impacts upstream the city of Abunã, located on the border with Bolivia. The absence of a transnational impact is a given boundary condition for reservoir design and management. There are relatively few uses of the reservoir, mainly for gold mining and fishing (see section 4).</p>			
• downstream flow regimes	<p>The regulator ANA performed a detailed hydrological study (published as ANA Technical Note 100/2006) as a basis for rulings on the operation-phase downstream</p>	<p>Scenarios, uncertainties and risks for water availability and reliability are routinely and extensively evaluated over the short- and long-term</p>	✓	<p>Technical Opinions 56/2017 and 23/2019-COHID/CGTEF/DILIC, in their analysis of the Environmental Programs of UHE Jirau, concluded that the hydro-sedimentological</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>flow requirements. In its Resolution 269/2009, ANA establishes the use rights to the water and also details other water users and their prospective needs now and into the future, as far as the year 2046. This, in combination with the official ANA letter dated 12th September 2012, provides a comprehensive identification of issues related to downstream flows for all stages and defines a minimum downstream flow of 3,240 m³/s. An important issue regarding the outflow from Jirau is the integrated operation with Santo Antonio HPP, due to their central role for national energy security. Technical discussions are carried out between the two operators, ANA and the National System Operator (<i>Operador Nacional do Sistema Elétrico</i>, ONS), to maximize energy generation while respecting flood protection limits defined by ANA.</p>		<p>monitoring program has to be continued throughout the life of the enterprise, and incorporated into the Jirau HPP operation.</p>
<p>If management measures are required then monitoring is being undertaken to assess if management measures are effective:</p>			
<ul style="list-style-type: none"> • reservoir management 	<p>✓</p> <p>The hydro-sedimentological monitoring program is ongoing to verify if the reservoir management measures defined by ANA and ONS are effective. Other monitoring programs have been concluded with approval of the regulators, after</p>		

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	demonstrating effectiveness, such as: water quality in the Nova Mutum Paraná water supply intake; switching from real-time water quality monitoring to bi-weekly monitoring; trace element monitoring; monitoring of slopes and areas prone to erosion, and monitoring of mining activities. All other monitoring programs included in the current PBA are being continued.		
• downstream flow regimes	✓ The official ANA letter dated 12 th September 2012, provides a comprehensive identification of issues related to downstream flow for all stages and defines a minimum of 3,240 m ³ /s as the downstream flow. There is ongoing monitoring and reporting to feed into regular technical discussions to optimize operations, as discussed above.		
Monitoring is being undertaken of hydrological resource availability and reliability	✓ ANA Technical Opinion 87/2021/COREG/SRE analyses the conditions and defines hydrometric monitoring conditions established in Resolution 269/2009. Jirau and Santo Antonio HPPs provide daily information to ONS on the reservoir operations including: observed average flows for the previous day at the gauge stations upstream and downstream of the reservoirs; precipitation accumulated over the	Identification of ongoing or emerging reservoir management issues takes into account both risks and opportunities	✓ The hydro-sedimentological monitoring program is ongoing, constantly providing information to ANA and ONS, and working as a tool to identify risks and opportunities. The location of mining barges on the reservoir is tracked remotely. The program for implementation and monitoring of the Permanent Preservation Area around the reservoir can identify encroachment and invasion risks, considering that

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>previous day; water levels at locations of interest for flood control; inflow forecasts to the Jirau reservoir over a 5-day horizon; Incremental flow forecasts for the Santo Antônio plant over a 5-day horizon.</p> <p>Jirau HPP has a collaboration agreement with the National Water Authority of Peru (ANA-PE), through its Puerto Maldonado regional office, under which since 2016 Jirau HPP has installed and operated the Amaru Mayu telemetry station, on the Madre de Dios River. Regarding the monitoring of the Bolivian part of the basin, Jirau HPP has made significant efforts to establish an agreement with SENAMHI-BO on expanding the monitoring network. However, an agreement has not yet been reached.</p>		<p>almost all of the reservoir's left margin is inside the Mapinguari National Park.</p>
Inputs to this monitoring include:		<p>Issues identification relating to downstream flow regimes takes into account both risks and opportunities</p>	<p>✓</p> <p>The operators of the Jirau and Santo Antonio HPPs have established a formal Communication Plan and Integrated Operation System between the two operations centres, to exchange information, monitor flows and identify any risk or opportunities. According to Jirau HPP, the main issue is avoiding of flooding of BR 364, downstream of Jirau dam.</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
• field measurements	✓	Measurements of water levels are carried out at 8 stations on the Madeira River, 3 stations on the Abunã River, 1 on the Mamoré River and 1 station on the Guaporé River. Quarterly measurements of water flows and sediment yield are carried out at the downstream Rio Beni, Nova California, Morada Nova Jusante and Porto R4 stations, and water flows measurements at the Príncipe da Beira and Nova California stations.			
• appropriate statistical indicators	✓	Appropriate statistical indicators are applied through the statistical models used for inflow and flood forecasting.	An assessment has been undertaken that includes identification of the flow ranges and variability to achieve different environmental, social and economic objectives based on field studies as well as relevant scientific and other information	✓	The reservoir management measures are defined by ANA and ONS, on the basis of an assessment of flow ranges and different environmental and social scenarios, which served to define the hydro-sedimentological monitoring program, and as the technical basis for the integrated operation of Jirau and Santo Antonio HPPs. The reservoir volume is too small for active flow regulation, and the operation rules ensure that the natural variability of the river is preserved as closely as possible.
• issues which may impact on water availability or reliability	✓	To constantly assess issues that may impact on water availability or reliability, besides the telemetric network installed which can foresee impacts on water availability and/or reliability, as well support the management of the reservoir through flow x flow models (daily, weekly and monthly), applied and updated daily, Jirau HPP maintain a hydrological crew with high expertise which uses data and hydrological models capable to identify any emerging issue			
• a hydrological model	✓	For operations, the internal hydrology team uses three models: for the expected inflows of the			

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	<p>following day (d+1), a value derived from the “Flow Translation Model from the Downstream Station of the Beni River to the Jirau HPP”; for the expected inflows of the days d+2 to d+5, values from the “Flow-Flow Model” and the “MHD Rainfall-Discharge Model”; for the expected flow over the horizon between 6 and 15 days, values derived from the “MHD Rainfall-Discharge Model”.</p> <p>An internal hydrological model is under development and expected to be operational by the end of 2023.</p>		
Management			
Measures are in place to guide generation operations that are based on:			
<ul style="list-style-type: none"> analysis of the hydrological resource availability 	<p>✓</p> <p>Jirau HPP’s hydrometric network complies with ANA/ANEEL Joint Resolution No. 03/2010 and enables monitoring of hydro-sedimentological variables at various points in the Brazilian portion of the Madeira River basin. In addition to regular data series, several additional measurement campaigns were carried out, allowing the characterization of discharges and sediments (in suspension and bedload). The discharge curves of the stations were revised in 2020 and in 2021. The precipitation series of the rainfall network were also revised and underwent a new</p>	<p>Planning of generation operations has a long-term perspective</p>	<p>✓</p> <p>According to the document <i>Diretrizes para Operação do Reservatório em Condições Normais</i>, the maximum time horizon for operation planning is monthly, considering the size of the reservoir, data received by the monitoring network, and the flow forecast models. Longer-term planning is done by ONS at the system level. (See also section 12 on long term climatic changes).</p>

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
	consistency analysis, in order to take into account Technical Opinion Nº 7/ 2021/COSET/SGH/ANA and also changes to the historical series. The measurements and analyses are provided by an external consultant company, and made available for Jirau’s hydrological team to feed into the models.		
<ul style="list-style-type: none"> • a range of technical considerations 	✓ The Jirau hydrological team applies a high level of expertise using data and hydrological models to analyse a range of technical considerations in order to guide generation operations.	✓ Planning of generation operations fully optimize and maximizes efficiency of water use.	<p>Jirau operation and hydrology teams use models capable of planning generation within a range of technical considerations, in order to optimize and maximize efficiency of water use. These considerations include inflows (including flood conditions) and reservoir levels, if necessary to comply with the operation rules, as well as equipment maintenance and other service schedules. Offers are sent daily to ONS so they can manage the national system by dispatching the power plants.</p> <p>Both the programming of dispatch and its execution in real time are defined by the ONS based on the offers from all plants and the system needs. In the real-time stage, if it becomes necessary to adjust the scheduled dispatch to meet water levels established in the programming stage, Jirau Energia</p>

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations		
			operators request any necessary adjustments from ONS operators.		
<ul style="list-style-type: none"> an understanding of power system opportunities and constraints 	✓ The national system operator ONS dispatches the power plant, taking into account national-level information on parameters such as demand, supply from variable renewables, reservoir levels, and transmission constraints, to minimize system costs while maintain a high level of supply reliability.	✓ Planning of generation operations has the flexibility to adapt to anticipate and adapt to future changes	As described above, there is some flexibility of daily generation operations within the constraints of the HPP's Operating License.		
Measures are in place to manage identified reservoir management issues	✓ The Jirau hydrological team with high expertise uses data and hydrological models capable identify reservoir management issues and propose measures to deal with them.	✓ Processes are in place to anticipate and respond to emerging risks and opportunities for reservoir management	The Jirau hydrological team has a high level of expertise and uses data and hydrological models to anticipate and respond to emerging risks and opportunities for reservoir management.		
Measures are in place to address identified downstream flow issues	✓ The operating rules address identified downstream issues. There are automatic hydro-sedimentological and water quality stations downstream of the Jirau dam to identify issues related to downstream flows. This data is analysed by an external consulting firm to identify patterns and deviations. There are also some social mitigation measures for downstream communities (see section 4).	✓ Processes are in place to anticipate and respond to emerging risks and opportunities for downstream flow regimes	As described above, there is a formal communication mechanism between the two operations centres of the Jirau and Santo Antonio HPPs.		
Where formal commitments have been made to downstream flow regimes, these are publicly disclosed	✓ The Hydro-sedimentological Monitoring Program is integrated with the Social Communication and Environmental Education programs,	✓ Commitments are made in relation to downstream flow regimes that include the flow objectives; the magnitude, range	ANA has defined a minimum downstream flow of 3,240 m ³ /s. Also, technical discussions are carried out between the two HPP		

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		disclosing the downstream flow information. Technical hydrological information is publicly accessible through ANA’s website.	and variability of the flow regimes; the locations at which flows will be verified; and ongoing monitoring		operators, ANA and ONS for the integrated operation of the two power plants considering flow objectives and the magnitude, range and variability of the flow regimes. The Hydro-sedimentological Monitoring Program is ongoing to verify how the parameters defined by ANA are being met.
Conformance and Compliance					
Processes and objectives in place to manage each of the following have been and are on track to be met:			There are no non-compliances relating to:		
• reservoir management, with no major non-compliances	✓	No major non-compliances have been identified.	• reservoir management	✓	No non-compliances have been identified.
• reservoir management, with no major non-conformances	✓	No major non-conformances have been identified.			
• downstream flow regimes, with no major non-compliances	✓	No major non-compliances have been identified.	• downstream flow regimes	✓	No non-compliances have been identified.
• downstream flow regimes, with no major non-conformances	✓	No major non-conformances have been identified.			
Commitments relating to the following have been or are on track to be met:			There are no non-conformances relating to:		
• reservoir management	✓	All commitments defined in the water rights conditions, regarding reservoir management have been met.	• reservoir management	✓	No non-conformances have been identified.
• downstream flow regimes	✓	All commitments defined in the water rights conditions, regarding downstream flow regimes have been met.	• downstream flow regimes	✓	No non-conformances have been identified.

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
Outcomes					
Downstream flow regimes take into account environmental, social and economic objectives	✓	Downstream flow regimes defined by the water rights conditions take into account the presence of Santo Antonio HPP reservoir downstream of Jirau and the integrated operation with that HPP, considering energy generation and public safety issues.	Downstream flow regimes and commitments are an optimal fit amongst environmental, social and economic objectives within practical constraints of the present circumstances	✓	The design of the plant, with a relatively small regulating capacity, provides for maintaining close to a natural flow regime. The operations aim to obtain the maximum possible generation of energy while respecting public safety (flood protection) limits defined by ANA. An optimal fit is achieved through frequent technical discussions between stakeholders.
Where relevant, they also take agreed transboundary objectives into account,	✓	Not relevant, since the downstream reach of the Madeira River is within Brazil's territory.			

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	16

Summary of findings and other notable issues
Jirau HPP maintains an extensive hydrometric network as well as modelling and forecasting expertise. The reservoir fluctuates between 362 km ² during the wet season and 207 km ² during the dry season, depending on the rainfall in the watersheds of the 4 main tributaries of the Madeira (Beni, Madre de Dios, Mamoré and Guaporé). After the historic 2014 flood that reached peak flows of around 56,000 m ³ /s, the hydrological studies were updated, changing the design flood (10,000 years recurrence period) from around 71,000 m ³ /s to around 76,000 m ³ /s. Operations of Jirau HPP and the downstream hydropower facility Santo Antonio HPP are managed and dispatched by the national system operator (ONS) on a daily basis, within the constraints of the HPP's Operating License. Operations are coordinated with Santo Antonio HPP, as well as with ONS and the National Water Agency – ANA, in order to obtain the maximum possible generation of energy while respecting flood protection limits defined by the authorities.

Relevant evidence	
Interview	6, 8, 14, 15
Document	312-329
Photo	2, 7, 10, 14-16, 18, 21, 22, 24, 29, 33, 35, 37-39, 42, 47, 48, 99, 104

12 Climate Change Mitigation and Resilience



Scope and Principle	
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 principle 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.	

Background	
Climate Change Mitigation	
Capacity (MW)	3,750 MW
Average reservoir area (representing area of flooded land, net of pre-impoundment water body) (km ²) (or additional reservoir area if any, for expansion/rehabilitation projects)	362 km ² at FSL (including original waterbody)
Power density (W / m ²)	10.4 W/m ² at FSL (including original waterbody)
Emissions intensity (gCO ₂ e / kWh)	N/a (as the value of the power density is above the 5 W/m ² threshold, even without considering the pre-impoundment water body of 154 km ² , no emissions intensity assessment including the reservoir was done). Jirau did produce separate emissions intensity estimates for 2021, without reservoir emissions. The estimates are 2.31 gCO ₂ e / kWh including illegal land use change in the reservoir buffer zone, and 0.14 gCO ₂ e / kWh excluding such land use change.
National and regional policies, plans and commitments relevant to mitigation	The main national policy relevant to climate change mitigation and adaptation is the <i>Política Nacional sobre Mudanças Climáticas – PNMC</i> , which encompasses relevant sectoral and regional plans including the <i>Plano Decenal de Energia – PDE (10-Year Energy Plan)</i> and the <i>Plano de Ação para a Prevenção e Controle do Desmatamento na Amazônia Legal – PPCDAM (Action Plan for the Prevention and Control of Deforestation in the Legal Amazon)</i> .
Climate Change Resilience	
Hydrological data available for the project site and the basin, and observed climate trends	The hydrological monitoring network supporting Jirau HPP consists of 14 stations, nine on the Madeira River, three on the Abunã River, one on the Mamoré River and one on the Guaporé River, with observations dating back at least since 2008. An assessment conducted by Jirau in 2019 showed a slight but insignificant increasing trend for annual precipitation, but up to now no clearly defined trends can be confirmed.
Regional and basin-level climate models relevant to the project location, if any	Based on previous literature, five general circulation models (GCM) were selected for the 2019 Jirau climate resilience assessment: CNRM-CM5, GFDL-ESM2M, HADGEM2-CC, MRI-CGCM3, MIROC% (AR5 GCM data IPCC). No specific regional or basin-level models were available.

Any climate change predictions for the project location, and degree of consistency	Observed trends coincide with uncertain climate change projections, indicating that the western portion of the Amazon basin, fed by the Andes mountains, may experience an increase in precipitation and runoff while the eastern portion will experience a decrease, with the Madeira River basin falling in between.
National policies, plans and commitments relevant to adaptation and resilience	See above under Mitigation

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
Assessment					
Climate Change Mitigation					
If power density is below 5 W/m ² , net GHG emissions (gCO ₂ e) of electricity generation are calculated, independently verified and periodically updated	✓	n/a (power density above 5 W/m ²)	If a site-specific assessment is required, it incorporates a broad range of scenarios, uncertainties and risks	✓	n/a (power density above 5 W/m ²)
If power density is below 5 W/m ² and estimated emissions are above 100 gCO ₂ e/kWh, a site-specific assessment of GHG emissions is undertaken and periodically updated	✓	n/a (power density above 5 W/m ²)			
Climate Change Resilience					
An assessment of the project's resilience to climate change is undertaken and periodically updated	✓	In 2019 Jirau contracted Tractebel/Leme Engenharia to prepare a Hydropower Plant Climate Risk Assessment study, to assess the project's resilience to climate change in its operational phase and identify any needs for functional or structural adaptation measures. The study considered the historical data related to initial project design,	Assessment of resilience incorporates sensitivity analysis, project specific hydrological modelling using recognized climate models	✓	A basic sensitivity analysis was performed by comparing projections from 5 different models, 2 different emissions scenarios and 2 different time horizons, for peak floods and annual generation.

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		<p>operational rules and monitoring programs; it also included the extreme flood in 2014. It recommended that the studies should be updated periodically. A follow-up risk/opportunity scoring study was prepared for Engie in 2022.</p> <p>In 2022 Engie also contracted Institut Pierre Simon Laplace-Climate Modelling Centre (IPSL-CMC) to prepare a study on the financial impact of climate change on hydropower and other renewable energy activities of Engie until 2050.</p>			
The assessment:					
• incorporates an assessment of plausible climate change at the project site	✓	The studies used results from several existing climate change studies and models for the Madeira basin.			
• identifies a range of climatological and hydrological conditions at the project site	✓	See above.			
• applies these conditions in a documented risk assessment or stress test	✓	The studies followed the IHA Resilience Guide (2019), completing steps 1 (screening) and 2 (initial analysis), but did not proceed to the full stress test (step 3).			
The risk assessment or stress test encompasses:					
• dam safety	✓	Flood risk was determined to have a low level of concern, with different	The project's opportunities to provide adaptation services are considered on an ongoing basis	✓	Adaptation services have not been evaluated. While this is a gap, it is considered non-significant because

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		climate change models and emissions scenarios all projecting peak floods within the capacity of the spillway, or in one set of projections for 2070-2010, within the combined capacity of the spillway and the powerhouse.			the Jirau project (with a single purpose, run-of-river reservoir) has very limited ability to provide any adaptation services (e.g. flow regulation during high-flow (flood) or low-flow (drought) conditions).
• other infrastructural resilience	✓	The resilience studies did not directly address the resilience of other infrastructure components such as roads and transmission lines. While this is a gap, it is not seen as significant given that the main road (BR 364) is already being adapted to cope with historic flood levels.			
• environmental and social risks	✓	The resilience analysis found a high risk of sedimentation, given the already observed state of the river basin, but did not provide further analysis on the pathways between a changing climate and increased erosion.			
• power generation availability	✓	The risk of reductions in energy production due to reduced flows was deemed to have a medium level of concern, with most projections indicating reduced generation.			
Management					
Climate Change Mitigation					
If GHG emissions estimates assume design and management measures, these measures are in place	✓	No reservoir GHG emission estimates have been undertaken, and hence no design and management measures assumed.	Management measures are in place to respond to risks and opportunities including offsetting emissions	✓	Jirau is implementing measures to offset the vegetation lost by the impoundment of the reservoir, including the reforestation of the

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)	Findings and Observations		Requirement is met: yes (✓) or no (✗)	Findings and Observations	
					APP (Permanent Preservation Area) buffer around the reservoir, adding and protecting 18,460 hectares of native vegetation, as well as 609 hectares of construction areas in the process of revegetation. A number of other initiatives e.g., to reduce the use of fossil fuels in transport are under implementation or consideration.
			Plans are in place to monitor parameters used in GHG emissions estimates or to monitor GHG stocks	✓	In 2021 Jirau produced its first internal Greenhouse Gas Emissions Inventory report, including Carbon Dioxide – CO ₂ , Methane – CH ₄ , Nitrous Oxide – N ₂ O and Hydrofluorocarbons – HFCs. The GHG emissions inventory will be updated annually. It does not yet include reservoir GHG emissions. A large majority of the estimated emissions are due to land invasions and illegal deforestation around the reservoir.
Climate Change Resilience					
Measures are in place to avoid or reduce identified climate risks	✓	Flood risk was determined to have a low level but even with the robustness of the spillway design the analysis should be updated at regular intervals. The risk of sedimentation was high, but operations and sediment management plans are already in place to successfully mitigate this risk. The continuous monitoring of hydro-climatic and sedimentation	Measures take account of a broad range of risks and interrelationships	✗	The climate resilience assessment concluded that given the low level for flood risk, medium level for energy production risk and high level for sedimentation risk, the measures already implemented (monitoring, reservoir management, etc) are sufficient to manage climate risks. However, only a limited number of scenarios and risks were considered,

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
		parameters ensures the ability to quickly detect any trend or acceleration in changes.			and global climate models were downscaled and not complemented by basin-specific models. A full stress test as described in the IHA Resilience Guide (2019) was not conducted. The absence of a broader risk analysis is a significant gap against advanced requirements.
			Processes are in place to respond to unanticipated climate change	✓	The climate resilience assessment concluded that it should be periodically updated to take improvements in climate modelling and projections, as well as major events such as floods into account. Jirau will also continue climatological and hydrological monitoring to reduce risks of surprising developments.
			Plans are in place to provide adaptation services if necessary	✓	With a single purpose, run-of-river reservoir, the Jirau project has very limited ability and no specific plans to provide any adaptation services. In a general sense, the improvements in socio-economic conditions resulting from the project will help communities adapt to climate change.
Conformance and Compliance					
Climate Change Mitigation					
Processes and objectives relating to mitigation have been and are on track to be met with:			There are no non-compliances	✓	There are no non-compliances related to climate change mitigation.
• no major non-compliances	✓	There are no major non-compliances related to climate change mitigation.			

Minimum Requirements			Advanced Requirements		
Requirement is met: yes (✓) or no (✗)		Findings and Observations	Requirement is met: yes (✓) or no (✗)		Findings and Observations
• no major non-conformances	✓	There are no major non-conformances related to climate change mitigation.	There are no non-conformances	✓	There are no non-conformances related to climate change mitigation.
Mitigation-related commitments have been or are on track to be met	✓	The mitigation-related commitments regarding offsetting of lost vegetation are on track to be met.			
Climate Change Resilience					
Processes and objectives relating to resilience have been and are on track to be met with:			There are no non-compliances	✓	There are no non-compliances related to climate change resilience.
• no major non-compliances	✓	There are no major non-compliances related to climate change resilience.			
• no major non-conformances	✓	There are no major non-conformances related to climate change resilience.	There are no non-conformances	✓	There are no non-conformances related to climate change resilience.
Resilience-related commitments have been or are on track to be met	✓	The resilience-related commitments regarding the raising of the BR 364 highway are on track to be met.			
Outcomes					
Climate Change Mitigation					
The project's GHG emissions are demonstrated to be consistent with low carbon power generation	✓	The power density of the Jirau project is relatively high, and while emissions from the Jirau reservoir GHG have not been estimated, given the characteristics of the reservoir (with a short water retention time) the emissions intensity is likely to be low.	Project net emissions are minimized, or project operations facilitate system emissions reductions	✓	Jirau's Greenhouse Gas Emissions Inventory for the 2021 period estimates avoided emissions at 5.2 million tCO ₂ e, or 141 times more than the company's own emissions (including land use change in the reservoir buffer zone, but not reservoir emissions). This does not yet include the positive mitigation effects from facilitating the integration of additional low-carbon, variable renewables into the Brazilian power system. The

Minimum Requirements		Advanced Requirements	
Requirement is met: yes (✓) or no (✗)	Findings and Observations	Requirement is met: yes (✓) or no (✗)	Findings and Observations
			inventory does not yet present measures to reduce emissions, although it includes recommendation to structure and define an action plan; establish reduction and compensation targets; and adhere to national and international initiatives.

Climate Change Resilience

Findings of the climate change assessment indicate that the project is resilient to climate change	✓	Most projections in the initial resilience analysis suggested that flood risks could be managed within the existing spillway capacity, and there is a significant safety margin with additional releases through the powerhouses. Risks for generation are possible but more likely to occur towards the end of the century. Increased sedimentation risks are also possible but there is no suggestion that they could not be handled. In summary, at the level of minimum requirements there are no indications that the project is not resilient.	The project is resilient under a broad range of scenarios	✗	As described above, the initial resilience analysis was limited and showed some downside risks (especially for generation) with only a very general description of how these could affect the project. At this stage there is not sufficient information to confirm that the project is resilient under a broad range of scenarios, which is a significant gap against advanced requirements.
			The project will contribute to climate change adaptation at a local, regional or national level	✓	See above. While the Jirau project has very limited ability to provide any specific adaptation services, in a general sense it contributes to an increased adaptive capacity.

List of significant gaps against Minimum Requirements	Number of Advanced Requirements met
None	13

Summary of findings and other notable issues

With an installed capacity of 3,750 MW, Jirau’s power density is relatively high and the characteristics of the reservoir indicate low emissions risks, so that no detailed emissions estimates are required. The reforestation of the reservoir buffer zone will absorb significant amounts of greenhouse gases. The characteristics of the reservoir limit the ability to provide any adaptation services to society, for example through water storage. Some initial climate resilience studies were undertaken, but results are inconclusive.

Relevant evidence	
Interview	15
Document	330-337
Photo	-

Appendix 1 – Interviews

Ref	Date	Organisation	Interviewee	Position
1	1/25/23	DSEI/Funai	Hélia Alves Pereira Reis	Referência Técnica do Serviço Social
			Suelen Teixeira de Faria Resende	Substituta Eventual do Coordenador Distrital de Saúde Indígena
			Italo Moreira da Cruz Franze	Apoiador Técnico em Saneamento
2	1/26/23	Iphan/Rondônia	Monica Castro de Oliveira	Chefe de Divisão Técnica do Iphan
			Augusto Celson Figueiredo Silva	Superintendente do Iphan em Rondônia
3	1/26/23	Semusa	Daniela Sousa	Gerente de Vigilância Epidemiológica da Secretaria Municipal de Saúde de Porto Velho
			Fábio Medeiros da Costa	Consultant ESBR
4	1/26/23	Sindicato Sindur	Nailor Guimarães Gato	Presidente do Sindicato dos Trabalhadores nas Indústrias do Estado de Rondônia - Sindur
5	1/26/23	Jirau Energia	Rodrigo Oliveira	Gerente administrativo e de suprimentos
6	1/27/23	Jirau Energia	Marcelo Fonseca	Gerente de Operação da Usina Jirau
7	1/27/23	Jirau Energia	Michel Obara	Coordenador de Meio Ambiente
			Juliana Oliveira	Coordenadora de Socioeconomia
			Verissimo Neto	Gerente de Meio Ambiente e Socioeconomia
			Augusto Borges	Analista de Meio Ambiente
			Vânia Ferreira	Analista de Meio Ambiente
8	1/28/23	Jirau Energia/Coopprojirau	Augusto Borges	Analista de Meio Ambiente
			Michel Obara	Coordenador de Meio Ambiente
			Fagno Reis de Paula	Responsável Técnico da Coopprojirau
			João Borges	Analista de Meio Ambiente
9	1/28/23	Remanejamento urbano e liderança na comunidade de Nova Mutum Paraná	Amanda Valle	Auxiliar de Comunicação do Programa de Educação Ambiental e Tesoureira da Associação do Observatório Socioambiental
		Coopprojirau	Gianni Cabral	Coordenadora de campo do Programa de Educação Ambiental e Secretária da Associação do Observatório Socioambiental
		Comunidade rural	Sandra Vicentini	Presidente da Coopprojirau
		Remanejamento rural	Diogo Lairana	Auxiliar da Coopprojirau
10	1/29/23	Liderança na comunidade de Nova Mutum Paraná	Romário Machado da Silva	Administrador público de Nova Mutum Paraná
		Comunidade urbana	Nélio Veríssimo de Oliveira	Professor da Escola Municipal Nossa Senhora de Nazaré e feirante
11	1/30/23	Remanejamento urbano	Rosilene Prestes	Moradora de Nova Mutum Paraná

		Unidade Básica de Saúde de Nova Mutum Paraná	Rosenilde Alexandria	Gerente da Unidade Básica de Saúde de Nova Mutum Paraná
		Unidade Básica de Saúde de Nova Mutum Paraná	Socorro Castro	Agende comunitária de saúde
12	1/30/23	Jirau Energia	Michel Obara	Coordenador de Meio Ambiente
			Vânia Ferreira	Analista de Meio Ambiente
			Augusto Borges	Analista de Meio Ambiente
13	1/30/23	Jirau Energia	Juliana Oliveira	Coordenadora de Socioeconomia
			Verissimo Neto	Gerente de Meio Ambiente e Socioeconomia
			Daiana Costa	Coordenadora de Comunicação Externa
			Clariana Belém	Analista de Socioeconomia
14	1/30/23	Jirau Energia	Claudiney Freitas	Gerente de Engenharia Civil e Segurança de Barragem
			Jakelline Jard	Coordenadora de Engenharia Civil de Segurança de Barragens
			Verissimo Neto	Gerente de Meio Ambiente e Socioeconomia
15	1/30/23	Jirau Energia	Camila Souto	Coordenadora Hidrologia
			Verissimo Neto	Gerente de Meio Ambiente e Socioeconomia
16	1/31/23	SEMA	Camila Afonso dos Santos	Departamento de Preservação e Conservação Ambiental - DPCA
			Vitória Bosco	Assessora Técnica de Projetos Especiais - ASTEC
17	1/31/23	Ibama Rondônia	Emerson Luiz	Analista Ambiental
18	1/31/23	UNIR	Glenda Maria Bastos Félix	Técnica de Laboratório Departamento de Arqueologia da Universidade Federal de Rondônia
19	1/31/23	Jirau Energia	Wagner Leite	Coordenador de Segurança e Saúde Ocupacional
			Gilmar Ferreira	Técnico de Segurança do Trabalho
20	1/31/23	Jirau Energia	Clariana Belém	Analista de Socioeconomia
			Miguel Lins	Analista de Socioeconomia
			Raul Campos	Analista de Meio Ambiente
			Veríssimo Neto	Gerente de Meio Ambiente e Socioeconomia
21	1/31/23	Jirau Energia	Ivar Araújo	Especialista de Segurança Empresarial
			Clariana Belém	Analista de Socioeconomia
			Miguel Lins	Analista de Socioeconomia
			Raul Campos	Analista de Meio Ambiente
			Michel Obara	Coordenador de Meio Ambiente
22	2/1/23	Regional Funai/ Guajará Mirim	Guilherme Machado Ferreira	Chefe do Serviço de Gestão Ambiental e Territorial
23	2/1/23	Colônia de Pescadores Z2/RO	Gerônima Melo	Presidente da Colônia de Pescadores Z2/RO
			Leivinha da Conceição Rocha Neto	Pescador

			Ludo Zamora	Vice Presidente da Colônia de Pescadores Z2/RO
24	2/1/23	Jirau Energia	Odenilcy Martins	Gerente de Pessoas e Cultura e SSO
25	2/1/23	Jirau Energia	Thiago Fonseca	Gerente de Estratégia e Riscos
26	2/3/23	ICMBio Brasília	Claudia Sacramento	Coordenadora/ Analista ambiental na Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio)
27	2/3/23	Ibama Brasília	Silvia Goes	Coordenadora de Licenciamento Ambiental do Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Ibama)
			Carlos Gonçalves	Analista de Licenciamento Ambiental do Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Ibama)
28	2/3/23	Jirau Energia (Rio de Janeiro)	Alexandre Hallais	Gerente de Auditoria e Controles Internos
			Rodolfo Torres	Gerente Jurídico
29	2/24/23	COOGARIMA	João Maria	Tesoureiro

Appendix 2 – Documents

Ref	Author	Year	Title	Notes / links
1	Jirau Energia	-	Licença de Operação nº1097/2012 – 1ª renovação 1ª retificação	
2	Jirau Energia	2022	3º Relatório anual dos programas socioambientais protocolado no Ibama	
3	Jirau Energia	-	PBA Fase Operacional dos Programas Socioambientais da Usina Jirau	
4	Jirau Energia	2023	1º ao 12º Relatório de Acompanhamento dos Investimentos Sociais – Subcrédito E	
5	Jirau Energia	2023	6º e 10º Relatório Semestral da Licença Ambiental de Operação nº 169/DLA relativa à Linha de Transmissão.	
6	Secretaria Municipal de Meio Ambiente (SEMA)	2023	Parecer Técnico nº 1655/2020 – Análise do relatório de monitoramento ambiental - RMA	
7	Jirau Energia	2023	Planilha de destinação das casas de responsabilidade da Jirau Energia	
8	Secretaria Municipal de Meio Ambiente (SEMA)	2023	Lei Complementar ne 138 – Código Municipal de Meio Ambiente	
9	Jirau Energia	2022	Plano Ambiental de Conservação e Uso do Entorno do Reservatório Artificial Fase Operacional	
10	Jirau Energia	2020	Sistema de Gestão Ambiental Fase Operacional (PBA)	
11	Jirau Energia	2020	Programa de Ações à Jusante Fase Operacional (PBA)	
12	Jirau Energia	2022	Apresentação: Avaliação e gestão ambiental e social	
13	Furnas – Odebrecht - Leme	2005	ESTUDOS DE IMPACTO AMBIENTAL RIO MADEIRA - RO	
14	ESBR	2010	Projeto Básico Ambiental para a Implantação das Linhas de Transmissão 1, 2 e 3 de 500kV UHE JIRAU – Subestação Coletora Porto Velho	
15	Jirau Energia	2023	Plano Anual de Treinamentos 2023	
16	Jirau Energia	2023	Programa Conte Comigo	
17	Jirau Energia	2021	Acordo Coletivo de Trabalho 2021/2023	
18	Jirau Energia	2019	Política de Direitos Humanos PO-GERH-US-GP-00014	
19	Jirau Energia	2022	Norma de Recrutamento e Seleção NOR-NO-0003-22	
20	Jirau Energia	2019	Política de Segurança e Saúde Ocupacional PO-GSSO-US-CP-00050	
21	Jirau Energia	2022	Manual de Segurança e Saúde Ocupacional, Meio Ambiente e Socio economia Para Contratadas NOR-MA-0003-22	
22	Jirau Energia	2022	MTZ Riscos e Oportunidades	
23	Jirau Energia	2022	Apresentação: 5ª Reunião de análise crítica de SGSSO	
24	Jirau Energia	2022	Matriz de contexto e partes interessadas	
25	Jirau Energia	2022	Matriz de objetivos e metas	

26	Jirau Energia	2022	Matriz de papéis e responsabilidade	
27	Jirau Energia	2022	1º Relatório de Auditoria Interna do SGSSO	
28	Jirau Energia	2022	Instrução de Trabalho - APCR - Análise de Perigo e Classificação de Risco em Segurança e Saúde Ocupacional	
29	Jirau Energia	2021	Instrução de Trabalho - Elaboração e Implantação de Análise de Risco e Processo Seguro de Trabalho - AR/PS	
30	Jirau Energia	2022	Instrução de trabalho de Investigação e Análise de Acidentes, Incidentes	
31	Jirau Energia	2021	Instrução de Trabalho - Avaliação de Impacto e Controle de Mudança em SSO	
32	Jirau Energia	2021	Instrução de Trabalho - Identificação e Atualização de Requisitos Legais e Outros Requisito	
33	Jirau Energia	2022	Instrução de Trabalho - Monitoramento, Medição e Análise do SGSSO	
34	Jirau Energia	2022	Instrução de Trabalho - Ações para Abordar Risco e Oportunidade dos Processos do SGSSO	
35	Jirau Energia	-	APCRS	
36	Jirau Energia	2021	Plano de Resposta a Emergência	
37	Jirau Energia	2022	Auto de Vistoria Contra Incêndio e Pânico	
38	Ministério do Trabalho e Emprego	2022	Recibo declaração SESMET	
39	Jirau Energia	2022	Programa de Controle Médico de Saúde Ocupacional	
40	Jirau Energia	2021	Programa de Gerenciamento de Risco	
41	Prefeitura Municipal de Porto Velho – Secretaria de Saúde	-	Licença Sanitária do Ambulatório	
42	Jirau Energia	2022	Apresentação: Processos e estrutura de RH	
43	Jirau Energia	2022	Organograma Jirau Energia	
44	Jirau Energia	2023	Extrato de uma vistoria técnica operacional	
45	Jirau Energia	2022	Relatório - Índice de Comportamento Seguro - ICS	
46	Jirau Energia	2023	Relatório - Visita Preventiva de Segurança - VPS	
47	Jirau Energia	2023	Relatório de inspeção de segurança - RIS	
48	Jirau Energia	2022	Avaliação de Fornecedores	
49	Jirau Energia	2023	Controle de acidentes	
50	Jirau Energia	2023	Apresentação: Estatista de Incidentes	
51	Jirau Energia	2022	Política Socioambiental PO-GMAS-US-GR-00017	
52	Jirau Energia	2023	Spreadsheet “Action Plan: Approved Identified Actions to Foster Workplace Gender Equality”	
53	Jirau Energia	2019	Norma de Remuneração e Benefícios NO-GERH-US-GR-001	

54	Jirau Energia		Condições Gerais de Contratação para Prestação de Serviços	
55	Jirau Energia	2022	Apresentação: Fluxos a jusante e sedimentação	
56	RHA Engenharia e Consultoria SS Ltda.	2021	Usina Hidrelétrica Jirau – Programa de Monitoramento Hidrossedimentológico – Fase Operacional	
57	Energia Sustentável do Brasil S.A.	2021	Usina Hidrelétrica Jirau – Programa de Monitoramento Hidrobiogeoquímico – PBA Fase Operacional	
58	Venturo Consultoria Ambiental	2021	Usina Hidrelétrica Jirau – Programa de Monitoramento Limnológico – Fase Operacional	
59	Energia Sustentável do Brasil S.A.	2021	Usina Hidrelétrica Jirau – Programa de Monitoramento do Lençol Freático – PBA Fase Operacional	
60	Energia Sustentável do Brasil S.A.	2021	Usina Hidrelétrica Jirau – Programa de Monitoramento de Pontos Propensos à Instabilização de Encostas e Taludes Marginais – PBA Fase Operacional	
61	Geomind Consultoria Geológica Ltda.	2022	3º RELATÓRIO ANUAL – Licença de Operação nº 1097 / 2012 (1ª Renovação – 1ª Retificação) – Programa de Monitoramento do Lençol Freático	
62	RHA Engenharia e Consultoria SS Ltda.	2022	3º RELATÓRIO ANUAL – Licença de Operação nº 1097 / 2012 (1ª Renovação) – Programa de Monitoramento Hidrossedimentológico	
63	Venturo Consultoria Ambiental	2022	3º RELATÓRIO ANUAL – Licença de Operação nº 1097 / 2012 (1ª Renovação – 1ª Retificação) – Programa de Monitoramento Hidrobiogeoquímico	
64	Energia Sustentável do Brasil S.A.	2022	3º RELATÓRIO ANUAL – Licença de Operação nº 1097 / 2012 (1ª Renovação – 1ª Retificação) – Programa de Monitoramento Limnológico – Subprograma de Monitoramento de Elementos Traços	
65	Estratégia Geologia e Meio Ambiente	2022	3º RELATÓRIO ANUAL – Licença de Operação nº 1097 / 2012 (1ª Renovação) – Programa de Monitoramento de Pontos Propensos à Instabilização de Encostas e Taludes Marginais	
66	IBAMA – COHID/CGTEF/DILIC	2017	Laudo Técnico nº 56/2017 – Resultados e continuidade do Programa de Monitoramento Hidrossedimentológico da UHE Jirau	
67	IBAMA – COHID/CGTEF/DILIC	2019	Laudo Técnico nº 23/2019 – Resultados e continuidade do Programa de Monitoramento Hidrossedimentológico da UHE Jirau	
68	Jirau Energia.	2022	Programa de Comunicação Social – Jornal Nova Mutum Paraná (digital) – Projeto de Pesquisa e Desenvolvimento referente aos níveis de Mercúrio na Região Amazônica	
69	Jirau Energia	2022	Programa de Comunicação Social – Jornal Nova Mutum Paraná (digital) – Já pensou na Falta que a água faria na sua vida?	
70	Universidade do Estado de São Paulo – UNESP	2013	Metallomic study of Mercury in fish from Amazon region - Brazil	English

	Botucatu e Universidade de Brasília UNB			
71	Jorge Molina Carpio	2006	Análisis de los Estudios de Impacto Ambiental del Complejo Hidroeléctrico del Rio Madeira – Hidrología y Sedimentos	Spanish
72	Philip M. Fearnside	2013	Viewpoint – Decision Making on Amazon Dams: Politics Trumps Uncertainty in the Madeira River Sediments Controversy	English
73	Leme Engenharia/Tractbel Engineering - SUEZ	2009	Relatório do Projeto Básico Consolidado - Hidrossedimentologia	
74	Furnas/PCE/Odebrecht	2006	Estudo de Viabilidade do Aproveitamento Hidrelétrico Jirau – Estudos Hidrometeorológicos e Fisiográficos	
75	Paulo Cesar Colonna Rosman COPPE/UFRJ	2011	Relatório de Modelagem de Processos Sedimentológicos no Reservatório do Aproveitamento Hidroelétrico Jirau	
76	SOGREAH Consultants	2011	Modelo Reduzido Tridimensional do AHE Jirau – Transporte de Sedimentos, Material Flutuante e Ovos, Larvas e Juvenis de Ictiofauna – Relatório Final	
77	CNEC-Worley Parsons	2012	Programa de Acompanhamento dos Direitos Minerários e da Atividade Garimpeira – Análise dos Processos Minerários em Interferência com o Reservatório	
78	CNEC-Worley Parsons	2012	Programa de Acompanhamento dos Direitos Minerários e da Atividade Garimpeira – Áreas de Inundação Potenciais para Dragagem no Futuro Reservatório	
79	CNEC-Worley Parsons	2012	Programa de Acompanhamento dos Direitos Minerários e da Atividade Garimpeira – Plano de Mitigação	
80	Energia Sustentável do Brasil – UHE Jirau	2012	Correspondência AJ/BP 1675-2012 – Encaminhamento de Documentos – Análise de Interferência de Processos Minerários e Estudos de Áreas Potenciais para Dragagem de Ouro.	
81	Escola Politécnica da USP – Laboratório de Planejamento e Gestão de Sistemas Georreferenciados	2016	Produtividade e Lavra no Rio Madeira (PLRM) – Relatório Final – Novembro 2016	
82	Geomind Consultoria Geológica Ltda.	2017	Parecer Técnico Final - Avaliação da operacionalidade das atividades garimpeiras no reservatório da UHE Jirau	
83	Energia Sustentável do Brasil – UHE Jirau	2019	Termo de Autorização de Uso Sustentável da Área de Preservação Permanente (TAUSAPP) nº 001/2019 firmado em 31 de outubro de 2019	
84	Energia Sustentável do Brasil – UHE Jirau	2020	Termo de Recebimento Definitivo dos Pontos de Atracação denominados “Palmeiral” e “Boca do Mutum” como indicado no Termo de Autorização de	

			Uso Sustentável da Área de Preservação Permanente (TAUSAPP) nº 001/2019 firmado em 31 de outubro de 2019	
85	Cooperativa dos Garimpeiros do Rio Madeira – COOGARIMA	2023	Ofício n 05/2023 ao Núcleo de Licenciamento Ambiental do IBAMA/RO informando entre outras informações e anexando o termo de entrega dos portos “Palmeiral” e “Boca do Mutum” entre COOGARIMA e UHE Jirau	
86	Jirau Energia	2016	Informativo Compensações Sociais da Usina Jirau: Benefícios para Jaci Paraná	
87	Oikos Consultoria e Projetos	2016	7º Relatório Semestral: Solicitação de Renovação da Licença de Operação nº 1097/2012 – Programa de Compensação Social	
88	Oikos Consultoria e Projetos	2016	Relatório de Monitoramento da Área de Influência Direta – T6	
89	Ecology Brasil	2009	PBA - Programa de Remanejamento das Populações Atingidas	
90	Jirau Energia	2019	7º Relatório Semestral: Solicitação de Renovação da Licença de Operação nº 1097/2012 – Programa de Remanejamento das Populações Atingidas	
91	Jornais de grande circulação	-	Matérias de Jornais – publicações em jornal de grande circulação 1ª fase de monitoramento reassentados	
92	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Remanejamento das Populações Atingidas	
93	Jirau Energia	2022	NT-NOR-NT 001-22 - Nota Técnica - Subprograma de Reorganização das Atividades Produtiva	
94	ASSIST Ações Sustentáveis	2022	T0- Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau.	
95	Jirau Energia	2019	Protocolo correspondência IT/CB 697-2019 – Atendimento ao Cronograma de Continuidade das Atividades do Novo Estudo de Remanso – 4º Relatório Trimestral	
96	Jirau Energia	2023	Histórico ações judiciais por conta da cheia histórica ocorrida em 2014	
97	ASSIST Ações Sustentáveis	2015	T2 - Relatório de Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau	
98	ASSIST Ações Sustentáveis	2015	T3 - Relatório de Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau	
99	ASSIST Ações Sustentáveis	2019	T3 – Monitoramento da viabilidade econômica de atividades reorganizadas da população atingida pela Usina Jirau.	
100	Jirau Energia	2019	13º Relatório Semestral da Licença de Operação nº 1097/2012 – Programa de Remanejamento das Populações Atingidas	
101	Jirau Energia	2023	Relatório sistema Jira e Canais de atendimento: Comunicação externa	
102	Oikos Consultoria e Projetos	2016	7º Relatório Semestral: Solicitação de Renovação da Licença de Operação nº 1097/2012 – Programa de Apoio às Atividades de Lazer e Turismo	

103	Oikos Consultoria e Projetos	2016	7º Relatório Semestral Complementar: Solicitação de Renovação da Licença de Operação nº 1097/2012 – Programa de Apoio às Atividades de Lazer e Turismo	
104	Secretaria Municipal de Integração (SEMI)	2018	Ofício nº 0391/SEMDESTUR/2018	
105	Oikos Consultoria e Projetos	2016	13º Relatório Semestral da Licença de Operação nº 1097/2012 – Programa de Apoio às Atividades de Lazer e Turismo	
106	Geomind – Geologia e Meio Ambiente	2017 2019	9º e 13º Relatório Semestral da Licença de Operação nº 1097/2012 – Programa de Acompanhamento dos Direitos Minerários e da Atividade Garimpeira – com anexos	
107	Geomind – Geologia e Meio Ambiente	2017	9º Relatório Semestral da Licença de Operação nº 1097/2012 – Programa de Direitos Minerários	
108	Geomind – Geologia e Meio Ambiente	2020	RTGM-02/2020 – Consolidação das Tratativas como o Público de Atividades Garimpeiras Manuais	
109	Jirau Energia	-	Cartilha “O Garimpo de Ouro”	
110	Jirau Energia		9º ao 12º Relatório de Acompanhamento dos Investimentos Sociais – Subcrédito E	
111	Presidência da República	2018	Lei 13.661 - Altera a Lei nº 8.001, de 13 de março de 1990, para definir as parcelas pertencentes aos Estados e aos Municípios do produto da Compensação Financeira pela Utilização de Recursos Hídricos (CFURH).	
112	Confederação Nacional de Municípios	-	Coletânea Gestão Pública – Finanças Municipais	
113	Estado de Rondônia	2021	Demonstrativo das Receitas e Despesas	
114	Ibama	2009	Parecer Técnico nº 042/2009 – COHID/CGENE/DILIC/IBAMA	
115	Kléber Lúcio Borges	2019	Tese de doutorado - IGUA - ÍNDICE DE GESTÃO AMBIENTAL DA QUALIDADE DA ÁGUA: proposta de um índice para a avaliação da qualidade da água captada utilizada no abastecimento em Porto Velho	
116	Prefeitura do Município de Porto Velho	2011	Lei Complementar nº 431 - Dispõe sobre criação do Núcleo Urbano “Nova Mutum Paraná”, e do “Pólo Industrial Nova Mutum Paraná”, estabelece normas relativas ao uso e ocupação do solo destas áreas no Município de Porto Velho, Distrito de Jaci Paraná e dá outras Providencias”.	
117	Instituto Previsão	2015	Pesquisa – Relatório Consolidado Geral	
118	Instituto Previsão	2015	Pesquisa – Análise Comparativa Consolidado Geral	
119	Coopprojirau	2022	Avaliação Anual do Programa de Educação Ambiental	
120	Jirau Energia e Prefeitura Municipal de Porto Velho	2019	Termo de Doação Jirau 061/19	

121	Jirau Energia e Prefeitura Municipal de Porto Velho	2019	Termo de Quitação e Encerramento do Convênio 019/11	
122	Oikos Consultoria e Projetos	2016	13º Relatório Semestral da Licença de Operação nº 1097/2012 – Programa de Compensação Social	
123	Jirau Energia e Prefeitura Municipal de Porto Velho	2012	Convênio Jirau 039/12	
124	Jirau Energia e Prefeitura Municipal de Porto Velho	2018	1º Aditivo do Convênio Jirau 039/12	
125	Secretaria Municipal de Agricultura, Pecuária e Abastecimento (SEMAGRIC)	2020	Ofício nº 229/GAB/SEMAGRIC/2020. Aplicação de Curso Básico em Apicultura Sustentável	
126	Jirau Energia, Coopprojirau e SEMAGRIC		Ata de Reunião realizada em 25/11/2019 - Apresentação de intenção de projeto sobre apiário a ser desenvolvido pela SEMAGRIC	
127	Jirau Energia	2023	Apresentação: Comunidades e meios de subsistência afetados pelo projeto	
128	Coopprojirau	-	RELATÓRIO DE SUSTENTABILIDADE. De pessoas para pessoas. 10 anos plantando histórias	
129	APROVEITAMENTO HIDRELÉTRICO JIRAU E SANTO ANTONIO	2012	RELATÓRIO FINAL DE IMPLANTAÇÃO PROGRAMA DE AÇÕES A JUSANTE RESPONSÁVEL PELA EXECUÇÃO: INSTITUTO BRASILEIRO DE PESQUISAS E ESTUDOS AMBIENTAIS PRO-NATURA, AGOSTO DE 2011 A FEVEREIRO DE 2012	
130	COALITION FOR HUMAN RIGHTS IN DEVELOPMENT	-	Uncalculated Risks: Killing of Nilce de Souza Magalhães and threats to activists	https://rightsindevelopment.org/wp-content/uploads/2019/05/CASE-9-Jirau-Dam-ENG.pdf
131	ESBR	2013	ATA DA DÉCIMA SEXTA REUNIÃO DO GRUPO DE TRABALHO SOCIOECONOMIA Data: 26 de março de 2013, Local: Centro Cultural (Nova Mutum Paraná)	
132	Jirau Energia	2023	CANAIS DE ATENDIMENTOS _jan.22 até jan.23	Communications log (excel)
133	CNEC WorleyParsons Engenharia S/A.	2012	Relatório Final de Implantação do Programa de Compensação Social PERÍODO DAS ATIVIDADES: Junho de 2009 a Fevereiro de 2012	
134	Município de Porto Velho e ESBR	2012/ 2018	CONVENIO N° 039/12 PRIMEIRO ADITIVO AO CONVENIO N° 039/12 (extrativismo – Projeto Babaçu)	
135	Município de Porto Velho e ESBR	2019	CONVENIO N° 019/11; TERMO DE QUITAÇÃO E ENCERRAMENTO DO CONVENIO N° 019/11 (combater a exploração sexual de crianças e adolescentes e demais violações do direito em comunidades)	

136	Erin Barnes	2007	Market Values of the Commercial Fishery on the Madeira River: Calculating the Costs of the Santo Antônio and Jirau Dams to Fishermen in Rondônia, Brazil and Pando-Beni, Bolivia	Tropical Resources Bulletin
137	Jirau Energia	-	Folder PBA Fase Operacional 27 - Monitoramento e Apoio Atividade Pesca	
138	ESBR	2009	AHE Jirau Projeto Básico Ambiental - PBA Julho de 2009 4.30 - Programa de Monitoramento e Apoio à Atividade Pesca	
139	Fundação Getulio Vargas	2012	Gestão da implantação do Plano Jirau de Desenvolvimento Local Sustentável. Produto 7 - Relatório Final	
140	IBAMA	2016	Resposta ao Ofício no 11239/2016 - SEI/CNDH/GM, referente às recomendações do Relatório do Conselho Nacional dos Direitos Humanos (Processo no 00005.217407/2016-08)	
141	Mayer et al	2022	Uncompensated losses and damaged livelihoods: Restorative and distributional injustices in Brazilian hydropower	Energy Policy
142	CNEC WorleyParsons Engenharia S/A	2011	Relatório Consolidado de Atividades: Programa de Acompanhamento dos Direitos Minerários e da Atividade Garimpeira PERÍODO DAS ATIVIDADES: junho/2009 a maio/2011	
143	COOGARIMA/IBAMA/Santo Antonio/Jirau	2019-2023	Correspondência portos de apoio	
144	IBAMA	2014	ATA DA 10ª REUNIÃO – GT MINERÁRIO LOCAL: Auditório da Superintendência do IBAMA/RO DATA: 07.10.2014 PARTICIPANTES: representantes da ESBR, DNPM, COOPREMI e IBAMA	
145	Jirau Energia	2020	Programa de Ações à Jusante, PBA Fase Operacional	
146	Intertechne Consultores	2012	Relatório Final 4.26 - Programa de Recuperação da Infraestrutura Atingida 2009-2012	
147	Jirau Energia	2020	Programa de Recuperação da Infraestrutura Atingida, PBA Fase Operacional	
148	Barcellos et al	2018	Health risk assessment associated with the implementation of the Madeira Hydroelectric complex	Ambiente & Sociedade, São Paulo. Vol. 21, 2018
149	MINISTÉRIO DA SAÚDE	2009	Sistema Nacional de Vigilância em Saúde: Relatório de Situação Rondônia	
150	Prefeitura Municipal de Porto Velho, Secretaria Municipal de Saúde	2010	Plano de Saúde	
151	ESBR	-	Folder PBA 22 - Programa de Saúde Pública	
152	CNEC WorleyParsons Engenharia S/A	2012	Relatório Final de Implantação do Programa de Saúde Pública PERÍODO DAS ATIVIDADES: Junho/2009 a Fevereiro/2012	

153	Oikos	2017	SUBPROGRAMA DE VIGILÂNCIA EPIDEMIOLÓGICA E VETORIAL PLANO DE MONITORAMENTO DE VETORES PARA A FASE DE PÓS- RENOVAÇÃO DA LICENÇA DE OPERAÇÃO DA UHE JIRAU, RIO MADEIRA, PORTO VELHO, RONDÔNIA – 2017 A 2018	
154	Jirau Energia	2020	Programa de Saúde Pública, PBA Fase Operacional	
155	CNEC WorleyParsons Engenharia S/A	2012	Relatório Final de Implantação do PROGRAMA DE USO DO ENTORNO DO RESERVATÓRIO PERÍODO DAS ATIVIDADES: Junho de 2009 a Fevereiro de 2012	
156	Jirau Energia	2019-2022	Relatórios de Acompanhamento dos Investimentos Sociais – Subcrédito “E” (para BNDES)	
157	ARC - FISTER	2012	LEVANTAMENTO DE INFORMAÇÕES DA PESCA ESPORTIVA E EMPREENDIMENTOS TURÍSTICOS EM FORTALEZA DO ABUNÃ – PORTO VELHO	
158	Jirau Energia	2022	Apresentação: Segurança de Barragens UHE Jirau	
159	Tractebel Engineering Ltda – GDF Suez – Leme Engenharia	2010	Estudo de Remanso – Rio Madeira no Trecho da UHE Jirau até Abunã	
160	Hicon Engenharia de Recursos Hídricos	2017	Modelo de Remanso 2016 – Calibração de Modelo Hidrodinâmico e Determinação dos Perfis de Linha D’Água	
161	Jirau Energia	2022	Usina Hidrelétrica Jirau – 3º Relatório Anual – Licença de Operação nº 1097/2012 (1ª Renovação 1ª Retificação)	
162	Energia Sustentável do Brasil S.A.	2020	Usina Hidrelétrica Jirau – Programa de Recuperação da Infraestrutura Atingida – Fase Operacional	
163	Energia Sustentável do Brasil S.A.	2020	Usina Hidrelétrica Jirau – Plano Ambiental de Conservação e Uso do Entorno do Reservatório Artificial – Fase Operacional	
164	Tractebel Engineering Ltda – GDF Suez – Leme Engenharia	2021	Usina Hidrelétrica Jirau – Plano de Ação de Emergência UHE Jirau	
165	Energia Sustentável do Brasil S.A.	2020	Usina Hidrelétrica Jirau – Programa de Monitoramento Sismológico – Fase Operacional	
166	Energia Sustentável do Brasil S.A.	2020	Usina Hidrelétrica Jirau – Programa de Recuperação da Infraestrutura Atingida – Fase Operacional	
167	Jirau Energia	2022	3º RELATÓRIO ANUAL – Licença de Operação nº 1097 / 2012 (1ª Renovação – 1ª Retificação) – Programa de Recuperação da Infraestrutura Atingida	
168	Terrafísica Inovações Sismológicas Ltda.	2022	3º RELATÓRIO ANUAL – Licença de Operação nº 1097 / 2012 (1ª Renovação – 1ª Retificação) – Programa de Monitoramento Sismológico	

169	Agência Nacional de Águas - ANA	2014	Nota Técnica nº 93/2014 Revisão dos estudos de vazões máximas no rio Madeira – UHE Santo Antônio e UHE Jirau	
170	Agência Nacional de Águas - ANA	2021	Ofício ANA nº 1512/2014 Atualização das Vazões Máximas no rio Madeira – UHE Santo Antônio e UHE Jirau	
171	Brasiliano Interisk	2022	GAP Analysis Security – Engie	
172	Jirau Energia	2022	Relatório Técnico para Atualização da Curva Cota x Área x Volume para atendimento ao Parecer Técnico ANA nº 166/2022/COSET/SGH	
173	Jirau Energia	2023	Status “Segurança Empresarial” – Company Security – UHE Jirau	
174	Themag Engenharia	2013	Aproveitamento Hidrelétrico Jirau – Projeto Executivo – Cercamento Patrimonial e Interesse Operacional – Planta de Situação	
175	Tractbel – Engie – Jirau Energia	2021	Mapa de Inundação – Estudo de Rompimento da Barragem – Cenário de Galgamento e Piping – Zona de Autossalvamento	
176	Frisius Consultoria e Projetos LTDA	2018	Aproveitamento Hidrelétrico Jirau – Projeto Executivo de Sinalização do Perímetro de Segurança	
177	Jirau Energia	2023	Relatório Mensal de Inspeção e Auscultação das Barragens e Estruturas Civas	
178	Jirau Energia	2022	Carta DC/CF 388/2022 – Envio da revisão do PAE Usina Jirau	
180	Carta – Cartografia e Agrimensua	2019	4º Relatório Trimestral de Atividades Novo Estudo de Remanso	
181	Santafé Ideias Comunicação	2019	4º Relatório Trimestral de Atividades Novo Estudo de Remanso – Programa de Comunicação Social	
182	ASSIST Ações Sustentáveis	2015	T2 - Relatório de Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau	
183	Jirau Energia	2019	13º Relatório Semestral da Licença de Operação nº 1097/2012 – Programa de Remanejamento das Populações Atingidas	
184	Jirau Energia	2016	7º Relatório Semestral da Licença de Operação nº 1097/2012 – Programa de Remanejamento das Populações Atingidas	
185	Ecology Brasil	2009	PBA - Programa de Remanejamento das Populações Atingidas	
186	Jornais de grande circulação		Materias de Jornais – publicações em jornal de grande circulação 1ª fase de monitoramento reassentados	
187	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Remanejamento das Populações Atingidas	
188	ASSIST Ações Sustentáveis	2015	T2 - Relatório de Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau	
189	ASSIST Ações Sustentáveis	2015	T3 - Relatório de Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau	

190	ASSIST Ações Sustentáveis	2017	T4 - Relatório de Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau	
191	ASSIST Ações Sustentáveis	2018	T4 - Relatório de Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau	
192	ASSIST Ações Sustentáveis	2018	T5 - Relatório de Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau	
193	ASSIST Ações Sustentáveis	2019	T3 - Monitoramento da viabilidade econômica de atividades reorganizadas da população atingida pela Usina Jirau.	
194	Jirau Energia	2019	Protocolo correspondência IT/CB 697-2019 – Atendimento ao Cronograma de Continuidade das Atividades do Novo Estudo de Remanso – 4º Relatório Trimestral	
195	Jirau Energia	2022	NT-NOR-NT 001-22 - Nota Técnica - Subprograma de Reorganização das Atividades Produtiva	
196	Jirau Energia	2023	Correspondência DC/CB 008/2022 protocolada no Ibama - Encerramento das Atividades de Acompanhamento da Assistência Técnica e Social – Subprograma de Reorganização das Atividades Produtivas	
197	ASSIST Ações Sustentáveis	2022	T0- Monitoramento da reinserção social e avaliação da recomposição da qualidade de vida da população atingida pela Usina Jirau.	
198	Jirau Energia	2023	Correspondência DC/CB 042/2023 protocolada na SEMUSA – Solicitação de Dados Epidemiológicos e Assistenciais de Nova Mutum Paraná	
199	Jirau Energia	2023	Apresentação: Remanejamento	
200	IBAMA	2019	Memória de Reunião no 23/2019-COHID/CGTEF/DILIC MEMÓRIA DA 7ª REUNIÃO DO GRUPO DE ACOMPANHAMENTO SOCIAL (GAS) DA UHE JIRAU	
201	Jirau Energia	2022	Jornal Nova Mutum Paraná: Edição 10/2022, Edição 11/2022, Edição 11/2022, Edição 12/2022	
202	Jirau Energia	-	Enchentes de 2014 - visão geral das ações judiciais	
203	ESBR	2014	UHE Jirau - Resposta ao Ofício nº 805/2014/SRE-ANA Levantamento de áreas urbanas, localidades e infraestruturas	
204	Cotrim & Sato Consultoria em Engenharia	2014	ESTUDO COMPARATIVO ENTRE O REMANSO ESTIMADO E O OBSERVADO NO RESERVATÓRIO DURANTE A CHEIA DE 2014. Nota Técnica - Preliminar	
205	PREFEITURA DO MUNICÍPIO DE PORTO VELHO	2011	LEI COMPLEMENTAR No. 431, 04 DE OUTUBRO DE 2011. “Dispõe sobre criação do Núcleo Urbano “Nova Mutum Paraná”, e do “Pólo Industrial Nova Mutum Paraná”, estabelece normas relativas ao uso e ocupação do solo destas áreas no Município de Porto Velho, Distrito de Jaci Paraná e dá outras Providencias”.	

206	Jirau Energia	2012	PROGRAMA DE REMANEJAMENTO DAS POPULAÇÕES ATINGIDAS: ANEXO AO RELATÓRIO FINAL DE IMPLANTAÇÃO	
207	Jirau Energia	2021	PBA - Programa de Remanejamento das Populações Atingidas Projeto Básico Ambiental (PBA) - Fase Operacional	
208	IBAMA	2021	Parecer Técnico. Programas de Educação Ambiental, Comunicação Social, Remanejamento das Populações Atingidas, Subprograma de Apoio a Atividade Pesqueira	
209	Jirau Energia	2023	Apresentação: Biodiversidade e Espécies Invasivas	
210	Venturo Engenharia e Consultoria Ambiental	2023	Apresentação: Fish deterrent associated with hydraulic flow rate increase in bulb turbine	
211	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Monitoramento de Limnológico	
212	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Monitoramento e Controle de Macrófitas Aquáticas	
213	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Conservação da Flora	
214	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Recuperação de Áreas Degradadas	
215	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Desmatamento do Reservatório	
216	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Conservação in situ da Fauna	
217	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Monitoramento da Fauna do Entorno do Reservatório	
218	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Resgate de Fauna	
219	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Conservação da Ictiofauna	
220	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 - Programa de Resgate e Salvamento da Ictiofauna	
221	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 - Programa de Compensação Ambiental.	
222	Jirau Energia	-	PBA Fase Operacional dos Programas Socioambientais da Usina Jirau	
223	Birdlife International	2023	Important Bird Areas factsheet: Abuna	www.birdlife.org
224	Instituto Chico Mendes	2018	Anexo TCCA nº 5	
225	Jirau Energia	2020	PBA Fase Operacional Programa de Compensação Ambiental	

226	Jirau Energia	-	Apresentação: 3º Relatório Anual da Licença de Operação nº 1097/2012	
227	ICMBio	2011	Plano de ação nacional para a conservação dos mamíferos aquáticos: pequenos cetáceos	
228	ICMBio	2018	Plano de manejo do Parque Nacional do Mapinguari – Vol I & Vol II	
229	Da Silva et al.	2018	<i>Inia geoffrensis</i> . The IUCN Red List of Threatened Species.	http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T10831A50358152.en
230	Aliaga-Rossel & Guizada Duran	2020	Four decades of research on distribution and abundance of the Bolivian river dolphin <i>Inia geoffrensis boliviensis</i>	ENDANGERED SPECIES RESEARCH Vol. 42: 151–165
231	ESBR	2011	PROGRAMA DE CONSERVAÇÃO DA ICTIOFAUNA: ESTRATÉGIA DE TRANSPOSIÇÃO DE PEIXES	
232	ESBR / Naturae	2013	PROGRAMA DE CONSERVAÇÃO DA ICTIOFAUNA: OPERAÇÃO DOS SISTEMAS DE TRANSPOSIÇÃO DE PEIXES DA UHE JIRAU (STP-1 e 2) 11o RELATÓRIO TÉCNICO MENSAL, OUTUBRO DE 2013	
233	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Apoio às Comunidades Indígenas	
234	Jirau Energia	2022	PBA Fase Operacional do Programa de Apoio às Comunidades Indígenas – Versão inicial	
235	Jirau Energia	2022	Folders com os canais de atendimento na linguagem Indígena	Indigenous languages
236	Jirau Energia	2022	Boletins informações sobre as ações executadas no âmbito do Programa de Apoio às Comunidades Indígenas	
237	Jirau Energia	2022	Correspondência DC/JB 054/2022 protocolada na Funai - Encerramento do Convênio Jirau 117/18.	
238	Jirau Energia	2020	Correspondência IT/JB 548-2020 protocolada na Funai - Termo de Quitação e Encerramento do Acordo de Cooperação JIRAU nº 057/17	
239	Jirau Energia	2021	Termo de Quitação e Encerramento do Convênio Jirau 118/15.	
240	Jirau Energia	-	Cartilha: Aspectos Socioculturais das Populações Indígenas Contempladas no Programa de Apoio às Comunidades Indígenas da UHE Jirau	
241	Jirau Energia	2022	Lista de Presença – Integração de colaboradores para atuação em território indígena.	
242	Funai	2022	OFÍCIO Nº 211/2022/COEP/CGLIC/DPDS/FUNAI - Autorização de Ingresso em Terras Indígenas	
243	Jirau Energia / Solaris	-	Apresentação: Aspectos Socioculturais das Terras Indígenas Igarapé Lage e Igarapé Ribeirão	
244	Jirau Energia	-	Currículo Lattes do responsável técnico pelo programa indígena	

245	Jirau Energia	-	Atas de reuniões das apresentações e consultas do PBA do Programa de Apoio às Comunidades Indígenas	
246	Jirau Energia	-	Atas de reuniões para validação das obras das escolas, unidades básicas de saúde e módulo sanitário domiciliares nas aldeias indígenas	
247	Jirau Energia	2021	Ata de reunião para validação do imóvel pelas lideranças indígenas	
248	Jirau Energia	2022	Correspondência DC/JB 233/2022 protocolada na Funai - Relatório Técnico de Monitoramento – Ano I.	
249	Jirau Energia	2020	1º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Apoio às Comunidades Indígenas	
250	Jirau Energia	-	Memórias de reuniões realizadas com as entidades representantes dos povos indígenas para tratativas as ações previstas no âmbito do Programa de Apoio às Comunidades Indígenas	
251	Jirau Energia	2020	Correspondência IT/JB 454-2020, contendo a atualização do status do Componente Indígena da UHE Jirau para solicitar posicionamento da Funai.	
252	Jirau Energia	2019	Correspondência IT/VF 543-2019, contendo a atualização do status do Componente Indígena da UHE Jirau para solicitar posicionamento da Funai.	
253	Jirau Energia	2023	Apresentação: Povos Indígenas	
254	Jirau Energia	2012	ATA DA REUNIÃO DO GRUPO DE TRABALHO INDIGENA Data: 19 de junho de 2012	
255	Jirau Energia	2021	ATA DE REUNIÃO DSEI-ARP - Validação Imóvel CASAI Extrema 14.01.2021 Kaxarari	
256	Yuanwei Qin et al	2023	Forest conservation in Indigenous territories and protected areas in the Brazilian Amazon	Nature Sustainability https://doi.org/10.1038/s41893-022-01018-z
257	Gabriel C. Carrero	2020	Spatiotemporal analysis of the Southern Amazonas/Northern Rondônia Mosaic: Socio-economics, infrastructure, land cover and land-use change	https://giamazon.org/wp-content/uploads/2021/09/GIA-Brazil-spatial-analysis_Carrero-Sep30_2020.pdf
258	Jirau Energia	-	Folder com Subprograma de Apoio à Saúde Indígena	
259	Jirau Energia	-	Folder com Subprograma de Apoio a Educação Indígena	
260	Jirau Energia	2023	Apresentação: Patrimônio Cultural	
261	Jirau Energia	2020	PBA Fase Operacional do Programa de Prospecção e Salvamento do Patrimônio Arqueológico	
262	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Prospecção e Salvamento do Patrimônio Arqueológico	

263	Jirau Energia	2022	20º Relatório Trimestral - Programa de Gestão do Patrimônio Arqueológico, Histórico e Cultural Manutenção e Guarda do Acervo Arqueológico UHE Jirau	
264	Jirau Energia	2020	1º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Prospecção e Salvamento do Patrimônio Arqueológico	
265	Jirau Energia	2016	7º Relatório Semestral de Solicitação de Renovação da Licença de Operação nº 1097/2012 – Programa de Prospecção e Salvamento do Patrimônio Arqueológico	
266	Jirau Energia	2016	7º Relatório Semestral Complementar de Solicitação de Renovação da Licença de Operação nº 1097/2012 – Programa de Prospecção e Salvamento do Patrimônio Arqueológico	
267	Iphan	2022	Ofício Nº 1392/2022/CNA/DEPAM-IPHAN - Análise do 19º Relatório Trimestral Programa de Gestão do Patrimônio Arqueológico, Histórico e Cultural	
268	Jirau Energia	2022	Condoles Específicas de Prestação de Serviços Nº 053/22	
269	Jirau Energia	2022	Correspondência DC/JP 271/2022 – Medida Compensatória 10 (Centro de Memória/Mutum) e Medida Compensatória 05 (Estudo de Viabilidade) e Medida Compensatória 07 (Estação Ferroviária de Guajará Mirim)	
270	Iphan	2022	Ofício Nº 439/2022/DEPAM-IPHAN - Procedimento Administrativo n.º 1.31.000.001857/2018-52 – Acompanhar o cumprimento pela Jirau Energia das condicionantes pendentes da UHE-Jirau.	
271	Iphan	2009	Ofício nº 067/09 – GEPAN/DEPAM/IPHAN – Medidas Compensatórias	
272	Procuradoria da República em Rondônia	2019	Ata de reunião 11/09/2019, ESBR, MPF, IPHAN, IBAMA, Comunidade de Guajará Mirim - Medidas Compensatórias	
273	Jirau Energia	2022	Apresentação: Status Report Controles Internos e Auditoria Interna	
274	Jirau Energia	2022	E-mail enviando o Status Report Controles Internos e Auditoria Interna	
275	Jirau Energia	2023	Prints Sistema “SE Suíte” – Monitoramento das Obrigatoriedades	
276	Jirau Energia	2023	Matriz SWOT 2023	
277	Jirau Energia	2023	Apresentação: Estratégia e Riscos Corporativos	
278	Jirau Energia	2023	Print: Contratos para aprovação em Reunião de Diretoria	
279	Jirau Energia	2023	Relatório de Verificação IBRACEM – Themag Engenharia	
280	Jirau Energia	2023	Questionário de Ética - Themag Engenharia	
281	Jirau Energia	2023	Organograma Societário	
282	Jirau Energia	2023	Fluxo Regulação e Gestão de Contratos de Energia: Representação da Jirau Energia junto a APINE	

283	Jirau Energia	2023	Fluxo Regulação e Gestão de Contratos de Energia: Gestão de Questões Técnicas nas Instituições Setoriais e Acompanhamento da Agenda Regulatória da ANEEL	
284	Jirau Energia	2021	Manual de Controles Internos	
285	Jirau Energia	2021	Política sobre Conflito de Interesse	
286	Jirau Energia	2022	Norma de Suprimentos NO-GADM-US-CS-00016	
287	Jirau Energia	2022	Instrução de Trabalho IBRACEM	
288	Jirau Energia	2022	Instrução de Trabalho Utilização do Portal Nimbi	
289	Jirau Energia	2023	Matriz de Risco do Negócio	
290	Jirau Energia	2023	Código de Ética	
291	Jirau Energia	2022	Condições Gerais de Contratação para Prestação de Serviços	
292	Jirau Energia	2022	Instrução de Trabalho Análise das Propostas Técnicas	
293	Jirau Energia	2019	Manual de Auditoria Interna MN-GACI-US-AD-00029	
294	Jirau Energia	2019	Política de Controles Internos PO-GAUD-US-CO-00009	
295	Jirau Energia	2008	Contrato de Concessão 002/2008-MME-UHE Jirau	
296	Jirau Energia	2022	Política Socioambiental	
297	Jirau Energia	2022	Manual de Segurança e Saúde Ocupacional, Meio Ambiente e Socioeconomia Para Contratadas	
298	Jirau Energia	2022	Instrução de Trabalho NOR-IT-0003-22: Utilização do Portal Nimbi	
299	Jirau Energia	2022	Instrução de trabalho NOR-IT-0005-22: Análise das Propostas Técnicas	
300	IBRACEM (Instituto Brasileiro de Certificação e Monitoramento)	2022	RELATÓRIO DE CONFORMIDADE LEGAL	
301	Jirau Energia	2022	Instrução de Trabalho IT-GADM-US-CO-00108: IBRACEM	
302	Jirau Energia	2022	3º Relatório Anual da Licença de Operação nº 1097/2012 – Programa de Comunicação Social	
303	Jirau Energia	2021	PBA Fase Operacional do Programa de Comunicação Social	
304	Jirau Energia	-	Matriz de stakeholders	
305	Jirau Energia	-	Política de Patrocínio	
306	Jirau Energia	2022	Plano de Comunicação	
307	Jirau Energia	2023	Planejamento de Patrocínios 2023	
308	ENGIE Brasil Energia	2021	Relatorio de Sustentabilidade	
309	Jirau Energia	2023	Apresentação: Comunicações e Consulta	
310	Jirau Energia	2020	RELATÓRIO FOTOGRÁFICO – MAIO DE 2019 A ABRIL 2020 Canais de Atendimentos da UHE Jirau	
311	Jirau Energia	2021	PBA Fase Operacional do Programa de Educação Ambiental	

312	RHA Engenharia e Consultoria SS Ltda.	2021	Usina Hidrelétrica Jirau – Programa de Monitoramento Hidrossedimentológico – Fase Operacional	
313	RHA Engenharia e Consultoria SS Ltda.	2022	3º RELATÓRIO ANUAL – Licença de Operação nº 1097 / 2012 (1ª Renovação) – Programa de Monitoramento Hidrossedimentológico	
314	Jirau Energia	2022	Usina Hidrelétrica Jirau – 3º Relatório Anual – Licença de Operação nº 1097/2012 (1ª Renovação 1ª Retificação)	
315	Agência Nacional de Águas - ANA	2006	ANA Technical Note nº 100/2006	
316	Agência Nacional de Águas - ANA	2009	ANA Resolution nº 269/2009	
317	Agência Nacional de Águas - ANA	2012	ANA Official Letter dated 12 th September 2012	
318	Agência Nacional de Águas - ANA	2014	Nota Técnica nº 93/2014 Revisão dos estudos de vazões máximas no rio Madeira – UHE Santo Antônio e UHE Jirau.	
319	Agência Nacional de Águas - ANA	2014	Ofício ANA nº 1512/2014 Atualização das Vazões Máximas no rio Madeira – UHE Santo Antônio e UHE Jirau.	
320	Agência Nacional de Águas - ANA	2021	Parecer Técnico ANA nº 87/2021/COREG/SRE	
321	Jirau Energia	2022	Organograma – Diretoria de Operação – Gerência de Operação – Coordenação de Hidrologia	
322	IBAMA – COHID/CGTEF/DILIC	2017	Laudo Técnico nº 56/2017 – Resultados e continuidade do Programa de Monitoramento Hidrossedimentológico da UHE Jirau	
323	IBAMA – COHID/CGTEF/DILIC	2019	Laudo Técnico nº 23/2019 – Resultados e continuidade do Programa de Monitoramento Hidrossedimentológico da UHE Jirau	
324	Jirau Energia	2022	NOR – IT – 0034 – 22 – Previsão de Vazão de Curto Prazo	
325	Operador Nacional do Sistema Elétrico	2018	Nota Técnica ONS nº 0017/2018 – Regra de Operação Hidráulica Integrada dos Reservatórios do Rio Madeira – Estação Chuvosa 2018	
326	Operador Nacional do Sistema Elétrico	2018	Carta ONS n 0047/DGL/2018 para ANA encaminhando a Nota Técnica ONS nº 0017/2018 – Regra de Operação Hidráulica Integrada dos Reservatórios do Rio Madeira – Estação Chuvosa 2018	
327	Jirau Energia	2022	Programa de Comunicação Social – Jornal Nova Mutum Paraná (digital) – Já pensou na Falta que a água faria na sua vida?	
328	Jirau Energia / Autoridad Administrativa de Água XIII Madre de Dios / Bolivia	2016	Compromiso de Colaboración	

329	Energia Sustentável do Brasil	2018	Diretrizes para Operação do Reservatório em Condições Normais	
330	Jirau Energia	2022	Apresentação: Mitigação e resiliência às mudanças climáticas	
331	Jirau Energia	2021	Programa de Monitoramento Climatológico – PBA Fase Operacional	
332	Hydroworld	2013	Brazil's Jirau hydro project world's largest CDM-registered renewable plant	
333	Tractbel Engineering Ltda. – Leme Engenharia	2019	Remarks on the Climate Resilience Guidelines and Jirau HPP Study Case	
334	Tractebel Engineering Ltda. – Leme Engenharia	2019	Jirau Hydropower Plant Climate Risk Assessment	
335	TRACTEBEL ENGINEERING S.A.	2022	ASSESSING CLIMATE CHANGE VULNERABILITY OF ENGIE HYDRO ASSETS Risk scoring and economic evaluation	
336	Jirau Energia	2021	Inventário de Emissões de Gases de Efeito Estufa 2021	
337	IPSL – Jan Polcher – Lucia Rinchiuso – Jérôme Servonnat	2022	Estimating the financial impact of climate change on the renewable energy activities of Engie until the 2050 horizon – Final report on the climate indicators for hydropower energy	

Appendix 3 - Photographs



Photo 1: Station of the Madeira-Mamoré railway in Guajará-Mirim, upstream of the Jirau reservoir






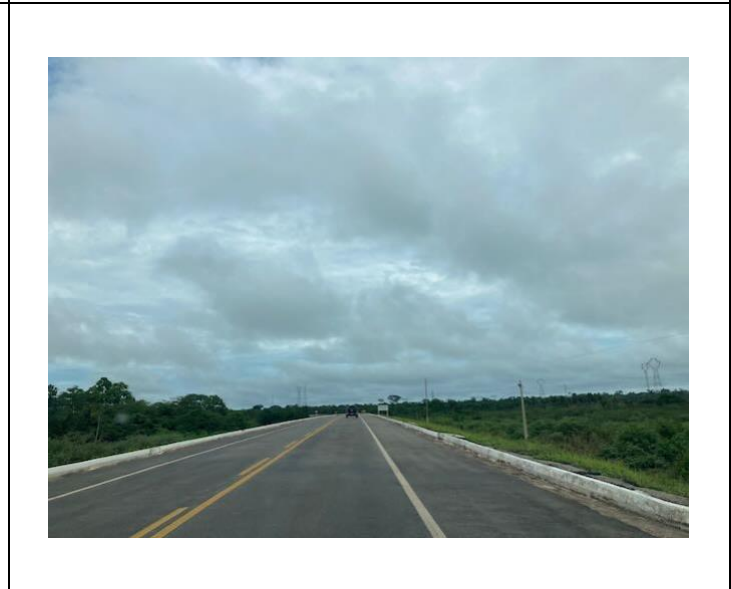


Photo 2: ANA rain gauge at Guajará-Mirim, with historic railroad water tower in background



Photo 3: Indigenous peoples' agency FUNAI office in Guajará-Mirim



<p>Photo 4: Ice production at fishing cooperative in Guajar-Mirim, financed by Jirau HPP</p>	<p>Photo 5: Public health campaign ship serving upstream river settlements, financed by Jirau HPP</p>	<p>Photo 6: Nova Mamor agricultural town upstream of Abuna</p>
		
<p>Photo 7: Potential site of Ribero Binacional HPP, between Abuna and Guajara-Mirim</p>	<p>Photo 8: Soybean fields upstream of the Jirau reservoir</p>	<p>Photo 9: Historic railroad depot in Abun, restored by Jirau HPP and used to accommodate 2014 flood victims</p>
		







<p>Photo 10: ANA gauge station at Abunã, with Bolivia on the other bank of the Rio Madeira</p>	<p>Photo 11: Pirarucú fish on upstream riverbank (photo ESBR)</p>	<p>Photo 12: Access road to Rio Madeira bridge, financed by Jirau HPP</p>
		
<p>Photo 13: BR 364 Rio Madeira bridge to western Rondônia and Acre, inaugurated in 2020</p>	<p>Photo 14: Confluence of Rio Abunã tributary with Rio Madeira, with former ferry port (view upstream from bridge)</p>	<p>Photo 15: Rio Madeira flowing into reservoir, with Brazil on left and Bolivia on right (view upstream from bridge)</p>
		
<p>Photo 16: Downstream view from Rio Madeira bridge over tail end of Jirau reservoir</p>	<p>Photo 17: Shallow reservoir arm turning into wetland</p>	<p>Photo 18: Fishing and mining activity in the reservoir - Mutum River branch</p>



Photo 19: Highway and historic railway bridges over Mutum River, and gold mining barge, near Old Mutum Paraná



Photo 20: Water level gauges with historic rail line in background



Photo 21: Area where the Degraded Area Recovery Program in the reservoir buffer zone has been concluded



Photo 22: Area revegetated 2 years ago along BR-364 highway, with buffer zone in background



Photo 23: Vegetation recovery area in the reservoir buffer (APP), implementation by COOPPROJIRAU



Photo 24: Large gold mining barge at riverport of miners' cooperative COOGARIMA



Photo 25: Barges at COOGARIMA riverport



Photo 26: Crew quarters on top of gold mining barge



Photo 27: EMBRAPA agricultural research and extension station at Nova Vida resettlement area



Photo 28: High-yield coffee varieties at EMBRAPA station



Photo 29: Floating water hyacinth on Jirau reservoir



Photo 30: Turn-off to Jirau HPP from main BR-364 highway



Photo 31: Checkpoint at entrance to Jirau HPP



Photo 32: Assessment team in front of right bank powerhouse



Photo 33: Left bank powerhouse from downstream



Photo 34: Revegetated and rapidly overgrowing camp areas on left bank



Photo 35: View downstream from spillway, with 3 gates partially open



Photo 36: Approach channel of one of two fish passage facilities



Photo 37: Upstream approach channel to log spillway



Photo 38: Log spillway upstream view



Photo 39: Log spillway with main spillway and right bank powerhouse in background



Photo 40: First aid clinic inside the powerplant



Photo 41: Debris on island, view towards left bank

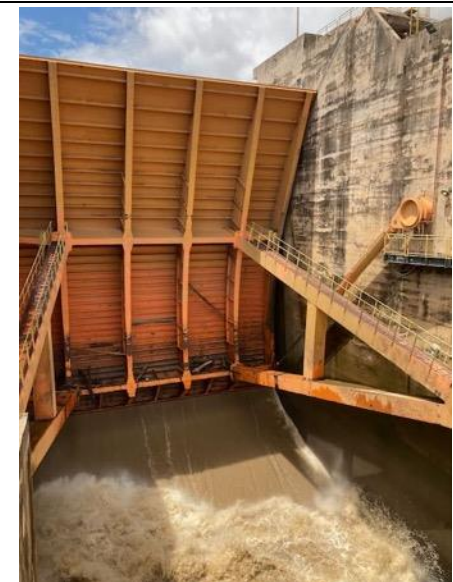


Photo 42: Spillway gate partially open



Photo 43: Downstream stop-log crane



Photo 44: Petroglyphs temporarily stored at powerplant 1



Photo 45: Petroglyphs temporarily stored at powerplant 2



Photo 46: Transformer



Photo 47: Control room right bank powerhouse

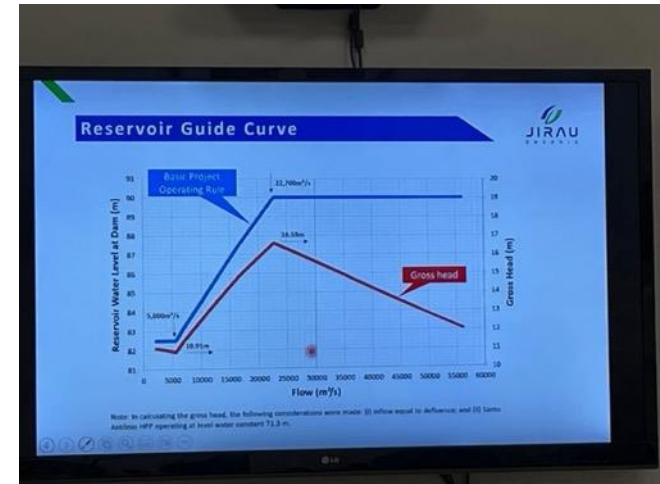


Photo 48: Operation Control Monitor - Reservoir Guide Curve



Photo 49: Electrical connections above generator level



Photo 50: View through left bank powerhouse

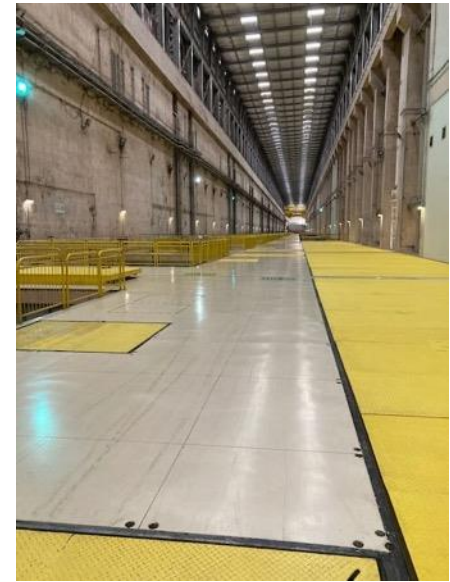


Photo 51: View through right bank powerhouse



Photo 52: Safety barrier during electrical panel maintenance



Photo 53: Transport in powerhouse

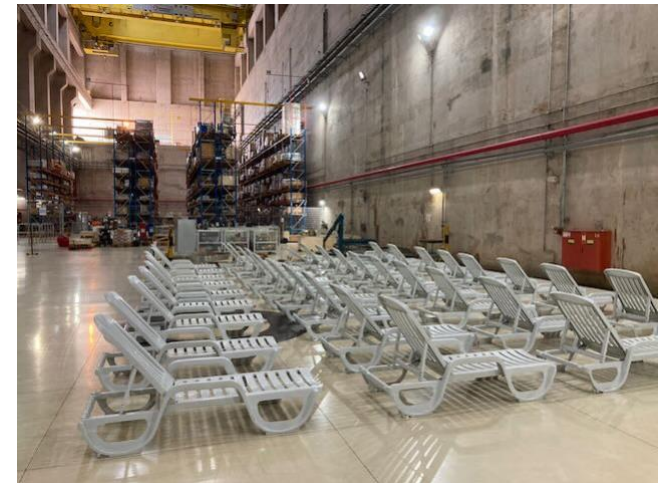


Photo 54: Isolation area for workers in powerhouse in case of major Covid-19 outbreaks



Photo 55: Alarm and warning signs in powerhouse



Photo 56: Confined space warning label



Photo 57: Safety instructions posted on the stairway steps

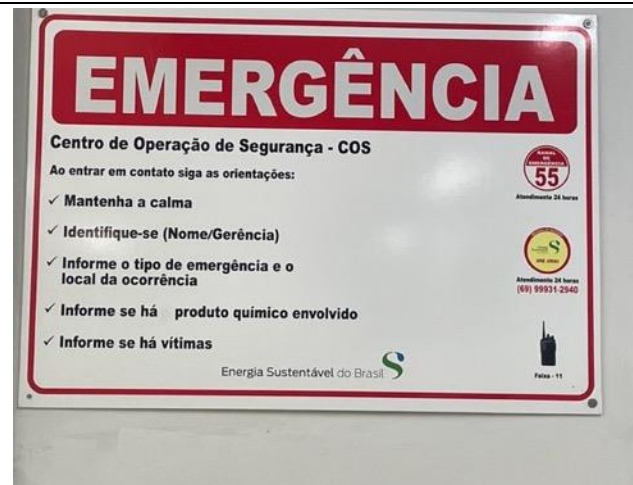


Photo 58: Emergency signage with instructions in powerhouse



Photo 59: Spill kit in powerhouse



Photo 60: Turbine data right bank powerhouse



Photo 61: Fire Department Permit



Photo 62: Porto Velho Municipality Permit



Photo 63: Jirau Environmental and Social Policy - full text

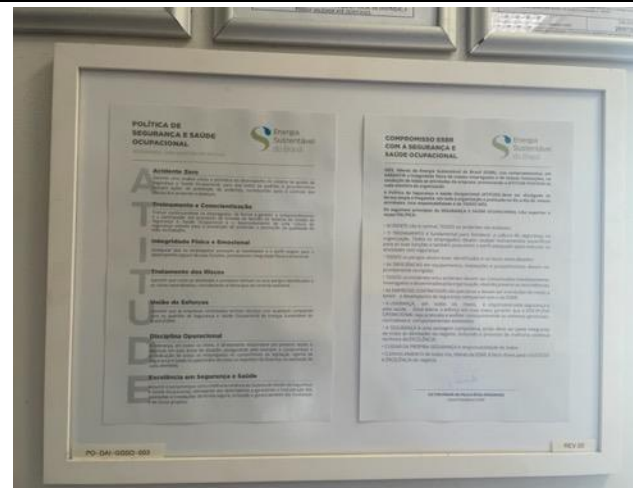


Photo 64: Jirau OH&S Policy



Photo 65: Water quality control billboard in powerhouse



Photo 66: Bulb turbine distributor, view from above



Photo 67: Technical school in Nova Mutum Paraná



Photo 68: Modern replacement church



Photo 69: One of many permanently protected plots in Nova Mutum Paraná



Photo 70: Waiting room in Nova Mutum Paraná health centre



Photo 71: Equipment in health centre



Photo 72: Equipment in health centre



Photo 73: Unused rooms in health centre due to staff and equipment shortages



Photo 74: Suggestion Box - Health Centre



Photo 75: Farmers' market building (former construction warehouse)



Photo 76: Farmers' market



Photo 77: Damaged warehouse in Nova Mutum Paraná, currently used for storing historic railway tracks



Photo 78: Recreation club for Jirau HPP staff and other residents of Nova Mutum Paraná



Photo 79: Pool in recreation club



Photo 80: Football field in recreation club



Photo 81: Disused cultural centre in Nova Mutum Paraná



Photo 82: Sewing machines in cultural centre, not used because of electrical safety issues



Photo 83: Auditorium in cultural centre



Photo 84: Building of Observatorio in Nova Mutum Paraná



Photo 85: Interview with resettled person at Observatorio



Photo 86: Vegetable gardens at Observatorio with recycled log boom sections



Photo 87: Vegetables grown by cooperative for sale to Jirau HPP



Photo 88: COOPPROJIRAU headquarter



Photo 89: Seedlings for revegetation program in reservoir buffer zone, behind COOPPROJIRAU building



Photo 90: Commercial area of Jaci-Paraná along BR-364 highway



Photo 91: Health center in Jaci-Paraná, with contributions from Jirau and Santo Antonio HPPs



Photo 92: Jaci-Paraná Military High School



Photo 93: Transmission lines from left bank powerhouse



Photo 94: 3 parallel 500 kV transmission lines from Jirau HPP to Porto Velho substation along BR-364 highway



Photo 95: Archaeology building at UNIR - *Universidade Federal de Rondônia* - sponsored by Jirau HPP



Photo 96: Artifacts from Jirau HPP in storage at UNIR



Photo 97: Artifacts from Jirau HPP in storage at UNIR 2

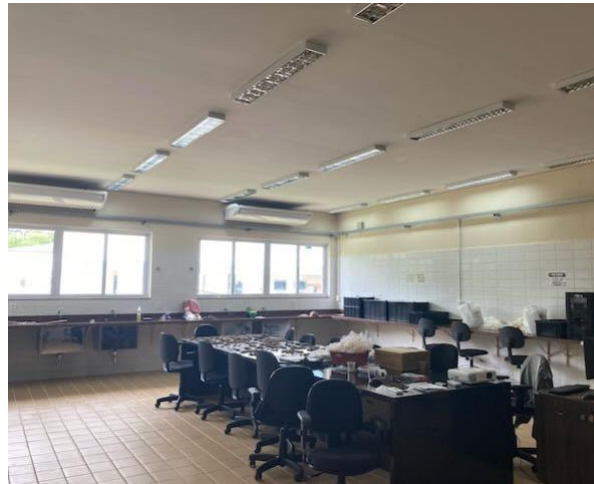


Photo 98: Lab in UNIR archaeology building



Photo 99: Floating restaurant and fishing station on Santo Antonio reservoir



Photo 100: Meeting with Health Services, Porto Velho Municipality - SAMUSA



Photo 101: Meeting with IPHAN-Rondônia Regional Office

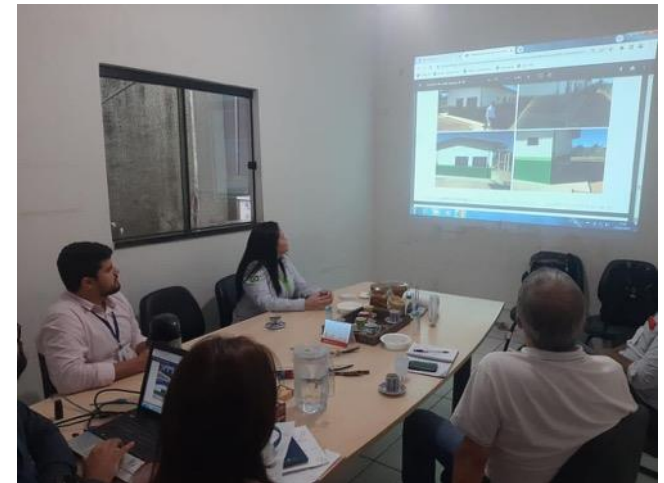


Photo 102: Meeting with Ministry of Health Porto Velho office - Indigenous Health Service



Photo 103: Offices of IBAMA in Porto Velho



Photo 104: Porto Velho port with Santo Antonio dam in background



Photo 105: Aerial view of one of two fish passage facilities, with approach channel, screening building with elevators and holding basins, and pipes that supply pumped water (photo provided by ESBR)