



Hydropower Sustainability Assessment Protocol

Official Assessment
Santo Antônio Energia
Santo Antônio
Brazil

Final



09/09/2014

Client: Santo Antônio Energia

Lead Assessor: Dr Bernt Rydgren, Senior Consultant, ÅF Industry, Hydropower

Co-assessors: Simon Howard, Sustainability Specialist, IHA; Aida Khalil, Sustainability Specialist, IHA; Doug Smith, Senior Sustainability Specialist, IHA

Assessor-in-training: Dr Donal O’Leary, Transparency International

Observers: Arnaldo Carneiro Filho, The Nature Conservancy; David Harrison, The Nature Conservancy; Ricardo Krauskopf Neto, Itaipu Binacional; Renato Dell’Erba Ortega, Odebrecht Infraestrutura; Lisangela Gnocchi da Costa Reis, Furnas; Gustavo Daniel Roig Sannemann, Itaipu Binacional

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Project stage: Implementation

Project size: 3 568 MW

Cover page photo: Construction on the Santo Antônio project in late April 2014, from the air

Acronyms

Acronym	Full Text
10 000-year flood	The amount of water flowing in a river with a calculated statistical return period of 10 000 years. This is only a statistical value, based on sophisticated analysis of existing hydrological records
AGEVISA	Agência de Vigilância em Saúde (Health Monitoring Agency of Rondônia)
AIDS	Acquired ImmunoDeficiency Syndrome
ANA	Agência Nacional de Aguas (National Water Agency)
ANEEL	Agência Nacional de Energia Elétrica (National Electrical Energy Agency)
APP	Área de Preservação Permanente (Permanent Protection Area)
BNDES	Banco Nacional de Desenvolvimento Econômico e Social (Brazilian Development Bank)
BOD	Biological Oxygen Demand
CCSA	Consórcio Construtor Santo Antônio
CDM	Clean Development Mechanism
CNRH	Conselho Nacional de Recursos Hídricos (National Council of Water Resources)
CONAMA	Conselho Nacional do Meio Ambiente (National Environment Council)
COOGARIMA	Cooperativa dos Garimpeiros do Rio Madeira (Cooperative of artisanal miners of the Madeira River)
COOTRAFER	Cooperativa dos Trabalhadores no Ramo Ferroviário e Manutenção da Construção Civil no Município de Porto Velho (Cooperative of railway workers)
CPPT	Centro de Pesquisas de Populações Tradicionais Cuniã (Centre for Research of Traditional Peoples, an NGO)
CRA	Conestoga-Rovers and Associates (Consultants who monitor groundwater)
CSAC	Consórcio Santo Antônio Civil, the civil works consortium for the project, part of the CCSA.
CSR	Corporate Social Responsibility
CTLPT	Coordenação Técnica Local de Proteção Territorial (FUNAI's local office of technical coordination of territorial protection)
CUNPIR	Coordenação da União das Nações e Povos Indígenas de Rondônia (Coordination of the Union of Indigenous Peoples and Nations of Rondônia)
CVM	Comissão de Valores Mobiliários (the Brazilian securities commission)
DNPM	Departamento Nacional de Produção Mineral (National Mineral Production Department)
DSEI	Distrito Sanitário Especial Indígena (The Special Indigenous Sanitary District authority)
DSR	Debt-Service Ratio
EFMM	Estrada de Ferro Madeira-Mamore (Madeira-Mamore railway)
EIA	Environmental Impact Assessment
EPE	Empresa de Pesquisa Energética (a Government research organisation for the energy sector)
EPC	Engineering, Procurement and Construction

ESBR	Energia Sustentável do Brasil, the owner and developer of the Jirau hydropower project located upstream of Santo Antônio.
FGTS	Fundo de Garantia do Tempo de Serviço (a workers' compensation-related fund drawing money from companies in the private sector).
FNDCT	Fundo Nacional de Desenvolvimento Científico e Tecnológico (National Fund for Scientific and Technological Development in Brazil) ¹⁹ bi
FUNAI	Fundação Nacional do Índio (National Indian Foundation, the authority in charge of contacts with indigenous communities)
FUNASA	Fundação Nacional de Saúde (National Health Foundation)
GIS	Geographic Information Systems
GHG	Green-House Gas
GICOM	Grupo Industrial do Complexo Rio Madeira, the electro-mechanical works consortium, part of the CCSA.
GRI	Global Reporting Initiative (a global standard for the reporting of sustainability indicators)
HR	Human Resources
HS&E	Health, Safety and Environment
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute of Environment and Renewable Resources)
IBGE	Instituto Brasileiro de Geografia e Estatística
ICMBio	Instituto Chico Mendes de Conservação da Biodiversidade - Chico Mendes Institute for Biodiversity Conservation
IFC	International Finance Corporation, part of the World Bank group
IHA	International Hydropower Association
ILO	International Labour Organization
IMMA	Indústria Metalúrgica e Mecânica da Amazônia Ltda
INCRA	Instituto Nacional de Colonização e Reforma Agrária (a land and agricultural reform institute of the Brazilian Government)
INPA	Instituto Nacional de Pesquisas da Amazônia (National Institute for Research in the Amazon)
INPE	Instituto Nacional de Pesquisas Espaciais (National Institute of Space Research)
IP	Indigenous Peoples
IPCA	Índice Nacional de Preços ao Consumidor Amplo (The Brazilian Extended National Consumer Price Index)
IPHAN	Instituto do Patrimônio Histórico e Artístico Nacional (Institute of Historic and Artistic Heritage)
IS	Instituto Socioambiental
ISO	International Standards Organisation
IT	Indigenous Territories
JGP/Exponent	The consortium hired by the business banks as auditors of the project's compliance with the Equator Principles.
km ²	square kilometres
kWh	kilowatt-hour (thousand watt-hours – unit of energy)

LI	Licença de Instalação (Installation Licence)
LP	Licença Prévia (Preliminary Licence)
m ³ /s	cubic metres per second (unit of flow)
MAB	Movimento dos Atingidos por Barragens (a Brazilian NGO for dam-affected peoples)
m.a.s.l.	<u>m</u> etres <u>a</u> bove <u>s</u> ea <u>l</u> evel
MESA	Madeira Energia S.A., the holding company that owns SAE
MME	Ministério de Minas e Energia (Ministry of Mines and Energy)
MoU	Memorandum of Understanding
MW	MegaWatt (million watts, unit of electrical capacity)
MWh	MegaWatt-hour (million watt-hours or thousand kWh, unit of energy)
MPE	Ministério Público de Estado
NGO	Non-Governmental Organisation (ONG in Portuguese, for Organização Não-Governamental)
OH&S	Occupational Health and Safety
ONS	Operador Nacional do Sistema Elétrico (National Electricity System Operator)
PACUERA	Plano Ambiental de Conservação e Uso do Entorno do Reservatório Artificial - the conservation and environmental management plan for the project-affected area
PBA	Projeto Básico Ambiental (Basic Environmental Project – A Brazilian standard approach to mitigation similar to individual programmes in an environmental management plan – EMP – in many countries)
PCE	Projetos e Consultorias de Engenharia (Sedimentation Consultants)
PDD	Project Design Document (in this case for the CDM process)
PGSP	Programma Gestão Sociopatrimonial (Asset management plan)
PPE	Personal Protection Equipment
PPP	Public-Private Partnership
RAPELD	Rapid Assessment and Long Term Ecological Research methodology
R&D	Research and Development
RFP	Request For Proposals
R\$	Real, the national currency of Brazil. At the time of writing this report, the exchange rate to the US\$ was approximately 2.3 R\$/US\$, and to the € approximately 3.2 R\$/€
SAE	Santo Antônio Energia (the developer of the Santo Antônio project).
SEBRAE	Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (National service for aid to micro and small enterprises)
SENAC	Serviço Nacional de Aprendizagem Comercial (National Commercial Education Service)
SENAI	Serviço Nacional de Aprendizagem Industrial (National Industrial Apprenticeship Service)
SENAR	Serviço Nacional de Aprendizagem Rural (National Rural Education Service)
SETE	Soluções e Tecnologia Ambiental (Biodiversity Consultant)
SIN	Sistema Interligado Nacional (National Interconnected Electrical Grid)
SIPAM	Sistema de Proteção da Amazônia, (System for protection of the Amazon), a Government body attached to the Brazilian military which monitors many aspects of the Amazon

SNISB	Sistema Nacional de Informações de Segurança de Barragens (National Dam Safety Information System)
SPU	Secretaria do Patrimônio da União (an authority responsible for management of land and land use). SPU is present at state level all over Brazil and is a part of Ministério de Planejamento, Orçamento e Gestão (Ministry of Planning, Budgets and Management)
STDs	Sexually Transmitted Diseases
TCE	Tribunal de Contas de Estado de Rondônia (A state-level Government auditing function for public funds, basically an anti-corruption function)
TUST	Transmission-System User Tariffs
UNIR	Universidade Federal de Rondônia (University of Rondônia)

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Executive Summary

This report presents an Official Assessment conducted in accordance with the Implementation Tool of the Hydropower Sustainability Assessment Protocol. The assessment is conducted for the 3 568 MW Santo Antônio hydropower project, presently under construction on the Madeira river, the largest tributary of the Amazon, in the western Brazilian state of Rondônia. The project developer is Santo Antônio Energia (SAE), a special-purpose company listed on the São Paulo stock exchange. The company has 377 employees at the time of this assessment. SAE is owned by a holding company, Madeira Energia S.A (MESA). Ownership in MESA is divided among Furnas (39%), Caixa FIP Amazônia Energia (20%), Odebrecht Energia (18.6%), Andrade Gutierrez (12.4%) and Cemig (10%).

The assessment focuses on the sustainability performance of the Santo Antônio project specifically, but for several Protocol topics, the corporate-level performances of SAE and its owners are relevant. The Implementation tool contains 20 topics. All topics are considered Relevant for the assessment of Santo Antônio. Appendices B and C contain information on the interviews conducted and the documents reviewed. SAE staff, as well as staff from the EPC consortium CCSA and the Assessment Team have all done their best to ascertain the accuracy of the information provided in those appendices. Triangulation of evidence – visual, verbal and documentary – is an important requirement for the evidence-collection and assessment processes. To this end, particular attention was paid to interviews with project-affected communities and regulatory agencies.

Follow-up evidence was requested by, and provided to, the assessors in the weeks following the assessment. A draft report was provided to SAE on the 23rd of June, 2014, for review of technical accuracy with respect to the project, the evidence and the institutional references. Comments were received from the project on the 6th, 20th, 25th and 29th of August, 2014. Following editing in response to these comments, this final Official Assessment report was filed on the 9th of September, 2014.

Cross-cutting issues are assessed in accordance with the instructions on pages 23-25 of the Hydropower Sustainability Assessment Protocol. Important cross-cutting issues in the Santo Antônio assessment are: Human Rights (mainly covered in I-9 and I-10); Climate Change (I-3 and I-19); Corruption (I-2 and I-8); Gender (I-1, I-9, I-10 and I-12); Grievance (I-1, I-2, I-10 and I-12); Livelihoods (I-7, I-9, I-10 and I-11); and Transparency (I-2, I-3, I-7, I-9, I-10 and I-11).

The project generally demonstrates very high standards in its sustainability management, a finding supported by the main socio-environmental regulator, IBAMA, which considers the project a good model for future hydropower developments in the Amazonian region. IBAMA regulates the project through the 28 basic environmental projects (PBA in Portuguese abbreviation) and some additional programmes added during implementation. The PBAs represent a detailed and very inclusive set of programmes addressing assessment, monitoring and management of predicted project impacts.

The project represents a solid design based on the considerable experience of the owners and members of the EPC consortium, which has resulted in energy delivery starting 9 months ahead of schedule, an unusual achievement for such a complex project, or indeed for any project. The assessment demonstrates that for the clear majority of the Protocol topics, the PBA programmes, in combination with the dedicated management of SAE's sustainability team and the sustainability-related staff of the EPC consortium, ensure that the Protocol criteria are met at the level of proven best practice. The two scored significant gaps against basic good practice affecting topics I-10 and I-11 are both related to legislation and regulation. In one of these cases the risks created, and the management measures needed to avoid these, are entirely out of SAE's control.

The Santo Antônio project meets or exceeds basic good practice (a score of 3) for 18 of the 20 topics assessed. The project performs with one significant gap at the level of basic good practice (a score of 2), for two topics: I-10 (Resettlement) and I-11 (Indigenous Peoples). The project performs with one significant gap at the level of proven best practice (a score of 4) on four topics: I-8 (Procurement); I-9 (Project-Affected Communities); I-13

(Cultural Heritage); and I-16 (Erosion and Sedimentation). The Santo Antônio project meets proven best practice (a score of 5) on the remaining fourteen topics: I-1 (Communication and Consultation); I-2 (Governance); I-3 (Environmental and Social Issues Management); I-4 (Integrated Project Management); I-5 (Infrastructure Safety); I-6 (Financial Viability); I-7 (Project Benefits); I-12 (Labour and Working Conditions); I-14 (Public Health); I-15 (Biodiversity and Invasive Species); I-17 (Water Quality); I-18 (Reservoir Preparation and Filling); I-19 (Reservoir Preparation and Filling); and I-20 (Downstream Flow Regimes).

The significant gaps that were identified by the assessment are listed in the table of Significant Gaps on page x. An important aspect of a Protocol Assessment is that significant gaps identified by the assessors are not double-counted. As such, a significant gap might be identified against the criteria in the scoring statements for several aspects of the same topic, or for several topics. It will only be scored in one place unless warranted by the context or specific demands of the scoring criteria. The table on page x indicates whether or not they are counted towards the score – asterisk-marked gaps are not scored. This is true for three of the five gaps identified against basic good practice.

The spider diagram on the following page summarises the Santo Antônio assessment in numbers. Detailed comments for each topic follow in sections 1-20.

Sustainability Profile

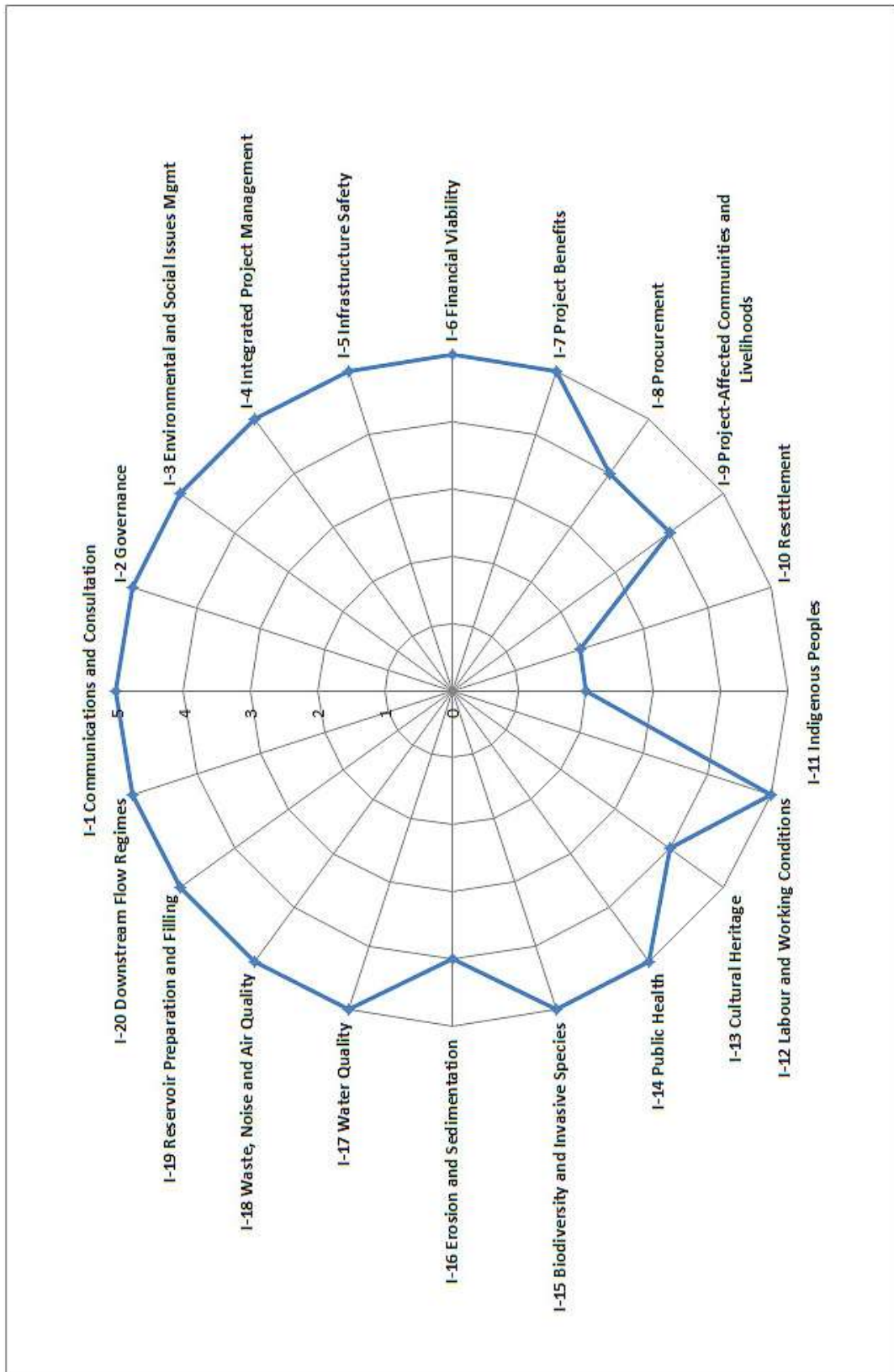


Table of Significant Gaps

	Level 3: Significant Gaps against Basic Good Practice	Level 5: Significant Gaps against Proven Best Practice
Assessment	I-10 The absence of monitoring and management for more than 50% of physically displaced households	None
Management	I-10 The absence of monitoring and management for more than 50% of physically displaced households* I-11 Delays in FUNAI's approval of the new PBA, exposing the ITs to risks.	I-8 Sustainability and anti-corruption criteria are weak in pre-qualification and lacking in procurement planning I-13 The lack of management of emerging risks
Stakeholder Engagement	None	None
Stakeholder Support	None	None
Conformance/ Compliance	I-10 The absence of monitoring and management for more than 50% of physically displaced households* I-11 Delays in FUNAI's approval of the new PBA, exposing the ITs to risks*.	None
Outcomes	None	I-9 Risks for residual impacts to some project-affected communities I-16 The significant riverbank erosion at Triangulo

*Not double-counted, for explanation see detailed topic evaluation.

Introduction

This report presents the findings of an assessment of the Santo Antônio Project using the Hydropower Sustainability Assessment Protocol. Santo Antônio is a 3 568 MW project under construction on the Maderia river in Rondônia state in north-western Brazil.

The Hydropower Sustainability Assessment Protocol

The Hydropower Sustainability Assessment Protocol (“the Protocol”) is a framework to assess the performance of hydropower projects according to a defined set of sustainability topics, encompassing environmental, social, technical, and financial issues.

Developed by the International Hydropower Association (IHA) in partnership with a range of government, civil society and private sector stakeholders, the Protocol is a product of intensive and transparent dialogue concerning the selection of sustainability topics and the definition of good and best practice in each of these topics. Important reference documents that informed the development of the Protocol include the World Bank safeguards policies, the Performance Standards of the International Finance Corporation, and the report of the World Commission on Dams. To reflect the different stages of hydropower development, the Protocol includes four assessment tools that are designed to be used separately, corresponding to the Early Stage, and Preparation, Implementation and Operation stages of a project.

Applying the Protocol delivers an evidence-based assessment of performance in each topic, with a set of scores providing an indication of performance in relation to basic good practice and proven best practice. The scoring system is as follows:

- 5 Meets basic good practice and proven best practice;
- 4 Meets basic good practice with one significant gap against proven best practice;
- 3 Meets basic good practice with more than one significant gap against proven best practice;
- 2 One significant gap against basic good practice;
- 1 More than one significant gap against basic good practice.

Assessments rely on objective evidence to support a score for each topic that is factual, reproducible, objective and verifiable. Key attributes of the Protocol are: (i) global applicability, i.e. it can be used on all types and sizes of hydropower projects, anywhere in the world; and (ii) consistency, i.e. the consistency of its application is carefully governed by a system of quality control encompassing accredited assessors, terms and conditions for use, and the Protocol Council.¹

Scoring is an essential feature of the Protocol, providing an easily communicated and replicable assessment of the project’s strengths, weaknesses and opportunities. The scoring system has been devised to ensure that a Protocol Assessment cannot provide an overall “pass” or “fail” mark for a project, nor can it be used to “certify” a project as sustainable. The Protocol provides an effective mechanism to continuously improve sustainability performance because results identify gaps that can be addressed, and the findings provide a consistent basis for dialogue with stakeholders.

Assessment Objectives

The main objective of an official assessment is to obtain impartial and verifiable findings on the performance of a project in relation to the sustainability issues set out in the Protocol.

¹ Full details of the Protocol and its governance, are available on www.hydrosustainability.org.

In addition to this over-arching goal for the assessment of the Santo Antônio project, SAE expects to:

- Identify opportunities to improve performance and for reaching proven best practice;
- Align this information internally, to optimise integrated management of the project and enable capacity-building for continuous improvement;
- Improve stakeholder engagement and dialogue with society;
- Strengthen commitments on environmental and social responsibility;
- Reinforce SAE's image, and achieve an improved future share value;
- Access carbon credits;
- Accomplish SAE mission, vision and values.

Project Description

The Santo Antônio hydropower plant is located on the Madeira River, 7 km upstream of the city of Porto Velho, the capital of Rondônia state, in north-western Brazil. The Madeira is a major tributary of the Amazon, the world's largest river in terms of runoff volume. The plant will have an installed capacity of 3 568 megawatts (MW), if a planned extension to the original plans for 3 150 MW are approved by all licensing authorities. The total investment for the implementation of the hydroelectric plant is estimated at R\$ 19.5 billion. The Santo Antônio project was purposely designed to get the maximum use of the water resources potential with minimal negative impact on the region, since biodiversity conservation is a permanent focus, especially in the Amazon.

Santo Antônio Energia (SAE) is the company responsible for the construction and operation of the Santo Antônio hydropower plant. SAE was granted a concession agreement for the use of the water resources for a period of 35 years.

The energy produced by the plant will reach the rest of the country via the national inter-connected grid, but part of it is intended for Rondônia and other states of the northern region, which will increase the region's energy security, which is experiencing problems at the moment, enabling the region to attract new businesses. The main connection to the Sistema Interligado Nacional (the Brazilian national interconnected grid) and the main Brazilian load centres in the south-east is through a 600 kV DC 2 385 km transmission link (the longest DC line in the world). This transmission line is not part of this assessment.

The ownership structure of SAE is divided among Furnas (39%), Odebrecht Energia (18.6%), SAAG – controlled by Andrade Gutierrez (12.4%), Cemig (10%) and Caixa FIP Amazônia Energia (20%). The project is funded by the Brazilian Development Bank (BNDES) and commercial banks. Construction is undertaken through an engineering, procurement and construction (EPC) contract. The main contracting consortium is called Santo Antônio Consórcio Construtor (SACC) and is described in detail under topic I-4.

After detailed studies, bulb-turbine technology was chosen, in order to enable the Madeira's high runoff to generate power with a minimum need for water storage. By using what basically amounts to the river's natural flow, the bulb turbines avoid the need for large heads or the formation of extensive water storage, effectively resulting in a run-of-river operating regime. These turbines provide high efficiency by being completely submerged and are able to cope with the large variations in water flow common in the Amazon region.

Construction began in September, 2008, after the Installation License was issued by IBAMA, the federal environmental institution responsible for the licensing process of the plant. In September, 2011, the Operational License was issued, the dam was closed and reservoir filling was initiated. This was finalised in January 2012, and the first two turbines started operations on the 30th of March, 2012, nine months ahead of the concession contract's scheduled date.

More detailed studies and improved hydrological knowledge of the Madeira river showed a potential for additional power generation at the site. A further 6 turbines could be accommodated within powerhouse 4 and the reservoir's operational level elevated by 0.80 metres, with comparatively low additional socio-environmental

impact, thus increasing the installed capacity by 417.6 MW. An operational rule was proposed by ANA, the federal regulatory agency for the water, in order to operate the plant at two different reservoir levels (70.2 m and 71.0 m), depending on the river flow, thereby guaranteeing the protection of specific areas around the reservoir. When the discharge in the river exceeds 36 200 m³/s, the reservoir will begin to be lowered, so that the area inundated does not exceed that which would be inundated by a flow of 38 550 m³/sec at the currently-licensed reservoir level. The discharge of 38 550 m³/sec represents the mean annual maximum flow registered for the Madeira River at the project site. A proposal for this project expansion was presented to ANEEL, the federal regulatory agency for the electricity sector. Following this, possible additional impacts were evaluated and presented to IBAMA. The expansion will not require a separate licensing process, but will be evaluated by IBAMA and, if approved, a revision of the existing licence will be made. A public hearing took place in Porto Velho on the 18th of December, 2013 for the extension. IBAMA have already indicated that they consider the expansion to be environmentally viable.

Santo Antônio Energia is registered with the UN's Clean Development Mechanism (CDM).

A schematic of the project's layout is presented in figure 1 below. Cross-sections of a power house and a spillway are shown in figures 2 and 3 below.

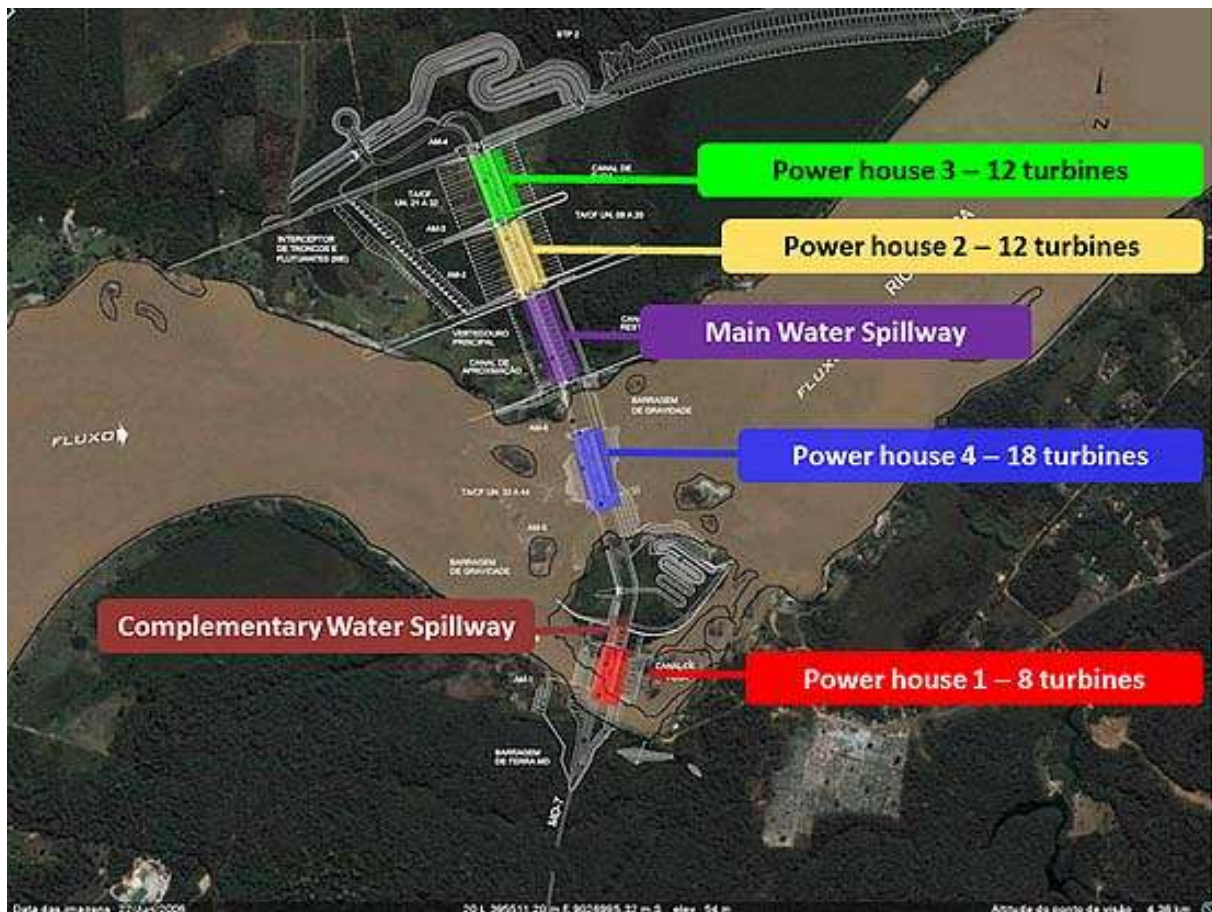


Figure 1. Overhead view of the Santo Antônio project layout, river flows from left to right.

The plant is expected to be completed by November, 2016, operating with 50 installed turbines (including the extension project) with a total of 3 568 MW of total power and with an average annual production of 21 236 GWh of energy.

The 50 turbines are distributed among four power houses. Power House 1 (the first to start operating) has 8 units and is located on the right bank, see figure 4. Power House 4, which will have 18 turbines, is being installed in

the centre of the river bed, see figure 6. The remaining two, powerhouses 2 and 3 with 12 turbines each, are located on the left bank of the river, see figure 7. The plant has two spillways with a total of 18 gates, with a design flow of 84 000m³/s. The dam also has a fish passage system built into the dam structure (see figure 5 and topic I-15), to allow migratory species to swim up the river during spawning season, in order to reproduce.

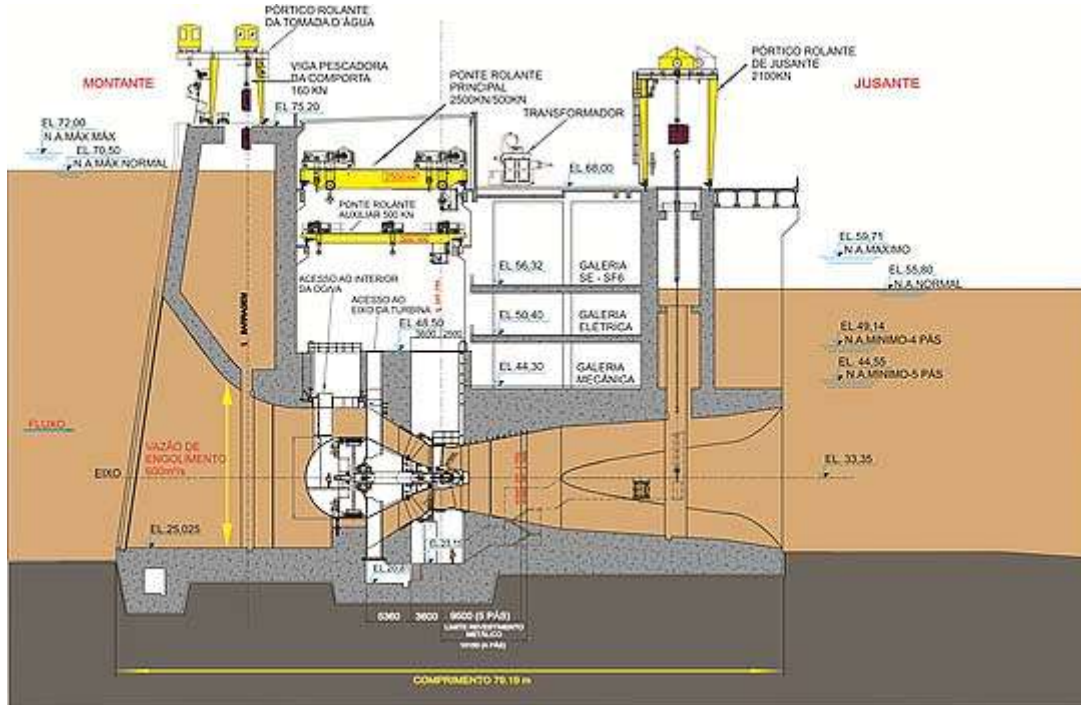


Figure 2. Typical section of a Santo Antônio powerhouse

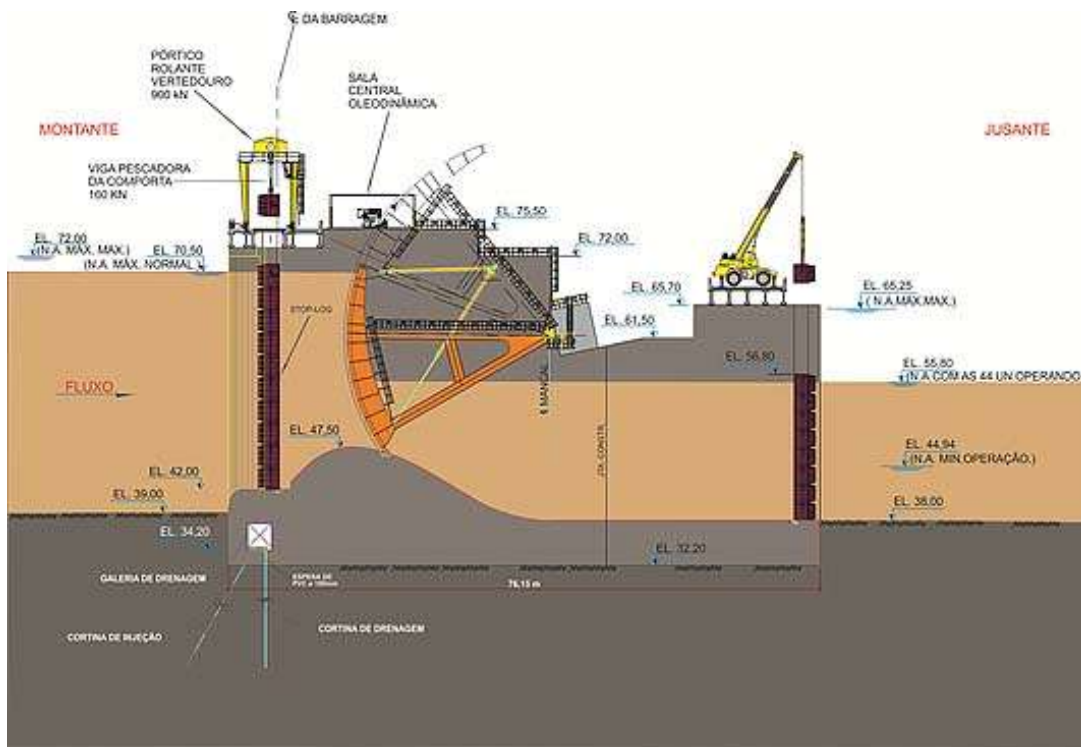


Figure 3. Typical section of a Santo Antônio spillway

The Madeira river gets its name because of the large amount of logs (madeira=wood in Portuguese) that travel downstream every year, especially during the flood season. To protect against damage from these logs, a mechanism was developed in order to divert the logs from the more sensitive dam structures, called a log boom, to direct the logs into a special-purpose log spillway.

Right-bank infrastructure

1. A fish-passage system - a "semi-natural" channel and one of the most important structures of the dam. It is designed to allow fish to move up- and downstream past the dam in order to facilitate reproduction, especially for migratory species. It has been operational since December, 2011. The photo in figure 5 shows an aerial view of the operational fish ladder.
2. Complementary spillway - This spillway is similar to the main spillway. The only difference is that it has 3 gates instead of 15.
3. Powerhouse 1 - This is the smallest powerhouse. It has 8 generating units and was the first one to be constructed.
4. Control building - this building presently hosts the operations and maintenance (O&M) team, and also the control team. In the future, the O&M team will move to its own building next to the right bank.

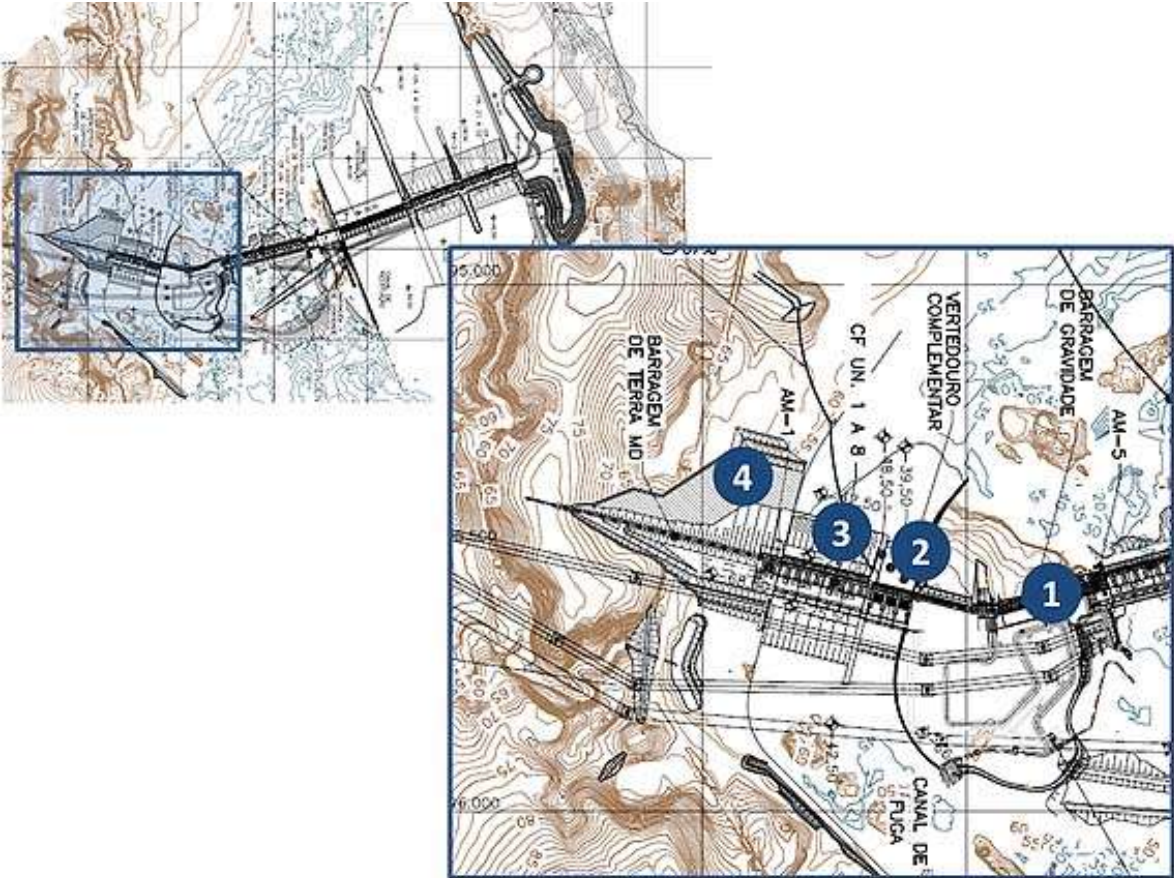


Figure 4. Right-bank structures of the Santo Antônio Project

Centre-of-the-river infrastructure

1. Gravity dam - This gravity dam is made of concrete and is approximately 187 meters wide. The structure is separated into independent blocks by contractions junctions.
2. Log-management system - The system is composed of a log boom and a log gate. The log gate is very similar to the regular spillways. The main differences are the height (8 metres) and the width (20 metres)

of the channel. The log-boom system will direct the tree logs to the log gate, so that the logs can be safely conveyed downstream, past the dam.

3. Powerhouse 4 - This will be the largest powerhouse. It will contain 18 generating units.



Figure 5. Aerial photo of fish-passage system

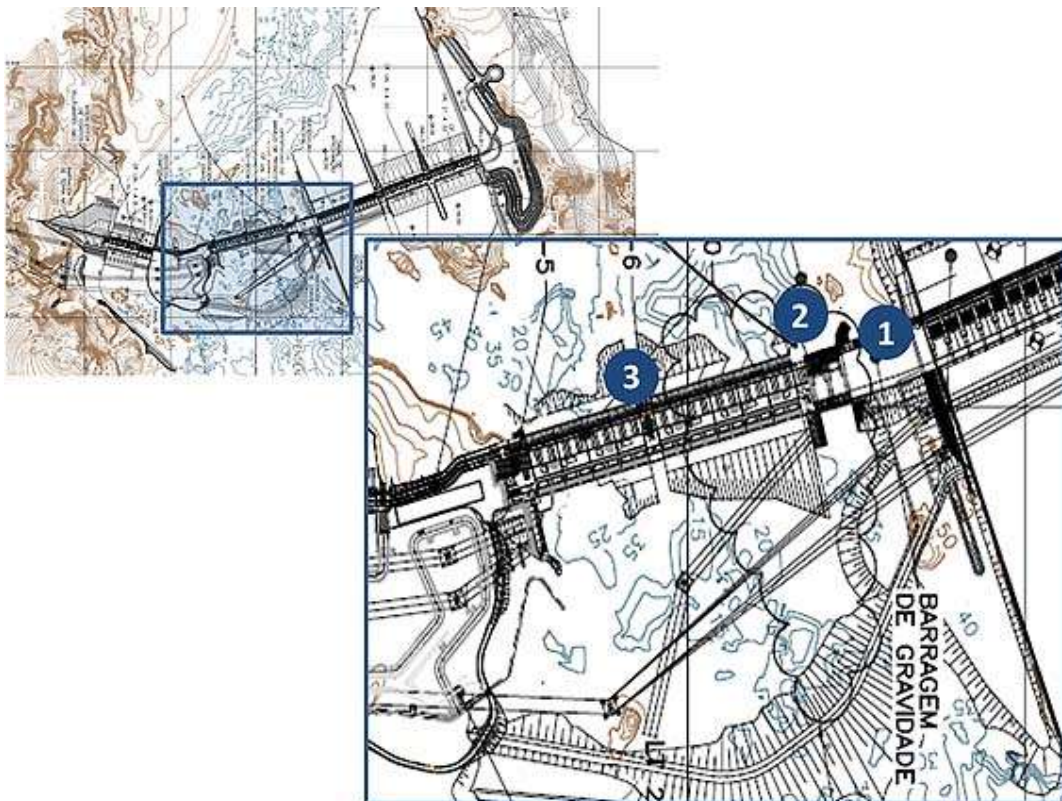


Figure 6 – Centre-of-the-river structures of the Santo Antônio Project

Left-bank infrastructure

1. A fish ladder – this fish ladder, although part of the project, is a secondary option and will only be constructed if the functionality of the right-bank fish-passage system is found to be less than satisfactory by the continuous monitoring and analysis.
2. Powerhouse 3 is located at the left abutment of the dam, containing 12 generating units.
3. Powerhouse 2, which also contains 12 generating units.
4. The main spillway – the two spillways were designed to meet safety requirements for both the diversion during construction and the operational phase of the plant (after filling of the reservoir). The design flow for these structures is 84 000 m³/s, which corresponds to a 10 000-year flow. The main spillway is composed of 15 radial gates.



Figure 7. Left-bank structures of the Santo Antônio Project

Table 1. Key characteristics of the project.

	Original Project	Expanded Project
Status	Construction and partial operation	Planning
Owner	Santo Antônio Energia	Santo Antônio Energia
Total Investment	R\$ 16 billions	R\$ 19 billion (incl. original project)
Investment in Sustainability	R\$ 1.7 billion	R\$ 2 billion (incl. original project)
Commissioning date	First unit in March, 2012 and last unit in November, 2015	First unit in March, 2012 and last unit in November, 2016
Average river discharge	19 000 m ³ /s	19 000 m ³ /s

Design flood (10 000-year return period)	84 000 m ³ /s	84 000 m ³ /s
Installed capacity	3 150.4 MW	3 568 MW
Secured capacity	mean 2 218 MW	mean 2 424.2 MW
Turbines	44 bulb turbines: 24 with 4 blades (rated power of 74.80 MW); 20 with 5 blades (rated power of 71.05 MW)	50 bulb turbines: 24 with 4 blades (rated power of 74.80 MW); 26 with 5 blades (rated power of 71.05 MW)
Average annual generation	19 430 GWh	21 236 GWh
Plant factor	70.4%	67.9%
Full supply level (FSL)	70.2 m.a.s.l. ² (constant under normal operations).	70.2 or 71.0 m.a.s.l. ² , depending on the flow (see below under “Reservoir”).
Minimum operating level (MOL)	56.3 m.a.s.l. ² .	56.3 m.a.s.l. ² .
Net Head	13.9 m	13.9 or 14.7 m
Generators	44 Generators with a rated power of 82.25 KVA each	50 Generators with a rated power of 82.25 KVA each
Dam	A total of 2.5 km long; mainly earth embankment with a ca 187 m wide concrete gravity dam in the central section; 4 independent Power Houses - PH (PH 1 = 8 turbines, PH 2 to 4 = 12 turbines); 1 complementary spillway (with 3 radial gates); 1 main spillway (with 15 radial gates)	Complementary 6 turbines accommodated in PH 4, which will have 18 turbines.
Reservoir	Covers a total of 350.03 km ² at FSL, not counting backwater effects, out of which app. 142 km ² is original river area. Considering backwater effects, the surface area varies up to 545.86 km ² , at a river flow of 38 550 ³ m ³ /s.	Covers a total of 421.56 km ² at FSL, not counting backwater effects, out of which 142 km ² is original river area. Considering backwater effects, the surface level varies up to 559.01 km ² , at a river flow of 36 200 ⁴ m ³ /sec. Total reservoir volume is: app. 2.71 x 10 ⁹ m ³ which is not used for storage as Santo Antônio, under normal runoff conditions, operates as a true run-of-river project.
Ancillary structures (access roads, switchyards, transmission lines)	Fish passage system Log management system with associated log-booms Switchyard and transmission line (connects the plant to the Porto Velho switchyard)	In addition to the original project: a 230 kV transmission line that will connect the plant directly to Rondônia’s and Acre’s electric grids

² an important note on elevations given in this report: IBGE (Instituto Brasileiro de Geografia e Estatística) revised the Brazilian elevation-reference system in 2009, and there has been a further correction to the system since then, resulting in two parallel systems being used in different regulatory documents for the project – the documentation for IBAMA uses a system with a base level 0.3 m lower than the system used in the ANEEL documentation.

³ 38 550 m³/s is the mean annual maximum flow.

⁴ 36 200 m³/s is a discharge introduced by ANA based on the need to protect the town of Jaci Paraná from flooding. Above that discharge, according to the operational rule, the reservoir is lowered down to a level (at dam site) of 70.2 m.a.s.l.²

IBAMA, the environmental regulator, has ruled that social and environmental mitigation and management should be implemented through 28 programmes, Projeto Básico Ambiental (PBA), with a number of identified sub-programmes. The 28 main programmes are listed, translated into English, in Table 2 below. Two more programmes were added later, and are now part of the licensing process: the Programme for Social Property Management and the Programme for Fishing Support)

Table 2. List of 28 main PBAs for the Santo Antônio project.

1. Environmental Programme for the Project Construction;
2. Environmental Management Programme;
3. Water Table Monitoring Programme;
4. Seismology Monitoring Programme;
5. Climate Control Monitoring Programme;
6. Hydro-geological Monitoring Programme;
7. Hydro-bio-geochemical Monitoring Programme;
8. Mining Rights and Prospecting Activity Monitoring Programme;
9. Paleontological Preservation Programme;
10. Limnological Monitoring Programme;
11. Aquatic Macrophytes Monitoring Programme;
12. Flora Preservation Programme;
13. Deforestation in the Area of Direct Influence Programme;
14. Fauna Preservation Programme;
15. Deforestation Activities Monitoring Programme and Fauna Rescue;
16. Ichthyofauna Preservation Programme;
17. Environmental Compensation Programme;
18. Social Communication Programme;
19. Environmental Education Programme;
20. Public Health Programme;
21. Support to Indigenous Communities Programme;
22. Archaeological, Pre-Historic and Historic Heritage Programme;
23. Relocation of Affected Population Programme;
24. Downstream Activities Programme;
25. Infrastructure Restoration Project;
26. Social Compensation Programme;
27. Conservation and Use of Surrounding Areas of the Reservoir Plan;
28. Leisure and Tourism Activities Support Programme.

Assessment Process

This assessment has been conducted using the Implementation Protocol, which contains 20 individual topics. This was a somewhat complex decision, as various aspects of the Santo Antônio project is, at the time of the assessment, in stages of Preparation, Implementation as well as Operation. As of April/May of 2014 at the time of this assessment, the status of the project could be briefly described as: in project preparation (including obtaining final regulatory approval) for generation units 45-50; in project implementation (including the commissioning of generation units 27-32 by August 2014 and generation units 33-50 by November 2016); as well as project operation (of the 26 generation units already commissioned). The client, Santo Antônio Energia (SAE), and the Assessment team have discussed the choice of Protocol tool for the assessment, and the choice was the Implementation tool, as it proved most relevant. Detailed analyses of where this might create problems have

identified one area of concern – the Implementation tool does not include a topic for Hydrological Resource (as do both the Preparation and the Operation tools). This has been resolved on this assessment by including findings from relevant interviews and documentary analysis in the assessment of topic I-3, Environmental and Social Issues Management and topic I-5, Infrastructure Safety. This includes attention to climate impacts on and of the project, as well as traditional trend analysis of hydrological regimes for generation planning.

This is an official assessment. The assessment-team members are accredited by the Protocol Governance Committee of the Hydropower Sustainability Assessment Protocol, and the assessment was conducted with the full support of Santo Antônio Energia, the owners of the project, as demonstrated by their support, see Appendix A.

All the 20 topics were considered relevant for inclusion in the assessment.

In this report we sometimes use SAE and the project interchangeably. This is normally not allowed in a Protocol assessment, as it is important to make sure to assess the Project, to capture all aspects of its sustainability properly, whether the responsibility lies with the owners, management or external actors. However, in the case of Santo Antônio, SAE was created solely as a vehicle for developing and operating the Santo Antônio project, making the distinction almost superfluous.

This Final Report was delivered to SAE on the 9th of September, 2014

Assessment Experience

The assessment was very well organised by Carolina Fiorillo Mariani of SAE (the Single Point of Contact), with the assistance of her Local Support Team, consisting of Naiara Florencio Pereira Vaz; Nubia Cristina Afra de Moraes; Mauricio Vasconcelos dos Santos; Andre Morello Alves; and Alexandre Marcos Queiroz. They assembled a wealth of documentary evidence, and organised interviews with internal and external stakeholders. The need for interpretation in most interviews was resolved with the use of four very capable interpreters, but some few interviews were conducted in English, where the interviewee felt comfortable with her/his knowledge of English.

The sharing of additional evidence after the field assessment suffered from some serious IT-related frustrations, resulting in significant delays. This experience is far from unique to this assessment (and by no means the fault of the Local Support Team), the assessment-team members have had similar issues on a number of previous assignments. There is clearly room for learning from experience for the future in relation to this issue, accepting that also modern IT instruments aren't infallible, and trying to organise alternative ways of sharing large amounts of information (often running into tens of gigabytes of disk space).

Given the very particular conditions in the Madeira river during and before the assessment, with unprecedented floods, some background on the hydrological analysis for the project is relevant here: Before the flood season of 2014, the all-time-high discharge at Porto Velho, based on 41 years of data collection (1967-2007, inclusive) was app. 47 000 m³/s. During the 2014 flood season the discharge was above this previous maximum during a period of over two months (late February to late April), peaking at over 58 000 m³/s. This is a highly unusual deviation from an existing flow regime for such a large catchment and based on a relatively long time series of data. This flood led to extensive flooding along the Madeira river, and impacts on and around the Madeira projects (Santo Antônio and the upstream-located Jirau), some of which were unforeseen, as discharges of this magnitude had not been assessed as part of the expected river behaviour, only as design parameters for the major infrastructure, which is designed to specifications of a 10 000-year flood. The city of Porto Velho and a number of other smaller settlements, such as Jaci-Paraná, suffered extensive damage from these floods. This type of event inevitably creates negative feelings vis-à-vis a project like Santo Antônio. The Assessment Team has tried to differentiate between reactions and opinions that are entirely based on these events and what were the pre-flood opinions on the project by stakeholders. However, under some topics, these negative impacts are considered examples of “emerging issues” and the project's management responses are then considered relevant.

The Assessment Team would like to thank all of the Santo Antônio project staff involved in the assessment for their friendly and efficient assistance to the team during the assessment process. We would also like to thank all the internal and external interviewees for providing their time to gather and provide a wealth of evidence, both in documentary and in verbal form.

The Santo Antônio project is staffed and managed by a very dedicated group of people – the strong commitments to professional excellence, stakeholder relations and socio-environmental management is impressive.

Layout of this Report

This report consists of twenty sections numbered in direct correspondence with the twenty topics of the Protocol's Implementation tool. Four appendices are provided, including the written letter of support of the project developer (required for an official Protocol assessment), and detailing the items of visual, verbal and documentary evidence referred to under each topic.

For each topic, findings are provided according to the criteria used in the Protocol's methodology: Assessment, Management, Stakeholder Engagement, Stakeholder Support, Conformance/Compliance, and Outcomes. Findings are presented against a statement of "basic good practice" and a statement of "proven best practice" for each, with a "Yes/No" indication of whether the scoring statement is met. A summary of the significant gaps against the scoring statement, the topic score and a brief summary are presented at the close of each topic section.

1 Communications and Consultation (I-1)

This topic 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 intent 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.

1.1 Background Information

This topic addresses the overall programme of stakeholder engagement, and ongoing communications with all project-related stakeholders.

The main external stakeholder groups in the project's area of influence are physically-displaced and economically-displaced communities, local communities (Jaci-Paraná, Santo Antônio, Porto Velho, and other downstream communities) and suppliers working for the project or involved in project-related programmes, federal, regional and local government institutions e.g. Porto Velho municipality, Rondônia state, IBAMA, ANA, ICMBio, Ministry of Environment, ANEEL, FUNAI, Ministry of Health Ministry of Mines and Energy and IPHAN, local NGOs, communities of indigenous peoples, and Energia Sustentável do Brasil (ESBR), owner and developer of the Jirau hydropower project located upstream. Key project-internal stakeholders include shareholders, contractors, financing banks and all employees working for the companies involved in constructing and operating the Santo Antônio project.

The project is located in Rondônia state, which comprises 52 municipalities, and in close proximity to the borders with Acre and Amazonas states. According to the Instituto Brasileiro de Geografia e Estatística (IBGE), the total population of the state of Rondônia has increased from 1 562 409 inhabitants in 2010 to 1 728 214 inhabitants in 2013. The percentage of illiterate population aged 15 or over varies by municipality in Rondônia, between 7.8 and 20% (in 2013) with Porto Velho accounting for the lowest rate.

Stakeholder engagement issues related to specific topics are described under the stakeholder engagement criterion findings under each topic. Internal and institutional communications are also included in the scope of this topic, but relevant aspects of this are also elaborated in topics I-2, I-3, I-4 and I-12.

1.2 Detailed Topic Evaluation

1.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Communications and consultation requirements and approaches have been identified through an assessment process involving stakeholder mapping, supported by ongoing monitoring.*

Stakeholder communications and consultations required were identified during the licensing process; firstly, from 2005 to 2007, the Madeira Complex Environmental Impact Assessment (EIA) identified an initial list of key stakeholders and community associations within the direct and indirect area of influence of the SAE project in the social baseline chapter; other stakeholders are referred to in relevant sections of the EIA (e.g. IPHAN, see topic I-13, Cultural Heritage). The preparation of the EIA involved institutional meetings (e.g. with IBAMA) and a number of public hearings and participation meetings were carried out during 2006-2007 to obtain the Preliminary Licence. The EIA communication and consultation activities involved working with a Non-

Governmental Organisation (NGO) called Centre for Research of Traditional Peoples (CPPT Cuniã) which had extensive knowledge of affected riparian communities and received training on hydropower-related issues.

The Environmental Management Plan (EMP), contained in the EIA, proposed guidelines for the elaboration of the social communication and environmental education programme to keep the population well informed about the project, its impacts and measures adopted targeting rural and urban communities affected by the Madeira complex, both upstream and downstream. In 2008, Madeira Energia S.A. (MESA) prepared the PBAs which includes a Programme for Social Communications describing the approaches to communications and consultation with affected communities. CPPT was involved in the update of the socio-economic information through additional surveys and consultations with the local community and institutions within the project influence area. One of the objectives of the assessment was to identify local leaders and the political and institutional actors, their demands, expectations and concerns.

The stakeholder mapping is updated as necessary in response to the findings of social experts working with communities; last update was undertaken in 2013. The mapping includes community associations, NGOs, federal, regional and local institutions, religious institutions, local and regional media, and indigenous peoples associations. There are a number of stakeholders that are not included in the stakeholder mapping, for example internal stakeholders, or ESBR, but this is not a significant gap, since there is evidence of communications processes (see under Management below). SAE and ESBR collaborate in implementing projects and programmes, e.g. the downstream communities programme. The mapping includes information on name, representative, description, details of events they participated and outcomes, the project's response and their position in relation to the PBAs for each stakeholder identified.

The programme considers approaches to ensure that all stakeholders receive information, including local and regional TV and radio programmes, visits in rural areas, distribution of bulletins, creation of local offices and provision of transport for those with disabilities or living far from information meeting venues; cultural norms are also taken into account for indigenous peoples (see topic I-11). The results of the monitoring programmes for downstream communities' activities and social compensation also influence in the needs assessment for, and approaches to, consultation.

Communications requirements are often influenced by the image of the project in the media. SAE's institutional relations department monitors the local, regional and national media and blogs related to the project and if required the consortium assess the need to respond to media critics, for example, in relation to strikes and the recent flood.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the stakeholder mapping takes broad considerations into account.*

The stakeholder mapping takes broad considerations into account, for example indicating the positions and opinions of stakeholders (positive and negative), the project's approach, staff responsible and, where relevant, the interrelationships with other stakeholders. The project has engaged with a broad array of stakeholders including those located in the project's indirect-influence area. Particular issues have their own stakeholder-dialogue interactions. As an example public health involves regular dialogue with ESBR and the secretary of health of the state and the municipalities as well as the ministry of health.

The monitoring of media also includes monitoring of issues related to the Jirau project to identify potential risks that may also affect Santo Antônio.

The project has also developed an 'image risk matrix and action plan' which identifies themes and issues that may influence negatively in the media classified as low, medium and high risk; how SAE should respond to each issue (reactive or proactive); key messages; target audience and the source of information.

1.2.2 Management

Analysis against basic good practice

Scoring statement: *Communications and consultation plans and processes, including an appropriate grievance mechanism, are in place to manage communications and engagement with stakeholders; these outline communication and consultation needs and approaches for various stakeholder groups and topics.*

The Social Communication Programme addresses all project-affected communities. Social communication actions implemented through the programme to ensure that information reaches all stakeholders include: over 160 public meetings and 94 workshops have been held between 2008 and 2012 with affected communities covering different topics (e.g. resettlement, cultural heritage, public health etc.); 78 consultation workshops have been held with institutions e.g. ICMBio, FUNAI, municipalities, etc.; presence of communication agents in all affected communities and resettled communities; maintain updated a database of media news and events; creation and distribution of materials for an 'Itinerant Community Communication' for downstream and upstream communities, including information on employment, and environmental education workshops (including workshops on citizenship, social life, environment protection, health, violence against women and children's rights, and activities for young people); creation of information materials for technicians and construction workers on community relations; monthly meetings with the environmental programmes coordinators; create and update a permanent record of trendsetters, leaders and community representatives; bimonthly meetings with the communities directly affected and additional meetings when required; implementation of a public information centre "Space Geração" for information and participation activities; door to door visits; logistical support for residents; information-dissemination activities: distribution of the monthly printed newsletter "Santo Antônio Energia Informs" in resettlement areas, affected communities and stakeholders; weekly radio programmes (on 2 frequencies) "Santo Antônio Energia and You"; and workshops.

An Institutional Visit Programme was implemented in 2010 and to date more than 6 000 people have visited the site, primarily universities, government institutions, international experts, and journalists. SAE's Corporate Communication division maintains direct contact with journalists and media relations for Rondônia state and Porto Velho municipality, prioritising the regional media. The project's exposure in the media is monitored and measured using a Quality Index of Media Exposure.

The project carried out a public hearing in December 2013 to inform about the expansion of the project; Tetra Tech was contracted to carry out the presentation of the expansion project during the public meeting. The project has taken an open and transparent approach to dialogue with strongly opposed groups, e.g. Movimento dos Atingidos por Barragens (MAB).

The project's grievance mechanism has been implemented through a toll-free number service, communication boxes and an online contact form. The toll free number has registered more than 1 500 enquiries to date. There are a total of 1 778 records of community enquiries raised in the period between July 2008 and December 2013, of which 308 were received from the Santa Rita resettlement site, followed by Jaci-Paraná (282); in 89 cases, staff were unable to get hold of the individual after several attempts, or a reply was not considered relevant, and therefore the query was considered as closed. Out of the remaining 1 689 queries, 1 656 have already been answered (98.04%), with the longest return period ever used being 228 days. In many cases, however, response is given on the same day (292 cases). Special attention is given to issues raised by resettled communities, which are classified in separate databases by resettlement area. The JGP/Exponent report indicates that SAE and CSAC's system for receiving demands guarantees the confidentiality of the applicants and registration of queries, answers and negotiations in accordance with IFC PS and EPs 1 and 6.

Other communications processes include reporting to IBAMA and financing institutions twice a year on the progress of the communications programme, including the number of queries raised and an analysis of source

and type of queries. The preparation of the project's Project Design Document (PDD) also involved a local and global consultation process (2007-2008) as required by the CDM regulations. The PDD was made publicly available in February 2012, in both Portuguese and English.

Internal communication processes include the distribution of media clippings via email to all project employees, and online portal and daily communications with division coordinators. Coordinators also hold regular meetings and cascade information through to the rest of employees. The project provided information to the Bolivian president when he visited Brazil during the floods.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, 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; and processes are in place to anticipate and respond to emerging risks and opportunities.*

Consultation mechanisms included in the communications programme aim to reach all members of the community and provide logistical support for transportation if required (including boats and helicopters in some cases). Groups of vulnerable community members (e.g. elders, people with disabilities, pregnant women, and illiterate people) receive information through notices on the radio, TV, and local agents visiting the communities. Examples are included in the Biannual Report to IBAMA. Meetings usually take place in public spaces with enough capacity (e.g. schools) and are well attended. Notice of the meetings is given through the mechanisms listed above (TV, radio, newsletters, local agents, etc.). Communication materials are prepared using easy language with graphic representations and reach the communities. Verbal evidence indicates that some terms used in public meetings may have caused initial confusion (e.g. upstream and downstream rather than up and down) however these issues were clarified at meetings and the communities understood the information transmitted. Indigenous communities also understand Portuguese language and meetings were culturally appropriate (see topic I-11, Indigenous Peoples).

Processes are in place to anticipate and respond to emerging risks and opportunities. The communication channels described above, have served to identify stakeholders' suggestions and concerns and take action in response; for example communities' concerns (Jaci-Paraná and Joana D'Arc) on groundwater level rise were considered and a decision was made to increase the number of groundwater-monitoring wells (see topic I-19 Reservoir Preparation and Filling).

The Social Communication Programme was designed to avoid or minimise risks of speculation, and circulation of non-official information. The programme also supports other actions undertaken through other environmental and social programmes, e.g. booklets and workshops, and involve meetings with programme coordinators. Semi-annual reporting on the programme progress and reviews by IBAMA and financing institutions provide recommendations for improvement; e.g. improving the response time of the grievance mechanism. Socio-environmental monitoring and media monitoring and proactive publication of articles contribute to anticipate and respond to risks and clarify certain public opinions, e.g. "floods are caused by dams".

Partnerships on communications relations with Porto Velho municipality and Rondônia state work very well and keep an ongoing channel of communication. The project sponsored the first conference on social communications carried out in the state of Rondônia (Conbrascom, 2010). Various stakeholders highlight the openness and good will of the project's communication staff and the well-working channels of communication compared to other projects, even stakeholders who have strong negative opinions about certain aspects of the project.

Criteria met: Yes

1.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The project implementation stage involves appropriately timed and scoped, and often two-way, engagement with directly affected stakeholders; engagement is undertaken in good faith; ongoing processes are in place for stakeholders to raise issues and get feedback.*

Key stakeholder consultations were undertaken at appropriate times during the licensing process; the preparation of the PBA, once SAE was awarded with the construction of Santo Antônio in 2008; the preparation of PDD; and during the construction phase and expansion licensing process. The Social Communications Programme describes different methods of engagement depending on the purpose of the meeting or activity. Over 160 public meetings and 94 workshops have been held between 2008 and 2012 with affected communities, and 78 workshops have been held with governmental institutions.

Community representatives indicated that the project engaged with stakeholders in good faith in a timely and two-way manner, with relevant information, and they were responsive to issues raised by stakeholders at public meetings and through the other communication channels. The grievance mechanisms, described under Management above, will continue to operate through the entire implementation phase; for example the 10th socio-environmental monitoring report indicates that 6 meetings were held between July and December 2013 in relation to various project aspects including resettlement communities of Joana D'Arc and Morrinhos, the restoration plan for degraded areas (PRAD) and actions to prevent rabies.

SAE delivered a public participation meeting with regard to the expansion in Jaci-Paraná in December 2013, and additional workshops will follow this year.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement is inclusive and participatory; negotiations are undertaken in good faith; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

Verbal evidence indicates that engagement with directly-affected stakeholders is inclusive and participatory and engaging with vulnerable groups as described under Management above; this was also encouraged by providing logistical support to attend meetings. Resettled and affected communities received continuous support and in many cases negotiations resulted in individual solutions for compensation that satisfied both parties; for example the layout of the works area was modified because there was a family that was not willing to be relocated outside their remaining owned land, and land compensation was paid at higher prices than the marketed value. The programme for the relocation of affected people describes the negotiation process. Stakeholders interviewed perceived that negotiations were undertaken in good faith, evidenced by a number of institutional agreements (with IPHAN, universities, FUNAI) and community groups (resettlees, miners, fisherpeople).

Feedback given in response to queries raised at public meetings or through the grievance mechanisms has generally been thorough and timely. The longest time required for feedback has been shortened in the last reporting period, now most queries are addressed within 1-29 days.

There were a number of court proceedings in relation to the incident at Triangulo (see topic I-10 Resettlement); negotiations followed the legal process for cash compensation and evidence indicates that compensation was higher than the value of the properties lost and support was provided to affected families. There is an outstanding court proceeding driven by the community of Vila Franciscana which claims that the groundwater level on their land has risen since the creation of the reservoir and has caused inundations; studies have been prepared in response.

Criteria met: Yes

1.2.4 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to communications and consultation have been and are on track to be met with no major non-compliances or non-conformances, and communications related commitments have been or are on track to be met.*

IBAMA's regulatory requirements for communications and consultation during the implementation phase are set out in the installation (2008) and operational (2011) licenses in relation to the preparation and continuity of the Social Communication Programme. Verbal evidence and the semi-annual monitoring reports indicate that those requirements have been met and there are no non-compliances. IBAMA suggested additional workshops with conservation institutes e.g. ICMBio, and they are currently reviewing the information presented to approve the expansion.

The objective of the PBA programme: to create and maintain open spaces for communication and consensus-building between the project and the concerned communities to enhance citizenship, conservation and environmental preservation in region, has been met.

The 11th JGP/Exponent report indicates that the project activities are compliant with equator principles 5 (stakeholder engagement) and 6 (grievance mechanisms) and there are no outstanding corrective actions.

SAE's corporate social responsibility (CSR) policy includes maintaining a good relationship with the local community through the compensation programmes and no non-conformances have been identified.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances*

Assessors did not find any evidence of non-conformances or non-compliances in relation to communications and consultations.

Criteria met: Yes

1.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

1.3 Scoring Summary

Communications and consultation requirements for affected stakeholders have been identified and implemented as set out in the Social Communication Programme and socio-environmental compensation programmes and mechanisms for institutional relations. An initial stakeholder identification is provided in the EIA, followed by an update in 2008, and subsequent updates as required, using local information. The stakeholder mapping and contacts database cover a broad array of stakeholders.

Communications mechanisms include workshops and target-group consultations, communication materials, and agents present on site; providing inclusive and participatory engagement. Fully-working grievance mechanisms are in place during the construction period (toll free number, online contact form and communication boxes).

Engagement and negotiations that have been undertaken are two-way, and in good faith as evidenced by examples of individuals solutions; even stakeholders with strong negative opinions about aspects of the project indicated that project staff are always open to talk and listens to them. Communications activities are compliant with IBAMA’s and Equator Principles’ requirements.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

1.4 Relevant Evidence

Interview:	1, 19, 26, 28-29, 43
Document:	1-5, 22, 26-29, 32-33, 36-37, 39, 41-49, 53-58, 63, 75, 77-79, 123-126, 257, 348, 390, 392-395, 398
Photo:	1, 2

2 Governance (I-2)

This topic addresses corporate and external governance considerations for the operating hydropower facility. The intent 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.

2.1 Background Information

Santo Antônio Energia (SAE) is the 4th-largest energy producer in Brazil and is owned by both public and private companies, which are all leaders in energy generation and transmission. The project is wholly-owned by a holding company, Madeira Energia S.A (MESA). Ownership in MESA is divided among Furnas (39%), Caixa FIP Amazônia Energia (20%), Odebrecht Energia (18.6%), Andrade Gutierrez (12.4%) and Cemig (10%). Caixa FIP Amazônia Energia is an investment fund owned by Odebrecht Energia and Fundo de Garantia do Tempo de Serviço (FGTS). The shareholders have considerable experience in planning, constructing and operating hydropower projects. Generally the construction consortium, Consórcio Constructor Santo Antônio (CCSA), is divided into three main parts: a civil-works consortium called Consórcio Santo Antônio Civil (CSAC), made up of Odebrecht (leader) and Andrade Gutierrez (both are part owners of the plant as well); an electro-mechanical equipment consortium called Grupo Industrial do Complexo Rio Madeira (GICOM), consisting of Alstom Power, Alstom Grid, Andritz, Bardella, Siemens and Voith; and with Odebrecht responsible for electro-mechanical installations. The contractor, owner's engineers and consultant arrangements are described in detail under topic I-4, Integrated Project Management. As a company that has a majority ownership from the private sector, SAE is not subjected to the rules and regulations in place for companies majority-owned by the public, but operates under the rules of the private sector.

Hydropower companies in Brazil operate in a strongly regulated environment. Several federal institutions play significant roles in relation to project governance and operation: ANA – Agência Nacional de Águas (National Water Agency); ANEEL – Agência Nacional de Energia Elétrica (National Electrical Energy Agency); FUNAI – Fundação Nacional do Índio (National Indian Foundation, the authority in charge of contacts with indigenous communities); IBAMA – Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute of Environment and Renewable Resources); IPHAN – Instituto do Patrimônio Histórico e Artístico Nacional (Institute of Historic and Artistic Heritage); Ministério Público (The Public Prosecutor's Office at both the federal and state level); and ONS – Operador Nacional do Sistema Elétrico (National Electricity System Operator).

The Corruption Perceptions Index (CPI), published by Transparency International, is based on an analysis of 177 countries and territories. In 2013, Brazil's score was 43 on a scale from 0 to 100. The Bribe Payers Index (BPI, from 2011) ranks the likelihood of companies from the 28 largest exporting economies to pay bribes to win business abroad. Brazil is ranked 14th. Civil-works contracting is generally perceived as the most corrupt sector.

Where this topic addresses stakeholder engagement, it is in direct relation to issues of governance. Wider issues of communication and engagement with all stakeholders are covered under topic I-1, Communications and Consultation. Governance-related issues associated closely with procurement are assessed and scored under that topic, I-8.

2.2 Detailed Topic Evaluation

2.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Processes are in place to identify any ongoing or emerging political and public sector governance issues, and corporate governance requirements and issues, and to monitor if corporate governance measures are effective.*

The formal responsibility for identifying and assessing governance issues lies with the President, who shares this responsibility with the board members. In practice, political, public-sector and corporate governance issues are primarily identified in the board meetings that are held in accordance with a set calendar, approximately 9-10 meetings per year. Key issues that are reviewed in board meetings, based on meeting preparations by senior management, are the status of major contracts and any governance implications of important operational issues and issues with the business plan.

Monitoring is mainly carried out through the same mechanisms as described above, with political and public-sector issues managed by the directorates of Legal Affairs, Institutional Relations and Commercial/Regulatory Affairs. The main focuses for the company's governance work are transparency, communication and responsibility. The other directorates: Financial Administration; Sustainability; and Technical Issues, are also involved in governance monitoring, e.g. through frequent and important contacts with the many Government agencies who hold a stake or an interest in the project. Meetings at the directors' level are conducted on a weekly basis providing additional monitoring and follow-up.

The president reports back to the board on the effectiveness of corporate governance.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no significant opportunities for improvement in the assessment of political and public sector governance issues and corporate governance requirements and issues.*

There are no significant opportunities for improvement to the assessment and monitoring of issues. Management continuously monitor and evaluate the repercussions of potential capacity shortfalls in key external actors, and of policies and processes important to the project. Important events with influence on governance have been the renewal of the concession in 2011 and the granting of the three licences; the Preliminary Licence (2007), the Installation Licence (2008) and the Operational Licence (2011).

The President normally presents a case of importance to the board (an example is the injunction dealing with management of flood impacts from the state prosecutor's office) for discussion and resolution.

The day-to-day assessment and monitoring of regulatory requirements and their follow-up is done by a special council. Project risks are mainly of a commercial nature, such as energy sales, contracts etc.

The company aims to establish an integrated management system by 2016 (see topics I-3 and I-4 for more details), and to certify this system to ISO 9001 and 14001 as well as OHSAS 18001. This is not a board issue, but dealt with by management, with the aid of external consulting expertise.

Criteria met: Yes

2.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to manage corporate, political and public sector risks, compliance, social and environmental responsibility, procurement of goods and services, grievance mechanisms, ethical business practices, and transparency; policies and processes are communicated internally and externally as appropriate; and independent review mechanisms are utilised to address sustainability issues in cases of project capacity shortfalls, high sensitivity of particular issues, or the need for enhanced credibility.*

The company board consists of 11 members, 2 are independent and the remaining 9 are nominated by the shareholders: 3 from Furnas, 2 each from Odebrecht and FIP, and one each from Cemig and Andrade Gutierrez. Decisions are captured by the secretary of the board meetings and senior management is responsible for implementation of decisions and action wherever necessary. The board has two standing committees, finance, and human resources (HR) which support the board with data for decision-making. In addition to these, ad hoc working groups are formed when the need arises, e.g. for an important contract or agreement to be negotiated, reviewed and concluded. The possibility of starting special permanent sustainability and technical committees is being discussed, but no decision is yet made at the time of the assessment.

The President has six directors responsible for their respective departments, being: Financial Administration; Sustainability; Legal Affairs; Institutional Relations; Technical Issues; and Commercial/Regulatory Affairs. The departments of Commercial/Regulatory Affairs and Legal Affairs are located entirely in the company's headquarters in São Paulo, while the other four departments are divided between São Paulo and the Rondônia office in Porto Velho. All six departmental directors are stationed in São Paulo.

As stated above, the company aims to certify its integrated management system to the three main ISO standards as soon the project is fully operational. However, all the major owners are certified in accordance with ISO 9001, ISO 14001 and OHSAS 18001, indeed Andrade Gutierrez was the first company in Brazil to achieve certification of an integrated management system for all three standards. The owners are leaders in their field, with long and successful experience of hydropower development and operation.

Sustainability is a central theme in the company's image and external communication; environmental, cultural and socio-economic aspects are leading themes in SAE's mission, vision and values. The processes and instruments described above are comprehensive tools for managing corporate, political and public sector risks, ensure compliance, manage social and environmental responsibilities and the procurement of goods and services, ethical business practices and transparency. The company operates several different grievance mechanisms, such as toll-free number, communication boxes and an online contact form and if requested, anonymity is guaranteed. More details on this are given under other topics, especially in topics I-1, I-10 and I-12.

There are 21 ethics- and management-related instructions, codes and policies governing company and employee behaviour. Examples are: the Code of Ethics, which is approved by the board and which every employee has to sign; the Code of Conduct; the Environmental Policy; Procurement Policy; Communications and Information Policy; Financial Management Policy; Human Resources Policy.

The company accounts are regularly audited. Every 6 months the consultants JGP/Exponent, hired by the commercial lenders' group led by Banco Santander, audits the project against the Equator Principles and the IFC Performance Standards. Ernst&Young are used as independent financial auditors; Concremat evaluate the engineering practices and performance (their reports also go to the financing banks); and Mott McDonald audit the project for insurance companies.

Policies and regulatory instructions governing the company must be known and applied by all employees. These policies and instructions are described in brochures and documents which can be accessed on the intranet through a heading of "Our Policies". The mission and vision statement for the company includes a Code of

Conduct and is developed from the bottom and up, ensuring the best possible buy-in by employees. The company's core values are defined as: sustainability; individual responsibility; innovation; preservation; friendship; efficiency; inspiration; and transparency.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, contractors are required to meet or have consistent policies as the developer; procurement processes include anti-corruption measures as well as sustainability and anti-corruption criteria specified in pre-qualification screening; and processes are in place to anticipate and respond to emerging risks and opportunities.*

Contractors are required to abide by SAE's policies on sustainability and licence requirements are internalised in contracts. The first three points of the company's "instructions" document on procurement are: compliance with the PBAs; compliance with the licence conditions of the Santo Antônio project; and compliance with the requirement of all project-relevant licensing bodies.

The overlap in the scoring statement with topic I-8, Procurement, regarding "procurement processes include anti-corruption measures as well as sustainability and anti-corruption criteria specified in pre-qualification screening" is assessed and scored under that topic, as it is a procurement criterion. It is, however, important to mention here that this criterion is the subject of the only significant gap assessed for Topic I-8.

Risks are largely managed through the processes described above under Assessment and Management, basic good practice. Comprehensive updating of spreadsheets for control of license requirements provides a strong tool for awareness of emerging risks. The owners regard the formation of the engineering, procurement and construction (EPC) consortium as the strongest risk-management tool they could have conceived.

A risk that has been identified, which is related to Rondônia being a less well-developed region than much of Brazil, is the tendency to transfer development demands from Government to private businesses active in the region. This risk manifested itself strongly at the beginning of project implementation, but through information dissemination local and regional residents are now able to understand and appreciate the responsibilities of the project better even if some capacity issues still remain and need to be managed as they occur.

Opportunities to improve governance have been taken in a variety of areas, among them: workshops on procurement are organised twice a year, dealing with the many aspects of contractor management; Adivisa was hired to study the HR structure of the company, and to provide advice in preparation for the transfer from implementation to operation; Hey Management has been contracted to assist on salary-structure management; and Towers Watson was hired to build the career structure for the company.

Criteria met: Yes

2.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The business interacts with a range of directly affected stakeholders to understand issues of interest to them; and the business makes significant project reports publicly available, and publicly reports on project performance, in some sustainability areas.*

As described in detail under Topic I-1, the PBA programme named Social Communications Programme describes approaches to communication and consultations. Over 300 public meetings and workshops have been held between 2008 and 2012 with affected communities and various Government institutions.

The project is very active in local and regional media in the project area, Porto Velho and Rondônia. This strong focus on the region is a conscious decision in order to better attend to major stakeholders' communication interests.

Representatives of project-affected communities indicated that the project and its staff are responsive to issues raised by stakeholders and all interviewed Government agencies are satisfied with their engagement with SAE. IBAMA considers the project to be a "model" project for hydropower development in the Amazon, a strong testament to the level of satisfaction the agency has with the project.

SAE makes significant reports publicly available and publicly reports on project performance, see below under proven best practice for details.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the business makes significant project reports publicly available and publicly reports on project performance in sustainability areas of high interest to its stakeholders.*

A main company report is published annually, the most recent version is, so far, for 2012. In 2010, the company also published a special-purpose Sustainability Report. The intent is to produce a new Sustainability Report in the near future. These reports are available to the public and sent to all the relevant Government agencies responsible for environmental and other licensing, as well as institutions such as Ministério Público and the Tribunal de Contas de Estado (TCE). These reports are, in principle, also available on the website of Santo Antônio Energia, in a specific folder with licensing-related documents. However, the company web site is presently undergoing reconstruction and will be fully functional later in 2014, when all publicly available communication material will have the new updated SAE branding. Financial statements are published every 3 months (reviewed by PWC) and an audit is published annually. These reports contain all the information that the company can legally divulge.

SAE's owners report on their activities in publicly available annual reports and include the Santo Antônio project in their reporting. Furnas publishes a separate sustainability report, while the other main owners integrate sustainability into their main annual corporate reports, where it plays a strong role. Odebrecht's main annual report for 2013 is titled "Sustainable Growth" and Cemig's 2013 annual report is titled Annual and Sustainability Report. All of these large business groups also use Global Reporting Initiative (GRI) for reporting of their sustainability performance.

Since SAE went public in late April, 2014, Comissão de Valores Mobiliários (CVM), the securities commission, have demanding standards for the information that is made available to stakeholders and shareholders. Clear regulatory requirements for the necessary public information are available and SAE has to abide by these regulations. Information that has to be reported is both regular financial information, prepared according to Brazilian generally accepted accounting practices, and non-financial information which may affect a company's future cash flow.

The reports on PBA management and implementation to IBAMA, filed every 6 months, include every conceivable sustainability-related aspect. They are publicly available on IBAMA's web site, together with all licence conditions and other information potentially of interest to stakeholders.

Criteria met: Yes

2.2.4 Conformance/Compliance

Analysis against basic good practice

Scoring statement: *The project has no significant non-compliances.*

External interviewees confirm the opinion of SAE's management, that the company and the project are fully compliant with their governance obligations.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *The project has no non-compliances.*

The assessors have not identified any non-compliances.

Criteria met: Yes

2.2.5 Outcomes

Analysis against basic good practice

Scoring statement: *There are no significant unresolved corporate and external governance issues identified.*

The project is constantly working on fulfilling its licence and other obligations vis-à-vis the public and the Government. The project has been singled out as a model project by IBAMA for its overall sustainability management, a statement that necessarily incorporates sustainability-related governance performance as well. Independent external interviewees and several Government regulators confirm that there are no significant unresolved corporate or external governance issues.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no unresolved corporate and external governance issues identified.*

The assessors have not identified any unresolved corporate or external governance issues.

Criteria met: Yes

2.2.6 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

2.3 Scoring Summary

Corporate and external governance issues for the company are assessed and managed through the board and its standing and ad hoc committees supported by the senior management with its six directorates. Comprehensive policies are in place that address transparency, integrity and accountability issues.

The company has a comprehensive and appropriate suite of ethical and management policies and processes in place that are binding for employees. Independent review mechanisms are employed for a number of issues, e.g. compliance with Equator Principles and IFC Performance Standards, financial management and engineering practices and performance. The company reports publicly on operations and sustainability, and details of PBA management is disclosed on IBAMA's web site. SAE's owners also issue annual publicly-available general corporate reports and several also publish special-purpose sustainability reports and report to GRI. Contracts

specify that contractors have to follow SAE’s policies and codes as well as all licensing requirements. Several opportunities have been taken, notably in the human-resources field.

Communication and information dissemination is mainly carried out in accordance with the relevant PBA programme and focusses strongly on the local and regional context, in order to be responsive to directly-affected stakeholders’ needs and concerns. IBAMA has dubbed the project a “model” for hydropower development in the Amazon region.

The project is fully compliant and has no identified unresolved corporate or external governance issues.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

2.4 Relevant Evidence

Interview:	5, 7, 12, 58, 60, 61, 68 – 71,
Document:	1 – 6, 8 – 14, 16 – 21, 120 – 130, 133 – 136, 227, 231 – 234, 257, 299, 300, 345, 374 – 382
Photo:	None

3 Environmental and Social Issues Management

(I-3)

This topic addresses the plans and processes for environmental and social issues management. The intent 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.

3.1 Background Information

The suite of 28 programmes of the Projeto Básico Ambiental (PBA) – basic environmental project in English – described below is a semi-standardised Brazilian approach to socio-environmental management of impacts and opportunities in Amazonian hydropower projects. The PBAs are defined, approved and audited by Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA), the Brazilian National Institute of Environment and Renewable Resources. Two additional management-related programmes have been added to the process and are now also managed by the project’s PBA management team.

Where this topic addresses stakeholder engagement, it is in direct relation to the management of environmental and social issues. Wider issues of communication and engagement with all stakeholders are covered under topic I-1, Communications and Consultation.

This topic overlays with most other topics, by its very nature as an integrated topic for environmental and social issues management. Where necessary for the description of assessment and management intervention and examples of interventions made, references will be made to the specific topic covering the respective issue.

3.2 Detailed Topic Evaluation

3.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Environmental and social issues relevant to project implementation and operation have been identified through an assessment process, including evaluation of associated facilities, scoping of cumulative impacts, role and capacity of third parties, and impacts associated with primary suppliers, using appropriate expertise; and monitoring is being undertaken during the project implementation stage appropriate to the identified issues.*

In the early 2000s, the project proponents (at that time FURNAS and Odebrecht), held discussions with IBAMA on the necessary sustainability-related content of an inventory of the Madeira river basin including the mapping of stakeholders. Terms of reference for the EIA were subsequently developed by IBAMA in 2004, and FURNAS and Odebrecht commissioned the EIA which identified the socio-environmental issues of relevance to project planning, implementation and operation. It was presented to IBAMA in 2005. Complementary studies were implemented and reported in 2006.

The key positive impacts as assessed by the EIA were: developments in the commercial sector; increase in job offers and incomes; strengthening of social organisations; increased electricity generation; enhanced income of the public sector; decrease in turbidity in the reservoirs; population growth of micro-crustaceans; decrease in turbidity downstream. The key negative impacts identified by the EIA were: sedimentation in the reservoir; changes in the water quality; increased erosion potential of the Madeira river downstream of the power plant; vegetation removal; disruption of migratory routes of fish; changing in the quality of life of the local communities;

increased in the number of malaria cases; resettlement; loss of archaeological and cultural heritage; conflicts between local and migrant population; changes in the fishing activities in the reservoir area; reduced employment/income of fishermen and miners.

Most of the PBA programmes include assessment and ongoing reassessment of issues through the investigations, monitoring and analyses carried out as an integrated part of most of these programmes.

It is the regulatory responsibility of the project to conduct impact assessments of all associated facilities with exception of the main transmission line for power evacuation (see below), and whenever necessary a licence had to be obtained for such facilities. That licensing procedure includes a formal EIA process and definition of monitoring, mitigation and compensation needs.

The main 500 kV DC transmission line belongs to another concessionaire – Electrosul and Furnas. They have performed licensing, including EIA, for this.

The original EIA looked at both the Madeira projects, Jirau and Santo Antônio, together. This facilitated an integrated assessment of the cumulative impacts of both projects – the only ones planned for the Madeira catchment in Brazil. IBAMA have put some licensing requirements in place that concern combined impacts from the two projects. Furthermore, IBAMA takes the initiative to call seminars on issues of cumulative impacts, bringing the two projects together for a joint assessment of e.g. fish passage and sediment issues. Other issues identified as part of the EIA studies, and with potential for cumulative impacts, are e.g. mercury and other water quality aspects. For details on monitoring and management of water quality and mercury – see topic I-17. The potential impacts on the communities living along the river downstream from the project were initially managed by SAE only. After a review conducted by IBAMA, it was determined that there was a need for sharing these costs and responsibilities between the two plants. SAE and ESBR hired the same company to implement this work. IBAMA has defined individual responsibilities for each project, and they address these separately with the aim of improving the quality of life for the affected communities by generating income through sustainable use of natural resources.

The two Madeira projects are the first hydropower projects to be implemented in the Amazon for a long time. The approach with reverse auction of the concessions (see topic I-6 for details) as a completely new approach to project development also brought a new approach to the management of socio-environmental aspects of the project (see below under Management). This necessitated improved capacity at IBAMA which was restructured in order to deal with these new challenges. Before the Installation Licence was granted in 2008, there were in-depth discussions with affected municipalities and state authorities, such that all possible impacts were understood and addressed in management plans and interventions. At the end of this process, memoranda of understanding (MoUs), were signed in order to define the project's responsibilities in relation to e.g. those of authorities and other non-project actors.

Impacts from primary suppliers were not assessed in the EIA. They are mainly dealt with through the certification of equipment suppliers and by the project transferring all of its standards to contractors performing work for the project through contract content (licensing requirements). Other major primary suppliers, such as quarries, are internal to the project and as such satisfactorily included in the assessment and management provided by the PBA structure.

The expertise used in the EIA work, and for many of the ongoing PBAs, consists of leading researchers and experts in their field in Brazil. IBAMA consider the assessment and monitoring to be of good scientific and methodological quality. The Madeira projects are “model projects” for future Amazon hydropower projects and there is an acknowledged element of “first provider” syndrome in that requirements might have been even higher than necessary for some aspects of the studies, just to make sure that they are not too low. IBAMA carry out most of their supervision through the issuance of technical opinions on the project's reports. They do, however, also carry out field inspections and during special crises (such as the recent flood) they carry out special visits and issue appropriate additional rulings. IBAMA also have direct access to the monitoring stored on the project's GIS-based

management system (see below under Management). Several of the PBAs are pure monitoring programmes – and are the ones identified by the regulator in order to ascertain successful implementation of avoidance, mitigation or compensation. The project reports on PBA implementation and progress to IBAMA. In the beginning of project implementation these reports were issued every 3 months, but now the frequency has been reduced to every 6 months. The 4th such report in accordance with the Operational Licence (2011) was filed by the project in October of 2013. IBAMA is presently working on their response and technical opinions on that report. IBAMA has responded positively to the 3rd report, and verbal evidence from IBAMA staff indicates that the project is considered fully compliant.

Some additional monitoring is also provided by various other Government agencies on e.g. issues relating to HS&E and the use of the water resource. The business banks involved in project funding monitors compliance with Equator Principles through their audit consultants JGP/Exponent. This is mainly focussed on construction-site monitoring (see also topic I-18 for all issues relating to construction-impact monitoring of waste, noise and air quality). FUNAI (the Government authority in charge of contacts with indigenous communities), INCRA (resettlement), Ministry of Health, Ministry of Works, Rondônia state authorities on land and fiscal management, and several others also monitor aspects of the project's activities. Several NGOs and some universities also monitor some or several aspects of the project. The state of Rondônia has a court which follows the project specifically regarding social investment. Sistema de Proteção da Amazônia (SIPAM), monitors issues relevant to the reservoir and climate.

Transboundary impacts of the project are limited to mainly that of fish migration, for which IBAMA puts joint responsibility on the two Madeira projects, as any fish trying to migrate to spawning areas in the Andean foothills would have to pass both dams.

A hydrological trend analysis was undertaken as part of the feasibility studies. It showed a weak negative but non-significant long-term trend in the average discharge of the Madeira river at the project site.

The most recent IPCC report indicates little or no change to the precipitation in the Madeira's catchment over the concession period of the Santo Antônio project. However, a well-described effect of the climate change predicted for the next half century is that of an increased variability in the hydrological regime. The extreme flood experienced during the past rainy season is a strong reminder of what this might entail. Empresa de Pesquisa Energética (EPE) conducts research at national level on climate change and specifically on greenhouse-gas (GHG) emissions from reservoirs. There is also an inter-ministerial working group on climate-change impacts on and of hydropower projects at national level.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of environmental and social issues during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

JGP/Exponent, the consortium hired by the business banks (led by Banco Santander) as auditors of the project's compliance with the Equator Principles, as one of its first major suggestions to the project management team, focussed on the issue of inter-relationships. It was pointed out that there are important inter-relationships both between the technical aspects of the project and the PBA management as well as between the various, often closely related, different PBAs. The PBA management team was significantly strengthened as a result, and regular meetings are conducted with participation from both the technical and the PBA teams, inter-relationships are discussed, and solutions agreed upon. Co-ordination of the various external experts and companies that are contracted to implement many of the PBAs is also discussed in these meetings, further facilitating regular monitoring and vigilance on inter-relationships. This work is further facilitated by the continued development of

the GIS-based EMS, which joins together into one data base all the information on the various programmes. Many of the PBA programme have a section at the end defining its inter-relationship to other PBAs.

There is a matrix kept which focusses on the need for follow-up of the various programmes, but also of inter-relationships in need of attention. One example of such an issue is where the results of the mercury studies conducted under the Hydro-bio-geochemical Monitoring Programme are used in the outreach work on health, resulting in e.g. leaflets on a varied diet in order to ascertain that people do not eat too much fish.

CSAC, the civil contractor (see topic I-4), carry out monthly checks on the conformance of their contractors and assess their performance on a broad scope of issues, among these occupational health and environmental management, identifying any emerging risks and opportunities in the process.

Apart from the IBAMA's PBA monitoring, the project also cooperates on various sustainability issues with a number of state-level organisations and authorities. An important example of this is the Secretaria do Patrimônio da União (SPU), a part of the planning ministry, responsible for land use issues. SPU supervises the project in two ways, through inspection visits (both planned and surprise visits) and by remote sensing for larger and/or remote areas. Reports on important issues are sent to the federal Government Controller's office. These reports are made public if any population is affected. If there is any decision or action taken by the project that affects a private person or a community (such as resettlement) SPU have to publish a "social interest statement".

The above mentioned processes provide regular and strong tools for the identification of emerging risks and opportunities.

Criteria met: Yes

3.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to ensure management of identified environmental and social issues utilising appropriate expertise (internal and external), and to meet any environmental and social commitments, relevant to the project implementation stage; plans are in place for the operation stage for ongoing environmental and social issues management; and the environmental and social impact assessment and key associated management plans are publicly disclosed.*

The sustainability team is formed to manage the PBAs, which have been defined by IBAMA to address mitigation and management of all identified negative impacts and successfully implement opportunities for enhancements to pre-existing socio-environmental conditions. Many primary implementers are external experts and companies, but the in-house team provide overall management (see also above under Assessment regarding the management of inter-relationships). Weekly coordination meetings are held for critical issues such as fauna and flora. General PBA management meetings are held monthly.

Key among the PBAs in relation to overall management of environmental and social issues are the PBAs entitled Environmental Management Programme, Environmental Programme for the Project Construction (see topic I-18) and the Environmental Compensation Programme. The Environmental Management Programme was set up as a GIS-based system developed for IBAMA by a company called Novaterra. This system has been developed further by Santo Antônio project staff in co-operation with Novaterra in order to tailor it to the needs of the PBA management team. The improved system allows for data loading via e-mail using a standardised spreadsheet and the system automatically controls the data for both quality and consistency. The system is capable of accepting multiple file formats, further improving the likelihood that it gets successfully used by all involved staff. IBAMA has full access to the system's outputs but are not able to make any changes to entered data. The second PBA programme mentioned above, that for the environmental management of the construction-site, is managed by the sustainability teams of the construction consortium, Consórcio Construtor Santo Antônio (CCSA). They have their own dedicated staff for this work which report to the project's PBA management team, but are fully

responsible for the implementation of this PBA. The performance of this PBA is mainly dealt with under topic I-18, Waste, Noise and Air Quality. The project exchanges information with the upstream-located Jirau project on a regular basis. Some issues are clearly of joint interest (e.g. fish migration, sediment transport), and the two projects also meet formally in workshops under the auspices of IBAMA, see above under Assessment.

Wherever capacity has been lacking, especially at municipal level, the project has tried to address this. One example is the lack of geo-referencing system for the town of Porto Velho, creating problems for the development of new roads and replacement of inundated or damaged ones. The project hired experts to support the municipality which also led to a transfer of skills and technology. Another example is the health sector (see topic I-14 for details), where the project provided training for public-sector employees, in order for them to be able to handle the increased population and pressure on services. Co-operation with state institutions have generally been successful. The project has been responsible for hiring several third-party implementing actors but with the appropriate government agency as the contracting party. Monthly meetings followed up progress. One regrettable effect of limited resources concerns a project originally defined for urban traffic issues, which has not been properly followed up.

A total of R\$ 1.9 billion has been spent on sustainability-related investments, out of which R\$ 673 million on the PBAs, R\$ 652 million on resettlement, R\$ 319 million on social compensation, R\$ 207 million on socio-environmental investments for the expansion project, and R\$ 74 million on direct environmental compensation (0.5% of the investment at the time of the auction of the development rights). The benefits generated by this are discussed in detail under topic I-7, Project Benefits. There is also a special so called "Subcrédito F" (for social issues) of R\$ 50 million, provided by BNDES, the Brazilian development bank. This is dealt with under topic I-7. The project spends R\$ 12 million per year on management of the socio-environmental aspects, around 85% of this goes to salaries.

During the operational phase, socio-environmental management will operate more or less with the same system, but with significantly fewer people. The down-sizing of staff was originally expected to have happened by the time of this assessment, but this has been delayed due to the needs created by the extension project. There is an action plan for the transfer to operation. This plan is a requirement according to the Equator Principles and monitored by JGP/Exponent.

The EIA was first publicly disclosed as part of the regulatory public hearing. All documentation relating to the project's fulfilment of the licence requirement are publicly available on IBAMA's web site.

A Project Design Document (PDD) was produced in order to register the project for certification of emissions reductions according to the Clean Development Mechanism (CDM). A validation report was produced by a US-based company called Perry Johnson Registrars Carbon Emissions Services. The project was validated for 5 146 403 tonnes of CO₂-eq. per year in the original project – the figure for the project including extension is not yet calculated, this will be done at a later date. SAE's interest in pursuing CDM credits are, for reasons associated with the recent significant fall of the market price of credits, presently on hold.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; and plans and processes are embedded within an internationally recognised environmental management system which is third party verified, such as ISO 14001.*

The project risk matrix is regularly reviewed, providing a formal process for risk identification and classification. For the extension project, the vegetation-clearing will be managed by the technical department, while the environmental aspects are managed by the sustainability department. They have done a joint risk assessment for this activity.

The project has two levels for capturing opportunities: In the yearly plan for each employee, the individual sets her/his goals for the programme that she/he is involved in. This includes the definition of improvement opportunities to be seized and implemented during the plan year. On a more short-term basis the regular PBA-team meetings and also the meetings of the inter-relationships group identifies opportunities for improved management. A number of other mechanisms for identifying risks and capturing opportunities are described under their respective topics and will not be repeated here.

Each contractor has their own management system and all the main members of CCSA are certified in accordance with ISO 9001, ISO 14001 and OHS 18001. The Santo Antônio project itself is not certified in accordance with ISO systems yet but the project's EMS, which is also PBA number 1, is regularly audited by a third party against IFC PS 1. As with most hydropower projects around the world, certification is not done during the construction stage, but when moving into operations. In the operational stage SAE plan to seek certification (with DNV as advisors on implementation) in accordance with ISO 9001, ISO 14001 and OHS 18001.

Criteria met: Yes

3.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *Ongoing processes are in place for stakeholders to raise issues and get feedback.*

This is covered in detail under Topic I-1 and for the respective issues under a number of other topics such as I-10, I-11, I-13 and I-14. Key ongoing processes in place for stakeholders to raise issues and get feedback are: information dissemination, both in the way of general information, but also tailored information to e.g. downstream communities; regular meetings with the directly-affected population groups; production and dissemination of a monthly newsletter; public hearings whenever major changes are being made; consultation workshops with government entities, NGOs, expert advisers etc.; a visitors' programme which was implemented in 2010, and which has resulted in more than 6 000 people visiting the project; a grievance mechanism using three different contact modes - a toll free number service, communication boxes and an online contact form.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, feedback on how issues raised have been taken into consideration has been thorough and timely.*

This is covered in detail under Topic I-1. Feedback on issues raised, either through public meetings, in door-to-door visits, the grievance mechanisms, etc., have generally had a short response time, and are considered by stakeholders to be thorough and timely.

Regulators, such as e.g. IBAMA, also commend the project on thorough and timely responses.

Criteria met: Yes

3.2.4 Conformance/Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in the environmental and social management plans have been and are on track to be met with no major non-compliances or non-conformances, and environmental and social commitments have been or are on track to be met.*

The project's processes and objectives on socio-environmental management are mainly codified in the PBAs and the various additional voluntary programmes the project has committed itself to. The licences for the project are: the Preliminary Licence, granted by IBAMA in July, 2007; the Installation Licence, granted in September,

2008; and the Operational Licence, granted in September, 2011. These internalise the PBAs (and other demands) as licence requirements.

JGP/Exponent, in their most recent report dated October, 2013, state that the project is in general compliance with both the Equator Principles and Brazilian legislation.

IBAMA considers the project fully compliant.

The external auditors, in response to minor deviations, have asked for improvement to socio-environmental management practices, especially on the analytical side of management. The early message was not just to gather information but to learn from the information gathered. One step towards responding to this was the establishment of the interface-management meetings. Major improvements have also been made in the follow-up of work-related accidents (see topic I-12 for details).

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

The assessment has not identified any present non-compliances or non-conformances and IBAMA, JGP/Exponent and several Government authorities, e.g. ANA and ANEEL, verify that the project is in full compliance.

Criteria met: Yes

3.2.5 Outcomes

Analysis against basic good practice

Scoring statement: *Negative environmental and social impacts of the project are avoided, minimised and mitigated with no significant gaps.*

Negative socio-environmental impacts have generally been avoided, mitigated or compensated with no significant gaps as evidenced in the detailed assessments conducted under several topics in this study. The delivery of development contributions has also been successful in many cases. IBAMA, in its document analysing the project's implementation of the PBAs in preparation for the issuance of the Operations Licence in 2011 (document Parecer No 26/2011 – COHID/CGENE/DILIC/IBAMA), commended the Santo Antônio project on its good performance and approach in its work on the PBAs. This fact has also been highlighted in an International Finance Corporation (IFC) review of projects in which Odebrecht is involved.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, negative environmental and social impacts are avoided, minimised, mitigated and compensated with no identified gaps; and enhancements to pre-project environmental or social conditions or contributions to addressing issues beyond those impacts caused by the project are achieved or are on track to be achieved.*

Negative impacts have generally been avoided, mitigated or compensated with no identified gaps as elaborated above under basic good practice.

Malaria risk was very high before the start of implementation of the Madeira projects, according to the Ministry of Health. The risk went from high through average and is now trending towards low, see topic I-14 for details. The project has also doubled the number of beds in the local hospitals. Further improvements to pre-project conditions include an urban transport plan including safety cameras, fire-fighting equipment provided to the municipality's civil defence as well as considerable amounts of equipment for the environmental police (e.g. vehicles, boats). The project is also trying to work against slum formation in Porto Velho. The amount of jobs

have clearly increased in the municipality and state, and even if much of this contribution is obviously of a temporary nature, the added value provided by e.g. the Acreditar and Acreditar Junior programmes (see also topics I-7 and I-12) for enhancement to the competence level of local and regional residents will have a lasting positive development impact. The sustainably increased income of Government; local, state and some federal; through the various taxes paid by the project (see topic I-7 for details) will improve their ability to address social needs in society.

Criteria met: Yes

3.2.6 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

3.3 Scoring Summary

The Santo Antônio project’s socio-environmental issues have been assessed, first in the joint EIA for the Madeira projects (2005) and later in complementary studies finalised in 2006. Ongoing assessment of emerging issues is carried out as part of many of the PBA programmes which make up the main regulatory licence requirement stipulated by IBAMA, the regulator.

The project regularly reports to IBAMA on its Operational Licence (issues in 2011) conditions and the PBA programmes. A variety of management procedures and processes ensure early identification of emerging risks and opportunities. There are two key PBA programmes relating to overall management of socio-environmental aspects: the Environmental Management Programme and Environmental Programme for the Project Construction. The members of the construction consortium are all certified in accordance with ISO 9001 and 14011 as well as OHSAS 18001, and the project’s management system will be certified once the project has entered into operation. Key sustainability-related documents are publicly disclosed.

Processes are in place for stakeholders to raise issues and the feedback provided by the project is generally considered thorough and timely by both project-affected communities and regulators.

The project is compliant and has no active non-conformances.

Negative impacts from the project are successfully avoided, minimised, mitigated or compensated and the project has contributed to enhance the pre-project socio-environmental conditions in the area in a variety of ways, notably by contributing to a significant decrease in malaria incidence in the region, a strong growth of the regional economy and strong capacity development of workers and young people through the Acreditar and Acreditar Junior programmes.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

3.4 Relevant Evidence

Interview:	7, 13, 22, 34, 39, 58, 60, 68, 69, 71,
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Document:	1 – 22, 60-62, 132, 139, 140, 213, 257, 285, 286, 301 – 303, 345 – 348, 374 – 384
Photo:	3 -6

4 Integrated Project Management (I-4)

This topic addresses the developer's capacity to coordinate and manage all project components, taking into account project construction and future operation activities at all project-affected areas. The intent is that the project meets milestones across all components, delays in any component can be managed, and one component does not progress at the expense of another.

4.1 Background Information

Organisation of the implementation of the on-site construction of the Santo Antônio project is under the responsibility of Santo Antônio Energia (SAE), with Furnas acting as the Owner's Engineer, including certifying the project designs and supervising on-site construction. The on-site construction is being carried out by an engineering, procurement and construction (EPC) contractor (Consórcio Construtor Santo Antônio, CCSA), under a lump-sum turnkey contract to SAE.

CCSA consists of three main parts: a civil-works consortium called Consórcio Santo Antônio Civil (CSAC), made up of Odebrecht (leader) and Andrade Gutierrez; an electro-mechanical equipment consortium called Grupo Industrial do Complexo Rio Madeira (GICOM), consisting of Alstom, Andritz Hydro, Areva Transmission and Distribution, Bardella, Siemens and Voith Hydro; and Odebrecht, responsible for electro-mechanical installations. Intertechne (with assistance from PCE) is CCSA's Engineer, with responsibilities for basic design as well as for the detailed design of the project's civil, electrical and mechanical components.

As part of the Concession Agreement awarded to SAE, the project includes two single-circuit 500 kV transmission lines, approximately 5 km in length and related equipment to link it with the substation in Porto Velho in the state of Rondônia. In turn that substation is linked with the Araraquara-2 substation in the state of São Paulo (and thereby the major load centres in South-east Brazil) through the recently commissioned 600 kV DC 2 385 km transmission link (the longest DC line in the world). The 600 kV transmission link between the states of Rondônia and São Paulo is not part of this assessment.

Project construction began in September 2008, following granting of the Installation License by IBAMA. Subsequent to the issuance of the Operation License by IBAMA in September 2011, the first units were commissioned in March 2012, nine months ahead of the schedule set out in the Concession Agreement. As of April 2014, 26 units have been commissioned and a further 6 units are scheduled to be commissioned by August 2014. The last of the 50 units is scheduled to be commissioned in November 2016

As of December, 2013, civil works was 87% complete, electro-mechanical installation 69% complete, 83% of equipment had been supplied, and 88% of auxiliary systems supplied.

Thus as of May 2014, the status of project development encompasses: project preparation (including obtaining final regulatory approval) for generation units 45-50; project implementation (including the commissioning of generation units 27-32 by August 2014 and generation units 33-50 by November 2016); and project operation of the 26 generation units already commissioned.

This topic focuses on the management processes for project delivery. Governance of the project is addressed under topic I-2, whilst management of the project's environmental and social issues is addressed under topic I-3.

4.2 Detailed Topic Evaluation

4.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Monitoring of project progress, milestones, budget and interface issues, and of the effectiveness of management of implementation stage plans including construction management, is being undertaken on a regular basis during project implementation.*

The framework for effective integrated project management of the project was put in place prior to the reverse auction in December 2007. The leading shareholders of SAE, a special-purpose company, are Furnas, a subsidiary of Eletrobras, and Odebrecht, both of which have extensive experience in hydropower development. In addition, Furnas and Odebrecht had previously collaborated in managing the feasibility study of the entire Madeira complex (Santo Antônio and the upstream-located Jirau project). Odebrecht and Furnas also took the lead in mobilising and agreeing on a draft EPC with CCSA, which both parties signed on December 10, 2007, the date on which SAE won the reverse auction. Further details on these arrangements is provided in topic I-6.

Monitoring of all of the above is being undertaken on a regular basis through: monthly reporting to ANEEL, which covers the updated project schedule (including the status of implementation of civil works and installation of the plant's generation units), the status of environmental licensing, and the status of commercial operation of each generation unit; quarterly reporting to BNDES, which sends engineering and socio-environmental consultants to the site to monitor and report on project progress, including contract and financial management; the EPC contractor's detailed monthly reports to SAE, focusing on a comparison of the completed work compared with the contractual commitments at the reporting date, the percentage of work completed in each activity in the previous month, and the total accumulated percentage up to the reporting date; CCSA's Engineer's monthly reports on project progress; Furnas, the Owner's Engineer's monthly reports to SAE on project progress; and SAE's Operations and Maintenance Department's (O&M) monthly reports on project operation issues.

In addition, there is a monthly cycle of meetings within SAE resulting in the monthly report, updates to the master plan and to the work breakdown structure, and monthly meetings of the project's technical and sustainability teams for coordination of the PBA implementation with construction activities. Internal project procedures flag interface issues and the steps needed to resolve them.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of the overall project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

The project has established an Interface Team to monitor and manage inter-relationships among issues. CCSA's management system includes processes of flagging, communicating and instigating early resolution of potential interface issues between manufacturing, delivery, installation and commissioning of electro-mechanical equipment. For example, quality problems in turbine parts' manufacture are flagged during factory inspection and followed up and reported on from the factory. In relation to addressing risks and opportunities, Furnas flags these types of issues in its monthly reporting as does SAE's O&M Department in its monthly reporting. For example, in their respective reports of March 2014, Furnas flagged the need for prompt resolution of a potential issue related to the planning/implementation of the 230 kV transmission line that would be used to evacuate power for units 45-50, while the O&M Department identified the need to coordinate repair work on one of the turbines with the schedule to reactivate the commissioned turbines after their shutdown due to the recent floods on the Madeira river.

Criteria met: Yes

4.2.2 Management

Analysis against basic good practice

Scoring statement: *An integrated project management plan and processes are in place that take into account all project components and activities with no significant gaps; and a construction management plan is in place that describes processes that contractors and others are required to follow to manage construction related activities and risks.*

An overall project management plan is set out in the Concession Agreement, including engineering and socio-environmental milestones. To avoid interface issues, target dates for social and environmental requirements are set out in the IBAMA license requirements, as codified in the PBAs (See topic I-3).

The EPC contract is designed to ensure that the engineering milestones of the Concession Agreement as they relate to on-site activities are achieved. A major component of the contract is ensuring the design and implementation of management systems to coordinate the major project components. This includes civil works and the sourcing, delivery, installation and commissioning of its electro-mechanical systems, and an appropriate construction management plan. An annex of the contract sets out a basic schedule, including deadlines and milestones for the commissioning of the electro-mechanical units. Another annex sets out detailed guidelines for a quality-control programme, including: documentation control; quality control in engineering; civil works; and assembly and installation of electro-mechanical equipment; electro-mechanical equipment and systems; interface management; and programme coordination.

Functioning of CCSA is governed by an agreement that is signed by all consortium members. The agreement includes its administration, handling of claims, defaults and penalties and dispute resolution amongst its members. An administrative committee, consisting of three members from CSAC and three members from GICOM, is responsible for the management of CCSA. The committee is responsible for approving the policies and guidelines of the consortium, as well as any changes in its contract with SAE.

The Concession Agreement and the EPC contract have incentives to meet the milestones set out in the Concession Agreement as well as penalties for delays in the commissioning of the project. In addition, the EPC contract has incentives for plant commissioning ahead of schedule.

SAE and CCSA ensure integrated project management through a matrix of responsibilities and a continuously updated work breakdown structure, supported by the use of PRIMAVERA software. They use CITADON software, a secure online environment, which enables the multiple organisations involved in project implementation to share and collaborate on documents and participate in business processes, including meetings, regardless of location or time zone.

The project team and key collaborators have access to the Odebrecht CITADON System, including its Instruction Manual, which provides the information needed by potential users on how to use the system, including its use for business processes. The manual has comprehensive rules for document management within the workspace (including defining who has access to what), and the format of documentation that can be handled by CITADON can range from computer aided design (CAD) drawings to documents issued under the Microsoft Platform (Word, EXCEL, POWERPOINT etc.). The minutes of all project coordination meetings are posted on CITADON.

All members of the EPC consortium are ISO 9001-certified.

In relation to managing construction-related activities and risks, the EPC contract has two detailed annexes that specify the processes that need to be followed by the consortium affecting the environment as well as occupational health and safety issues. In relation to managing construction related activities and risks affecting the environment, the EPC contract mandates the implementation of programmes of treatment and recuperation of degraded areas, the treatment and control of liquid effluents, and the management and disposal of solid wastes as part of one of the PBAs (see topics I-3 and I-18).

Analysis against proven best practice

Scoring statement: *In addition, the plan identifies a range of potential interface issues and sets out measures to manage interface and delay issues without impinging on overall project timetables and budgets; processes are in place to anticipate and respond to emerging risks and opportunities; and construction management plans ensure that land disturbance and waste generation activities will be managed so that later rehabilitation activities can be undertaken efficiently and effectively.*

Through the use of PRIMAVERA software, the master plan identifies a range of potential interface issues. These include that the coordination of the scheduling of on-site civil works and the installation and assembly of electro-mechanical equipment. PRIMAVERA software is also particularly effective in identifying the critical remaining work on specific activities and thus enabling management to focus its efforts to keep the project on schedule.

The Interface Team manages interface issues related to civil works construction and assembly/installation of electro-mechanical equipment. They manage interfaces within the matrix of responsibilities, following up with inter-mediation, and conflict resolution. An example of the work of the Interface Team was to facilitate an expedited resolution to a turbine problem, which led to a non-conformance report by the Owner's Engineer. This necessitated follow up with a number of actors within SAE and CCSA (including the EPC's Engineer) as well as with the manufacturer. The team also facilitates coordination of turbine testing and commissioning, which may involve many companies, and can be challenging in periods of high sediment load in the Madeira river when diving inspections may be needed. Reporting on non-conformance issues is available on CITADON.

The project is developing an Integrated Management System (SGI) for the operational phase, and plans to benchmark it against best practice and exceed the norms of Furnas, the benchmark organisation for power-plant operation in Brazil. DNV GL is advising the project on the design of the SGI. By definition, the SGI will minimise interface issues in plant operation.

Processes in place to anticipate and respond to emerging risks and opportunities revolve around scheduled meetings relating to fabrication/testing (quarterly), construction (monthly) and commissioning (monthly). Particularly important is the Project Coordination (Monthly) Meeting which includes representatives of the Owner's Engineer (SAE/EP), the owners O&M team and representatives of CCSA (including CSAC, GICOM and their Engineer-CCSA/EC). Prior to the meeting, regular reports are circulated in relation to important aspects of project planning, implementation and operation. This meeting is particularly effective in flagging emerging risks and opportunities and identifying appropriate follow-up steps.

Consistent with the EPC contract, there is a unified policy on quality management. It is managed in four groups relating to electro-mechanical equipment: manufacturing inspection; delivery of equipment; assembly and installation; and plant operation. Every six months, a critical analysis is undertaken to identify lessons learned and improvements for quality management. It bears noting that quality management in the Santo Antônio project is based on the concept of "plan-do-check-act" (PDCA), which is one of the guiding principles of quality management. In addition, the use of insurance to manage risk, is described under I-6.

Interface issues are comprehensively anticipated, and emerging risks avoided and minimised. To assure the timely supply of cement to the project (as well as to the Jirau project), a cement factory was built at Porto Velho. Another example of an opportunity realised as a result of the project, together with the upstream Jirau project, was the initiative of Alstom and Bardella to create Indústria Metalúrgica e Mecânica da Amazônia Ltda (IMMA), a Porto-Velho based company which is responsible for supplying hydro-mechanical equipment to both projects.

In relation to construction management plans, CCSA have facilitated later rehabilitation through the locating of camps and works in areas that were already degraded, and through appropriate topsoil management. In addition, SAE and the EPC contractor have agreed under the construction management plan to put in place a recovery programme in the degraded areas, once the project is completed. This will include the dismantling and

removal of temporary structures. Details of land reclamation efforts in accordance with the Environmental Programme for the Project Construction can be found in topic I-18.

Criteria met: Yes

4.2.3 Conformance/Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in the integrated project management plan and the construction management plan have been and are on track to be met with no major non-compliances or non-conformances.*

The project is in full conformance with its project master plan and its construction management plan with no major non-compliances. A focus on avoiding problems that typically arise in the implementation of hydropower projects has been an important part of SAE's strategy in project implementation. For example, as mentioned above, the specially constituted Interface Team has focused on interface issues relating to the timely commissioning of the project's generation units. So far, 26 generating units have been commissioned ahead of the schedule set out in the Concession Agreement, and the project is on track to have all of the 44 units mentioned in the agreement commissioned ahead of schedule.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

There is no evidence of non-compliances or non-conformances with project management and construction management planning.

Criteria met: Yes

4.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *The project is meeting overall budget and timing objectives and targets; interface issues are managed effectively; and construction risks are avoided, minimised and mitigated with no significant gaps.*

The first units of the project were commissioned in January 2012, 9 months ahead of the schedule specified in the Concession Agreement. As of January 2014, 84% of project was completed and by April 2014, 26 units were fully commissioned.

The project is on track to be completed ahead of schedule. Project management have indicated that the overall project budget, not including the expansion cost, has increased from R\$ 12 billion to R\$ 16 billion, representing a 7% increase in real terms (i.e. excluding inflation), which they consider manageable. Interface issues are managed effectively, particularly to enable the early delivery, installation, testing and commercial operation of the generation units. Construction risks have been avoided, minimised and mitigated with no significant gaps

SAE, in collaboration with CCSA, demonstrated its capacity to successfully address unexpected interface issues, through collaborating with ONS and the management of the Jirau project in addressing the challenges caused by the severe floods in the Madeira River in 2014.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, interface issues are anticipated, and avoided or minimised; and construction risks are avoided, minimised, mitigated and compensated with no identified gaps.*

Interface issues are fully anticipated, and avoided or minimised, by CCSA within its management of the EPC contract, as well as by SAE in its coordination on all project components, including social and environmental commitments. Examples of minimising interface issues have been given above. The quality of coordination of the PBA was instrumental in IBAMA awarding the Santo Antônio project its Operational License. A further example of the management of interface issues is the staged filling of the reservoir to minimise the risk of interference in the animal rescue programme and other PBA components, in accordance with the Operational License.

An important example of the anticipation and avoidance of interface issues is the 230 kV transmission link to the Acre-Rondônia interconnected system. To address the repercussions of the early commissioning date of the first generation units of the project (in March 2012) in combination with the delayed (November 2013) commissioning date of the 600 kV DC line between the states of Rondônia and São Paulo (which is designed to evacuate the project’s power), SAE and CCSA collaborated in developing and arranging financing for this 230 kV transmission link, which is an additional component to the Santo Antônio project and not part of the original concession for the project. This allowed the project’s energy production to replace costly and polluting diesel generation.

There are no apparent gaps in avoiding, minimising, mitigating or compensating construction risks. Examples of addressing these issues are given above.

Criteria met: Yes

4.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

4.3 Scoring Summary

The management of the Santo Antônio project is being undertaken in accordance with a Master Plan that integrates on-site and off-site processes. Responsibilities are clearly allocated between the Owner (Santo Antônio Energia) and the EPC contractor (Consórcio Construtor Santo Antônio). Its first units were commissioned 9 months ahead of schedule set out in the Concession Agreement. As of January 2014, 84% of project was completed and by April 2014, 26 units were fully commissioned. The project is on track to be completed ahead of schedule. There are numerous examples of anticipation, avoidance, minimisation and management of interface and construction-related risks.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

4.4 Relevant Evidence

Interview:	14, 15, 26, 31, 39, 49, 68, 69, 71, 87
Document:	42, 138, 172-174, 179, 248, 249, 268, 304, 305
Photo:	7 – 8

5 Infrastructure Safety (I-5)

This topic addresses management of dam and other infrastructure safety during project implementation and operation. The intent is that life, property and the environment are protected from the consequences of dam failure and other infrastructure safety risks.

5.1 Background Information

The Santo Antônio project has been designed, approved and is being delivered by a set of developers, consultants, regulators and contractors with strong hydropower-development experience and expertise.

Dam safety is regulated by a number of agencies in Brazil. The agency responsible for the technical integrity of the structures is ANEEL, the national electrical energy agency. ANA, the national water agency, is developing a national system for dam safety, mainly in relation to river flows and floods.

The catchment of the Madeira River is very large, with a surface area of 989 000 km² at the project site, most of which is located in the neighbouring countries of Bolivia (71%) and Peru (11%), but also in the Brazilian states of Rondônia (where the power plant is located), Acre, Amazonia and Mato Grosso (a total of 18%). The reservoir volume (around 2.7 x 10⁹ m³ at the full supply level (FSL) of 71.0 m.a.s.l.) is mainly storage resulting from damming the river for the purpose of creating a head for the Santo Antônio hydropower plant, and is not for regulation, as it is supposed to be operated mainly at a constant level. The dam is a total of 2.5 km long. Most of it is an earth-fill embankment structure but there is also a 187 metres' wide concrete gravity dam in the central section. The dam has four independent power houses (with 8+12+12+12 turbines, with an additional 6 planned for power house 4 if the extension project is approved and licensed). There is one main spillway with 15 radial gates and a complementary emergency spillway, with 3 radial gates.

Public safety outside the site is affected by an increased amount of road traffic. The construction traffic has had to share local roads and the construction site is located along national highway 364, which connects the centre and east of Brazil with Acre province in the extreme west of the country and carries a substantial amount of non-project-related traffic.

As listed at the beginning of this report, in the section on project description, an important note on elevations used in this report refers to the fact that IBGE (Instituto Brasileiro de Geografia e Estatística) revised the Brazilian elevation reference systems in 2009. There has been a further correction to the system since then, resulting in two parallel systems being used in different regulatory documents for the project – the documentation for IBAMA uses a system with a base level 0.3 m lower than the system used in the ANEEL documentation. We use the IBAMA system throughout this report in order to minimise confusion, hence the two levels at which the reservoir at the dam will mainly be kept are 70.2 and 71.0 m.a.s.l. respectively.

There is one Projecto Básico Ambiental (PBA) which is particularly relevant to this topic – the Seismology Monitoring Programme. This topic focusses on infrastructure, community and environmental safety. The safety of workers is dealt with under topic I-12, Labour and Working Conditions. There is also some potential overlap between this topic and topic I-4, Integrated Project Management.

5.2 Detailed Topic Evaluation

5.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Dam and other infrastructure safety risks relevant to project implementation and operation have been identified through an assessment process; and safety monitoring is being undertaken during the project implementation stage appropriate to the identified issues.*

The basic assessment for dam design and dam-safety work is the hydrological assessment. The first phase was a hydrological data-base establishment for a hydropower inventory of the Madeira basin. After that, the Madeira projects feasibility studies increased the level of detail, which resulted in the project hydrology acting as a basis for the concession. The early studies were conducted by experts from Intertechne and PCE in 2002-3, and are now updated on a continuous basis by project-internal hydrological expertise. The present project hydrology is based on 42 years of data.

At the dam site, the Madeira river has an average runoff of 19 000 m³/s, based on hydrological data from the 1967 – 2007 period. The maximum flow registered during that period was 48 570 m³/s and the minimum flow 2 588 m³/s. The assessment of flood peaks for various return periods was conducted as part of the hydrological study. The approach adopted was to design major safety-related infrastructure, such as spillways, for the 10 000-year flood, which was estimated at 84 000 m³/s.

The basic-design criteria for the project were developed by Intertechne and PCE in 2008. During project design, mathematical modelling was conducted for the concrete structures of the dam. The modelling was done in accordance with the standards of the US Army Corps of Engineer. The main dam-safety concern is, however, not with the concrete structures, but with piping of the earth structures. Piping has, together with overtopping, been defined as the main failure modes. ANEEL has studied and approved the design, and issued its approval, see documentary evidence 306: NT ANEEL No 288.

Intertechne and PCE have carried out the analysis of dam stability for Santo Antônio Energia (SAE), including the extension and raising of the reservoir level. Furnas, the owners' engineer has validated this independently from the design team. The criteria used are US standards. The dam structure has also been independently evaluated by consultants for the insurance companies.

In accordance with Law No 12.334 of the 20th of September 2010 on the Safety of Dams, each dam owner has to: classify the dam (Article 7); develop a plan for dam safety (Article 8); conduct regular inspections (Article 9); carry out regular revisions of dam-safety aspects (Article 10); and prepare and test an Emergency Action Plan (Articles 11 and 12). The classification involves a standard risk assessment whereby the Santo Antônio dam was classified as belonging to the "Low Risk" class, but also to the "High Damage" class.

The dam-safety plan contains a definition of the instrumentation used for dam-safety monitoring (e.g. triangular weirs for flow measurements; extensometer rods; piezometers; concrete thermometers, movement sensors etc.). It describes the dam's operational plan and maintenance plan and determines the level of qualification needed by staff dealing with the various aspects of dam safety under the plan. Specific documents that need to be developed are e.g. a procedural manual, operational rules for emptying of the reservoir, an emergency action plan, reporting of security inspections and periodical safety review. The monitoring plan contains 4 inspections per year. The plant is divided into four groups: group 1 is the right-bank structures; group 2 is the river bed structures; group 3 is the concrete on the left bank; and group 4 is the rest of the dam infrastructure. Every quarter, two groups are inspected. Each visit includes an inspection and the production of both a technical-inspection report and an infrastructure-status report. A technical-inspection report is produced and filed with ANEEL, the regulator, every 6 months, and an infrastructure-status report is filed every year. Monitoring is carried out using a detailed checklist for instrumentation, galleries etc. The list is defined in order to respond to the risks

identified in the risk matrix. Trends, magnitudes and risk level are logged. All data capture is automated and turned into well-visualised diagrams for continuous early-warning supervision.

IBAMA (the environmental licensing authority) has only one PBA relevant to infrastructure safety, the programme for seismological monitoring, focussing on seismicity induced by the reservoir. This programme has two monitoring stations, one at the dam site and one farther upstream. The Project is located within a region of low natural seismic activity in Brazil, but fairly close to the tectonically very active Andean areas of Bolivia and Peru. The seismic events historically reported in the area were of magnitude 4.2 on the Richter scale, and located about 200 km away from the location of the plant. During the implementation of the PBA for seismic monitoring, the strongest regional event registered was at a level of 4.7.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, consideration of safety issues takes into account a broad range of scenarios and both risks and opportunities.*

The Furnas monitoring takes broad considerations into account, and access to Furnas' laboratory also allows the project to develop and test new and improved equipment as well as conduct staff training.

A non-standard aspect of infrastructure safety which carries very high relevance for the Santo Antônio project is that of tree logs transported with the river flow from the upstream catchment, mainly in Bolivian territory. The amount of large tree trunks in the river is so great that it has given the river its name – “madeira” means wood or timber in Portuguese. For further information, see below under Management.

An example of an opportunity seized was the well-formulated public information events which the project developed and implemented in response to community concerns during the 2014 flood. This demonstrated to people that the dam was safe under unprecedented flood conditions. A project-external interviewee attested to the successful communication that came out of this.

Criteria met: Yes

5.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to address identified dam and other infrastructure safety issues, and to meet any safety related commitments, relevant to the project implementation stage, including providing for communication of public safety measures; a formal quality control program is in place for construction; safety management plans for the operation stage have developed in conjunction with relevant regulatory and local authorities; and emergency response plans include awareness and training programs and emergency response simulations.*

The EPC contract includes management systems to coordinate the major project components. An annex of the contract sets out detailed guidelines for a quality-control programme including dam and infrastructure-safety issues. The same team is responsible for quality control through to operation, and the designers (Intertechne) are continuously involved in ensuring that construction follows design and that quality is maintained. Furnas, as the owners' engineers, are responsible for overseeing the adequacy of the safety management with a special focus on dam safety. Furnas has more than 50 years' experience from their own plants and provides this service for many other dam owners in Brazil. This work is implemented through a dedicated sector for dam safety with specialists certified under ISO 9001. They are responsible for dam safety for hydropower dams with over 15 GW of installed-capacity. The process includes a classification system for the severity of an emerging issue. It divides issues into three levels where level 1, the least severe category, is handled by regular staff, level 2 requires a

specialist to be brought in, and level 3 is defined as a major issue and has to be attended to immediately using a set of pre-determined procedures.

Communication procedures for safety-related issues include general information (see also Topic I-1) and specific information campaigns regarding the power plant and its operations as well as planning for emergencies. In cases of emergency, communication follows clearly defined regulatory requirements with notification of civil defence, ONS (the system operator), ANA, ANEEL, the fire brigade, military police, the Navy etc. The civil-defence authorities, who carry the responsibility for communication with the public on emergencies, are alerted and the public telephone network and an internal radio network are utilised for rapid information dissemination.

The Law No 12.334/2010 on the Safety of Dams (see above under Assessment) regulates the development of a dam-safety plan, the implementation of regular inspections, regular revisions of dam-safety aspects and the preparation and testing of an Emergency Action Plan. Regulation for this law is still being prepared, but ANEEL issued technical notes on emergency planning to SAE in November of 2013. The project has responded to these notes. A meeting will follow between key stakeholders and a decision is expected by June, 2014. ANEEL do not expect changes in licensing requirements, except possibly minor changes in the operational rules. ANA's responsibilities were amended by the law, specifically by article 21, and a three new duties were established for ANA: to organise the National Dam Safety Information System (SNISB); to promote coordination among regulatory state agencies of dams; and to coordinate the elaboration of the Report on Dam Safety and submit it annually to the National Council of Water Resources (CNRH).

SAE have voluntarily developed an emergency action plan, which is divided into two parts: an internal plan and an external one. The internal plan addresses incidents at the plant and has procedures for identification, classification, notification (in steps), actions to be implemented in case of a need for evacuation, means of transport, evacuation and return of staff and the general public, as well as response and coordination aspects. This plan is in preparation, but many aspects are already operational such as: evacuation plan; procedures for closing down the area; the use of sirens to alert people, etc. There is a system of well-developed and clearly sign-posted meeting points (see photographic evidence in Appendix D). There is a special-purpose team which deals with emergency repairs. Depending on the kind of incident, a decision is made for the response by the shift supervisor. The external plan deals with incidents that occur at the plant but affect external stakeholders.

The project staff have developed flood maps to define the extent of a potential dam failure caused by the simulated flood-wave passage downstream (including time estimates). The flood calculations have simulated the result of different failure modes in situations of: "average rainy season discharge", 25 000 m³/s; "average annual maximum discharge", 38 550 m³/s; "25-year flood", 53 667 m³/s; and a "10 000-year flood" at 84 000 m³/s (based on the original project hydrology). Based on the most recent update, the 10 000-year flood is estimated to be 75 000 m³/s. For each of these discharges, both overtopping of the dam and piping of the dam structure were considered. Modelling the highest discharge, 84 000 m³/s, the resulting peak flow for overtopping is 112 000 m³/s. A 50-cm resolution topography for the downstream area was developed with information from orthophotos and bathymetric inventories, using 79 sections in the downstream section of the river along a 12 km reach. The flood maps also include the water depths that would result, dividing this into four classes – less than 2, 2-3.5, 3.5-6 and >6 metres' depth. The estimate of the affected population was made for a worst-case scenario using Jacobs' method and resulted in 13 000 people. The exercise has resulted in suggestions to the authorities for alarm/alert system, evacuation routes, signposted meeting points and siren placements. Civil defence is solely responsible for training and simulation exercises with communities. The flood mapping was checked using the 2014 flood using HEC/RAS software. A discharge of 54 000 m³/s was routed through the model and checked in the field to ground-truth model prediction, which proved to be accurate. The project staff have developed a methodology to monitor the downstream area by radar and interferometry, and also produced a digital map down to Humaitá, an area of wave-propagation influence of 2 218 km² and 200 km long.

The coffer dams for the construction stage were designed for a 300-year flood (app. 57 000 m³/s), an unusually risk-averse approach which has proven diligent as 2014 has seen unprecedented flows in the river, peaking at

58 559 m³/s on the 30th of April, making it necessary to add height on to the coffer dams to secure the areas with ongoing construction. See photographic evidence in Appendix D, photos 7 and 8. During this flood, several meetings with ANA and ANEEL took place. As a result of the magnitude of the flood, SAE have used the newly acquired data to recalculate the rating curve and the return period periods for extreme flows.

Training and exercises for safety-related aspects, as well as emergency simulations, are conducted regularly. Clear records are kept of simulations, with photos and a resulting action list for improvements.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; and public safety measures are widely communicated in a timely and accessible manner.*

As described above under Assessment, the access to Furnas' laboratory allows the project to seize opportunities for new and improved equipment and to conduct training for staff under safe, simulated conditions.

The significant risk related to the large number of logs transported by the river (see above under Assessment) has received special attention, and, in order to safely pass all the large tree trunks past the dam structure, special "log-booms" diverting the trunks are installed and anchored upstream of the dam, designed to steer the trunks to a special-purpose "log spillway". See appendix D, "photo" 169, for a drawing of the installation.

The research and development committee of the project have identified a number of opportunities and approved funds for the implementation of emergency alarms for the plant which can only be heard inside the plant itself (operational), a robot to clean up the gates (currently done by divers – which involves safety risks), and improved prediction of high runoff.

Formally, it is the civil-defence authorities' responsibility to interact with the public on issues relating to public safety, but SAE are constantly communicating with the authorities on all issues pertinent to the project. Public information and communication processes described in detail in Topic I-1 provide strong mechanisms for the timely communication of safety-related concerns through a variety of channels appropriate for reaching the different groups of society. As an example, the intense communication efforts in conjunction with the 2014 flood demonstrated to the community that the dam is safe even under unprecedented flood conditions.

Criteria met: Yes

5.2.3 Conformance/Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to safety have been and are on track to be met with no major non-compliances or non-conformances, and safety related commitments have been or are on track to be met.*

All regulators report that the project is in full compliance, with the emergency action plan being developed in line with requirements. The assessors have not identified any non-conformances.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

The regulators and assessors have not defined any non-compliances or non-conformances.

Criteria met: Yes

5.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Safety risks have been avoided, minimised and mitigated with no significant gaps.*

Safety risks have been avoided, minimised or mitigated with no significant gaps. As stated above under Conformance/Compliance, the regulators and various authorities involved in aspects of public and infrastructural safety concur with this conclusion.

Plans are aligned with the identified risks and the emergency plans (internal and external) are developed and tested in full compliance with requirements. The extensive modelling of the consequences of the various identified failure modes for the dam yields a strong basis for the planning of emergency actions, including communication and evacuation needs.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *Safety risks have been avoided, minimised and mitigated; and safety issues have been addressed beyond those risks caused by the project itself.*

Safety risks have been avoided, minimised or mitigated with no identified gaps. SAE have participated in a review of the Rondônia road system and at a more detailed level also of the roads in and around Porto Velho. The study team for this study was hired and paid for by the project. In response to this study, several municipal roads were realigned and/or improved. The project has also hired a company to implement a CCTV system for public safety/security in Porto Velho. Campaigns on traffic safety have been conducted in Porto Velho, including the promotion of baby seats in cars (something that was previously very uncommon in the project area). Project staff also prepare bulletins on traffic safety and public safety. The project has provided equipment for the fire brigade and the environmental police.

Criteria met: Yes

5.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

5.3 Scoring Summary

This project is managed such that dam and other infrastructure-safety aspects of project implementation and operation will ensure that people, property and the environment are protected from the consequences of dam failure and other infrastructure safety risks.

Assessment is carried out in accordance with extensive regulation and supervised by several regulatory bodies, notably ANA and ANEEL. The design of permanent structures is based on the calculated 10 000-year flood, 84 000 m³/s, and the temporary structures, such as coffer dams on the 300-year flood, approximately 57 000 m³/s.

Management is done in accordance with procedures defined by the 2010 Law on dam safety and supervised by the designers and the owners’ engineer. Modelling is done of the consequences of the defined failure modes as different river discharges, resulting in flood maps and a well-developed emergency-response plan. Comprehensive communication procedures are in place.

The project is fully compliant and has no identified non-conformances. Safety risks have been avoided, minimised or mitigated with no identified gaps and the project has contributed to addressing public-safety issues beyond those risks caused by the project itself.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

5.4 Relevant Evidence

Interview:	6, 11, 68, 69, 71,
Document:	1 – 5, 7, 10, 13, 14, 151, 167, 168, 215, 222, 223, 256, 257, 259, 306, 385 – 389
Photo:	7 – 12, 169

6 Financial Viability (I-6)

This topic addresses project financial management, including funding of measures aimed at ensuring project sustainability, and the ability of the project to generate the required financial returns to meet project funding requirements. The intent is that the project is proceeding with a sound financial basis that covers all project funding requirements including social and environmental measures and commitments, financing for resettlement and livelihood enhancement, and delivery of project benefits to project-affected communities.

6.1 Background Information

The Santo Antônio project costs R\$ 19.5 billion, including R\$ 1.9 billion invested in sustainability. This includes the expansion of the project which costs approximately R\$ 3 billion.

The project is financed by Santo Antônio Energia's (SAE) equity (R\$ 6.5 billion), debt (R\$ 11.3 billion), and some revenue from early operation that is used for construction (R\$ 1.7 billion). Debt financing is provided by a consortium of banks, led by Brazil's National Economic and Social Development Bank (BNDES) and including Banco Santander, Banco do Brasil, Banco Bradesco, Unibanco and the Fund for the Northern Region (FNO, a federal constitutional fund managed by the Banco de Amazonia), through loans with terms of more than 20 years. In addition, SAE is raising R\$ 2.64 billion through the issuance of secured debentures. BNDES has indicated that it would fund 65% of the costs of the expansion, with the remainder to be raised from SAE's shareholders.

SAE is a special-purpose company established to develop and operate the Santo Antônio project. SAE is majority-owned (51%) by private sector companies. Its shareholders consist of Furnas (39%), Caixa FIP Amazônia Energia (20%), Odebrecht Energia (18.6%), SAAG – controlled by Andrade Gutierrez (12.4%) and Cemig (10%). Caixa FIP Amazônia Energia is an investment fund owned by Odebrecht Energia and Fundo de Investimento-Fundo de Garantia de Tempo de Serviço (FI-FGTS), a public fund based on employer contributions made on behalf of workers.

In accordance with its concession, SAE has entered into long-term (30 year) power sales agreements (CCEARs) with 37 utilities. These had an average sale price of R\$ 109.2/MWh in December 2013, are indexed to the Extended National Consumer Price Index (IPCA), and currently provide 64% of sales. In addition, SAE has entered into bilateral 15-year contracts (CCVEs) with Cemig and eight private-sector companies. These had an average price of R\$ 182.3/MWh in December 2013, and are also IPCA-indexed.

Much of the Santo Antônio project is now operational. Twenty-six generating units were fully commissioned at the time of this assessment (April 2014), and SAE expects 32 units to be commissioned by November 2015 and all 50 units by November 2016. In keeping with the concession agreement, the project includes two single-circuit 500 kV transmission lines, approximately 5 km in length, that link it with the Coletora substation in Porto Velho in the state of Rondônia. In turn the Coletora substation is linked with the Araraquara-2 substation in the state of São Paulo, and thereby the major load centres in south-eastern Brazil, through the recently commissioned 600 kV DC 2 385 km transmission link, the longest DC link in the world. The 600 kV transmission link is not part of this assessment.

6.2 Detailed Topic Evaluation

6.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment has been undertaken of project financial viability, including project costs and revenue streams, using recognised models and including risk assessment, scenario testing and sensitivity*

analyses; and monitoring of the financial situation during project implementation is being undertaken on a regular basis.

Odebrecht, Furnas and their consortium partners assessed the financial viability of the project in considerable detail prior to bidding in the reverse auction for the concession agreement on 10 December 2007. They assessed expected revenue from the sale of 70%, now 64%, of the project's generation through the regulated market, and took into account the expected terms and conditions of financing, based on BNDES's proposed involvement alongside the commercial banks.

Their financial advisor, Banco Santander, initially developed a financial model for the project in preparation for their auction bid, and SAE has adopted this model. On the cost side, the model includes capital and other expenditures; and on the revenue side, it includes energy sold into the regulated market as well as into the non-regulated market. A major focus of the model is cash flow (including earnings before interest, taxes, depreciation and amortisation –EBITDA), which takes into account inflation on revenues and costs, as well as the debt-service ratio (DSR). Other inputs to the model are: expenditures (including O&M and general and administrative costs); electricity sector charges including transmission system user tariffs (TUST); sales taxes; income taxes; and financing costs, including payments of principal and interest. The model can also calculate the internal rates of return to the shareholder and to the company.

The financial model is used to undertake risk assessments, scenario analysis and sensitivity analysis, including on revenues and capital expenditures, transmission costs, O&M, and inflation. SAE's Finance Department runs the model with updated information on a monthly basis to evaluate and monitor the financial viability of the project. SAE's Finance Department monitors the financial viability of the expansions, i.e. the Acre-Rondonia 230 kV interconnected system, and increasing the number of units from 44 to 50.

Price Waterhouse Coopers carry out independent quarterly and annual financial audits of SAE, including review of internal financial controls. SAE publishes its annual financial audits in two Brazilian newspapers. In addition, SAE's Report on Asset Controls, which is produced annually and submitted to ANEEL, is a further means of monitoring financial performance.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, project costs and revenue streams are fully detailed; and financial viability of the project has been analysed and optimised including extensive scenario testing, risk assessment and sensitivity analyses.*

The financial model as well as other accounting and contract instruments, described below under Management, are fully detailed and account for all project costs and revenue streams as well as all other relevant financial information. SAE regularly reviews the impacts of changes in project parameters, including project costs and revenues (e.g. the impact of plant shutdown due to the 2014 floods), on cash flow and return on investment.

In addition, SAE frequently tests the financial viability of the project by extensive scenario testing, risk assessment and sensitivity analysis. This is particularly relevant in the context of the planned expansion of the plant capacity from 3 150 MW to 3 568 MW. To frame this decision, SAE's Finance Department carried out a detailed sensitivity analysis of the expansion project. This analysis took into account variations in the amount of guaranteed average energy available for sale, electricity sale prices, TUST, and different blends of financing (debt, equity and debentures), and showed that the expansion project was robust under a wide combination of assumptions. Based on this analysis, SAE's Board approved the expansion project on 18 September 2013. In addition, financial risk assessment is informed by other risk assessment processes (described under 1-4 Integrated Project Management). This scenario testing does not explicitly include currency risk, but this risk is managed through the EPC contract (see Management below).

6.2.2 Management

Analysis against basic good practice

Scoring statement: *Measures are in place for financial management of project implementation; plans are in place for financial management of the future operating hydropower facility.*

The provisions of SAE's EPC contract with Consórcio Construtor Santo Antônio (CCSA) are fundamental measures for the financial management of implementation. The SAE consortium partners negotiated a fixed-price turnkey contract for on-site construction, including all civil and electro-mechanical works, with the CCSA consortium prior to the auction, and signed the EPC contract immediately after winning the auction. Payments under this contract are adjusted for inflation in accordance mainly with IGP-M, and it includes a composite formula for adjusting the price of imported electro-mechanical equipment that takes into account price movements in copper and aluminium on the London Metal Exchange.

SAE's Finance Department is responsible for the ongoing financial management of the Santo Antônio project, including its various funding sources, cost categories and funding streams, as well as the transition from implementation into operation, including for the expansion. The department bases its activities on its annually-updated rolling 5-year business plan, which is approved by management and shareholders, and is publicly disclosed. Financial ethics form part of SAE's Code of Conduct (see I-2 Governance).

The Finance Department has put in place a system to record and control the transactional processes of the company. The system is based on the Oracle E-Business platform, covering areas such as accounts receivable, accounts payable, and purchase orders. This platform is integrated with discrete systems linking the Plant Operating System (using the Sigo/Informa software), Personnel Management (using the SENIOR software), Financial Operations and Budgetary Control (using the GESPLAN software), Fixed Assets System (using the NSS software), the Commercial System (using the GENE software), and Tax Obligations (using the MASTERSAF and SYNCHRO softwares). Both the MASTERSAF and GESPLAN software are adapted for Brazil. The Finance Department plans to keep this transactional system in place, including the Oracle E-Business and GESPLAN platforms, during the operation of the project. Financial audits by Price Waterhouse Coopers include the review of internal controls.

These measures are reinforced by project monitoring by the banks. I-4 sets out the project reporting/monitoring system used by BNDES, which also interacts frequently with SAE's Finance Department on the project's financial management and performance.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, financial management plans provide for well-considered contingency measures for all environmental and social mitigation plans and commitments; and processes are in place to anticipate and respond to emerging risks and opportunities.*

Owing to the project's advanced stage of completion, the risks of project cost overruns, including those arising from environmental and social mitigation, are low. During the course of project preparation, SAE designed a number of contingency measures for environmental and social mitigation plans and commitments. These included: a 10% contingency for environmental and social costs in the original budget; BNDES's restriction on the payment of dividends and/or interest to SAE's shareholders, which provides a buffer to cover unexpected cost increases such as costs of environmental and social commitments; and reserve accounts on loans and the issuance of debentures.

Extensive processes are in place in the project to anticipate and respond to emerging risks, including: entering into appropriate insurance policies to mitigate risks during project construction and operation; negotiating long-term sales contracts in the competitive and bilateral markets; and a mechanism to share hydrological risk.

The project has a comprehensive insurance portfolio covering risk during project construction and operation. This includes: risk coverage relating to the performance bond; engineering; national and international shipment; third-party risks; maintenance guarantees; and advance loss of profits. Liability risk is included in the EPC contract, and the EPC contractor has its own insurance. The banks check all changes to insurance on a quarterly basis. The insurance team follows construction to check that all is in keeping with insurance stipulations.

Sales contracts are used to manage revenue risks by: sales to a large diversity of off-takers, limiting off-taker risk; requiring the off-taker to set up an escrow account corresponding to two months of purchases; and regulatory penalties imposed on delinquent off-takers, which may exclude their participation in future energy auctions as well as converting their energy purchases into senior debt. In relation to the bilateral contracts, BNDES requires that a risk analysis is undertaken of every potential off-taker and that they approve every contract and SAE requires that a Letter of Guarantee, equivalent to two months of sales, is issued by each off-taker. In a further example, BNDES has set a condition on its next loan disbursement that SAE enter into long-term contracts relating to the sale of the additional power generated by the project expansion. In addition, hydrological risks in these sale contracts are mitigated by regulation establishing a Mechanism of Energy Reallocation.

The project has been adept in responding to and anticipating emerging opportunities. Good examples of how their sound finance allows them to respond to unanticipated events are: the response with financial assistance to people affected by the recent flooding; and the decision to link the Coletora substation in Porto Velho to manage the transfer of electricity generated by the earlier-than-planned commissioning of the first 4 project units. The latter was developed to advance the project revenue stream, and brought additional benefits of reducing the use of diesel-fuelled thermal generation, contributing to downward electricity tariff adjustments, increasing the reliability of electricity supply and reducing emissions.

Criteria met: Yes

6.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to financial management have been and are on track to be met with no major non-compliances or non-conformances, and funding commitments have been or are on track to be met.*

As described above, the financial viability of the project is regularly evaluated in terms of updated information on costs and revenues. Owing to sound financial management measures, cost increases have been relatively small - 7% in real terms - and revenue generation began 9 months ahead of schedule.

There are no non-conformances. Funding commitments, under the leadership of BNDES and with the support of the commercial banks, have been met. Other projected-funding requirements are on track to be met through the issuance of secured debentures.

There is no evidence of legal non-compliances in financial management. The development of the project is in line with the policies of the Federal Government of Brazil, including the promotion of private sector investment in hydropower, and the provision by the Government of attractive finance.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

There are no non-conformances or non-compliances.

Criteria met: Yes

6.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *The project or the corporate entity to which it belongs can manage financial issues under a range of scenarios, can service its debt, and can pay for all plans and commitments including social and environmental.*

The project and SAE have proven that they are able to manage financial issues under a range of scenarios, service their debt, and pay for all plans and commitments including social and environmental. SAE, its shareholders, BNDES and the private sector lenders, and members of the EPC consortium are financially strong institutions, operating in a well-understood legal and financial environment. BNDES's involvement in the project lowers the cost of debt, including private-sector debt. In the long term, BNDES's involvement will be reduced, and that of the private sector lenders will increase.

With over 80% of the project completed, the certainty of the final cost of project implementation is growing and financial risks are lessening. While the total estimated cost has increased from R\$ 12 billion (2007 R\$) to R\$ 19.5 billion (2014 R\$), this is an increase of only 7% in real terms when the cost increase related to the expansion is taken into account. Based on its initial configuration of 3 150.4 MW, the project's specific capacity cost is R\$ 5 079/kW or US\$ 2 256/kW), which is in line with Brazilian experience and low compared to international experience. In addition, financial projections indicate that the DSR is expected to average 1.37 over the next 10 years, compared with BNDES's minimum requirement of 1.2, or 1.30 after 2024.

The financial model can demonstrate the project's financial sustainability, including debt service and operational costs as well as planned and unplanned social and environmental expenditures. Environmental and social measures are the main areas of overspend (e. g. land acquisition and clearance of the reservoir area of vegetation), but have been and can be expected to be met through the measures set out above.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *The project can manage financial issues under a broad range of scenarios.*

The project has the capacity to manage financial issues under a large range of scenarios. The first semester of 2014 was a challenging time for revenue generation because of the need to modify reservoir operating levels to manage the 2014 floods, and therefore shut down project generation. This illustrates the project's ability to manage financial issues under a broad range of scenarios. The project is scheduled to resume full operation in mid-May 2014.

Scenarios under which the project might not be able to meet its debt service and operational costs are highly unlikely. Reinforcing this conclusion are good relations between SAE and the EPC consortium, which accounts for about 84% of the uses of project funds. In addition, the hiring of large numbers of people from Porto Velho was a major factor in reducing the size and risks of work-camp disturbances and thereby the risks of project delays and their resulting impacts on project costs.

Criteria met: Yes

6.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

6.3 Scoring Summary

When completed, the Santo Antônio project will be the fourth-largest assured-energy supplier in Brazil. The project is well-funded and well-managed. It is well-placed to contain costs and, with its assured revenues, will be very likely to meet its debt service, operational costs and other obligations, including taxes and royalties. A significant margin of security remains to cover any contingencies that may arise in the final stages of construction and into the operation stage, including unexpected additional expenditures under the PBA programmes. This includes the expansion of the project from 3 150 MW to 3 568 MW. The project is in line to meet all of its financial obligations. The margin of security is also bolstered by a sophisticated approach to risk management, including appropriate insurance policies during project construction and operation, negotiating long-term sales contracts in the competitive and bilateral markets, and mitigating operational and hydrological risks.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

6.4 Relevant Evidence

Interview:	8, 9, 26, 39, 54, 86, 87
Document:	61, 62, 131, 138, 155-159, 161, 163, 246-249, 251, 252, 255, 374, 402, 403
Photo:	None

7 Project Benefits (I-7)

This topic addresses the additional benefits that can arise from a hydropower project, and the sharing of benefits beyond one-time compensation payments or resettlement support for project-affected communities. The intent is that opportunities for additional benefits and benefit sharing are evaluated and implemented, in dialogue with affected communities, so that benefits are delivered to communities affected by the project.

7.1 Background Information

This topic primarily addresses additional benefits generated by the project beyond mitigation and compensation of direct project impacts, as well as specific benefit-sharing strategies for affected communities.

The scope of this topic includes: support for local businesses and suppliers; job opportunities and qualified training for unemployed local people; payment of royalties to be invested in the affected area as a benefit-sharing mechanism; investments on research and development (R&D) projects with potential benefits for affected communities; and voluntary programmes and development initiatives implemented by SAE in the project influence area.

Project contributions addressing project-affected communities, labour and resettled communities beyond the impacts caused by the project are also addressed under topics I-9, Project-affected Communities and Livelihoods, I-10, Resettlement and I-12, Labour and Working Conditions, respectively. Employment as a compensation measure is also addressed under topic I-9 and I-12. Biodiversity compensation and offsets beyond direct mitigation of project impacts are addressed in topic I-15, Biodiversity and Invasive Species.

7.2 Detailed Topic Evaluation

7.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Opportunities to increase the development contribution of the project through additional benefits and/or benefit sharing have been assessed. In the case that commitments to additional benefits or benefit sharing have been made, monitoring is being undertaken on delivery of these commitments.*

Opportunities to increase the development contribution of the project have been assessed in a variety of ways, which are described below with its relevant commitments and monitoring arrangements.

Under the requirements of the laws 8.001/1990 and 9.984/2000, ANEEL requires SAE to pay annual royalties. Royalties are calculated with a formula prescribed by law (6.75% of the Energy Generated Updated Reference Rate which is set annually). Out of this 6.75%, 6% is distributed according to this formula: 45% is paid to the state of Rondônia, 45% to the municipality of Porto Velho, 3% to the Ministry of Environment, 3% to the Ministry of Mines and Energy (MME) and 4% to the National Fund for Scientific and Technological Development (FNDCT). The remaining 0.75% of the total 6.75% levied go to the implementation of the National Water Resources Policy and the National System for Water Resources Management regulated by ANA, the National Water Agency. In 2012, SAE paid about R\$ 4 million in royalties and R\$ 17 million in 2013. The state and local governments will be responsible to invest the incoming revenue in actions to benefit the population and that is outside the scope of the project; however, SAE contracted MB Associados in 2010 to prepare a study on possible development options for the state of Rondônia to facilitate investment routes for royalties. The study identifies three key areas for development: agribusinesses, including production of corn, soya, and milk, aquaculture, and reactivation of cocoa and rubber production; strengthening of the municipality of Porto Velho in order to create a logistics,

technology and training hub that can influence other states like Mato Grosso, and Acre a; and enhance sanitation in urban areas. The payment of royalties is monitored by the project and ANEEL on a monthly basis.

The project has signed an agreement with the municipality of Porto Velho and the Rondônia government to provide support and capacity for infrastructure-services developments that has elements that go beyond compensation. The assessment stipulated that areas needing investment are: public health; education; urban infra-structure; and leisure and culture, as indicated in the Programmes for Social Compensation and the Support to Porto Velho Municipality and Public Health. These programmes are monitored by project staff, and semi-annual progress reports are sent to IBAMA and JGP/Exponent.

The EIA identified the need for skilled and unskilled labour during the construction period. SAE, as required by the PBA, monitors population and migration monthly (through a company called Praxis) and reports semi-annually to IBAMA; and prepares quarterly monitoring reports on training activities, and the hiring of local labour in various economic sectors in the municipality of Porto Velho (see topic I-9, Project-affected Communities).

SAE prepared a proposal with potential voluntary projects after consultation with key stakeholders for BNDES for approval. BNDES monitors the delivery of ongoing programmes and visit the sites, and SAE reports every 3 months to BNDES.

Under the requirements of the law 9.991/2000, the project is required to invest 1% of its net operating income in research and development projects regulated by ANEEL. 40% (of the 1%) will go to the National Scientific and Technological Development Fund (FNDCT), 20% to the MME and 40% is invested by SAE in R&D projects compliant with ANEEL's criteria. SAE's R&D committee prepared a strategy which sets out the objectives for the selection of R&D projects, which include watershed management and reservoirs, environment, security and planning, operation, monitoring, control and protection of electric-power systems.

There is also a number of voluntary projects sponsored by SAE through their institutional relations unit. Communities can propose ideas for sponsorship in the areas of local culture (e.g. festivals), health (e.g. support for a cancer hospital), education (e.g. aquaculture training) and community leisure (e.g. cinema, sports).

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment of delivery of project benefits takes into consideration both risks and opportunities.*

The different ways of assessing the benefits described above have considered risks and opportunities. The MB study was prepared to provide support to local and state governments in their regional planning, to minimise the risks of investing royalties in non-priority activities and to enhance existing market opportunities in the state of Rondônia, building on successfully implemented initiatives from other states of Brazil, such as Espírito Santo. The expansion project, if approved, would provide an increased amount of royalties. The definition of preferences for hiring local workers and the skills training aimed at minimising the risks of migration, reduced the capacity needs for the camps, reduced existing unemployment and sustainably contributes to an educational legacy in local markets, with the potential to attract future investments and businesses growth. Decisions on investment in R&D or sponsorship projects look at the alignment of potential projects with project strategies and the benefits they could bring.

BNDES funds are allocated only after an assessment of opportunities, to ensure that the projects contribute to regional development and create new skills and opportunities for affected people also in the indirectly-affected areas (e.g. Candeias do Jamari). R&D initiatives can address potential risks associated with, e.g. a decrease in the fish stock, and knowledge gained could be used for future local aquaculture projects.

Criteria met: Yes

7.2.2 Management

Analysis against basic good practice

Scoring statement: *Measures are in place to deliver commitments by the project to additional benefits or benefit sharing; and commitments to project benefits are publicly disclosed.*

Measures in place to deliver commitments to project benefits are described below.

Monthly payment and control of royalties as described in the Assessment section above; commitments on royalties are publicly disclosed in the media and on SAE's website.

The agreements with the municipality and state governments (Protocolo de Intenções) which involve 13 projects on social compensation (e.g. building of new schools), 10 projects for supporting the municipality (e.g. construction of an administrative centre), and 15 projects on public health compensation. The projects have some elements that provide support beyond compensation of capacity needs caused by the project. There are specific signed documents for the completion of the works indicating that responsibilities for maintenance and operation of new-built facilities are the responsibility of the local and state governments. IBAMA and JGP/Exponent oversee the implementation of the social compensation programmes and the commitments are included in the PBA and publicly disclosed.

The project aimed at hiring 70% of the workers from the state of Rondônia to reduce local unemployment and minimise the risks of migration influx. The main vehicle for accomplishing this has been the implementation of the ambitious "Acreditar" training programme (see also topic I-12), but also the training of local suppliers. All this training, well beyond the direct hiring and supply needs of the project, will leave a legacy of skills enhancement in the region. The Acreditar programme has trained 45 271 people and a further 636 people have been trained through partnerships with other well-known and recognised technical training institutions including the National Industrial Apprenticeship Service (SENAI), National Rural Education Service (SENAR), National Commercial Education Service (SENAC) and the Brazilian Navy. Courses provided through SENAI include a programme to deliver training for children from families working at the project and specific training for approximately 1 000 women on tasks that are commonly viewed as male jobs. IBAMA and JGP/Exponent oversee the implementation of the PBA measures, and the commitments are parts of the PBA, and publicly disclosed. In addition to the above, there is also the "Acreditar Junior" programme, providing training for children of project workers.

BNDES provides additional funds for projects with above R\$ 100 million funding, to be invested in voluntary projects. In the case of the Santo Antônio project, R\$ 50 million are available for SAE to invest in projects related to socio-economic development and infrastructure in the direct- and indirect-influence areas. SAE used BNDES' voluntary funds to implement 33 projects on agricultural subsistence and economic development support for the local and state governments, all of which fit within BNDES' strategy for development. Commitments for the investment of approved funds are publicly disclosed in the media.

The project's strategy for R&D investments framed the approval of the 3 R&D projects currently ongoing; one to research reproduction of fish from the Madeira river; one to create an operations simulator and the third to create a system of safety-related alarms for the plant, see also topic I-5. Commitments on R&D are publicly disclosed on the SAE's website. Verbal evidence indicates that there are plans to disclose results through a workshop with communities in June. Projects may provide indirect benefits for affected people, for example through improved safety systems and better knowledge of fish in the Madeira River for aquaculture projects.

Sixty-three projects have been sponsored through the corporate-communication activities; members of the community can apply through the SAE website and SAE holds internal meetings every 3 months to review applications and grant sponsorships. The selection process is publicly disclosed on the website and projects are also disclosed (e.g. via press releases).

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Processes that are in place to anticipate and respond to emerging risks and opportunities include periodic monitoring on progress by IBAMA and JGP/Exponent on PBA activities and reporting; BNDES monitoring on voluntary programmes; and SAE's assessment and periodic committee meetings to assign funds to voluntary programmes and R&D projects. There is a scope for flexibility in the institutional agreements, for example, the project initially allocated funds for an emergency unit in Jaci-Paraná; after which SAE was informed that the state Government was planning to invest directly in the same emergency unit with its own funds, and consequently the project re-directed its funds to create new emergency units in Porto Velho instead.

Monitoring of the workforce and employment in the region and the programme for the demobilisation of the workforce identify regional trends and risks that could influence the economic development of the state, and options for workers that are no longer working for the project. Results indicate that the economy has grown in the period 2010-2012 and that Porto Velho is becoming an important centre for trade and services in the southwest Amazon region, with the assistance of support activities to the local and state government. The promotion of local businesses has had some considerable success, for example Indústria Metalúrgica e Mecânica da Amazônia Ltda (IMMA), the Porto Velho-based business started jointly by Alstom and Bardella (encouraged by SAE and ESBR) in order to secure their supply of hydro-mechanical equipment, now delivers key hydro-mechanical equipment to a hydropower project in Panama.

There are always expectations for additional investments which may create a risk of dependency on private funds but the royalty fees paid can be used to address any emerging social risks and opportunities; for example, the state will have to spend about R\$ 5 million to recover the damages caused by the floods. Assessors evidenced that hospitals and schools that formed part of the institutional agreements have been delivered, handed-over to the authorities and seem well-maintained; however despite ongoing communications with the government, evidence indicates that the State has been not yet taken actions in response to the MB study recommendations. The state and the municipality monitor expenditures of their actions and programmes and there is a "Transparency Portal" that discloses this kind of information. It is not clear to the assessors how royalties have been spent to date beyond maintenance of additional infrastructure provided as social compensation, in particular at municipal level. There is pre-floods evidence of the lack of maintenance of public spaces, such as the Estrada de Ferro Madeira-Mamore Railway, a cultural community centre in Santo Antônio village, or poor municipal waste-collection services. This is a risk that needs to be carefully managed by the authorities, since it could compromise the delivery of benefits for the community if the municipality does not spend additional resources strategically. Given the generally successful delivery of benefits, this is considered a non-significant gap.

Criteria met: Yes

7.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to project benefits have been and are on track to be met with no major non-compliances or non-conformances, and any additional benefits or benefit sharing commitments have been or are on track to be met.*

There are no identified non-compliances in relation to the payment of royalties or payments for R&D projects; fulfilling the commitments set out in the institutional agreements; meeting the objectives of the PBA programmes, e.g. training and employment generation, social compensation and institutional support; or in the implementation of voluntary projects funded by BNDES. Interviews with IBAMA and BNDES, and the latest bi-

annual reports from JGP/Exponent indicate that all commitments are on track to be met. There are no identified non-conformances in relation to the implementation of SAE-sponsored projects.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

Assessors did not find any evidence of non-conformances or non-compliances in relation to the delivery of commitments on project benefits.

Criteria met: Yes

7.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Communities directly affected by the development of the hydropower project have received or are on track to receive benefits.*

Directly affected communities have already received, and will continue to receive, a variety of additional benefits, which go beyond compensation of impacts from the project. Communities and institutions are involved in the planning of commitments for additional benefits; for example agreements with the local and state governments, consultations with stakeholders during the preparation of the BNDES proposal for voluntary projects and funding of projects proposed by the community which have later been implemented.

Examples of additional benefits delivered to date include: Provision of training for local community members and suppliers (outside of Acreditar); it is estimated that 4 690 professionals were trained in 16 key roles required by the project. In addition, 5 000 people received training including teachers, police officers, professionals in tourism activities, farmers and households in areas directly or indirectly affected, and employees and family members of small companies producing goods or services demanded by firms responsible for implementing the project. In total, 13 720 people have been qualified to work in the construction of the plant and later will be able to move on to other projects and specific activities; qualification of an average of 300 suppliers per year. The project provided technical assistance to producers and service providers based in Porto Velho and rural areas operating in sectors of project demands (e.g. horticultural products, tourism and leisure, maintenance and repair of vehicles and household appliances). The project also assisted businesses to improve their profitability. Although these actions are part of the social compensation programme, in the long term they will contribute to the development of the region; community projects and additional actions above the requirements of the PBA programmes (a total of R\$ 11 150 709) for example aquaculture projects in Porto Velho and Jaci-Paraná; the BNDES funds of R\$ 50 million have been invested in projects such as the refurbishment of Antonio Ferreira, Pingo de Gente and São Miguel schools; provision of surgery units at a general hospital in Porto Velho; and employment and small businesses (e.g. aquaculture) in the direct and indirect influence area; SAE has sponsored 63 community projects with values from R\$ 4 000 to R\$ 1 million each; events and campaigns in Porto Velho and resettlement areas (a total of R\$ 3 483 365); and provision of enough public infrastructure to cover pre-project shortfalls and meet project demand; and in some cases exceed the expected demand from public infrastructural capacity. For example, the expansion of the general Hospital and children's hospital in Porto Velho, the hospital in Cacoau, and the Osvaldo clinic (by ESBR), has doubled the number of beds available in Rondônia as compared to pre-project conditions. These facilities are used by people from Rondônia, Acre, Amazonas and even Bolivia.

SAE estimates that over R\$ 100 million will be paid annually as royalties to the state, local and federal governments by 2017.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: In addition, benefits are significant and the project has delivered or is on track to deliver significant and sustained benefits for communities affected by the project.

Skills training provide an opportunity for unemployed and unskilled labour to find other jobs in the region and contribute to the local and regional development plans.

The royalties paid are quite high by international comparison, and will provide a sustained income for the municipality and the state government. Infrastructure delivered to date is well-maintained and if funds are invested in strategic priorities can bring significant and sustained benefits for communities affected by the project.

Representatives of affected communities interviewed consider the reduction of malaria risks, employment generation and new public infrastructure to be the key project benefits.

Criteria met: Yes

7.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

7.3 Scoring Summary

The project contributes to benefit-sharing strategies driven by legal requirements to recurrently pay royalties to the local, state and federal governments that will be invested in infrastructure and projects for affected communities. It is estimated that over R\$ 100 million will be paid annually as royalties by 2017. The project is also required to pay ANEEL 1% of project net operating income for R&D projects, of which 40% is invested in SAE R&D projects, e.g. researching fish reproduction. BNDES has secured R\$ 50 million to invest on voluntary projects for socio-economic development in the project's area of influence. SAE has sponsored 63 community projects to date, with values ranging from R\$ 4 000 to R\$ 1 million each.

Benefits provided by the PBA programmes beyond compensation include support for local businesses and suppliers; job opportunities and training for unemployed local people; and provision of enough public infrastructure to cover pre-project shortfalls and in some cases significantly exceed the project demand. These actions, will sustainably contribute to enhancing the technical skills and capacity in the region.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

7.4 Relevant Evidence

Interview:	1-3, 26, 42, 44, 83-84,
Document:	18-20, 22-25, 48, 119, 133-134, 137, 213-214, 236-237, 257, 289-290, 308-313, 394-397
Photo:	13 - 17

8 Procurement (I-8)

This topic addresses all project-related procurement including works, goods and services. The intent is that procurement processes are equitable, transparent and accountable; support achievement of project timeline, quality and budgetary milestones; support developer and contractor environmental, social and ethical performance; and promote opportunities for local industries.

8.1 Background Information

The Santo Antônio project has required the procurement of over 500 contracts for works, good and services. The following findings are provided in relation to three areas of procurement for the project: the formation of the CCSA (Consórcio Construtor Santo Antônio) consortium and the procurement of this consortium by SAE; the procurement by individual companies/consortia within the CCSA consortium, in particular procurement by CSAC (Consórcio Santo Antônio Civil) for the civil works component; and the procurement by SAE for all other necessary ongoing goods and services activities, including PBA programmes.

CCSA is formed of CSAC (which is providing civil works), Odebrecht (electro-mechanical installation), and GICOM (electro-mechanical equipment supply). CSAC is a consortium of Odebrecht (leader) and Andrade Guterrez, and GICOM is a consortium consisting of Alstom, Voith, Andritz, Siemens, Bardella and Alstom grid. For full details, please refer to I-4.

A key part of procurement concerned the development and supply of 50 bulb turbines. The project's major needs for the supply of materials are for fuel, steel, cement, and personal protection equipment (PPE). CSAC's 22 largest contracts total R\$ 1.5 billion in value, out of R\$ 2.8 billion of expenditure since 2008.

Rondônia State does not have a large number of companies capable of delivering the project's requirements, on the scale or technical standard required. In addition, there are competing demands from concurrent large civil infrastructure projects in Brazil, not least the neighbouring Jirau project.

8.2 Detailed Topic Evaluation

8.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Major supply needs, supply sources, relevant legislation and guidelines, supply chain risks and corruption risks have been identified through an assessment process; ongoing monitoring is being undertaken to monitor effectiveness of procurement plans and processes.*

SAE's Procurement Department was formed in 2009 to assess, manage and monitor all of SAE's procurement activities other than the EPC contract. This department has assessed procurement needs and relevant legislation, resulting in a range of measures for procurement management, including the management of supply chain and corruption risks, as described under Management below.

Major supply needs and sources were initially assessed by the companies forming the CCSA consortium and SAE, prior to SAE being awarded the concession. These companies and SAE negotiated the structure and terms of the consortium for approximately 5 years, during which they agreed a pre-concession agreement with Madeira Energy (the precursor to SAE, and now the holding company owning all of SAE's stock, see topic I-2). This was followed by the signing of the consortium agreement and EPC contracts immediately upon the award of the concession. Further details are provided in topic I-4.

Companies within the consortium continuously assess and update their procurement requirements, applying the procurement processes described under Management to assess relevant legislation and supply chain risks, and to manage corruption risk. For example, CSAC carry out monthly checks on the conformance of their contractors with contractual requirements, and assess their performance every 4 months, summarising performance using a 0-5 scoring system for a range of indicators. These indicators concern non-conformities, quality, occupational health, and environmental management.

SAE, and their shareholders and financiers, continue to monitor the effectiveness of the EPC contract, including through the use of owner's and lender's engineers, financial audits and auditing of adherence to the Equator Principles. Full details of this are provided in topics I-3, I-4, and I-6. SAE's Engineering Department has responsibility for monitoring the EPC contract.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment includes opportunities for local suppliers and local capacity development.*

SAE Procurement Department and CCSA, in particular CSAC, continuously assess opportunities for local suppliers and local capacity development. When issuing a request for proposals (RFP), SAE checks whether the services can be procured locally, and they aim to include at least one local supplier in the shortlist on every tender procedure. CSAC will only procure from outside of the state of Rondônia when it is not possible to find a local supplier (applying a policy of "Porto Velho first, Rondônia second, outside Rondônia third"). In addition, the project's Acreditar programme provides training to local people to enable them to take up employment on the project, enhancing opportunities for local suppliers. Full details on Acreditar are provided under topics I-7 and I-12.

Criteria met: Yes

8.2.2 Management

Analysis against basic good practice

Scoring statement: *Measures are in place to guide procurement of project goods, works and services and address identified issues or risks, and to meet procurement related commitments.*

The EPC contract and the underlying CCSA consortium agreement provide the project's most important measure for guiding procurement. This accounts for over 80% of project costs. Negotiating and achieving the formation of the consortium, with the inclusion of the equipment providers was a critical step, especially for the provision of the 50 very large bulb turbines.

Within the consortium, procurement processes are well-defined. For example, CSAC applies a procurement programme requiring the receipt of quotes from 3 different providers, and defined criteria for selection (commercial evaluation, tax compliance, and the requirement for need/support from CSAC). CSAC uses standard contract templates that include provisions on occupational health and safety, worker-public interactions, environmental management, applicable legal requirements, and quality management. In addition, CSAC applies a preference for ISO-certified suppliers.

SAE's Procurement Department focuses on the procurement of services other than that provided by the EPC contractor. For example, this would include consultancy services for the PBA programmes. Its responsibilities are therefore focused mainly on the procurement of services, as the procurement of engineering works fall under the EPC contract. The procurement department applies the use of technical specifications, RFPs, and supervision by SAE's technical departments through its procurement processes. They are developing a Procurement Manual which will incorporate these measures and applicable legal requirements. SAE applies internal policies on

procurement (including standards IN-DP-001-10 on the contracting of contractors and services, and IN-DP-009-09 on limits of responsibility) that govern procurement, for example requiring at least three quotes for each purchase, placing limits on the amount of expenditure that may be authorised by different levels of director, and requiring the authority of three directors above a certain level.

SAE also apply an internal procedure Manual de Saúde e Segurança do Trabalho e Meio Ambiente (procedure for worker health and safety and environmental management), which sets out the responsibilities that they require their contractors to meet. The RFP document and minutes of agreement (prior to contract) include boiler plate clauses on environmental management.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; sustainability and anti-corruption criteria are specified in the pre-qualification screening; and anti-corruption measures are strongly emphasised in procurement planning processes.*

The management procedures described above (and the detailed procedures for project management set out under I-4) provide processes to anticipate and respond to emerging risks and opportunities. For example, CSAC's monitoring of its contractors through their monthly checks tracks their productivity and quality and leads to their dismissal if they fail to meet the contracted standard. Processes to respond to emerging opportunities include CSAC's and SAE's work with potential local suppliers to improve their capacity to bid successfully (for example by providing a training programme on tax procedures, or providing training on how to make tender documentation compliant with procurement rules). CSAC's close working relationship with some contractors has led to their moving their sites of production into Rondônia, in order to meet the dual objectives of reducing transport risk and providing local employment.

SAE's pre-qualification system consists of the registration of potential suppliers as follows: a potential supplier is asked to complete a form providing details on the company; the Procurement Department then checks the form and screens the supplier for critical issues, for example their indebtedness/solvency; the Procurement Department registers the supplier on SAE's intranet if approved. The form includes some information on environmental, health and safety management. SAE may check some specific environmental or safety requirements following registration, for example on whether electricians have the required levels of technical, including safety, training. However, it is not clear how sustainability considerations are considered during the registration process, for example it is not clear whether the absence of sufficient environmental or health and safety management would preclude their registration. In addition, there is no evidence that CCSA consortium members or CSAC apply pre-qualification.

SAE apply an employee Code of Conduct which includes items on financial ethics, and plan to extend access to this code to contractors, and adopt a supplier Code of Conduct that was recently developed by Odebrecht. However, anti-corruption criteria are not specified in pre-qualification screening (the registration process) and overall anti-corruption measures are not strongly emphasised in procurement planning by either SAE or CCSA/CSAC, meaning that corruption risks amongst suppliers and through the supply chain are not managed in a satisfactory manner. Combined with insufficient specification of sustainability criteria in prequalification, this is a **significant gap** against proven best practice.

Criteria met: No

8.2.3 Conformance/Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to procurement have been and are on track to be met with no major non-compliances or non-conformances, and any procurement related commitments have been or are on track to be met.*

Processes and objectives relating to procurement and procurement-related commitments are on track, including adherence to CSAC and SAE contract evaluation processes, and delivering on commitments to build and use local capacity. CCSA is delivering its commitments in the EPC contract, training for local suppliers is being provided to enable a significant proportion of procurement to be locally procured, and the Acreditar programme has facilitated a high level of local employment. There are no major non-conformances or non-compliances identified.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

No non-conformances or non-compliances were identified in this assessment.

Criteria met: Yes

8.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Procurement of works, goods and services across major project components is equitable, efficient, transparent, accountable, ethical and timely, and contracts are progressing or have been concluded within budget or that changes on contracts are clearly justifiable.*

Procurement of the EPC contract has met these requirements through a fair and transparent process for the concession award which met legal requirements, and which SAE won with clear description of its proposed EPC contractor. This accounts for all major project components, and provided for a very efficient approach to procurement, avoiding the need for subsequent bidding for separate components. The EPC contract is progressing within budget (but note that it is index-linked). Further details are provided on topic I-4.

In addition, these requirements are met by procurement processes which follow competitive bidding procedures applied by CCSA and SAE, in keeping with the company policies and procedures, as described above.

Major changes, for example requiring the procurement of works to construct the additional 230 kV transmission line, and equipment and works that will be required for the expansion of the project, are fully justifiable.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, opportunities for local suppliers including initiatives for local capacity development have been delivered or are on track to be delivered.*

Santo Antônio has delivered considerable benefits to local development by extending opportunities for local suppliers, and actively supporting their capacity to supply the project. Examples include: the project's main cement provider, following discussions with CSAC and SAE, built a cement plant within Porto Velho municipality; and local suppliers have been provided with company sites within the Santo Antônio work site. An outstanding example is the development and coaching, jointly with the Jirau project, of Bardella, a Porto-Velho based company, used for supplying hydro-mechanical equipment to both projects, and which is now exporting its

products internationally. Supplies of food to the site canteen are referred to as a particular success: moving from 80% of supplies being sourced from outside of Rondônia at the start of construction, to 90% from within Rondônia today. In addition, Santo Antônio has ensured that a large proportion of employees are from Porto Velho and Rondônia.

Criteria met: Yes

8.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

Sustainability criteria are not sufficiently specific in pre-qualification, and anti-corruption criteria are not specified in pre-qualification screening or considered in procurement planning.

1 significant gap

8.3 Scoring Summary

Major supply needs and sources were initially assessed by the companies forming the CCSA consortium and SAE, prior to SAE being awarded the concession, and continue to be assessed by CSAC (the civil works contractor) and SAE's Procurement Department. SAE and CSAC continuously assess opportunities for local suppliers and local capacity development.

The EPC contract and the underlying CCSA consortium agreement provide the project's most important measure for guiding procurement. In addition, CSAC and SAE's Procurement Department apply a number of procurement standards and approaches. Procurement is proceeding through fair and transparent processes and major contracts are delivered on time and within budget. The project has delivered considerable benefits to local development by extending opportunities for local suppliers, and actively supporting their capacity to supply the project.

However it is not clear how sustainability considerations are considered during SAE's prequalification procedures, and there is no evidence that CCSA consortium members or CSAC apply pre-qualification. Anti-corruption criteria are not specified in pre-qualification screening and overall anti-corruption measures are not strongly emphasised in procurement planning by either SAE or CCSA/CSAC.

There is one significant gap against proven best practice, resulting in a score of 4.

Topic Score: 4

8.4 Relevant Evidence

Interview:	15, 26, 30, 68, 69, 71, 99
Document:	38, 127, 138, 226, 227, 232, 233, 314, 399-401
Photo:	None

9 Project-Affected Communities and Livelihoods

(I-9)

This topic addresses impacts of the project on project-affected communities, in relation to economic displacement, impacts on livelihoods and living standards, and impacts to rights, risks and opportunities of those affected by the project. The intent is that livelihoods and living standards impacted by the project are improved relative to pre-project conditions for project-affected communities with the aim of self-sufficiency in the long-term, and that commitments to project-affected communities are fully delivered.

Topics I-10 'Resettlement' and I-11 'Indigenous Peoples' that follow, specifically address two sub-sets of project-affected communities.

9.1 Background Information

Groups of communities affected by the project addressed under this topic include: landowners affected by land acquisition non-physically displaced (assessed as 1 878 households); and their workers or renters; miners (formal or informal) operating in the area of influence of the project; fisherpeople and other users of the river (e.g. transportation or leisure); communities affected directly or indirectly by project activities (e.g. businesses and residents in Porto Velho, Santo Antônio village, Vila Franciscana, Joana D'Arc and Jaci-Paraná); communities downstream of Porto Velho (including Cujubim, 36 km downstream; São Carlos, 86 km; Nazare 112 km; and Calama 174 km; approximately 2 600 families in total).

The Brazilian Institute of Geography and Statistics (IBGE) reported that the population of Rondônia (1.7 million) has increased by 140 000 inhabitants from 2012 to 2013, becoming the 3rd most populated state in the Northern region. Porto Velho is the capital of the Rondônia state with around 484 000 inhabitants and it was founded around 1907, during the construction of the Madeira-Mamoré railway; main economic activities include farming, timber extraction, fishing, mining, and tourism.

Additional benefits provided to project-affected communities beyond compensation are addressed further in topic I-7, Project Benefits. Topics I-10 and I-11 address issues in relation to two sub-sets of project-affected communities: physically relocated people and indigenous peoples; so these are not addressed in this topic.

9.2 Detailed Topic Evaluation

9.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Issues relating to project-affected communities have been identified through an assessment process utilising local knowledge; and monitoring of project impacts and effectiveness of management measures is being undertaken during project implementation appropriate to the identified issues.*

Issues related to various groups of project-affected communities have been identified, first in the Madeira Complex EIA (2005), and then in the PBA programmes (2008). The EIA data indicated that in the year 2000 there were 66 337 households (261 223 permanent residents) in Porto Velho and 412 households (1 775 permanent residents) in Jaci-Paraná. The most popular means of transportation within the reservoir area were identified as boat, on foot, buses, cars and bicycles. There is a water-supply system for the city of Porto Velho about 5 km downstream from the city and about 36 wells that supply 22 neighbourhoods. MESA (now SAE) and CTPP Cuniã (see topic I-1) updated the socio-economic baseline in 2008, and they jointly carry out the monitoring of the

socio-economic PBA programmes. Key assessment findings for each group and monitoring of impacts are described below.

A total of 228 land plots were affected by the acquisition of land for the establishment of construction sites, borrow and disposal areas, and the creation of the reservoir and the protection area, without being physically relocated; those 228 land plots were only partially affected and only 48 of these had residents. The expansion of the reservoir will require the acquisition of an additional 118 non-residential land plots whose main use is agricultural; surveys are currently ongoing. Landowners and their workers received cash compensation and this group has not been monitored by the project; however this is not a significant gap because evidence indicates that vulnerability of landowners is lower than those physically displaced (see topic I-10, Resettlement) and community interviewees indicated that individuals compensated have used the money adequately (e.g. for new businesses, tractors, or found other jobs) and their livelihoods have been restored and even improved.

Key economic activities in the project area are agriculture, fishing, rural labour, commerce and mining. The EIA identified that 5 110 direct and indirect jobs were generated by mining activities in the Madeira complex area (115 dredges and 164 barges were identified). Traditional gold miners (“garimpeiros”) are mainly found in Jaci-Paraná, Teotônio and rural areas. The PBA identified 78 gold-mining locations, and the National Mineral Production Department (DNPM) studies identified 12 legal areas of which 9 were entitled for mineral exploration (granite, ornamental granite, gold, sand and titanium), 2 going through the licensing phase (granite, clay and laterite) and 1 mining concession. The project carried out an inventory of mining activities (currently 14 dredges, 29 barges and 3 manual miners) and staff monitor mining activities, including the annual cycle of socio-economic aspects, the legal status of the activity with the DNPM and environmental agencies, type and production, income, methods of extraction, equipment and markets. The creation of the reservoir has affected the equipment used (not suitable for deeper areas) and areas designated to operate; barges and manual miners will not be able to carry on with their activities. The use of barges and manual tools is a seasonal activity performed during the dry season and only dredger users can operate during the winter in deeper areas (around 18m).

The EIA did not identify any direct impacts on fisherpeople, but recommended a monitoring programme and if any impacts arise, the project should look into alternative income-generating activities. Updated data indicate that there are about 700 fisherpeople in the upstream and downstream project-influenced areas of the project, as defined by IBAMA. SAE have implemented a monitoring plan recording fish catch, equipment and fishing activities, and data indicate that there have been no changes to date at most of the monitoring points.

The EIA identified impacts associated with immigration in particular in Porto Velho (and in Jaci-Paraná for Jirau). The EIA estimated that a total of 54 343 workers will be needed, with a maximum peak of 20 199 workers. The construction period was extended to reduce the peak of construction labour to 9 135, estimating that the project would attract 37 213 people. Monitoring of demography and local population changes is currently undertaken by SAE and Praxis in partnership with the Municipality of Porto Velho, monitoring the housing market, migration, public safety, vehicles, housing (including high-risk areas) and education.

The EIA identified public sites of importance for leisure and tourism that may be affected by the project including beaches of Jaci-Paraná, Santo Antônio, Teotonio and Porto Velho.

Downstream communities were identified in the EIA (64 communities, 32 on each bank) with a total of 7 624 households and 32 402 inhabitants according to data from the year 2000. The baseline information was prepared taking into account information collected in interviews with leaders and officials from public institutions and communities’ surveys and includes demographic trends, economic activities, properties and infrastructure. The main economic activities are agricultural and extractive land-use activities (about 80% of households surveyed). The project monitors socio-economic practices and soil-fertility changes associated with sedimentation and erosion patterns.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of project-affected communities issues during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

Monitoring of affected groups described above takes into account inter-relationships amongst issues, all PBA programmes refer to issues that are inter-related to other programmes. For example, the mining activities programme is inter-related with the cultural-heritage programme and the social communications programme and there is evidence of miners reporting paleontological findings.

The monitoring programmes take into account risks that become evident in the results. For example, monitoring of mining activities resulted in the inclusion of 4 additional manual miners in the programme; monitoring of fishing activities detected that there were changes in the type of fishing (“pesca de aburra” is forbidden) and some fisherpeople need support in adapting their equipment; and inclusion of 6 monitoring points for groundwater in response to complaints raised in Vila Franciscana and Joana D’Arc, and Jaci-Paraná. Examples of opportunities include training workshops for fisherpeople to participate in the monitoring and consideration of infrastructure improvements needed to enhance agricultural production downstream.

Landowners receiving cash compensation were not as vulnerable as those resettled, and they were not monitored; all landowners and people compensated for the loss of jobs were given the option of support if needed although in principle all affected groups should be monitored, assessors did not find evidence to conclude that there were significant negative consequences for their livelihoods and interviewees indicated that known cases of impoverishment were related only to those being physically relocated. Therefore this is not considered a significant gap.

Criteria met: Yes

9.2.2 Management

Analysis against basic good practice

Scoring statement: *Measures are in place to address identified issues that affect project-affected communities, and to meet commitments made to address these issues; and if there are any formal agreements with project-affected communities these are publicly disclosed.*

Measures to address identified impacts and requirements for formal agreements are contained in the PBA programmes which have been implemented by the project, partly through contracted companies. The PBAs are publicly disclosed.

The affected-people programme describes compensation options for landowners. Non-resident owners of land or farms are entitled to cash compensation at market value, improvements and, if required, support in finding, selecting and purchasing alternative property; permanent employees on affected farms receive assistance in finding an alternative job, compensation for the loss of job and optional participation in training programmes for alternative jobs or rural programmes; people living from wild-food-extraction activities receive support for continuing activities in other areas, including conservation areas as agreed with IBAMA.

The programme for mining activities comprised: an agreement with DNMP for stopping granting of new mining titles (2008); registration and monitoring of mining activities; negotiations and compensation agreements with rights holders and DNMP; and reallocation of mining activities in sectors free from any conflicts with the project. An additional study has been prepared by the University of São Paulo in 2014, which identifies areas compatible with mining with the purpose of relocating these activities. The study indicated full compatibility between the project and dredges activity without the need of mitigation measures. SAE has negotiated with Madecon Engenharia e Participações Ltda which had a title for granite exploration (2011) and with manual miners and

barge users, in order to support them in finding alternative sources of income. The agreement with DNMP is publicly disclosed.

The social compensation programme provides actions to meet the increase in demand for public services and provide support to the municipality in reviewing and implementing the Municipality Master Plan. New and improved infrastructure related to education, transport, sanitation, public health and safety was delivered through agreements with the municipality and the state. Training programmes were implemented for local residents (Acreditar, see e.g. topics I-7 and I-12), involving a total of 54 265 graduates in basic and technical modules. Camp rules forbid workers to enter the Santo Antônio village. The programme for social and environmental education includes activities to encourage workers from the region around the city of Porto Velho to be hired by the project, and includes the creation of a Reference Centre for Migrants, for those seeking employment opportunities. Commitments are publicly disclosed.

The fishing support programme involved support to adapt fishing equipment and provision for docks as well as a training programme.

The programme for the support of leisure and tourism involved: the identification of areas for new beaches and associated structures in Jaci-Paraná and Teotônio, with broad participation of stakeholders; beaches have been developed in accordance with the PACUERA (see topic I-19); 3 environmental/cultural centres in Jaci-Paraná, Santo Antônio and Candelaria; and institutional capacity building with the National Service for Aid to Micro and Small Enterprises (SEBRAE), the National Commercial Education Service (SENAC) and the National Industrial Apprenticeship Service (SENAI).

The implementation of the downstream activities programme is shared with Jirau, and contains actions to structure, empower and develop existing productivity and commercial activities in downstream communities; for example an agro-industrial plant under construction in Cujubim Grande and a palm-oil plantation.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Processes in place to anticipate and respond to risks and opportunities include JGP/Exponent's bi-annual audits which identify new or ongoing impacts, mitigation measures and recommendations (e.g. recommends a formal transfer of the land title to Madecon quarry through IBAMA and DNPM); IBAMA monitoring processes on the implementation of programmes; ongoing monitoring of PBA programmes and communication mechanisms with institutions (e.g. DNMP, Porto Velho municipality) and communities. For example, monitoring erosion can predict emerging risks such as slides on riverbanks, which is a natural phenomenon in the Madeira River and may affect riparian communities.

Evidence of opportunities to enhance mitigation measures include initiatives such as Acreditar Junior (see I-7 and I-12) which has trained 1 204 graduates since August 2009; and voluntary actions implemented by the project, for example a campaign against domestic violence, sponsorships of community fairs, and aquaculture projects in Porto Velho and Jaci-Paraná.

Criteria met: Yes

9.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *Ongoing processes are in place for project-affected communities to raise issues and get feedback.*

Ongoing processes available for affected communities to raise issues and get feedback include a toll-free number service, employment offices, suggestion boxes, direct contact with communication agents present on site, and an online contact form available on SAE's website. These mechanisms are working well and communities are aware of, and use them.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, feedback on how issues raised are taken into consideration is thorough and timely, and project-affected communities have been involved in decision-making around relevant issues and options.*

Interviews with representatives of project-affected communities indicate that issues raised are taken into consideration in a thorough and timely manner using the communication mechanisms listed above. As described in topic I-1, Communications and Consultations, feedback is provided within 29 days on average and often within 1-2 days.

Project-affected communities have been involved in decision-making, for example in compensation support for fisherpeople, compensation for manual miners and barge users on their preferred alternative jobs; consultation meetings with landowners and people affected by job losses ending in individual solutions in some cases; and selection of suitable leisure sites. Additional engagement meetings related to the expansion are to be undertaken.

Criteria met: Yes

9.2.4 Stakeholder Support

Analysis against basic good practice

Scoring statement: *Affected communities generally support or have no major ongoing opposition to the plans for the issues that specifically affect their community.*

There is no evidence of major ongoing opposition. Evidence of general support and collaboration of project-affected communities is e.g. the participation in public meetings and training initiatives; collaborating with fish monitoring; supporting the dialogue to reach a common consensus, even if they believe that certain actions could be done in a better way.

There are dam-opposed groups present in the region, e.g. MAB in São Carlos and Calama (downstream), they led demonstrations against the project, in particular in 2010. There are no signs of opposition since 2012. Vila Franciscana has presented their concerns on groundwater levels to the court in 2013, these proceedings are still ongoing but this is a small minority. Verbal evidence indicates that most people in Jaci-Paraná are not in favour of the expansion project, but additional meetings with other communities are to be undertaken.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, formal agreements with nearly all the directly affected communities have been reached for the mitigation, management and compensation measures relating to their communities.*

SAE has signed relevant agreements relating to mitigation, management and compensation measures: agreements with the municipality and the state on social compensation activities for affected communities; agreements with SENAI and other institutions to provide technical training for affected people; agreement with DNMP and mining cooperatives or individuals; agreement with fisherpeople to provide equipment support; agreement on compensation with miners not using dredgers; and individual agreements with land owners and rural workers affected by land acquisition.

9.2.5 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to project-affected communities issues have been and are on track to be met with no major non-compliances or non-conformances, and commitments have been or are on track to be met.*

IBAMA issued a series of regulatory requirements for each of the programmes described in the management criterion above which are set out in the installation (2008) and operational (2011) licenses. Verbal evidence and the PBA reports (every 6 months) indicate that those requirements have been met and there are no non-compliances. The objectives of the PBA programmes have been met or are on track to be met.

The 11th JGP/Exponent report indicates that the project activities are compliant with Equator Principles 2 (environmental and social assessment), 5 (stakeholder engagement) and 6 (grievance mechanisms) and there are no outstanding corrective actions in relation to the community groups addressed in this topic.

SAE's CSR policy includes a dedication to maintaining a good relationship with the local community through the compensation programmes, with particular attention to the population of Porto Velho and Rondônia. No non-conformances have been identified.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

Assessors did not find any evidence of non-conformances or non-compliances in relation to communications and consultations.

Criteria met: Yes

9.2.6 Outcomes

Analysis against basic good practice

Scoring statement: *Livelihoods and living standards impacted by the project have been or are on track to be improved, and economic displacement is fairly compensated, preferably through provision of comparable goods, property or services.*

Livelihoods of project-affected communities affected by the project have improved or are on track to be improved through the implementation of the programmes listed under the Management criterion. The land compensation and negotiation processes have been fair, including compensation for crops, trees or businesses, with compensation for land exceeding the market value; people who lost their jobs were able to find other jobs or training to access other alternative sources of income. Manual miners and barge users will receive fair compensation and support to find alternative sources of income. Dredgers are still able to continue working in new designated areas, and their activities are compatible with the project.

Although there are no indications that fishing is affected in the region, or the measures implemented are not working (e.g. the fish passage) it is a major risk that the project is monitoring carefully (see topic I-15, Biodiversity and Invasive Species). The extensive continuous monitoring and involvement of fishermen/fisherwomen and downstream communities will help identify any emerging risks.

The social compensation agreement with the state of Rondônia has provided around R\$ 39.2 million to be invested. This money has gone to health infrastructure (R\$ 31.7 million), public-safety infrastructure

(R\$ 5 million) and state sector plans (R\$ 2.5 million); and the agreement with the municipality of Porto Velho provided around R\$ 65.6 million for investments in schools, public-health infrastructure, training of local suppliers, and municipal support. CSAC (the civil-works consortium, see topic I-4) delivered significant efforts by hiring 70% of the workforce locally, following technical and professional skills-training courses to minimise the in-migration of people. The influence of immigration in Jaci-Paraná has become more evident in the last years, but external interviewees indicate that most of this impact is not caused by the Santo Antônio project. The Praxis report indicate that unemployment has increased in the last years due to the demobilisation of workers, and some people have migrated to other areas, but the project has left a legacy of skills, with more skilled workers available to the labour market than under pre-project conditions.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the measures put in place to improve livelihoods and living standards are on track to promote self-sufficiency in the long-term.*

There are a number of residual impacts which have not been compensated for, exposing affected communities to medium- and long-term risks, or that have not been adequately compensated such as: groundwater-level rises in Vila Franciscana, potentially due to the reservoir levels; lack of compensation for leisure areas associated with access to the river in Santo Antônio village; although the programmes provide for a regeneration of the Madeira-Mamoré railway as part of the leisure and tourism programme, the municipality will take some time to resettle communities along the old railway before the regeneration programme can start; miners from the cooperative of garimpeiros of the Madeira River (Coogarima), with a title for up to 15 dredgers, can still work in the river with a formal title, but they claim that the creation of the reservoir required changes in their equipment, and areas allocated are not good enough for gold mining, hence currently only 4 operate after some of them decided to move upstream; and cultural and livelihoods impacts on communities left in place after partial resettlements of Joana D'Arc community, causing disruptions to community cohesion.

Hence there is evidence to conclude that not all communities will experience self-sufficiency and sustained improvements in livelihoods and living standards. This is a **significant gap** against proven best practice.

Criteria met: No

9.2.7 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are medium and long-term risks for residual impacts to some project-affected communities which have not been compensated for.

1 significant gap

9.3 Scoring Summary

Project-affected communities addressed under this topic include miners, economically displaced landowners and their employees or tenants not physically displaced, fisherpeople, communities not resettled within the project-influence area including downstream communities, tourist operations and other river users. The EIA identified impacts and risks on different community groups and a socio-economic baseline was updated in the PBA, providing measures and monitoring arrangements for the impacts identified. The project is in compliance with

the PBA objectives and lender requirements for the relevant Equator Principles 2, 5, and 6. Applicable compensation agreements are in place and their commitments are publicly disclosed. The compensation measures are fair, but there are a number of risks and residual impacts that have not been managed or compensated for, which results in a significant gap against proven best practice.

There is one significant gap against proven best practice, resulting in a score of 4.

Topic Score: 4

9.4 Relevant Evidence

Interview:	1, 4, 20-21, 27, 29, 44, 57, 66-67, 72, 75-76, 79, 81, 83, 85
Document:	1-5, 16-18, 21-23, 25-27, 29, 32-33, 49, 53, 68-72, 83, 86-88, 292-294, 315-318, 320-321, 328
Photo:	13 – 27

10 Resettlement (I-10)

This topic addresses physical displacement arising from a hydropower project development. The intent is that the dignity and human rights of those physically displaced are respected; that these matters are dealt with in a fair and equitable manner; that livelihoods and standards of living for resettles and host communities are improved; and that commitments made to resettles are fully delivered.

10.1 Background Information

Physical displacement has been required for the construction site, the reservoir, and the permanently protected areas around the reservoir. Additional physical displacement would be required for the expansion project. Issues of economic displacement are addressed under I-9, whilst this topic focuses on physical displacement only.

The total number of households physically displaced to date is 1 021 households. People affected previously resided in the villages of Engenho Velho and Teotônio, parts of the areas of Joana D'Arc, and Morrinhos, and part of the town of Jaci-Paraná. Project staff expect the expansion to affect a further 253 households, mainly in Jaci-Paraná, Joana D'Arc and Porto Seguro, some of which will involve physical displacement. The expansion will not require the physical relocation of any households that were previously displaced, though some may be economically displaced by the loss of farmland.

The project has offered three main choices to people displaced by the project: relocation with provision of a new dwelling; letter of credit, i.e. the provision of a document committing SAE to contribute to the cost of a new dwelling and/or land up to a stated amount; and indemnification, by which a lump sum compensation is provided to enable the household to purchase a new dwelling and/or land on the open market. Households selecting these options totalled: relocation, 497; letter of credit, 106; and indemnification, 418. Note that wealthier households, i.e. those with over 60 ha in land, were offered the indemnification option only.

Brazil does not have an overarching policy framework specifically dealing with involuntary resettlement. However, the Federal Constitution requires the option of compensation in cases of expropriation of legally-titled property, and the environmental licensing process provides the main regulatory framework for planning and implementing resettlement, as a measure to address the negative social impacts of land expropriation.

Please note that none of the newly constructed rural resettlement areas have been affected by the recent flooding. The flooding restricted access to and from Parque dos Buritis due to the flooding of a nearby road, and affected the sewage system, but no one was displaced, and no houses were flooded.

10.2 Detailed Topic Evaluation

10.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of the resettlement implications of the project has been undertaken that establishes the pre-project socio-economic baseline for resettles and host communities; monitoring is being undertaken of implementation of the resettlement plans, and to see if commitments made to resettles and host communities have been delivered and are effective and to identify any ongoing or emerging issues.*

An initial assessment of the resettlement implications of the project was presented in the EIA, including the numbers of people affected by each of the Jirau and Santo Antônio projects, and an initial 4-page description of a proposed resettlement programme. This assessment drew upon public hearings for the EIA and the licensing process in 2005/06 (for the EIA and EIA update) and 2006/7 (for the Preliminary Licence, 64 meetings, 2 000

people). Resettlement implications were assessed in further detail and presented in the PBA in 2008, prior to the granting of the Installation Licence.

The EIA established a general pre-project socio-economic baseline for the area to be affected. Livelihoods in rural areas consisted mainly of farming and fishing, and some small informal enterprises and casual employment, and in Jaci-Paraná consisted mainly of casual employment. Some of the rural households had substantial areas of farmland and forest, over 100 hectares in some cases, and some moved into the area relatively recently in the 1980s and 1990s with the promotion of the colonisation of Rondônia.

Socio-economic baselines were subsequently developed for each community to be relocated, and set out in plans agreed with the communities (see Management). Detailed socio-economic and physical (land and buildings) surveys were conducted for the purposes of estimating resettlement and compensation packages. For the group of 484 households selecting relocation, the consultants hired to conduct socio-economic monitoring of affected households (Plenus) established detailed “origin” baselines on each community, following resettlement.

There are no host communities, as the new settlements have been constructed on land acquired from absentee owners of large areas of land, who accepted the indemnification option. The area at Parque dos Buritis was previously occupied by a sawmill whose owner was not resident in the area, and one caretaker who was resident and who chose to be resettled to Morrinhos.

Monitoring is being undertaken of the implementation of the resettlement process and to determine whether commitments have been delivered, through: reporting on the PBA programme concerning resettlement to IBAMA, setting out details of progress made; and review by JGP/Exponent, as independent consultants appointed by the project’s financiers, of compliance with the Equator Principles and through these with IFC Performance Standard 5 on Land Acquisition and Involuntary Resettlement.

The Installation Licence requires monitoring of social reinsertion and the reestablishment of the quality of life of resettled people for a minimum term of three years following relocation. The project has contracted Plenus since 2010 to carry out monitoring of the households who chose the option of relocation (a total of 497 out of a total of 1 021 physically displaced households). They conduct monthly monitoring on parameters on income, education, agricultural production, culture and leisure, health and welfare, infrastructure and environment. They compile an annual report, including 28 socio-economic indicators. All households interviewed during this assessment confirmed that monitoring was taking place. In addition, SAE contracted an additional one-off opinion survey in 2011 of households that selected the letter of credit option (106 households), concerning the quality of their new housing, access to services, employment and incomes.

However, the project has not conducted monitoring of any households that selected the option of indemnification. This is approximately 40% of physically displaced households (418 out of 1021). Although a number of these households were relatively wealthy owners of large areas of land, they also included poorer households. Some households may not as readily adapt to a new livelihood (for example, because they have no prior experience of paid employment, or only had previous experience in farming or fishing, or lack basic skills such as literacy), or do not have previous experience of handling large sums of cash or property transactions. The absence of monitoring and a management response (see Management) concerning the households that chose the indemnification and letter of credit options is a **significant gap**. This gap affects Assessment, Management and Conformance/Compliance but will only be counted once.

Criteria met: No

Analysis against proven best practice

Scoring statement: *In addition, the assessment of delivery of commitments to resettles and host communities takes into consideration both risks and opportunities.*

Not assessed.

Analysis against basic good practice

Scoring statement: *Measures to address resettlement are documented in a Resettlement Action Plan; measures are in place to deliver commitments to resettles and host communities and to manage any identified issues relating to resettlement, including provision of grievance mechanisms; and formal agreements with resettles and host communities are publicly disclosed.*

Measures to address resettlement were documented in the PBA document concerning resettlement, prepared in February 2008. This included objectives, methods, areas affected, categories of people affected, general measures planned (including the options offered to physically displaced households), an initial eligibility matrix, monitoring and reporting, and schedule. Following the PBA, the project put in place a range of measures to deliver commitments. These included development of the matrix of eligibility and an internal regulation/policy on resettlement. Each household was surveyed, and their land classified and valued, buildings valued and crops valued (in accordance with Brazilian technical standards on valuation). Households without legal titles and those who were resident as employees (caretakers or housekeepers etc.) or tenants were included in the programme. Project staff made special efforts to encourage households to choose the relocation option through workshops.

New dwellings provided to people choosing the relocation option were built in 7 locations: new “rural” settlements of Morrinhos (51 households), Novo Engenho Velho (40 households), Riacho Azul (30 households), São Domingos (34 households), and Santa Rita (153 households); one “urban” settlement in a rural location, Novo Teotônio (48 households); and Parque dos Buritis (150 households), a new neighbourhood within the town of Jaci-Paraná. Thirteen households relocated within the remaining area of their partially-affected land.

Households moving to the new settlements were engaged in the development of an action plan for their new community, which are reviewed with community participation on an annual basis. Resettlement began in 2008-09, one year after initial consultation meetings. Starting in 2010, a number of options for livelihoods development have been provided for all of the rural resettlement locations. Options include agricultural training and extension, nutrition and health, support to enterprise development and fish culture. Six farmers’/social organisations have been formed to facilitate the provision of livelihoods assistance and community engagement. The project hired a company to provide psychological and emotional support (coaching and neuro-linguistics) in Teotônio, Santa Rita and Parque dos Buritis. A PBA programme concerning replacement infrastructure has delivered the construction of health clinics, schools, water-supply systems, electricity supplies, wastewater treatment plants, community centres and churches in the new settlements. Resettlement also required the relocation of a cemetery, which was carried out in consultation with relatives and with the appropriate ceremonies. Resettlement activities have been implemented, and issues identified through the use of a dedicated resettlement team from SAE and through the use of EMATER-RO, the State of Rondônia technical assistance and rural extension service.

The implementation of the resettlement programme for the households that chose the relocation option has been of an exceptionally high standard, meeting international best practice.

SAE recognises the vulnerability of households that chose the option of letter of credit, as indicated by the survey they commissioned. However, no management response has been taken to the findings of this survey, through which a majority of households reported declining livelihoods or incomes (section 6.3). SAE understand the risks associated with the letter of credit and indemnification options, as indicated by their greater promotion of the relocation option. However, it is not clear whether SAE focused this encouragement on the more vulnerable households, and no management measures were put in place to respond to the risks arising if households were unable to re-establish a livelihood or manage the cash compensation. The absence of monitoring (see Assessment) and a management response concerning the households that chose the indemnification and letter

of credit options is a **significant gap**. This gap affects Assessment, Management and Conformance/Compliance, and will not be double-counted.

Additional requirements for resettlement arose from the unanticipated erosion of the riverbank at Triangulo (see I-16). In this case, the project sought to avoid displacement of the affected people by the construction of bank protection. Ultimately a group of households took legal action, whilst others remained to demand compensation. An agreement was reached with the Rondônia State Attorney on compensation for the affected households, including compensation for housing, land and per person, provided to both owners and tenants. No other options were made available due to the urgency of the situation, and SAE has provided compensation as agreed.

The project is now making budgetary allocations for additional resettlement for the expansion project, which will be combined with the resettlement of people displaced by flooding from Jaci-Paraná (R\$ 36 million for 210 properties, and R\$ 40 million for infrastructure and public services), and San Sebastian (R\$ 4 million).

Grievance mechanisms are described under Stakeholder Engagement below. All households interviewed during this assessment confirmed their knowledge of how to raise grievances, either through approaching SAE directly, via consultants appointed for livelihoods support activities (ATES) and the 1-800 number.

Formal agreements were signed with all resettled households. These are private arrangements and not publicly disclosed, and therefore this is not a gap against the requirement for public disclosure in the above scoring statement. Community-level action plans were developed with full public disclosure during community meetings. Households interviewed during this assessment confirmed that they had participated in many meetings that were held to develop and agree community plans.

Criteria met: No

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Not assessed.

10.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *Ongoing processes are in place for resettles and host communities to raise issues and get feedback.*

Processes for raising issues and receiving feedback have been ongoing through implementation. One hundred and sixty public meetings were held over the 2008-2014 period, and open public meetings held in cinemas 2009 and 2011, attended by 400 and 600 persons respectively. The project has used a wide range of channels for communications and engagement on resettlement, including information centres in each settlement, several leaflets, regular information leaflets providing updates, radio programmes, a booklet describing the process of resettlement, a welcome brochure for arrival in new housing, and manuals describing four alternative house types. Materials were of a high quality, accessible and informative (for example with many pictures, and with detail down to the level of why resettlement is required from the area to become the permanent protection area around the reservoir).

Project staff have continuing close relations with households relocated to the new settlements, providing a basic ongoing process of direct communication with the project's resettlement team and EMATER-RO, who are in the settlements on a daily basis. Formal ongoing processes include: a continuing 1-800 hotline (grievances are recorded in an excel worksheet, and tracked for their resolution; note that the proportion of resettlement-related formal grievances raised to date is 70%); at least one meeting per month with each farmers' association;

weekly reports by EMATER-RO; and a form for technical staff to complete to capture any concerns community members raise with them. Examples of responses taken in response to issues raised are: the continuation of the temporary allowance for a further 8 months; a programme to provide fertilizer and seeds in response to declining agricultural incomes; and extension of a period of free electricity.

Households interviewed during this assessment reported that they are able to contact members of the team directly, as they have their mobile-phone numbers, speak to their consultants, visit the office in Porto Velho or use the 1-800 number. Interviews in all locations described a very good relationship with SAE, noting their flexibility and sensitivity, and that feedback is prompt and responsive in the majority of cases. Note that some concerns about slow responses from SAE were heard in Parque dos Buritis, where residents feel “abandoned” by SAE, complaining of a slow response to loose tiling in houses and the impact of the flooding on the sewage system.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, feedback on how issues raised have been taken into consideration has been thorough and timely, and resettles and host communities have been involved in decision-making around relevant issues and options.*

Not assessed.

10.2.4 Stakeholder Support

Analysis against basic good practice

Scoring statement: *Resettles and host communities generally support or have no major on-going opposition to the Resettlement Action Plan.*

There is general support amongst resettles for the Resettlement Action Plan and its implementation and there is no evidence of major on-going opposition. Interviews held during this assessment confirmed support for the project, citing the choice of resettlement option and their involvement in decision-making as the basis for this support. Support in Parque dos Buritis may have been affected recently due to the broader impacts of the recent flooding.

All resettles interviewed were aware of signed agreements, and this assessment has seen evidence of a large number of signed statements on surveys and compensation agreements. Support is further demonstrated by the consensus reached in community planning meetings on their action plans, which were signed by all present in some cases.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there is consent with legally binding agreements by the resettles and host communities for the Resettlement Action Plan.*

Not assessed.

10.2.5 Conformance/Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in the Resettlement Action Plan have been and are on track to be met with no major non-compliances or non-conformances, and any resettlement related commitments have been or are on track to be met.*

Processes and objectives are set out in the PBA, Installation Licence, and Operational Licence. The principal objectives and goals of the PBA are: to restore livelihoods and quality of life at least to that preceding displacement, and to establish measures to restore incomes and maintain economic activities, including to empower affected people to develop alternative economic activities where it is impossible to continue their previous occupations. The PBA sets out commitments under a series of headings as follows: establish a management unit for the resettlement programme; physical and socio-economic surveys; valuation of properties; prepare detailed compensation plans (eligibility matrices); disclosure and consultation with the affected population; identification, selection and evaluation of areas for relocation; processes of negotiation; acquisition of land for new settlements; preparation of architectural and engineering works; approval of the plans for the new settlements by relevant agencies; construction of the new settlements; monitoring and assistance during resettlement; monitoring of adjustment after resettlement; and monitoring the economic viability of new economic activities. The Installation Licence required, amongst other details, a sub-programme of Social Reinsertion Monitoring and Evaluation of Life Quality for at least 3 years, for all categories of resettled people. The Operational Licence required the continuation of the PBA commitments.

Santo Antônio is largely in conformance with these requirements, and is fully compliant with Brazilian expropriation laws. However, monitoring has omitted the groups referred to under Assessment above. This is a **significant gap** in conformance with the PBA, and is that same gap as identified under Assessment and Management above and will not be double-counted.

Criteria met: No

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

Not assessed.

10.2.6 Outcomes

Analysis against basic good practice

Scoring statement: *Resettlement has been and is being treated in a fair and equitable manner, and 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.*

Resettlement has been managed in a fair and equitable manner. This is ensured through the establishment of clear standards (in the eligibility matrix, equality in the options offered to displaced people for example, and transparency in these) that have been applied equally to all affected.

People who were resettled by the project into the new settlements have experienced improvements in their livelihoods and living standards: all households have improved housing; all have registered house and land titles; some have experienced a significant improvement in incomes; whilst those who have not experienced an improvement in incomes are likely to do so through ongoing support from EMATER-RO or SAE. Households that have found it more difficult to improve their incomes have been the elderly, and those that were previously fishermen, who have found it difficult to adjust to farming. In community-level interviews during this assessment, people confirmed their improvements in living standards with reference to: concrete houses compared to previous wooden houses; provision of water and sanitation in comparison to no water and sanitation services previously; separate houses for grown children and their children whilst extended families lived in one house only previously; new public infrastructure including schools, health centres, water supplies, shops, buildings for cassava-flour milling, barns for the storage of agricultural equipment, , community centres, churches, bus services, and the provision of nets and fuel to fishermen. Incomes and livelihoods have been supported through:

short-term provision of allowances; generous allocation of land plots; closer proximity to Porto Velho for the marketing of agricultural produce; employment at the plant (Novo Engenho Velho) or other employment (Parque dos Buritis); effective agricultural support programmes in cattle-raising, crops and orchards; pilot aquaculture programmes; and training programmes.

Rural resettlements are firmly on track towards self-sufficiency. Incomes are now more than 50% higher in some communities, following the cessation of the transitional allowance which resulted in an increase in the area of land farmed. Livelihoods support has now ceased in Novo Engenho Velho (the first community to be resettled) and Riacho Azul, and will shortly cease in other communities. At Morrinhos, the community is entering an agreement with the municipal agricultural department for continued support.

Evidence for an improvement in livelihoods and living standards is set out in Plenus monitoring reports: out of 28 indicators, most are improved, whilst 4-5 remain unchanged. In Novo Engenho Velho and Teotônio, many households are employed on the project, due to their proximity to the plant. The implementation of resettlement in rural communities is of an exceptionally high standard, and outcomes are very positive. Interviewees are confident about the future, and the sentiment amongst affected people in these communities is that it has been a radical and difficult change, but it has been for the better.

In several areas, services that SAE agreed with the municipality are not being provided, for example in solid waste collection, the maintenance of equipment at schools (in Riacho Azul, problems with computers, air conditioning, and drinking fountains), and the maintenance of recreational facilities at Parque dos Buritis. Ongoing complaints from residents largely concern such services, and project staff are pressing the municipality to respond, and expresses disappointment with the municipality's adherence to commitments in agreements. Project staff acknowledge that some measures have been more successful than others, but that the growth in income and development vindicates their approach to resettlement.

However, the above refers to 497 households out of a total of 1 021 physically displaced households. There is some evidence that there has not been a timely improvement in livelihoods and living standards amongst some of the other 524 households. The project-commissioned opinion survey of households that chose the letter of credit option showed the majority of respondents (74 out of 100) report a worsening in livelihoods or incomes, related to the difficulty in adjusting from fishing or farming activities to employment. Significant numbers of respondents have either sold their new house or are renting it, in order to use the proceeds as income. However, it is also notable that the survey shows that the vast majority report improved housing conditions and services compared to their pre-project conditions.

There is no survey or monitoring data available to determine whether households choosing indemnification have improved or worsening livelihoods and living standards. However, the majority of interviewees met at the community level during this assessment reported knowledge of some households that have fared poorly, with reference to examples of: households that had spent their compensation unwisely; divorces or marital disputes arising around the use of the compensation; some families suffering due to the departure of the male head of the household; and frequent reference to households that have "lost everything". In one interview, it was claimed that a number of households from Jaci-Paraná that chose the letter of credit or indemnification options have returned to living in illegal settlements with unsanitary conditions, in an area adjacent to Parque dos Buritis. Some of the displaced households have settled on the edges of the new settlements (for example at Teotônio), and are now demanding support equivalent to the rest of the community. Even amongst the category of 484 households choosing the relocation option, there are some that have sold or are letting their properties for income.

This evidence points to the risk that vulnerable households amongst these groups are experiencing declining living standards and incomes as a result of the project. This is not identified as a significant gap against Outcomes, as it has not been possible to determine the scale of the issue. However, it underlines the significance of the

absence of monitoring and ongoing support for more than half of the physically-displaced households, addressed under Assessment, Management and Conformance/Compliance above.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the measures put in place to improve livelihoods and living standards are on track to promote self-sufficiency in the long-term.*

Not assessed.

10.2.7 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

The absence of monitoring and a management response concerning the households that chose the indemnification and letter of credit options, more than 50% of affected households. This gap affects the criteria of Assessment, Management and Conformance/Compliance. It will, however, not be double-counted.

1 significant gap

Analysis of significant gaps against proven best practice

Not assessed

10.3 Scoring Summary

The implementation of resettlement amongst some relocated communities is of an exceptionally high standard, and outcomes are very positive, with significantly improved living standards and security of livelihoods amongst many households.

The resettlement implications of the project were assessed through a series of steps, beginning with the EIA, through numerous consultation meetings and public hearings, the development of socio-economic baselines, and socio-economic and physical surveys. Monitoring is being undertaken of the implementation of the resettlement process through reporting to IBAMA and audits of conformance with the Equator Principles.

Measures to address resettlement were documented in the PBA document and community-level actions plans, seven new settlements were established, with replacement infrastructure of a high standard, and a range of options for livelihoods development. Engagement with resettled households has been ongoing through implementation, using a wide range of channels and materials of a high quality. Project staff have continuing close relations with households relocated to the new settlements. The involvement of relocated households in decision-making has been high, contributing to their general support for the Resettlement Action Plan and no evidence of opposition. The project is largely in conformance with its PBA requirements and is fully compliant with Brazilian expropriation laws.

Households that chose the option of relocation to one of the new settlements are experiencing improved incomes and living standards, and are on-track to self-sufficiency. However, there is some evidence that there has not been an improvement in livelihoods and living standards amongst some of the households that chose the options of indemnification or a letter of credit. Whilst socio-economic monitoring of relocated households has been carried out in detail, the project has not conducted monitoring of any households that selected the option of indemnification. No response has been taken to the findings of a project survey of households that chose the letter-of-credit option, through which a majority of households reported declining livelihoods or incomes. The absence of monitoring and a management response concerning the households that chose the indemnification or the letter-of-credit options, which are 524 out of 1021 households, is a significant gap.

There is one significant gap against basic good practice resulting in a score of 2.

10.4 Relevant Evidence

Interview:	7, 9, 23, 24, 26, 35, 36, 67, 72, 75, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98
Document:	1, 3, 4, 5, 10, 16, 17, 21, 22, 34, 36, 39, 41, 49, 63-67, 73-76, 78-82, 262, 264-266, 291, 304, 322-324, 329, 337
Photo:	28 – 80

11 Indigenous Peoples (I-11)

This topic addresses the rights, risks and opportunities of indigenous peoples with respect to the project, recognising that as social groups with identities distinct from dominant groups in national societies, they are often the most marginalised and vulnerable segments of the population. The intent is that the project respects the dignity, human rights, aspirations, culture, lands, knowledge, practices and natural resource-based livelihoods of indigenous peoples in an ongoing manner throughout the project life.

11.1 Background Information

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 "traditional lands", which are demarcated as Indigenous Territories (ITs). Fundação Nacional do Índio (FUNAI) is the Brazilian governmental agency responsible for addressing issues such as land demarcation, defence of indigenous Brazilian's rights and all issues concerning Brazilian IPs.

While there are no direct impacts of the project on IPs, the risk of **indirect/induced** impacts of intensified encroachment into indigenous lands was identified early in the development of the Santo Antônio project and the upstream Jirau project, which is being developed by Energia Sustentável do Brasil (ESBR). It is difficult to distinguish the **indirect** impacts of the Santo Antônio and Jirau projects, but FUNAI allocated responsibilities for the indigenous communities between the two projects based simply on splitting responsibility and roughly by geographical proximity. Thus FUNAI has allocated responsibility to Santo Antônio Energia (SAE) for providing administrative and financial support to two of the ITs, Karipuna and Karitiana, as well as to one indigenous community located in the municipality of Porto Velho (Cassupa). It bears noting that the **indirect** impacts on the Karipuna and the Karitiana IPs cannot be solely attributed to the Santo Antônio project. In addition, FUNAI has also allocated responsibility to SAE to provide financial and administrative support for implementing emergency plans for isolated IPs.

The Karipuna Territory is located about 100 km from the project site and has a population of 30-40 people, of which the long-time resident population is approximately 26, while the Karitiana Territory is located about 50 km from the project site with a population of approximately 300 people. The Cassupa community consists of approximately 34 people.

The project is implementing a R\$ 25-30 million "Support to Indigenous Communities Programme", as part of the PBA as well as fulfilling the conditions for the Installation and Operating Licenses.

In accordance with its statutory responsibilities "to lead all contacts with indigenous communities", FUNAI places restrictions on whether third parties can interact with IPs and particularly isolated IPs. As explained below, FUNAI's role has been key in determining the scope and the management of the PBA programme, as well as influencing its outcomes. As explained in the Introduction, the findings of this assessment in general address the project, including outside actors' responsibilities in regards to the management of impacts, and not only the actions of SAE.

11.2 Detailed Topic Evaluation

11.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Issues that may affect indigenous peoples in relation to the project have been identified through an assessment process utilising local knowledge; and monitoring of project impacts and effectiveness of management measures is being undertaken during project implementation appropriate to the identified issues.*

The EIA identified five ITs in the indirect influence area of the Madeira projects (Jirau and Santo Antônio), including the territories of Karitiana and Karupa described above. Issues that may affect indigenous peoples were identified in the EIA, and concerned possible indirect impacts of the development of the region due to the Jirau and Santo Antônio projects that may contribute to further encroachment into and degradation of ITs. Opinions provided by FUNAI were also a key part of the identification of issues affecting indigenous people, and it was at FUNAI's suggestion (after the completion of the Emergency Programme, discussed under Management below) that Santo Antônio's Indigenous Peoples PBA, Support to Indigenous Communities Programme, was expanded to include the Cassupa community.

Subsequent to the EIA, further detailed diagnostic and planning work was undertaken in relation to the Karipuna, Karitiana and Cassupa IPs as well as with isolated IPs and on health issues.

At the instigation of FUNAI, and with their approval of the terms of reference, detailed socio-environmental diagnoses of the Karitiana and Karipuna IPs were carried out in 2011 (The report was published in December 2011) by a 15-member team from Arcadis Tetraplan from São Paulo, with experience in environmental management, agronomy, biology, forest engineering, health, nutrition and social anthropology. The scope of the study included: territorial protection; landscape monitoring; monitoring of water resources and water quality; monitoring of fauna and fish; (economic) production and sustainability; health and social rights; and education and cultural values. Local knowledge was used by including qualified Indigenous Peoples (IP) members on the team, and through extensive consultation with the local communities

This study was then followed by an updating of the PBA for the Karipuna and Karitiana IPs, which was prepared by a team consisting of an anthropologist and a forester from Gameleira Consultoria of Rio Branco in Acre State, and published in June, 2013. The proposed two-year updated PBA programme consists of: an indigenous programme of production and sustainability; a programme of ethnic strengthening based on using indigenous knowledge and skills; a territorial protection programme; and PBA management including full participation of the indigenous communities.

In relation to the Cassupa IP, a similar two-stage approach was followed. A team from Gameleira Consultoria undertook a socio-environmental diagnosis followed by the development of a socio-environmental compensation plan. Because Cassupa is located in an urban environment, the compensation plan did not include a territorial-protection programme. In all other aspects, the scope of the compensation plan mirrored the scope of the updated PBA for the Karipuna and Karitiana IPs. Local knowledge was used through extensive consultation with the Cassupa community.

In relation to isolated IPs, an objective of FUNAI is to ensure "to the Indians and the Isolated Indigenous Groups, the right to remain so, maintaining the integrity of their territory, intervening only when any factor endangers their survival and socio-cultural organisation". In accordance with the agreement signed in October 2010 (see Management below), FUNAI is collaborating with the project on a programme focusing on isolated IPs. The first phase, completed in 2011, consisted of: localisation of isolated IPs; supervision and surveillance; protection for the recently contacted IPs; and educational activities. FUNAI has developed plans for the second four-year phase of the programme that will have a similar scope and take into account the lessons learnt from Phase 1.

In relation to the monitoring of the effectiveness of management measures, the project reports to IBAMA each semester on the status of the support programmes, in the context of its PBA reporting. In addition, FUNAI, ESBR and SAE have agreed to set up a Management Committee to oversee the implementation of the support programmes in collaboration with representatives of the affected IPs (but it is not clear whether this committee has met or delivered any reports to date). Also, FUNAI made a commitment to prepare and submit a final report on the Emergency Programme, but this report, more than sixteen months overdue, has not yet been prepared and there is no firm schedule for its completion.

In relation to monitoring of the project's indirect impacts on IPs and ITs, there is no evidence that any agency is actively monitoring the territorial integrity of the ITs. SAE supported a course on monitoring and territorial protection that was taught by FUNAI, and FUNAI's local office of technical coordination of territorial protection (CTLPT) receives information on deforestation based on satellite data from FUNAI's Geoprocessing Center. SAE has stated that the Phase 2 agreement is anticipated to provide for the creation of FUNAI's own cartographic (GIS) center in Porto Velho/Rondônia to work specifically in the Karipuna and Karitiana ITs, but this assessment did not receive any documentary or interview evidence, for example from FUNAI or CTLPT, of this. The Emergency Programmes included surveillance of encroachment, and a number of surveillance activities were carried out during 2011-2014 (including those organised and/or coordinated by FUNAI/CTLPT) but these activities are management measures, as opposed to monitoring of project impacts. Interviews with IP representatives indicate that impacts (such as illegal logging and poaching) on the Karipuna and Karitiana ITs may be worsening. The absence of monitoring of these impacts, which were predicted during the EIA and which underlie the basic rationale for providing assistance to these ITs, is a gap. It is not considered significant because there is no definitive evidence of impacts, and impacts would not be due directly or solely to the Santo Antônio project.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, identification of issues that may affect indigenous peoples is undertaken with the free, prior and informed participation of indigenous peoples; and monitoring during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

Not assessed

11.2.2 Management

Analysis against basic good practice

Scoring statement: *Measures are in place to address identified issues that may affect indigenous peoples in relation to the project, and to meet commitments made to address these issues; and formal agreements with indigenous peoples are publicly disclosed.*

While the PBA has guided activities with IPs, its scope and coverage has changed over time. Initially the programme consisted of emergency plans and action plans. In its present form, it consists of two phases, Phase 1 being emergency protection programmes for IPs and their territories and emergency plans for isolated IPs; and Phase 2 being a socio-environmental assessment of each indigenous community, updating and implementing the PBA for the Karipuna and Karitiana communities and developing and implementing a socio-environmental compensation programme for the Cassupa community. Pending the signature of the Phase 2 agreement, SAE is supporting the construction of the access road to Panorama village and works under a Production and Sustainability component. In addition, the project signed an MoU on the 2nd of May, 2014, with DSEI (O Distrito Sanitário Especial Indígena), the Special Indigenous Sanitary District authority, of Porto Velho to support the implementation of an 18-month Comprehensive Plan for Indigenous Health that will benefit the IP communities of Karitiana, Karipuna and Cassupa. The comprehensive plan was prepared by the DSEI in consultation with the

District Council of Indigenous Health and project staff. This partnership aims to implement actions that will provide improvements, mainly in health infrastructure and services, to the three indigenous communities. In addition, the plan includes capacity building in relation to managing water supply and sanitation in the IP communities.

In relation to the emergency programmes (i.e. Phase 1 as described above), SAE's and ESBR's responsibilities are set out in an agreement signed with the President of FUNAI in October 2010. SAE's responsibilities were: supporting the implementation of emergency programmes in the Karipuna and Karitiana; and implementation of emergency plans for isolated IPs. FUNAI would be responsible for the coordination and execution of the Phase 1 activities, including the preparation and submission of the final report.

SAE implemented the emergency programmes during one year in partnership with FUNAI, as agreed. These consisted of the construction of surveillance stations (buildings); surveillance posts; the provision of equipment to FUNAI (including surveillance vehicles, GPSs, cameras, a computer and printers); opening of tracks and bridge construction; resolution of the location of IT borders; and their physical demarcation through the installation of signage. The programmes involved IP teams, who were financed and given training/capacity development under the project and collaborated with FUNAI and SAE in IT surveillance activities. SAE supported FUNAI/CTLPT's management/coordination of the IT surveillance activities through the supply of fuel as well as the maintenance and the provision of spare parts for the surveillance vehicles. The project also provided for the organisation of community assemblies to inform and receive feedback from the IP communities on the project.

The seventh clause of the the agreement mentions that a new agreement, for the second phase of the support programmes, would be signed within 18 month of the date of signature of the original agreement (i.e. by April 2012) "as long as the deadlines and stipulated contributions of the present agreement, Phase 1, are observed by the Parties". FUNAI expects to be able to get legal clearance to approve the updated PBA for the Karipuna and Karitiana IPs by the end of May 2014, including the socio-environmental compensation plan for the Cassupa IP and Phase 2 of the Isolated IP Plan, after which FUNAI and SAE would sign a new agreement to implement these activities.

However, as of May 2014, with 84% of the Santo Antônio project's construction completed, the status of PBA implementation is that the project is awaiting FUNAI's approval of the updated PBA programme for the Karipuna and Karitiana IPs as well as the socio-environmental compensation plan for the Cassupa IP and phase 2 of the isolated-IP Plan, prior to beginning implementation on these programmes and plans. Overall, implementation of the PBA has been delayed several times. Initially, implementation was delayed by more than two years, from the time of issuance of the Installation License in August 2008 to getting the go ahead in October 2010 from FUNAI to begin emergency activities. Since the conclusion of surveillance activities under the emergency programmes in the Karitiana and Karipuna ITs in 2012, more than 16 months have passed and implementation has been at a minimum. The updated PBA programme has been severely delayed, owing to FUNAI's delays in approval, to the frustration of both the IPs and SAE. Measures are not fully in place, and the project is not meeting its commitments. This is a **significant gap** against basic good practice. It is the same gap as that identified under Conformance/Compliance and Outcomes below, but will only be counted once.

Regarding formal agreements, it should be noted that while there are no formal agreements signed between the Brazilian Government and IPs, this is not considered a significant gap because there are numerous opportunities for public disclosure. FUNAI, which has the statutory responsibility to lead all contacts with indigenous communities, does not sign agreements with IPs. SAE (through its President) has signed three agreements, in 2010, 2012 and 2013, with the Presidents of the Karitiana and Karipuna IP Associations, to support institutional development in their communities. The 2010 agreement provided for supporting, over a renewable twelve-month period, the human resources and ordinary expenses of each association, as well as for budgetary support for the villages located in the ITs. A special item in the budget was the inclusion of per diems to enable IP members to support the implementation of the socio-environmental diagnoses described above. Other agreements referred to support for transportation and for fuel expenses for the associations. In addition, the

proposed management measures coming out of the socio-environmental studies were developed with the participation of the Karipuna and Karitiana IPs. A three-day community meeting was organised at the conclusion of each study to enable the communities to understand and agree collectively on the proposed management measures. A similar approach was used for the Cassupa socio-environmental study. These conclusions were confirmed in interviews with representatives of the IPs.

Criteria met: No

Analysis against proven best practice

Scoring statement: *In addition, measures for issues that may affect indigenous peoples have been developed with the free, prior and informed participation of indigenous peoples; and processes are in place to anticipate and respond to emerging risks and opportunities.*

Not assessed

11.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *Ongoing and mutually agreed processes are in place for indigenous peoples to raise issues and get feedback.*

Ongoing processes for raising issues and getting feedback include a very open relationship between project staff and IP leaders, who have each other's mobile-phone numbers. IP leaders confirmed their ability to easily contact project staff. Arrangements were made to ensure wide consultation with the communities concerned in the conduct of the socio-environmental studies, including providing feedback on the draft report's management recommendations in plenary community meetings. These arrangements were supported by the agreements signed by the Presidents of two IP Associations and the SAE President in 2010 (See Management above). In addition, quarterly meetings are held with FUNAI, the State Public Attorney and IP leaders. However, the IPs' representatives complain of delays in feedback

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, feedback on how issues raised have been taken into consideration has been thorough and timely; and directly affected indigenous peoples have been involved in decision-making around relevant issues and options.*

Not assessed.

11.2.4 Stakeholder Support

Analysis against basic good practice

Scoring statement: *Directly affected indigenous groups generally support or have no major on-going opposition to the plans for issues that specifically affect their group.*

There are no indigenous people directly affected by the project. However, the PBA programme developed to address the risk of indirect impacts on ITs is designed to deliver benefits for IPs. There is general support for the programmes and no opposition.

It is notable that consent for the PBA programme has been sought and gained from those directly affected by the programme. The Protocol defines consent as "signed agreements with community leaders or representative bodies". The FUNAI-ESBR-SAE agreement meets this definition for the PBA programme, see also above under Management.

However, because of the severe delays in the implementation of the PBAs, there is scepticism by the IPs of the real commitment by FUNAI and SAE to the implementation of the support programmes. This is dealt with under Conformance/Compliance and Outcomes below.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, consent has been sought and gained by directly affected indigenous groups for the project.*

Not assessed.

11.2.5 Conformance/Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to issues that may affect indigenous peoples have been and are on track to be met with no major non-compliances or non-conformances, and any indigenous peoples related commitments have been or are on track to be met.*

There is no evidence of any non-compliances. The project is in compliance with the requirements of the International Labour Organisation Convention (C 169) concerning Indigenous and Tribal Peoples, which Brazil ratified in 2002. The first component of the PBA was the development/implementation of emergency plans for the indigenous communities, including the protection and surveillance of the Karipuna and Karitiana ITs and the implementation of an emergency plan for isolated indigenous people. The protection and surveillance programmes were designed and managed by FUNAI, and implemented by SAE in partnership with FUNAI. FUNAI trained the IPs in surveillance activities, and supervise their ongoing surveillance.

However, the agreement between FUNAI, SAE and ESBR, which assigned specific responsibilities to SAE in relation to the PBA, was signed in October 2010, more than two years after the award of the Installation License to the Santo Antônio project (in September, 2008). Implementation of the one-year protection and surveillance programme for the Karipuna and Karitiana IPs began subsequently and was completed in 2012. Since then, more than sixteen months have passed and implementation has been at a minimum; the updated PBA programme has been severely delayed, owing to FUNAI's delays in the approval, to the frustrations of both the IPs and SAE. Measures are not fully in place and the project is not meeting its commitments. This is a **significant gap** against basic good practice. This is the same gap as that identified under Management above, and will not be double-counted.

Criteria met: No

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

Not assessed.

11.2.6 Outcomes

Analysis against basic good practice

Scoring statement: *Plans provide for major negative impacts of the project to indigenous peoples and their associated culture, knowledge, access to land and resources, and practices to be avoided, minimised, mitigated or compensated with no significant gaps, and some practicable opportunities for positive impacts to be achieved.*

Consistent with the findings of the EIA, the Instituto Socioambiental (IS) have flagged the continuing risk of degradation of the Karipuna and Karitiana ITs as well as the risk of encroachment in the Karitiana IT. For the

period 2001-2012, data on deforestation rates in the Karipuna and Karitiana ITs published by the National Institute of Space Research (Instituto Nacional de Pesquisas Espaciais –INPE) indicate varying annual rates, with an upsurge in deforestation in the ITs from 2011, particularly in the Karitiana IT. However, there is no evidence that these trends, which are still low in percentage terms, are caused by the Madeira projects or specifically by the Santo Antônio project. It bears noting that the Karipuna and Karitiana ITs are close to some of the leading logging districts in Rondônia State. Once the updated PBA programme is under implementation for the Karipuna and Karitiana ITs, the risks of negative impacts should be minimised or avoided.

There are some opportunities for positive impacts to be achieved. These include implementation of the updated PBA and the socio-environmental compensation plan which would benefit all three concerned IP communities through an indigenous programme of production and sustainability; a programme of ethnic strengthening based on using indigenous knowledge and skills PBA management including full participation of indigenous communities. In addition, the surveillance component of the updated PBA for the Karipuna and Karitiana IPs would be able to build on the capacity development component of the emergency programmes. Also, a number of voluntary programmes have been developed to support the Karitiana and Karipuna IPs, including the construction of schools and health posts. In relation to the schools, the project has made arrangements to hand over the schools to the education authorities, who would be responsible for furnishing and staffing these facilities. The health posts would be incorporated in the Comprehensive Health Plan for Indigenous Health (see Management above). Finally, FUNAI has developed a plan for the second phase of the isolated IP plan.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, opportunities for positive impacts have been thoroughly identified and maximised as far as practicable.*

Not assessed.

11.2.7 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

Measures are not fully in place and the project is not meeting its commitments, because of delays in FUNAI's approval of updated PBA programme. This gap affects the criteria of Management and Conformance/Compliance. However, it will not be double-counted.

1 significant gap

Analysis of significant gaps against proven best practice

Not assessed

11.3 Scoring Summary

The Santo Antônio project is responsible for the management of potential indirect impacts (encroachment and degradation) of the Madeira projects on Karitiana and Karipuna indigenous territories, the Cassupa people of Porto Velho and isolated Indians. Issues that may affect indigenous peoples were identified initially in the EIA, and through subsequent detailed diagnostic and planning work. With the continuing support of SAE, there is protection of the indigenous territories, albeit at a minimum level, by FUNAI's local office (CLTPT) and by the indigenous peoples themselves.

The project has developed a PBA programme (Support to Indigenous Communities Programme), consisting of emergency plans and action plans, and implemented the emergency protection programmes for Karipuna and Karitiana territories. The project has a very open relationship with indigenous leaders and consultation during

the development of the programmes has been extensive, with all indigenous peoples expressing support for the programmes.

However, as of May 2014, with 84% of the Santo Antônio project’s construction completed, the updated PBA programme remains severely delayed owing to FUNAI’s delays in approval, to the frustration of both the indigenous peoples and SAE. Measures are not fully in place and the project is not meeting its commitments. The delays are undermining trust by the indigenous peoples in FUNAI and SAE.

This is one significant gap against basic good practice, resulting in a score of 2.

Topic Score: 2

11.4 Relevant Evidence

Interview:	7, 26, 37, 38, 59, 67
Document:	1, 3 – 5, 10, 16, 17, 22, 23, 189 – 212, 267, 304, 350 – 362, 404 – 414
Photo:	81 – 83

12 Labour and Working Conditions (I-12)

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

12.1 Background Information

The EPC consortium, Consórcio Constructor Santo Antônio (CCSA), is divided into three main parts: a civil-works consortium called Consórcio Santo Antônio Civil (CSAC), made up of Odebrecht (leader) and Andrade Gutierrez (both part owners of the plant as well); an electro-mechanical equipment consortium called Grupo Industrial do Complexo Rio Madeira (GICOM), consisting of Alstom Power, Alstom Grid, Andritz, Bardella, Siemens and Voith; and with Odebrecht responsible for electro-mechanical installations. This is described in detail under topic I-4, Integrated Project Management.

An important aspect of large infrastructure projects in Brazil at present is the strong competition for qualified labour. The presence of other large hydropower projects in the Amazon region, like the neighbouring Jirau and the recently started Belo Monte, has contributed to short turn-over times and strong pressure on salaries.

Where this topic addresses stakeholder engagement, it is in direct relation to the management of human resources and labour management issues. Wider issues of communication and engagement with all stakeholders are covered under topic I-1, Communications and Consultation. In terms of safety, this topic assesses the safety of workers while wider issues of community safety are dealt with under topic I-5, Infrastructure Safety. There is also some overlap with topic I-9, Project-Affected Communities, in terms of the benefits the project realises through its capacity-building activities.

12.2 Detailed Topic Evaluation

12.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Human resources and labour management requirements have been identified through an assessment process, including occupational health and safety (OH&S) issues and risks; and processes are in place to identify any emerging or ongoing issues, and to monitor if management measures are effective.*

In 2008, at the start of project construction, the EPC contractor evaluated the local supply of labour. The result was that Porto Velho and surrounding areas of Rondônia state could only supply around 30-40% of the labour needs at the same time as Porto Velho had around 30 000 people unemployed. This led to the idea to create the Acreditar programme, see below under Management. Outside of the people recruited through Acreditar, there was also a need to recruit additional staff, especially staff with previous experience from similar projects, and these underwent an internal process to test competence. Senior management and graduate-level technical people were recruited in a normal manner, with many moving to from previous projects built by the CCSA partners.

The work force of the project reached its maximum number of workers in 2011, at 20 700, and is now decreasing as the project is nearing completion. The decision to go for the extension project (see topic I-4 for details on construction progress and the extension) has delayed the draw-down in numbers, as there will now, if the extension is approved and licensed, be a remaining significant demand for construction workers. The number of employees in CCSA as of the 31st of March, 2014 was 7 447, divided between: CSAC, 5 790; Odebrecht's electro-mechanical installation team, 1 636; and 21 more divided among management, GICOM and commissioning staff.

There were 1 837 CCSA-external contractors and sub-contractors numbered 2 878 on site for a total work force of 10 325. SAE itself had a total of 377 employees as of March, 2014.

The risks on the construction site are assessed through a special risk-mapping process, which consists of mapping ten risks which are evaluated in regards to the dangers involved and the importance of the risk. This is then combined with the number of people involved and the seriousness of potential outcomes. This results in a traditional probability-consequence risk number. If a particular issue passes a cut-off level, another round of assessment takes over. This develops into an operational analysis which is carried out by a health, safety and environment (HS&E) team. The operational tool is developed by the team managers themselves, and guarantees the flow of information up and down the chain of command. This has led to a definition of special procedures for specific risks such as electricity, work in confined spaces, work at height, etc.

Monitoring, including identification of any ongoing or emerging issues, of HR, labour management and occupational-safety issues is carried out by SAE's and CSAC's special-purpose HR and HS&E staff, and also by several Government entities, e.g. ANEEL, Ministry of Labour and the Regional Superintendent for Labour. The various engineers (Furnas for the owners) also carry out HS&E monitoring. Specific audits of the company's own Saúde, Segurança do Trabalho e Meio Ambiente (SSTMA) HS&E system are conducted every 6 months by Lus Natura. Also every 6 months, JGP/Exponent audits the project against the Equator Principles and the IFC Performance Standards on behalf of the financing business banks.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and both risks and opportunities.*

Risks are identified through the SSTMA described below under Management. The spreadsheet that is used for risk identification has a significance/importance filter. This identifies the "low-hanging" fruit, both in terms of risks that need particular attention, and opportunities for reducing overall risk levels.

The HR managers take broad considerations into account by analysing trends in accident rates, trends in turnover rates and use the contacts with the owner companies, who are always involved in the construction of other hydropower projects, in order to capture the human resources from any deactivating projects. A demobilisation interview which evaluates performance and a post-demobilisation interview on what the interest is in future work for the company provides a mechanism to assess opportunities to maintain well-trained workers. For this purpose, the Belo Monte project has a recruitment department in Porto Velho that tries to utilise the opportunity offered by the fact that the Santo Antônio project is now demobilising a large number of workers.

CSAC carry out monthly checks on the conformance of their contractors with contractual requirements, and assess, among other issues, occupational health and score performance indicators on a 0-5 scale every 4 months.

Criteria met: Yes

12.2.2 Management

Analysis against basic good practice

Scoring statement: *Human resource and labour management policies, plans and processes are in place that address all labour management planning components, including those of contractors, subcontractors, and intermediaries, with no significant gaps.*

As described in detail under topic I-4, Integrated Project Management, the construction and management of the Santo Antônio project is divided between the EPC contractor with its three main parts and its own HS&E

management, and Santo Antônio Energia (SAE) itself, which also has a human-resources (HR) structure, and also supervises all HS&E work on the project.

HS&E is managed through the SSTMA system which has a policy document supported by a detailed manual. The manual describes aspects such as (but not limited to): legal documentation; risk assessment and management; sanitary conditions; preventive health care; personal protective equipment (PPE); accident prevention; work at height; work in confined spaces; work with electricity; safety signage; blasting; emergency procedures; training; safety inspections and investigations of accidents.

SAE's and CCSA's HS&E standards are applied to contractors and sub-contractors as well. Each new potential contractor is analysed with a comprehensive risk analysis before contracting. Once the contract is signed, there is an initial meeting where a detailed analysis is made defining critical risk vectors for which management measures are established. Every labourer and employee, before getting into a work site, has to show evidence of approval in order to gain access. Each employee receives 4 hours of training and receives performance criteria which are evaluated on a monthly basis. Low performances yield a bad ranking. Each contractor knows their own results and their needs for improvement. HS&E managers of SAE have access to all such rankings.

A major aspect of addressing the planning for, and supply of, sufficient numbers of qualified labour for the project has been the Acreditar programme. It was started as a means to train unqualified and often unemployed people from Porto Velho and the surrounding areas of Rondônia state through a suite of 15 different training programmes. A total of over 42 000 people have been trained through Acreditar Profissional out of which almost 29 000 have been employed on the Santo Antônio project at some point during its implementation. The programme is now finished, as there is no need for training more people.

A stated HR policy for the project is "to hire the best". Cost is considered secondary and handpicked candidates are often the solution, and not just in the higher employee categories. The evaluation process is internal, but they do have contacts with Government employment agencies, both at state and municipal level, in order to assist with employment where possible.

In terms of ensuring equal opportunity in terms of race, gender etc., there is a clear strategy in place: to not have any rules or defined practices that would restrict equal opportunity. The Acreditar programme leveraged equal opportunity, especially in terms of gender. 10% of the employees on the project are women; major construction sites in Brazil normally have numbers around or below 5%.

Retirement benefits are provided through a programme where the company withholds 20% of the salary and where the individual worker can choose to voluntarily contribute an additional maximum of 482 R\$/month. Brazilian law prescribes very clear rules for layoffs and dismissals that clearly regulate the responsibility of the employer. Collective bargaining is a legal requirement in Brazil and negotiations are traditionally held at the end of April each year. The process of negotiations is spelled out by law and provides a time frame for starting and finishing. Most issues discussed relate to working hours, food vouchers and family benefits, e.g. home visits.

The project has a special programme for labour retention. Through a loyalty programme there are benefits related to the time of employment. If you stay on more than 6 months, you get an extra salary increment, after each additional 6 months (up to 18 months), an additional amount. There is also a credit for always showing up at work. According to verbal evidence from workers, the key to successful retention of workers is the provision of good conditions: good, healthy food; good preventive and curative medical care; a clean and comfortable place to sleep and care for hygiene; and opportunities for meaningful recreation.

The health facilities are staffed by a doctor and a nurse and have a laboratory and X-ray facilities. X-rays are sent via Internet to Brasilia where a radiologist diagnoses the patient. There is a malaria ward with room for 11 patients (none at the time of the assessment). The laboratory and X-ray facilities are outsourced to companies delivering such professional services. There are two ambulances on site, one with full ICU capacity, and a registry

that keeps records of each employee's health history. Records of staff who have left the site are moved to a special confidential register.

Safety-related signage in the finalised power houses, on the construction site, in and around offices, restaurants, accommodation etc., is omnipresent, clear and informative. Safety equipment has a high standard and is available in all appropriate places. House-keeping in operating units is excellent and of normal satisfactory standard on the construction sites.

The kitchen is run by a professional nutritionist to the highest standards. The storage facilities, preparation and cleaning areas are spotlessly clean and efficient, and the building is well planned to avoid cross-contamination between the workers' eating area and the preparation areas. Well-planned architecture and ventilation provide cool, comfortable working conditions. No frying is done in the kitchen in order to provide a safer working environment for the staff, avoid disposal issue with used frying oil and avoid health impacts on the staff. The food is cooked, grilled or baked.

The company supplies PPE for each employee and supplies transport to and from the work place. Due to problems with public transportation between Porto Velho and the project site, CCSA/CSAC run their own fleet of buses.

SAE and the EPC consortium have Codes of Ethics and standards that all employees are contractually bound by. Under the new anti-corruption laws in Brazil, the scope of such codes of ethics has been made much more all-inclusive and demanding. For standards of ethical behaviour, please see topic I-2 for details.

Several types of training are provided to workers: work safety; personal health; technical skills; health & safety courses related to the individual's function; technical courses, also adapted to function. Every worker who is promoted is subjected to 45 days of training, after which the promotion is approved or not. There are special leadership programmes at all levels. Staff are also given special training through campaigns in areas such as sexual health, the fight against violence on women, as well as against the sexual abuse of minors and adolescents.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

The Equator Principles audits conducted every 6 months by the commercial banks' consultants provide a very strong tool for the identification of both risks and opportunities. As a conscious policy, these audits employ considerably stricter standards than those required by IFC PS and Brazilian law. This inevitably leads to a number of non-conformances against these self-imposed standards, but also significant opportunities for improvement beyond the requirements.

SAE, CCSA and CSAC all have designated HR and HS&E managers who are responsible for the continuous monitoring of emerging issues and attention to opportunities. In addition to this, suggestion boxes around the construction sites and workers' accommodation provides a source for the identification of opportunities for improvements.

SAE is a signatory to the Brazilian national commitment to improve conditions of work in the construction industry, giving them access to experience gained by other companies and the opportunity to learn from that.

There is a rigorous system for analysis and response in place for accidents. As an example, a fire that took place in 2013 led to an increase in the amount of breathing equipments and protective masks. One of the defined causes of the accident was the presence of flammable material too close to the operating equipment and, after analysis, wood scaffolding was replaced with metal.

In the case of fatalities, the cause has frequently been a failure on the part of the individual to follow the security regulations in place. This has led to further intensification of training and the focusing on safety. The EPC contractor provides continuous safety training to all workers, and all work groups have a specific safety theme every day.

Access to all sites, both construction sites and to the sections that are already operational, is strictly controlled in order to avoid accidents. If, e.g., a contractor needs to access the machine hall of an already operational power house, the manager needs to apply for access, a risk assessment for the work is compiled, and safety rules and restrictions are imposed accordingly in order to control risks.

Samples of the food served in the restaurants are kept for 3 days in order to ensure the ability to identify the source of any food-related problems developing in the labour force. There has, however, not been a single case of food poisoning on the project to date.

The Acreditar Profissional programme, and its extension with Acreditar Junior, is an outstanding example of an opportunity taken to leave a lasting positive impact on Porto Velho and Rondônia through the notable increase in trained workers and workers with experience from a large construction project who are now able to seek well-paid employment on similar projects elsewhere. The end result of the Acreditar programme is that approximately 80% of the total project workforce has come from Rondônia, most of this from Porto Velho itself. This not only yields a lasting positive development impact, but has also been the key management measure to avoid significant in-migration and camp-follower issues. Acreditar Junior is an ongoing activity offering skills training to children of project employees.

Criteria met: Yes

12.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *Ongoing processes are in place for employees and contractors to raise human resources and labour management issues and get feedback.*

There are three channels for grievances: the immediate supervisor, the response is given by each employee's own boss; the Ombudsman system, which is anonymous and normally yields a personal response within a maximum of 48 hours; and the workers' Commission.

The CCSA ombudsman logs approximately 1 issue per day on average. All cases are treated as confidential, if requested. The type of requests/complaints vary a great deal, and all open cases are clearly marked in the confidential log.

The commission coordinators meet 3 times per week to discuss day-to-day issues. Any issues are reported to line managers for immediate action. If this does not yield a satisfactory resolution, the issue is escalated to the next level. If this still does not result in a satisfactory resolution, the CCSA ombudsman is brought in. The system is based on creating good conditions for the entire group of workers, but also individual complaints are treated in the same manner. Common issues that the Commission have to deal with are accommodation (light, cleanliness of bathrooms), transport, inter-personal relationships and bureaucratic issues. The first Wednesday of the month, the Commission members meet with company representatives. HR, and often the Finance Department, are present. The Commission members are very satisfied with the process, and feel they are able to resolve all emerging issues. They feel that the company takes their safety and well-being seriously; the communication on safety is strongly emphasised as one of the main focuses for the company.

A clear majority of the workers are unionised, unless they purposely choose not to be members. Membership carries with it a 1% of salary fee, but that entitles the employee to family-health benefits, a strong motivator for membership.

Analysis against proven best practice

Scoring statement: *In addition, feedback on how issues raised have been taken into consideration has been thorough and timely.*

The grievance mechanism has a form on which each grievance is entered. The company has to respond to each grievance on the same form with a thorough explanation of how the complaint is being dealt with and when. The process is clear and confidential (when requested) and normally yields a response within 48 hours. The workers' Commission report that responses to grievances are always timely and thorough. The monthly meetings are reported and available such that any employee can check that issues are dealt with in a proper and timely manner.

Criteria met: Yes

12.2.4 Conformance/Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to human resource and labour management have been and are on track to be met with no major non-compliances or non-conformances, and any labour related commitments have been or are on track to be met.*

The project is regularly audited against both Brazilian laws and regulations, as well as against the Equator Principles and the IFC Performance Standards. The auditors have not identified any non-compliances, but some minor non-conformances. As described above under Management, the project imposes stricter standards than required by either IFC or Brazilian law. This leads to the identification of non-conformances against self-imposed standards. Identified non-conformances have not been recurrent, and all labour-related commitments are met.

The internal targets for accident rates are measured against one of the owners' (Odebrecht) metrics, which means they are ambitious targets, as those metrics include significant elements of non-construction work. In 2013, CCSA established a more relevant set of targets that concern the reduction of the accident indicators: 40% reduction of accident without absence and 25% reduction for lost-time accidents. For cumulative lost days due to severe accidents, the reduction target was set at 40%. Progressively, through 2013 and into the beginning of 2014, these targets are on track to be achieved. The metrics for accidents for 2013 were: accidents without leave, 6.3/1 000 000 work hours (down from 10.1 in 2012 and down to 4.6 through the first four months of 2014); cumulative lost-time accidents, 5.4/1 000 000 work hours (down from 7.8 in 2012 and 4.4 through the first four months of 2014); cumulative lost days due to severe accidents, 323/1 000 000 work hours (down from 672 in 2012 and at 80 through the first four months of 2014). The project has suffered a total of 10 fatalities (7 on site and 3 off site), the last one in October 2013. Compared to other hydropower construction sites in Brazil, the indicators for the Santo Antônio project are all low.

The rigorous system in place for accident investigation, reporting and actions has been followed. The Equator Principles auditors have also worked together with SAE in order to improve the management system so that accident rates can be successfully reduced.

The contractors for the vegetation clearing of the reservoir area initially caused a number of reported non-conformances. This was resolved by stationing a project representative (10 people were hired specifically for this purpose) on every work front to assure that all safety standards were followed. This has improved the conformance record significantly.

The operational safety standards set by the project are so high that ANEEL's inspectors were refused entry during one of their visits when they demanded access to a confined work space for which they were not properly qualified. The inspection was postponed, training and certification was provided, and the situation resolved.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

The project has no non-compliances as evidenced by the Equator Principles/IFC PS audits carried out by JGP/Exponent every 6 months, and other audits by various Government departments.

The only non-conformances noted are against self-imposed targets for the absolute level of accident indicators that are not entirely relevant (see above) and the more realistic targets concerning reduction of accident indicators are fully on track.

Criteria met: Yes

12.2.5 Outcomes

Analysis against basic good practice

Scoring statement: *There are no identified inconsistencies of labour management policies, plans and practices with internationally recognised labour rights.*

The assessors have not identified any inconsistencies with internationally recognised labour rights.

The project goes beyond regular attention to labour and human rights issues by conducting training and campaigns against racism, sexual harassment and the sexual exploitation of children. A special programme was put in place for a group of Haitian refugees in the area to assist with their adaptation to their new situation. The project has also organised a special programme to make it possible for people who are in prison to work during the day and go back to the prison at night, in order to assist with rehabilitation and re-adaptation to society.

JGP/Exponent in its most recent audit report (October, 2013) commended CSAC for: “practices that ensure a safe and healthy workplace, taking appropriate measures to prevent accidents and negative impacts to workers’ health. Furthermore, its hiring procedures ensure avoidance of child labour, forced and compulsory labour and the avoidance of all kinds of discrimination”.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, labour management policies, plans and practices are demonstrated to be consistent with internationally recognised labour rights.*

The Santo Antônio project is fully legally compliant in a jurisdiction that has put into force 7 out of the 8 ILO “fundamental” conventions. The one that is missing is “C087 - Freedom of Association and Protection of the Right to Organise Convention”. Brazil is a signatory to the UN Convention on the Rights of the Child.

The project is not certified in accordance with ISO/OHSAS 18001 yet, but there are well-developed plans in place for the certification of the integrated management system once the project is fully operational (for more on this, see topics I-2 and I-3). However, all members of the EPC consortium CCSA are certified, which demonstrates that policies, plans and practices applied on the project’s construction are consistent with internationally-recognised rights concerning occupational health and safety.

Although SAE have not demonstrated that other labour policies, plans and practices meet all internationally recognised labour rights (including the missing “fundamental” ILO convention mentioned above) through a special-purpose analysis, this is not a significant gap, as the independent audits against the Equator Principles and IFC Performance Standard 2 performed every 6 months by JGP/Exponent for the financing business banks have established compliance with those standards. The Equator Principles auditors verified that the project is compliant with IFC and the 35 Brazilian standards for working conditions, which are described as considerably

more demanding and specific than IFC PS 2. In relation to the fundamental ILO convention not signed by Brazil, collective bargaining is a legal requirement in Brazil (see above under Management).

In 2011, the IFC reviewed Odebrecht's performance in relation to IFC PS. Odebrecht's involvement in the Santo Antônio project was one of the major infrastructure projects that formed part of the basis for this review. The company was found to be fully compliant with all IFC PS.

It is notable that the members of the workers' Commission grade the conditions for the project's construction workers as the best they have seen anywhere in Brazil.

Criteria met: Yes

12.2.6 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

12.3 Scoring Summary

SAE and the members of CCSA have identified labour needs with a strong focus on HS&E aspects of the construction work. Internal monitoring takes place on a continuous basis and external parties, both Governmental and independent auditors working for the consortium of business-bank lenders that are signatories to the Equator Principles, audit the project on a regular basis with a strong focus on labour issues.

Management is carried out through the SSTMA system, which has a detailed manual for the full range of HS&E issues. The SSTMA standards apply to sub-contractors as well, and each new contractor is subjected to a risk assessment and constant follow-up and scoring on performance. Safety-related signage on the site is excellent and kept in clean and working order. The workers' facilities are world class with good, healthy food, first-rate well-staffed medical facilities, air-conditioned lodging and clean showers and toilet facilities with good capacity. Social programmes and leisure activities are given high marks by interviewees and the general workers' conditions are described as "the best I have seen" by several interviewees.

The policy of the project has been to focus on quality rather than cost when hiring labour. Collective bargaining takes place on an annual basis and retirement, severance and other benefits are strictly regulated by national law. There is a specific programme for the retention of labour, with bonuses for each 6-month period worked.

The Acreditar Profissional programme was created in order to satisfy labour needs in a competitive market, minimise in-migration from other regions of Brazil and to maximise the local and regional development contribution in Porto Velho and Rondônia. Over 40 000 people were trained and almost 30 000 of these were hired by the project at some point. The programme also helped create a situation where 10% of the labour force has been women, an approximate doubling of the average figure for major construction sites in Brazil. A spin off of the programme, Acreditar Junior, helps train children of project employees, preparing them for the labour market.

Training, both skills and HS&E, is an ongoing activity with safety themes for the day during all morning meetings, extensive capacity building and testing in conjunction with promotions and a suite of voluntary training/information programmes on important social topics such as sexual health, the fight against violence on women and sexual abuse of minors.

There is an ombudsman system in place for workers to report their grievances. The workers’ commission report that the system functions well and that grievances are dealt with in a thorough and timely manner. The project is in full compliance with all health and safety-related laws and regulations, as evidenced by regular audits by JGP/Exponent against Brazilian law and the Equator Principles and e.g. IFC PS 2. Conditions for the workers are generally of very high standard, and the formulated targets for reduction of the accident indicators are on track.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

12.4 Relevant Evidence

Interview:	7, 45 – 48
Document :	1 – 6, 17, 21, 38, 70, 123, 133 – 138, 167, 168, 172 – 175, 178 – 184, 188, 218, 219, 225, 226, 231 – 234, 257, 288, 380, 381
Photo:	84 - 109

13 Cultural Heritage (I-13)

This topic addresses cultural heritage, with specific reference to physical cultural resources, associated with the hydropower facility. The intent is that physical cultural resources are identified, their importance is understood, and measures are in place to address those identified to be of high importance.

13.1 Background Information

The beginning of human occupation in the Amazon took place at least 14 000 years ago, between the late Pleistocene and early Holocene. Pre-historic occupants were groups living by hunting, fishing and gathering. These groups of nomads left fleeting traces, such as the remains of stone chipping and scattered bonfires. As populations grew, contacts with other neighbouring indigenous groups intensified, leading to frequent conflicts. Following the arrival of Europeans in the area, the Jesuits tried to unify the different villages and conducted research on economic exploitation in the area between 1669 and 1672.

The first urban areas (e.g. Porto Velho) in the Santo Antônio project area were created during the development of the extractive economy based on rubber, gold and cassiterite in the region, which attracted large numbers of immigrants. During that period, the Madeira-Mamoré Railroad was built by the English and Americans, and it remained in active use until 1972. The railway is now deactivated, and its remains are protected for their historic value by both the state and federal legislation. Other historical sites of importance in the project area are: the “Three Caixas” or water tanks, the first water-supply system in the Amazon, built with cast iron in 1900-1902 and now is the symbol of Porto Velho; the Sagrado Coração de Jesus cathedral in Porto Velho; and the church of Santo Antônio.

Cultural heritage issues of importance for indigenous communities in the project area are addressed more in detail in topic I-11 Indigenous Peoples.

13.2 Detailed Topic Evaluation

13.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Cultural heritage issues, with respect to physical cultural resources, that are relevant to project implementation and operation have been identified through an assessment process utilising appropriate expertise; and monitoring is being undertaken during the project implementation stage appropriate to the identified issues.*

The Madeira Complex EIA provides an initial assessment of physical cultural-heritage issues. The EIA identified and described historic and archaeological sites in the direct-impact area of Santo Antônio based on results of investigations undertaken in 2004; and areas with potential for palaeontological finds in areas of past mining activity. No archaeology or palaeontology investigations had been undertaken in the project area until the licensing process for the Madeira River complex.

Scientia undertook an assessment update of archaeological and palaeontological sites after the approval of the PBA, which took into account those sites identified in the EIA, and covers areas directly affected by the Santo Antônio project and nearby areas.

The EIA identified 25 pre-historic sites, out of which 14 required further investigations. Historic sites identified (17) were classified into: colonial settlements; settlements related to the extraction of rubber (19th to 20th centuries); “English camps” related to the construction of the Madeira-Mamore railway; and remains of the railroad. As indicated in the programme for archaeological, pre-historic and historic heritage, the selection of the

sites for heritage salvage was determined by considering a number of factors: state of conservation, area with presence of archaeological materials, historic importance and impact and likelihood of risks. Scientia carried out additional surveys and monitoring of excavations during construction (including at the resettlement areas) and stratigraphic profiles were prepared. Archaeological surveys identified 58 archaeological sites, out of which 43 were pre-colonial and 15 were historical; in addition 157 isolated archaeological items, that are not defined as sites, were identified. Professional divers and local miners (“garimpeiros”, informal gold miners) participated in aquatic prospections. In total, 155 rocks with engravings were identified (937 figures) distributed across 8 sites, mainly near pre-historic sites; rocks were registered, photographed, filmed, and replicated with physical and 3D techniques (e.g. at Ilha do Japó and Ilha das Cobras).

During the preparation of the EIA, two studies were undertaken that identified the existence of fossils of scientific value, for example megafauna from the quaternary period. The palaeontology programme required a more detailed desktop study of resources previously identified by the National Mineral Production Department (DNPM), analyses of satellite images and identification of potential sites in the reservoir area proposed for excavations. The assessment involved revisiting the 57 points with palaeontological potential identified in the EIA, palaeo and 65 additional points. The assessment identified an area with potential (Praia do Urubu) and the first known palaeo-botanical site in the Amazon region on the right bank of the construction site, and provided better knowledge of general stratigraphy. Scientia carried out monitoring of the construction works.

The project hired SVS to prepare a master plan for the recovery of the Estrada de Ferro Madeira-Mamore (EFMM) or Madeira-Mamore railway and related assets. The plan identifies existing railway assets and proposes a detailed survey and mapping, and identifies the Instituto do Patrimônio Histórico e Artístico Nacional’s (IPHAN’s) pre-project proposals related to the EFMM, and the Candelaria cemetery project. The recovery of the EFMM was monitored, and activities were accompanied by a representative of IPHAN in Rondônia.

During operation, the only issues identified are related to the protection of 20 heritage sites not affected by the reservoir that will remain in the reservoir protection area, and maintenance and protection of the EFMM assets. Those sites will not be affected by the expansion, and no further surveys will be required since the assessment cover up to 100 m.a.s.l., which comprises approximately 2 000 hectares.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of cultural heritage issues during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

An assessment of palaeontological issues identified the need for a characterisation of palaeontological resources to identify potential relationships between humans and megafauna, and archaeology; and involved the local knowledge of garimpeiros.

Surveys and field activities involved local miners to engage them in the conservation of heritage resources and included training of local students to perform field and lab activities, and partnerships with universities. The assessment considers proposal plans from the authorities and involved meetings with the municipality of Porto Velho, IPHAN and the cooperative of railway workers (COOTRAFER).

Criteria met: Yes

Analysis against basic good practice

Scoring statement: *Processes are in place to ensure management of identified cultural heritage issues, and to meet commitments, relevant to the project implementation stage; plans are in place for the operation stage for ongoing cultural heritage issues management.*

The project contracted Scientia to implement the PBA programme for archaeological, pre-historic and historic heritage and the programme for the conservation of palaeontological resources. The archaeology programme describes the procedures for archaeological investigations and techniques to be used for stratigraphy and excavations (e.g. trenches). A well-working chance-find procedure was implemented during construction, which involved training of construction workers.

The palaeontology programme involved the following measures: surveys and trenches to define stratigraphic profiles, elaborate a register of relevant information (lithology, geographical position, collection of findings, preparation of a photographic register and laboratory analysis, including C-14 dating. The programme describes the procedure for the collection of fossils. In total, Scientia collected 176 blocks of vegetal fossils between cofferdams 3 and 4; registered possible vegetal fossils in areas of the construction site; dated the palaeobotanical site to an age of more than 46 000 years; and found animal fossils from various families such as Melanosuchus, Testudines, Doradidae and Felidae. Palaeontological and archaeological remains collected and records are currently stored at Scientia lab, and will be exhibited at a museum at the University of Rondônia (UNIR) together with remains encountered during the construction of the Jirau project. Verbal evidence indicates that the plan is still to be approved by IPHAN.

The EFMM master plan (2010) prepared by SVS describes the activities that have been already implemented: a cooperation agreement with COOTRAFER to clean and recover the workshops, railway turning points, build new installations, an indigenous cultural centre in Santo Antônio and restore the Candelaria cemetery. These activities have already been successfully implemented. The project will also contribute to a landscaping project to rehabilitate the railway between Porto Velho and Santo Antônio, but this requires the resettlement of some people presently settled on the railway alignment or the right-of-way (to be undertaken by the municipality). The workshops will serve as a space for the community to organise fairs and festivals.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

The PBA programmes described above interrelated with the social and education programme, providing opportunities for training and awareness on cultural heritage issues. Evidence indicates that the chance find procedures worked well, and miners also reported potential palaeontological or archaeological findings.

Numerous meetings and agreements with IPHAN, the municipality and COOTRAFER on the activities related to the EFMM have served as a process to identify opportunities for improvement of the EFMM and tourism development. Verbal evidence indicates that the workshops were occupied by drug addicts that were relocated to a treatment centre in Porto Velho.

Workshops and other assets related to EFMM are located in close proximity to the river, and some of these have been affected by the recent flooding. Before the recent rainy season, there had never been a flood of that magnitude recorded in the Madeira river, however, there is evidence that indicates that floods of lesser magnitude, that were still close to affecting the EFMM workshops, had occurred. In spite of this, there is no evidence that the design and implementation of the restoration programme have considered the risk of flooding of the EFMM assets. The municipality was able to move some of the old trains to the administration building in

Porto Velho, however clean-up activities will take some time and resources for this are now supposed to come from the municipality (now responsible for its maintenance). The EFMM plan recommends that once the activities have been finalised, there should be agreements to ensure the adequate operation and maintenance of the assets. This is another risk that should be managed better by the municipality and IPHAN; evidence from before the recent flooding indicates that the maintenance of the EFMM assets was already poor, and the cultural centre in Santo Antônio is not functioning, due to the lack of maintenance from the municipality, meaning that the federal government had to take over the responsibility.

While not under the control of the Santo Antônio project or its owners, this lack of management of emerging risks on the part of the responsible actors, affecting several important cultural heritages in the area, is a **significant gap** against proven best practice. The unexpected erosion event that affected the “marco historico Rondon” has been addressed under topic I-16.

Criteria met: No

13.2.3 Stakeholder Support

Analysis against basic good practice

Scoring statement: *There is general support or no major ongoing opposition amongst directly affected stakeholder groups for the cultural heritage assessment, planning or implementation measures.*

Directly-affected stakeholders in relation to physical cultural resources include the local communities, indigenous communities, on-site workers, miners, institutions related to the preservation of cultural heritage (e.g. COOTRAFER), organisations responsible for regulation of cultural heritage resources (IPHAN) and palaeontology (DNMP), IBAMA, and potential disseminators of acquired knowledge in the scientific and academic community (e.g. university of Rondônia, UNIR).

There is no evidence of major ongoing opposition to the cultural-heritage-related plans. Monitoring reports, and communities’ participation in meetings, training workshops and inauguration of the EFMM provide evidence of support amongst relevant stakeholders.

There are minor issues related to the support from indigenous communities in constructing an indigenous cultural centre in Santo Antônio village. A section of this centre represents a replica of an “Oca”, or traditional indigenous house, and verbal evidence indicates that the relevant communities were not consulted or engaged in decision-making, but this does not represent major opposition and they are not directly affected by the project.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, formal agreements with the directly affected stakeholder groups have been reached for cultural heritage management measures.*

SAE reached formal agreements with IPHAN and DNMP for the approval of the PBA programmes, and with COOTRAFER, IPHAN and the municipality to implement activities related to the rehabilitation of the EFMM.

A formal agreement of cooperation between SAE, ESBR, and UNIR to build a new palaeontology/archaeology exhibition area at UNIR is not yet in place since it needs the approval of IPHAN, and this approval is still pending. If the agreement is not reached soon, this could lead to some developing opposition from the community, which is a risk that should be managed by all entities involved. Unless resolved, this would develop into a significant gap as the risk for negative impacts increases, and time is short to address it successfully.

SAE agreed in February 2012 to reconstruct the “marco historico Rondon” affected by the erosion event at Triangulo (see topic I-16, Erosion and Sedimentation); this agreement was signed by SAE, IPHAN, the municipality, the state, IBAMA and the federal attorney.

Criteria met: Yes

13.2.4 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in place to manage cultural heritage issues have been and are on track to be met with no significant non-compliances or non-conformances, and cultural heritage related commitments have been or are on track to be met.*

Interviews with IBAMA, IPHAN and DNMP indicate that regulatory requirements for cultural heritage issues set out in the Installation and Operational licenses have been met and no non-compliances have been identified. The objectives of the programmes are on track to be met, subject to the approvals of IPHAN and the municipalities on issues like the rehabilitation of the railway between Santo Antônio and Porto Velho, and the exhibition space at UNIR.

Interviews and the JGP/Exponent monitoring report indicate that the project is compliant with the requirements of the equator principles (and IFC performance standard 8, Physical Cultural Resources).

Scientia required IPHAN's approval to undertake archaeological investigations as defined in the "Official Gazette Union". Scientia also prepared quarterly reports for IPHAN on the progress and findings of the implementation of the programmes, and a final report on completion including a register of all findings. Scientia delivered the final reports in July 2011.

SAE's vision recognises their commitment to reconstruct the heritage of the EFMM, and that objective is on track to be met.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

The assessors did not identify any evidence of non-conformances or non-compliances.

Criteria met: Yes

13.2.5 Outcomes

Analysis against basic good practice

Scoring statement: *Negative cultural heritage impacts arising from project implementation are avoided, minimised, mitigated and compensated with no significant gaps.*

Negative impacts on archaeological, palaeontological or historical heritage resources arising from the project construction have been adequately identified in the EIA and subsequent investigations prior to construction. Management measures in the relevant PBA programmes are formulated to avoid, minimise and mitigate the potential impacts.

Archaeological surveys identified 58 archaeological sites, out of which 43 were pre-colonial and 15 were historical. Archaeological remains were rescued from 24 sites, of which 10 sites were in the construction-site area and 14 in the reservoir area. A well-functioning chance-find procedure and training of workers and local miners provided good results. Where it was not possible to recover all artefacts (e.g. rock engravings), impacts were compensated by creating a photographic register, videos and replicas or 3D representations; and impacts

are and will be compensated by disclosing the findings and results to the general public and the scientific community.

SAE agreed to reconstruct the “marco historico Rondon” affected by the erosion event at Triangulo, with guidance from IPHAN and the municipality.

The rehabilitation of the EFMM and related assets commenced in 2009 and the displays were opened to the public in 2012. These works, together with the Indigenous People’s cultural centre and the rehabilitation of the public area surrounding Santo Antônio church (including the cemetery), are an investment of about R\$ 20 million and an additional R\$ 50 million will be invested in the construction of the museum and the rehabilitation of remaining areas of the railway.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, negative cultural heritage impacts arising from project implementation are avoided, minimised, mitigated and compensated with no identified gaps; and contributions to addressing cultural heritage issues beyond those impacts caused by the project are achieved or are on track to be achieved.*

Negative cultural heritage impacts arising from project implementation have been successfully avoided, minimised, mitigated or compensated, with no identified gaps.

Contributions to addressing cultural heritage issues beyond impacts caused by the project are evidenced by scientific papers contributing to a better knowledge of the heritage resources in the region and the recovery of the EFMM and related assets that were previously abandoned, as well as providing new community spaces and contributing to tourism development plans in the region. Publications sponsored by the project also contribute to highlight the history of the EFMM, working closely with former workers of the railway.

Results of investigations have been presented at national palaeontological congresses in Brazil, and palaeontological workshops have been held at schools in the urban and rural areas of Porto Velho. Results of the archaeological and palaeontological investigations have been disseminated through workshops with communities, elaboration of a video and records of traditional practices affected by the project. The results have been disclosed in four ways: annual reports sent to IPHAN and disclosure in the Official Gazette; publication of articles in international scientific journals; disclosure of the research, and articles in newspapers and magazines (Época, Isto), websites (e.g. Diário da Amazônia, Jornal o Globo); and participation in scientific conferences.

Criteria met: Yes

13.2.6 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

The lack of management of emerging risks on the part of the responsible actors.

1 significant gap

13.3 Scoring Summary

This topic addresses impact on physical cultural heritage resources including archaeological, palaeontological and historical sites, and sites of importance for the community (e.g. churches). The EIA provided an initial assessment of heritage sites which was later updated through the implementation of the PBA programmes.

Scientia carried out the surveys, covering the construction sites and associated facilities, resettlement areas, and up to 100 m.a.s.l. around the reservoir area. Scientia identified 58 archaeological sites, out of which 43 were pre-colonial and 15 were historical; and 157 isolated archaeological finds as well as 20 sites not affected by the reservoir that will remain in the reservoir protection area. Scientia also surveyed 122 sites with palaeontological potential, including a palaeo-botanical site dated to more than 46 000 years before present.

Management measures include a well-working chance-find procedure which involved training of construction workers; elaboration of stratigraphic profiles and registers; rescue of resources of importance; and implementation of the EFMM master plan to rehabilitate the railway and associated assets. There are agreements in place with IPHAN, the municipality of Porto Velho and COOTRAFER, and an agreement is still to be signed with IPHAN and UNIR for a space to exhibit heritage findings. The EFMM’s workshops, assets and railway turning points were rehabilitated in 2011, and after the handover to the municipality, there has been a lack of maintenance of those facilities, as well as the new cultural centre in Santo Antônio. Another emerging risk that has not been considered with regard to the conservation of the EFMM is the risk of flooding, and this is considered a significant gap against proven best practice. Negative cultural-heritage impacts arising from project implementation have been successfully avoided, minimised, mitigated or compensated. Results of the archaeological and palaeontological investigations have been disseminated through workshops with communities, videos and records, international scientific journals and articles.

There is one significant gap against proven best practice, resulting in a score of 4.

Topic Score: 4

13.4 Relevant Evidence

Interview:	1, 4, 26, 41, 72, 79-80
Document:	1-5, 16-17, 98-101, 124, 162, 257, 295-298, 319, 328, 330-338, 390-391
Photo:	22 – 27, 110 - 132

14 Public Health (I-14)

This topic addresses public health issues associated with the hydropower project. The intent is that the project does not create or exacerbate any public health issues, that improvements in public health are achieved through the project in project-affected areas where there are significant pre-existing public health issues, and that commitments made by the project to implement public health measures are fulfilled.

14.1 Background Information

This topic covers public-health impacts caused by the project on affected communities, including indigenous peoples.

The public-health situation in the state of Rondônia (1.7 million inhabitants in 2013) is broadly representative of average conditions in Brazil, with the exception of higher incidences of some tropical diseases such as malaria (35 884 cases in 2006, before the start of the Jirau and Santo Antônio projects) and dengue. Other tropical diseases that were present are Leishmaniasis, Chagas disease, and Onchocerciasis or “river blindness”.

Gold-mining activities, present in the region since the early 1900s, used mercury for gold processing, and cases of deformations in humans caused by a bio-accumulation of methyl-mercury in fish were present before the project. Riverine communities such as Teotônio, depend on fish for subsistence. Other public-health related issues present before the project include tuberculosis, hepatitis, rabies, snake bites and traffic accidents.

Topic I-18, Waste, Noise and Air Quality, addresses any issues related to noise, dust and vibration generated by the project and their impacts on project-affected communities. Topic I-11, Indigenous Peoples, covers general issues concerning the indirectly-affected indigenous communities supported through the Support to Indigenous Communities Programme.

14.2 Detailed Topic Evaluation

14.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Public health issues relevant to project implementation and operation have been identified through an assessment process utilising appropriate expertise; and monitoring is being undertaken during the project implementation stage appropriate to the identified issues.*

Public-health issues relevant to construction and operation were identified in the EIA for the Madeira complex. The public-health assessment for the Santo Antônio project was carried out by the company IPEATRO, from May to June 2004, and involved random sampling of 104 families and 317 (including in Jaci-Paraná) individuals out of a total of 2 982 individuals identified in the area of direct influence of the project. Results indicated that, in general, the state of health of the population was satisfactory. Clinical tests identified key public-health issues as parasites (worms) infections being the most frequent diagnosis, followed by hypertension cases, anaemia and eye disorders. Malaria was the most frequent cause of hospitalisation and blood transfusions, followed by complications with pregnancy. Malaria, dengue and hepatitis were the most frequent diseases, followed by Leishmaniasis, Tuberculosis and Leprosy. The assessment also provided an overview of primary health services in the region (less than 30% of the population had access to primary health care) and hospital coverage in the state of Rondônia and the south-western Amazon; and a study of vector-borne diseases in the region.

The expected public health impacts of the project identified in the EIA are: the temporary increase in population during the construction period and associated increased demand for public-health services and potential increase of contagious and sexually transmitted diseases (STDs) (e.g. AIDS), violence; potential increase in area

of stagnant waters (including reservoir area) where mosquitoes could breed; a potential increase of bio-accumulation of mercury; and road accidents. Indigenous communities in the area of indirect influence may be affected by pressure of population increase, and an increase in malaria incidence.

The public-health programme of the PBA, includes a health monitoring sub-programme integrating surveillance of health issues in Porto Velho and the state of Rondônia in partnership with the Health Monitoring Agency of Rondônia (AGEVISA) and the Ministry of Health and agreements with well-recognised research institutions (Cepem and Ipepatro) and the University of Rondônia (UNIR) and the National Institute for Research in the Amazon (INPA). Health issues monitored include: external causes (violence, traffic accidents and injuries caused by venomous animals), malaria, dengue, Chagas disease, leprosy, filariasis, onchocerciasis, leptospirosis, leishmaniasis, hepatitis, tuberculosis and STDs/AIDS. The hydro-bio-geochemical programme includes monitoring of mercury and bio-accumulation. Vectors of diseases are also monitored (e.g. mosquitos and flies like anopheles, blackflies, *Aedes aegypti*, *phlebotominae* and *lutzomyia*; dogs and cats; urban pests; and bats).

The public-health monitoring committee formed by representatives of SAE, ESBR, IBAMA, Ministry of Health and the secretaries of health of both the municipality and the state of Rondônia, publishes a report on a yearly basis. The monitoring of vector-borne diseases includes 14 monitoring points targeting hotspots and more densely populated areas (e.g. Jaci-Paraná and Joana D'Arc).

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of public health issues during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities for different community groups that become evident during implementation.*

The monitoring takes into account inter-relationships amongst issues; the programme identifies indicators that are monitored under other monitoring programmes that contribute to the monitoring of health issues, for example monitoring of air quality, noise, and mercury are part of bio-physical monitoring programmes, and the monitoring of rabies is related to occupational health of those working on the clearing of the reservoir. Potential implications of the expansion project have been assessed and as a result, three additional monitoring points will be included in the programme, in areas close to communities with a higher potential or risks for vector-borne diseases. Monitoring also addresses risks that become more prevalent during implementation, such as road accidents, and higher exposure to wildlife transmitting diseases.

The monitoring of health issues in the project area is unusually comprehensive, and covers the direct and indirect area of influence of the project. As described above, the monitoring covers a broad range of diseases and vectors beyond those traditionally monitored on Brazilian hydropower projects. Some health programmes, e.g. malaria and monitoring initiatives in partnership with government institutions, have been recognised at national level for their effectiveness and represents an opportunity for other projects in Brazil (e.g. it is currently being applied in other projects like Belo Monte).

Criteria met: Yes

14.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to ensure management of identified public health issues, and to meet commitments, relevant to the project implementation stage; plans are in place for the operation stage for ongoing public health issues management including hand-over to local authorities as appropriate.*

The project has implemented a public-health programme that involves appropriate activities for the pre-construction, construction and operation phases: upgrade and/or construct new health centres, hospitals and

emergency services in Porto Velho and Jaci-Paraná under the social compensation programme and agreements with the municipality and state governments (e.g. provision of new surgery units at São Cosme hospital and expansion of the children's hospital in Porto Velho); provision of new equipment (e.g. vehicles and microscopes); measures to control immigration of population (e.g. workers are forbidden to enter the Santo Antônio village); provision of new and improved health centres in resettled communities; psychological support during resettlement; educational campaigns on violence, STDs and dental care in partnership with the University of São Lucas; intensified monitoring and control of diseases of epidemiological importance during construction (e.g. STDs/AIDS, vector-borne diseases and external issues); distribution and installation of over 30 000 mosquito nets with insecticide including for the downstream communities as well as in the indigenous areas of Karitiana and Karipuna; wetting of roads to minimise dust nuisance near the Santo Antônio village; and continued monitoring in the area of influence of the reservoir for a minimum period of 10 years during operation.

The health programme for indigenous peoples included urgent actions due to problems with an agreement between FUNASA (National Health Foundation) and CUNPIR (Coordination of the Union of Indigenous Peoples and Nations of Rondônia). Actions included: provision of medical staff for emergency care; spraying to control the proliferation of mosquitoes; analysis and control of water consumed by indigenous communities; assess the need for improved health infrastructure, services and sanitation; and health tests.

Handover of new health centres and equipment is carried out under a completion agreement indicating that the responsibilities for maintenance and operation are transferred to the municipality or state government. Infrastructure provided as social compensation has been sufficient to handle increased project demand but the local government needs to invest more resources to provide additional infrastructure to attend to pre-existing shortfalls. Verbal evidence indicates that the state government is going to invest in a new hospital in Porto Velho (near the general hospital). Visual and verbal evidence indicates that maintenance is adequately carried out; however the risk of inadequate resources (and royalties) invested in public health to provide or operate new health systems requires continued attention by the public authorities. For example, since the federal government allocated sufficient resources for sanitation infrastructure in Jaci-Paraná, project resources initially earmarked for this purpose were redirected to improve surgery facilities in Porto Velho. Problems with the contractor have, however, meant that the work in Jaci-Paraná has been temporarily stopped.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

The public-health monitoring committee has been working since 2008 and represents a viable process for the anticipation and response to emerging risks and opportunities. There have not been any unexpected issues emerging, other than an underestimation of road accidents. In response, the committee proposed actions for improving signage, crossings and education campaigns, with good results. There was an outbreak of malaria in 2010 which affected the Amazon basin and, in coordination with the municipality, control actions were implemented, e.g. intensification of waste collection.

Recognition of the high level of mercury in fish has led to limits being put on the amount of fish that can be consumed as school dinners to 200 g per pupil per week.

Other emerging risks are claims by families in Jaci-Paraná about groundwater contamination caused by the reservoir formation. In response, the project increased the number of wells used for groundwater monitoring. There are a number of health issues (e.g. STDs, violence on women and drug traffic) that have increased and became more evident in Jaci-Paraná in recent years, mainly attributed to the influx of workers from the Jirau project; however SAE's programmes and voluntary actions also contribute to prevent and mitigate these issues with new infrastructure and educational campaigns.

Emerging opportunities have been captured by a strengthened health system and training of local communities, and through support to a monitoring committee that involves key health institutions at municipal and state level, and that will continue during operation.

Criteria met: Yes

14.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in place to manage public health issues have been and are on track to be met with no significant non-compliances or non-conformances, and public health related commitments have been or are on track to be met.*

No significant non-compliances and non-conformances have been identified, and the health-related activities under the PBA are on track to be met. Recommendations from JGP/Exponent, IBAMA and the health committee have been followed. The latest JGP/Exponent monitoring report recommends new campaigns for monitoring of mercury in the riverside communities for mid-2014, and planning for this is in progress. Other recommendations attended to include continuity and strengthening of vector monitoring in Joana D'Arc, Vila Franciscana, Cujubim Grande and Santa Rita. Social compensation agreements with the municipality and the state have been fulfilled and proposed infrastructure has been delivered and handed over to the municipalities.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

No non-compliances and non-conformances have been identified.

Criteria met: Yes

14.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Negative public health impacts arising from project activities are avoided, minimised and mitigated with no significant gaps.*

Negative public-health impacts caused by the project have been prevented through education campaigns, minimised and mitigated through the implementation of a comprehensive public-health programmes with no significant gaps. Key outcomes of the programmes include a reduction of over 30% in the incidence rate of malaria in the city of Porto Velho between the years 2008 and 2013, and the number of dengue cases was also reduced. Monitoring will continue for 10 years during the operational phase. Data from January to November 2013 shows a reduction of 42.4% in cases of malaria in comparison to the same period in 2012, indicating that measures are continuing to be effective.

Issues, such as bio-accumulation of mercury did not experience any changes compared to pre-project conditions. Changes in the trends of other issues include increases in traffic accidents, STDs, urban violence, psycho-social impacts (e.g. drug abuse) and an increase in population which in the view of key regulatory authorities (state of Rondônia, Ministry of Health and IBAMA) have been mitigated in a satisfactory manner in accordance with the PBAs.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, negative public health impacts arising from project implementation are avoided, minimised, mitigated and compensated with no identified gaps; and enhancements to pre-project public health conditions or contributions to addressing public health issues beyond those impacts caused by the project are achieved or are on track to be achieved.*

Potential residual impacts caused by the project, and still under study, are related to the potential groundwater-level variations and contamination (see topics I-9, I-17 and I-19) in Jaci-Paraná and Vila Franciscana, but this situation has been addressed under topic I-9, Project-affected Communities. All other impacts are successfully avoided, minimised or mitigated with no identified gaps through the implementation of the PBAs.

Key project contributions to enhancing pre-project conditions are: reduction of the malaria risk category in Porto Velho from high to medium, and in Rondônia from medium to low; provision of public-health infrastructure which in some cases go above and beyond the increased demand caused by the project; and lessons learnt from the malaria-control programme which are currently implemented in other projects. Payment of royalties can contribute to enhancing the cost-benefit of the project through public-health improvements, if resources are invested adequately, in particular to address potential legacy issues of immigration in Jaci-Paraná.

Criteria met: Yes

14.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

14.3 Scoring Summary

Public health issues in the area of influence of the project include: immigration and potential increases of STDs; prostitution and violence; noise and dust nuisance; a potential increase of cases of tropical diseases (malaria, dengue, leishmaniasis, Chagas disease), and other diseases (hepatitis, rabies and tuberculosis); and bio-accumulation of mercury.

Public-health issues during construction are managed through a public-health programme, a social-compensation programme for new and improved health infrastructure, a programme for the support of indigenous peoples, and interactions with bio-physical monitoring programmes (e.g. monitoring of mercury and air quality). The programme is very comprehensive and covers a broad range of issues which are monitored and followed up by a committee involving local, state and federal government, SAE and ESBR. Public-health infrastructure provided has covered the increased demand caused by the project, and handover to local authorities is undertaken through an agreement of completion.

The potential health impacts of the project are well managed, and measures implemented show a good level of responsiveness to emerging risks and opportunities. The project has contributed to a number of enhancements to pre-project public-health conditions, in particular the reduction of the malaria risk category in Porto Velho, which dropped from high to medium, and in Rondônia from medium to low.

There are no significant gaps against proven best practice, resulting in a score of 5.

14.4 Relevant Evidence

Interview:	1, 26, 42, 55-56, 77-79, 82,
Document:	1-5, 15-18, 22-24, 40, 50-52, 257, 339-341, 361
Photo:	13 – 15, 133 – 137

15 Biodiversity and Invasive Species (I-15)

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

15.1 Background Information

The project-affected area is world renowned for its biodiversity, providing habitat for a wide range of flora, fauna and fish, although none are endemic. The reservoir (including the project expansion) will cover a maximum of 542 km² (142 km² being original river area) of land, 122 km² of which consisted of tropical rainforest and the remainder largely pasture. The project has not impacted the Matinguari National Park on the left bank of the Madeira, although the region as a whole is under pressure from deforestation for small-scale agriculture. The permanently protected riparian areas around the reservoir now constitute an important ecological corridor linking the Iténez-Mamoré corridor to central Amazon forested areas. The Dourada catfish spawns in the headwaters of the Madeira River in the Andes, and uses central Amazon floodplains as nursery areas. Its importance to the economy of the region and its requirement for migration has made it a key species for monitoring.

A number of the PBAs are relevant to this topic, including Limnological, Aquatic Macrophytes Monitoring Programme, Flora Preservation Programme, Deforestation in the Area of Direct Influence Programme, Fauna Preservation Programme, Deforestation Activities Monitoring Programme and Fauna Rescue, Ichthyofauna Preservation Programme; and the Conservation and Use of Surrounding Areas of the Reservoir Plan. SAE have coordinated the execution of these plans by a number of consultants. “Soluções e Tecnologia Ambiental” (SETE) monitor birds, mammals, reptiles and amphibians, “Probiota” monitor insects, “Ecology Brasil” monitor water quality and aquatic organisms and “Neotropical” monitor fish. A number of renowned research institutions are involved in these programmes, such as “Instituto Nacional de Pesquisas da Amazônia” (INPA), “Universidade Federal de São Carlos”, “Universidade Federal de Juiz de Fora”, “Museu Nacional do Rio de Janeiro” and “Museu Emílio Goeldi”, among others.

There is overlap between this topic and I-19 Reservoir Preparation and Filling, particularly regarding reservoir clearing and fauna rescue. Detailed discussion of biodiversity issues will be covered here.

15.2 Detailed Topic Evaluation

15.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Biodiversity issues relevant to project implementation and operation have been identified through an assessment process utilising appropriate expertise; and monitoring is being undertaken during the project implementation stage appropriate to the identified issues.*

SAE have identified biodiversity issues relevant to project implementation and operation through an assessment process utilising appropriate expertise. In the project preparation phase some of Brazil’s leading institutions and researchers compiled a baseline study of biodiversity in the region as part of the EIA submission for both the

Santo Antônio and Jirau projects. The monitoring programmes set out in the PBAs have continuously developed SAE's understanding of potential impacts. The research has not revealed any issues with invasive species.

The research documented 533 species of trees, some of which are listed on the IUCN red list of threatened species or on the official list of threatened Species of Brazilian Flora. These are the Black Manwood (*Minquartia guianensis*), Brazil-nut Tree (*Bertholletia excelsa*), Mahogany (*Cedrela sp*), Itaúba (*Mezilaurus itauba*), and the Large-leaved Mahogany (*Swietenia macrophylla*)

Fauna surveys were undertaken before the reservoir filling, from November 2009 to December 2011, and after filling, from 2012 onwards. A wide range of insects, reptiles, amphibians, mammals, bats, and birds was recorded. The reservoir area provides habitat for some endangered species including the giant otter (*Pteronura brasiliensis*), the black-faced spider monkey (*Ateles chamek*) and the gray woolly monkey (*Lagothrix cana*). Monitoring has identified many new species of insect, for example increasing the number of registered aquatic insect taxa from 4 to 40. 152 termite species were recorded, the greatest diversity of termite species recorded anywhere in the world.

The University of Rondônia carried out a survey of fish in the river from 2009 until 2011 revealing 998 species of fish, 47 families and 13 orders, though none are endemic. Some characins and catfishes migrate up the river, including the economically important catfish Dourada (*Brachyplatystoma roussexii*). Numerical models have also been used to predict the rate of eggs and larvae passage through the Jirau and Santo Antônio reservoirs, to the floodplain downstream of the dam.

SAE run a number of biodiversity monitoring programmes appropriate to the identified issues. Anperes, a consultant to SAE, delivers the Monitoring of Vegetation Succession at Reservoir Banks sub-programme (part of the Flora Preservation Programme). They check for invasion of the protected area around the reservoir by people, animals, ants, or pests. Anperes investigate any plant dieback, and measure seedlings annually to check growth rate and to assess if fertilisation is required. Fauna and vegetation succession monitoring is done using the Rapid Assessment and Long Term Ecological Research methodology (RAPELD) which was developed by the Amazonian Research Institute - INPA (from the Portuguese "Instituto Nacional de Pesquisas da Amazônia"). The method aims to highlight species that are rare in and around the impact area to prioritise things most valuable to conserve. This, together with the Jirau project, is the largest applications of this methodology in the world. The method uses transects in five areas around the reservoir at various distances from the river to understand ecological variation over space and time. Seven areas were monitored prior to filling, one of those areas have since been submerged, as planned, by the reservoir. Two of the areas were in the Jirau project's impact area and the responsibility of those was handed over to ESBR. After the filling of the reservoir, a new monitoring area was created to replace the one that had been submerged by the reservoir. This new area, along with the four relevant areas remaining from the pre-filling stage, constitute the five monitoring areas currently used.

SAE also use the RAPELD to monitor fauna effected by the project, managed by the "Fauna Preservation Programme" and its eight sub-programmes: Entomofauna monitoring (insects); Herpetofauna monitoring (reptiles and amphibians); Terrestrial-mammal monitoring; Chiroptera monitoring (bats); Monitoring and control of incidence of rabies transmitted by bats; Monitoring of aquatic and semi-aquatic mammals; Monitoring of bird species; and Monitoring of birds' environments.

Monitoring began in 2009, by three separate consulting companies – INPA who monitored birds, amphibians, bats and reptiles during the pre-filling stage, SETE who took over from INPA to monitor birds, amphibians, reptiles and bats after the reservoir filling, and also monitor terrestrial mammals. Probiota has been responsible for insects monitoring since the pre-filling stage. The consultants monitor some groups every three months, the remaining groups every six months. The monitoring programme results will be presented to IBAMA in August 2014 following which the frequency of monitoring and species focus will be revised.

The Ichthyofauna (fish) preservation programme consists of six parts: taxonomic inventory, ecology and biology, Ichthyoplankton (eggs and larvae of fish), population genetics, and fish monitoring. Neotropical, a consultancy, have been contracted by SAE since 2011 to undertake monitoring of Ichthyofauna and run three programmes:

- Radio monitoring of key large migratory fish
- Monitoring of ecology, biology, eggs and larvae
- Monitoring of landings by local fishing communities.

Radio-monitoring transmitters have been put in 315 fish to date, including Dourada, Pinarnetola, Bohio, Fulliote, Jau and Sunlism, species which IBAMA require to be monitored. Neotropical use 16 receivers around the dam and spillway to monitor fish movement.

From 2013, Neotropical carry responsibility for the conservation programme and now monitor ecology, biology, eggs and larvae above and below the dam. Eggs and larvae are collected every two weeks at six points using draw nets. Neotropical also collect fish at nine monitoring points using gill nets, Seine nets and long lines. Monitoring of the fish ladder using sampling, ultrasound and radio tagging has revealed 70 species of fish actively using the passage.

The fishing community monitoring sub-programme records the catch of fish at seven communities in the project-affected area, including Porto Velho. Neotropical began this monitoring in 2013, taking over from the University of Rondônia who were responsible for collecting the baseline data from the same communities. However, this baseline does not allow valid comparison with the data currently being collected, because previously if a fisherman did not catch anything, the trip was not recorded, now 'no catch' is recorded and is part of the statistical analysis. This is not considered a significant gap as Neotropical are analysing the difference and pursuing technique to correct the data. SAE were also able to undertake additional random sampling of the fish population rescued when cofferdams were dewatered.

The biodiversity of the project area has become some of the most intensively studied in the world with 188 conference presentations, scientific theses and papers published in the last five years. In addition, two books documenting the research findings have been published: Fish from Madeira river (from the Portuguese "Peixes do rio Madeira") and a guide containing the Fauna Species Rescued (from the Portuguese "Guia de Espécies de Fauna Resgatadas").

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of biodiversity issues during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

The monitoring of biodiversity issues during project implementation takes into account inter-relationships amongst issues. Each PBA explicitly considers interrelationships with other programmes and all monitoring streams go to the same project management team within SAE who identify emerging relationships risks and opportunities. In addition the consultant Ecology (responsible for water quality) hold an annual seminar bringing together SAE staff from different work areas to discuss water quality and variation in aquatic life. This gives an opportunity for the interrelationships between issues to be observed. Detailed analysis of the interrelationships between different species groups and other environmental variable, such as water quality, is planned for August 2014, the end of this phase of monitoring, when monitoring consultants will examine any trends that have emerged.

The monitoring of biodiversity issues also takes into consideration both risks and opportunities that became evident during the implementation. For example the project licence required monitoring of fauna using pitfall traps. However, monitoring teams found that pitfall traps could not be used effectively in rocky areas (trap could

not be buried) or in high water table areas (trap floats), areas which happen to be of most interest for monitoring. As such, the team adopted an active sampling method, manually raking leaf litter in search of animals. The monitoring of birds by boat also required adaptation to avoid the noise caused by the boat engine - cutting the engine allowed birds to be monitored by their song.

Further examples of the monitoring programme adapting to emerging risks and opportunities includes some of Neotropical's fish ecology and biology monitoring points, which were originally located too close together to accurately cover the study area. The consultants reviewed the coverage and put new stations in place. Neotropical's fish ecology monitoring programme has formed a partnership with Waterloo University in Canada to develop and improve sampling techniques. The programme is also using radioisotopes to understand if the long distance migratory fish return to the spawning grounds from which they originated.

Criteria met: Yes

15.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to ensure management of identified biodiversity issues, and to meet commitments, relevant to the project implementation stage; and plans are in place for the operation stage for ongoing biodiversity issues management.*

Numerous PBAs are in place to ensure management of identified biodiversity issues and to meet commitments, in both the implementation and operation stage. The plans have clearly allocated responsibilities, appropriate funding and resources, objectives and targets, and monitoring and evaluation provisions.

The Recovery of Permanent Preservation Area sub-programme, part of the Flora Preservation Programme, has managed the rehabilitation of 1 244 hectares of land from pasture around the reservoir to form the protective buffer strip, which ranges in width from 30 to 500 meters. Local fishermen also advised which species SAE should plant along the shoreline to attract fish. Brazilian law now protects the area which is fenced and monitored by a dedicated team. Recent flooding has affected some areas of reforestation which will require replanting and re-fencing. SAE established a nursery with Porto Velho town hall to support the reforestation, which is capable of producing 60 000 seedlings a year. This partnership is coming to end, but SAE will donate the facilities and some seedlings to the municipality.

SAE used the Fauna Rescue Programme to relocate fauna that could not move away from the deforestation and inundation areas. In total, 105 000 animal were rescued over a five-year period. SAE relocated most of the animals to unaffected forest areas on the same side of the river that they were captured, with the exception of most venomous snakes which were sent to a research institute, and honeybees which were sent to beekeepers. SAE maintained a record of the species and location of every animal relocated. The fauna rescue team now focus on removing animals from the construction site, largely crocodiles, snakes, sloths, anteaters, and birds. 10 staff are available around the clock, including trained biologists. A wildlife-rescue centre was operated during the reservoir-clearing process to provide veterinary care for 1 767 animals injured by the clearing. SAE still fund the operation of the facilities although they no longer contain any project-affected animals. All inhabitants are now animals confiscated by IBAMA, and SAE is seeking to hand over operational responsibility to IBAMA.

The Ichthyofauna Preservation Programme (fish) aims to maintain the population of fish in river. SAE built a one-kilometre fish pass into the centre of the dam to allow migratory fish to reach their spawning areas up stream of the project. Engineers and biologists designed the pass using numerous physical modelling exercises to optimise its shape, depth and flow rate. The pass extends 30 meters to the riverbed to encourage access by bottom feeding fish. SAE will establish a fish bio-engineering research lab in the next two years to test major changes in setup on a range of migratory fish and investigate new approaches to attracting fish to the ladder.

SAE used the Ichthyofauna rescue sub-programme to rescue fish trapped when the cofferdams were dewatered. During this operation biologists monitored water quality and maintained the oxygen level using pumps. The sub-programme was also required to rescue fish from the turbines if the turbine needed to be dewatered. Going forward fish rescue from the turbines will become a periodic event coinciding with scheduled maintenance activities.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Processes are in place to anticipate and respond to emerging risks and opportunities. There are monthly meetings between the staff responsible for the PBAs to identify problems, coordinate solutions, check targets and look for opportunities for improvement. For example SAE are using radar to monitor the conservation areas for deforestation, new structures, fences or paths. A field team follows up any signs of logging to investigate on the ground and initiate legal action if required. The radar has proven sufficiently sensitive to highlight selective removal of trees as well as clear felling.

The Flora Rescue sub-programme collected seeds and saplings from the inundation area. 5 300 plant samples were catalogued in a Herbarium set up at the University of Rondônia funded by SAE. The collection is now available online and the University of Rondônia shares samples with museum and researchers around Brazil. SAE also funded a Germoplast lab at the same university which holds 1 200 samples of plant to conserve their genetic diversity. The University of Rondônia also manage a collection of almost 1 000 species of fish from the river basin, collected during the joint EIA for the Madeira projects and during the 4-year monitoring period Unir has been responsible for. SAE have supported the collections documentation in books and a website. The collection is also available to researchers on request.

SAE are supporting the development of a fish-breeding programme for Dourada, Piraiba and Babao aiming to develop the technology to reproduce these species, in case it is required in the future. The potential benefits of the project are: enhanced knowledge of these species; improved income for local communities; and a contingency plan if the fish ladder fails to allow passage of the long-distance migratory fish. Fish from this programme are not intended for release at this stage, due to potential environmental risks.

Criteria met: Yes

15.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in place to manage biodiversity issues have been and are on track to be met with no significant non-compliances or non-conformances, and biodiversity related commitments have been or are on track to be met.*

IBAMA have confirmed that SAE have met all legal requirements. All commitments and objectives set out in the PBAs have been or are on track to be met.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

There are no non-compliances or non-conformances.

Criteria met: Yes

Analysis against basic good practice

Scoring statement: *Negative biodiversity impacts arising from project activities are avoided, minimised, mitigated, and compensated with no significant gaps.*

Before the project commenced, small-scale deforestation for agriculture was making significant inroads into the area's forest. Whilst the project required the clearing of trees for the reservoir, SAE have reforested the reservoir margin with 170 species of tree using seeds and seedlings collected during the reservoir clearing. The relocation of species in the restored area mimics the previous composition, based on the original inventory.

Monitoring has not noted the disappearance of any fauna species from the project area, although it is too early to make definitive conclusions as to the impact. Some groups have been more sensitive to project impacts, particularly those that rely on riparian habitat such as aquatic birds, mammals and reptiles, whose numbers have decreased. For example, some turtles which nest on islands in the river have lost their breeding areas. Further monitoring will need to follow if new breeding areas can be established for these turtles. It is unclear if the relocation of animals away from the project area has had any conservation benefit as the project does not monitor the relocation areas.

The major impact to the river habitat has been the loss of a waterfall and rapids at the dam site, and the dam now reduces the ability of fish to migrate upstream. Fish are making use of the fish pass, but it is not yet clear how the volume and composition of migration has been altered. Fish biologists do not believe that the project has significantly effected fish stocks, although the historic trend towards decline, thought to be due to overfishing, has continued. Fish catch data shows a decline in the amount of fish landed by local fishermen, particularly above the dam. This is attributed to a number of factors particularly the forced change in fishing methods. Historic monitoring data also shows significant annual variation in composition and volume of fish catch, so analysing the impact of the dam over the last few years remains difficult. The poor quality of historical data compounds this difficulty. Neotropical's ecology and biology monitoring programme (limited to the last year) shows that fish that previously inhabited the rapids have disappeared from that area since the rapids were inundated, and there has been some decline in the number of migratory fish. However, fish are feeding and reproducing, the quantity of eggs and larvae in the areas sampled also remains similar. Some fish deaths in the project's turbines were noted when the first commissioning took place. However SAE engineers and biologists have worked together to reduce incidents of decompression on fish by adjusting operational procedure. Furthermore, specific structures to facilitate and improve efficiency in fish rescue in the turbines were designed and installed.

IBAMA considers the only open question to be that of the migratory fish. They consider this issue on track, in full compliance with the adaptive-management approach they have mandated. If the monitoring programme identifies significant residual impacts, additional mitigation and/or compensation will be put in place.

SAE must pay into a national biodiversity compensation fund as a requirement of their operational licence. The payment is equivalent to 0.5% of the total construction cost – presently R\$ 74 million. The fund is divided between the federal (R\$ 41 million), state (R\$ 14 million) and municipal (R\$ 1 million) administrations⁵. ICMBio, the government body responsible for conservation areas, will administer the federal funds. ICMBio will spend the money on land titles, fencing, training and equipment to support existing conservation areas across Brazil. The project has already given R\$ 7 million worth of equipment (boats, microscopes etc.) to ICMBio to distribute over 100 conservation areas. The project will hire a fund manager to administer the state fund to ensure that

⁵ The (originally) R\$ 56 million total compensation fund was calculated based on the project excluding the expansion. A revised breakdown between municipalities has not been established after the revision of the amount to R\$ 74 million to include the expansion, so the breakdown here is based on the original project size.

the money reaches its intended destination. The fund manager will focus expenditure on seven conservation areas within Rondônia and will be supervised by SAE and the Ministério Público de Estado (MPE). SAE will administer the municipal fund, monitored by IBAMA. This fund will be used to construct buildings and buy equipment for the municipal park in Porto Velho.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, negative biodiversity impacts arising from project implementation are avoided, minimised, mitigated and compensated with no identified gaps; and enhancements to pre-project biodiversity conditions or contribution to addressing biodiversity issues beyond those impacts caused by the project are achieved or are on track to be achieved.*

The loss of riparian habitat above the dam has negatively affected aquatic mammals, reptiles, and birds, although none of these species is endemic or endangered. There is a small population of river dolphin in the reservoir thought to number around 20 individuals. The dolphin cannot migrate out of the reservoir, and a population this size is not theoretically viable, so some measures may need to be taken in the future to increase its genetic diversity. The dam provides a major challenge to the continued migration of fish, and it is not clear at this stage that the impact will be entirely minimised, mitigated and compensated. However this is not seen as a significant gap as the project is channelling significant resources into solving this issue with best available technology.

The project has made a significant contribution to the conservation of biodiversity in the region beyond those impacts caused by the project, through the reservoir buffer strip and the various compensation fund projects. The research undertaken in the project-affected area has contributed to understanding of biodiversity in the Amazon region and the Madeira River in particular. Resources such as the fish and plant collections are publicly available and are being well used by researchers. Telemetry monitoring by Neotropical has proven that this technique is possible in a sediment heavy river such as the Madeira, and is continuing to improve understanding of the behaviour of its migratory fish. Use of the RAPELD fauna and flora monitoring method has contributed to understanding of this spatially explicit approach. If continued in the long term the monitoring will build a significant and valuable biodiversity knowledge resource for the region.

Criteria met: Yes

15.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

15.3 Scoring Summary

A range of specialists with appropriate expertise has comprehensively assessed the biodiversity impacts arising from the Santo Antônio project. This research discovered a large number of new species and has built an impressive body of biodiversity knowledge about a region which was previously poorly understood by science.

The research has informed a range of monitoring and management plans to address the potential impacts identified. Seeds and saplings from the deforested area were replanted in the reservoir margins, terrestrial fauna was relocated, and a fish passage has been installed to facilitate upstream migration. Processes are in place to

identify emerging risks and opportunities, which have led to a number of innovative approaches such as the use of radar to monitor protected areas. All legal requirements and commitments to implement biodiversity and invasive species measures are fulfilled.

There are healthy, functional and viable aquatic and terrestrial ecosystems in the project-affected area that are sustainable over the long-term. It is not clear yet that the impact of the project on the Madeira’s migratory fish will be fully mitigated, but ample resources are assigned to implementing best-available technology to address the issue of migration.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

15.4 Relevant Evidence

Interview:	17, 18, 26, 32 – 34, 40, 44, 51, 53, 62, 63, 65, 74
Document:	1 – 5, 10, 16, 17, 21, 22, 59, 88, 89, 91, 103 – 113, 129, 168, 221, 238 – 242, 244, 254, 271 – 274, 301, 309
Photo:	138 – 151

16 Erosion and Sedimentation (I-16)

This topic addresses the management of erosion and sedimentation issues associated with the project. The intent is that erosion and sedimentation caused by the project is managed responsibly and does not present problems with respect to other social, environmental and economic objectives; that external erosion or sedimentation occurrences which may have impacts on the project are recognised and managed; and that commitments to implement measures to address erosion and sedimentation are fulfilled.

16.1 Background Information

The Madeira River has an exceptionally high, very fine-grained, sediment load. It is estimated that the Madeira contributes 500 million tonnes of sediment to the Amazon each year. The sediment composition is 30% clay, 55% silt and 10% sand, and the riverbed is almost entirely made up of sand. The majority of sediment transport occurs when the river flow is greater than 20 000 m³/s, during the high flow months between February and May.

There are five management programmes which are relevant to this topic: the Monitoring of Vegetation Succession at Reservoir Banks sub-programme; the Recovery of Permanent Preservation Area sub-programme; Deforestation in the Area of Direct Influence Programme, the Monitoring of Sediment Behaviour in Downstream sub-programme; and Conservation and Use of Surrounding Areas of the Reservoir Plan.

SAE contract the monitoring of erosion and sediment out to “Projetos e Consultorias de Engenharia” (PCE) the engineering firm responsible for a number of aspects of the project. PCE employ 50 members of staff at various levels on the erosion and sediment-monitoring programme.

There is some overlap between this topic and I-18 (Waste, Noise and Air Quality) which addresses all construction-site-related erosion and sedimentation. There is also overlap with I-17 (Water Quality) which addresses all non-sediment related water quality issues.

16.2 Detailed Topic Evaluation

16.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Erosion and sedimentation issues relevant to project implementation and operation have been identified through an assessment process utilising appropriate expertise; and monitoring is being undertaken during the project implementation stage appropriate to the identified issues.*

Odebrecht began erosion and sedimentation studies in the Madeira River in 2001. PCE updated and developed the original studies from 2007 onwards. The studies focused on the high sediment content of the river and aimed to quantify the level of transport and predict changes over time. Modelling of the risk of erosion focused on the increased erosive capacity of the river following sediment deposition in both the Jirau and Santo Antônio reservoirs. PCE undertook one-dimensional modelling of sediment flow from the Jirau reservoir to Humaitá (upstream to app. 350 km downstream of the Santo Antônio project), incorporating monitoring data from the stretch to understand the project’s medium to long-term impacts. The modelling allowed an estimate of the level of sediment retention in the reservoir to be estimated, as well as sediment transport downstream. PCE also undertook two-dimensional modelling of the Madeira immediately up and down stream of the Santo Antônio dam to improve understanding of the characteristics of sediment transport around and through the new structure.

The project has contracted PCE to undertake a programme of monitoring of erosion and sedimentation to build on the knowledge gained in the EIA and to understand changes in the behaviour of sediment in the river. The

area covered by the monitoring extends from the confluence with the Mamoré River and the Beni River upstream of the Jirau Reservoir, and until Humaitá, downstream of the Santo Antônio dam. It also includes the Jaci-Paraná River, a key tributary of the Madeira which flows into the Santo Antônio reservoir.

PCE have 16 active gauging stations which take readings twice a day, and 10 telemetric stations which measure water level and rainfall. On a monthly basis PCE use Acoustic Doppler monitoring to measure the river's discharge of liquid and solid at 9-12 vertical points across five transects to gain an integrated sample. PCE also undertake point sampling to obtain the particle size of the bed material, and suspended sediments at five points, four times a year. PCE operate a dedicated laboratory which analyses, records and stores each water or sediment sample. PCE keep the results of the analysis in a database and feed them into the ongoing modelling efforts.

PCE undertake bathymetric surveys to monitor how the project is influencing the shape of the riverbed, up and downstream of the dam. They also monitor the location and characteristics of riverbanks, islands, and alluvial deposits. The monitoring programme attempts to measure the movement of the riverbed and sandbanks, but the dynamic nature of the environment has made this very challenging. PCE visually inspect riverbanks annually to observe the impact of erosion.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of erosion and sedimentation issues during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

SAE sustainability and engineering managers regularly review the results of the sediment-monitoring programme to observe inter-relationships between changes in the sediment regime and other environmental aspects which they monitor (described in more detail in I-3). For example, during January and February of 2014 the exceptionally high river flow rates brought large volumes of sediment into the turbines, blocking the cooling system. PCE shared sediment-monitoring data with the engineering team who revised the operating procedure to adapt to the sediment load. The project engineers have also made use of bathymetry data to understand how the lowering of the downstream riverbed could increase power generation by increasing overall head. In addition the sediment monitoring programme also has a close relationship with the Limnological Monitoring Programme (described in I-17), and results are regularly shared.

The sediment-monitoring programme has adapted to new risks by increasing the frequency of sampling through the recent flood to improve their understanding of this high sediment transfer event. PCE have also increased monitoring of areas close to dredging activities and of riverbanks erosion in vulnerable places.

In terms of monitoring opportunities, SAE will begin monitoring riverbank erosion using Radar, which provides better coverage of riverbanks as it can operate through rain and clouds which are ever present in the region. PCE are also currently evaluating how to better understand what bank side erosion is caused naturally and what can be attribute to the project. PCE present reports twice a year to SAE who share with IBAMA for review. This process regularly reveals opportunities to improve the project or revision of the monitoring campaign.

Criteria met: Yes

16.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to ensure management of identified erosion and sedimentation issues, and to meet commitments, relevant to the project implementation stage; plans are in place for the operation stage for ongoing erosion and sedimentation issues management.*

The project design has a number of features which contribute to the management of erosion and sedimentation. For example, the power plant is located at the river level to allow as much direct sediment transport as possible. As a run-of-river project, the dam does not reduce the water velocity and sediment carrying capacity significantly, and the use of bulb turbines facilitates sediment flow. SAE will maintain the reservoir level at a relatively constant level so erosion associated with fluctuating levels will be avoided, and SAE's environmental licence prohibits the flushing of sediment from the reservoir.

Rip rap has been installed at key erosion points along the riverbank. However, the installation was too late to prevent a significant erosion event at the Triangulo neighbourhood of Porto Velho, discussed in the Outcomes section. SAE could reduce downstream riverbank erosion by installing large-scale structure, like riprap, however, given the low level of habitation, and historically high rates of erosion, SAE do not believe protection is necessary.

The PACUERA, SAE's conservation and environmental management plan for the project-affected area, inserts the reservoir into the region's legal context. The PACUERA includes the Recovery of Permanent Preservation Area Subprogram which will reduce erosion and sedimentation from around the reservoir by afforesting and protecting 32,000 hectares of land, some of which was previously pasture or small-scale cultivation.

Construction plans emphasise the importance of avoiding erosion and sediment run off from the construction site, quarry, spoil areas and road using underground drains and channels, stilling basins, maintenance of land cover, and gradients. This is discussed in more detail in topic I-18 Waste Noise and Air Quality.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

PCE's monitoring programmes have allowed them to anticipate and respond to emerging risks. For example monitoring has revealed significant sediment build-up, up and downstream of the dam in the recent floods. SAE are currently investigating the issues further and looking at strategies to help remove this sediment.

Modelling revealed that the dam design was creating a circular flow of water upstream of the intakes, creating a risk of sediment deposition. This finding led to a change in the dam design to maintain river flow. Modelling also revealed that sediment may build up below the spillways though the dry season when they are not operating. A large release, caused by a shutdown for example, through the spillway could create a large sediment release to the river. SAE are developing plans to prevent this sediment build-up. Furthermore, the project expansion may improve sediment transport through the dam, since the additional 6 turbines will operate in the centre of the river, where the flow is strongest.

SAE have a budget for research and development which must be spent each year on opportunities for improving the project. Teams must look for research opportunities and make proposals to receive the funding. One such opportunity was using radar to monitor riverbank erosion. SAE have also regularly shared the research undertaken into the sediment dynamics at international conferences, allowing the conclusions to be scrutinised and opportunities for improvement identified. The monitoring programme collaborates with the University of Rio, the University of Rondônia and has an exchange programme with Canadian consultants NHC.

Criteria met: Yes

16.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in place to manage erosion and sedimentation issues have been and are on track to be met with no significant non-compliances or non-conformances, and erosion and sedimentation related commitments have been or are on track to be met.*

SAE have met all the regulatory requirements set out in their installation and operational licence by IBAMA, such as land rehabilitation, riverbank protection and construction site management. SAE have also met or are on track to meet internal commitments and goals regarding erosion and sedimentation.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

The project has no non-compliances or non-conformances.

Criteria met: Yes

16.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Erosion and sedimentation issues during project implementation are avoided, minimised and mitigated with no significant gaps.*

The modelling undertaken by PCE showed that if the Jirau and Santo Antônio projects were not built there would be little or no variation in the riverbed over 120 years. The modelling suggests that there will be some erosion of the riverbed downstream of the Santo Antônio project in its initial years. The maximum variation could be 7-8 meters after 30 years of operation. However, the model predicts that by 60 years of operation the riverbed will begin to rise with gradual sedimentation, and will be almost entirely recovered after 120 years.

Over the first 30 years of operation, modelling predicts that the sediment deposition in the Santo Antônio reservoir will be relatively low, at less than 15% of the total volume. At the end of the 120 simulated years, the reservoir is predicted to have accumulated a volume of sediment equivalent to 63% of the total volume of water found in the stretch, and will be close to reaching the system's sediment balance.

Monitoring of riverbanks before the project showed a very high natural level of erosion, up to 100 meters a year in places. Continued monitoring on the ground and using radar has shown that the level of erosion has, in general, not increased. A one off erosion event took place at the Triangulo district of Porto Velho in 2012, described below.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, erosion and sedimentation issues during project implementation are avoided, minimised, mitigated and compensated with no identified gaps; and enhancements to pre-project erosion and sedimentation conditions or contribution to addressing erosion and sedimentation issues beyond those impacts caused by the project are achieved or are on track to be achieved.*

In February 2012, following the initial reservoir impoundment and onset of the rainy season, high (but not unusual) river flows prevented five of the 15 spillway gates from opening, due to construction-related safety considerations. This concentrated flow in the remaining 10 gates created unexpected turbulence in the downstream reach which extended beyond the stilling basin and caused significant erosion of the riverbank in

the Triangulo neighbourhood of Porto Velho. The modelling had not predicted this erosion, no modelling of this type of event had occurred, and riprap to protect this section of the riverbank had not been installed. While this was an extreme event that normal modelling does not predict, the severe impacts caused renders this a **significant gap** at the proven best practice level for these criteria.

The project is making enhancements to pre-project erosion and sedimentation conditions through the Recovery of Permanent Preservation Area sub-programme which will reduce the erosion potential of land surrounding the reservoir.

Criteria met: No

16.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

The significant riverbank erosion at the Triangulo district of Porto Velho in 2012 is a significant gap against the outcome criteria at the proven best practice level.

1 significant gap

16.3 Scoring Summary

SAE made a comprehensive assessment of erosion and sedimentation issues relevant to project implementation and operation, using empirical measurements and computer models, focusing on the exceptionally high rate of sediment transport in the Maderia River. PCE run a broad sediment monitoring and analysis programme which provides ongoing input to the computer simulations. The monitoring of erosion and sedimentation issues takes into account inter-relationships amongst issues through the sharing of results across the various PBAs and accounts for risks and opportunities through ongoing revision of the programme’s activities.

Processes are in place to ensure management of identified erosion and sedimentation issues at the implementation and operation stages, through the project design, installation of rip rap, and through the Recovery of Permanent Preservation Area sub-programme. The extensive monitoring campaign allows SAE to anticipate and respond to emerging risk like sediment build ups, and regular review by IBAMA helps identify new opportunities to improve the project.

The project has no non-compliances or non-conformances, and in general SAE avoid, minimise and mitigate erosion and sedimentation issues. There will be some downstream erosion and some reservoir siltation, but PCE expect the river will create small changes to the erosion and sedimentation regimes, and slowly approach a new long-term equilibrium. SAE expect the project will improve the erosion and sediment situation in some places, by improving land management of the area around the reservoir. However, there was a serious erosion incident at the Triangulo district of Porto Velho in 2012 which is considered a significant gap at the proven best practice level.

There is one significant gap against proven best practice, resulting in a score of 4.

Topic Score: 4

16.4 Relevant Evidence

Interview:	4, 16, 26
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Document:	1 – 5, 10, 17, 21, 22, 35, 71, 89, 91 – 94, 129, 221, 254, 275, 301, 342, 343,
Photo:	152 – 156

17 Water Quality (I-17)

This topic addresses the management of water quality issues associated with the project. The intent is that water quality in the vicinity of the project is not adversely impacted by project activities; that water quality issues are monitored and addressed as required; and commitments to implement measures to address water quality are fulfilled

17.1 Background Information

The Madeira River at the project site has very high flow and few existing sources of pollution so water quality is generally good. There is no sewage treatment in the region and very little collection, with most wastewater discharged directly to the river, but high dilution rates prevent this approach from becoming an issue. Groundwater quality in the region is good, and most people, especially outside of Porto Velho, draw water from their own well. Mercury level in the water is high which some studies suggest is due to historical gold mining in the region. However, other studies suggest that the level of mercury in the river is naturally high and supplemented by deforestation, intensive land use, slash and burn agriculture, and soil erosion.

Five management plans are relevant to this topic, the Water Table Monitoring Programme, the Hydro-geological Monitoring Programme, the Hydro-bio-geochemical Monitoring Programme, Limnological Monitoring Programme, and the Aquatic Macrophytes Monitoring Programme.

The project contracts several companies to monitor and continuously re-assess issues. “Conestoga-Rovers and Associates” (CRA) monitor groundwater, “Ecology” monitor water quality, “Hicon” is responsible for the water-quality modelling, “Projetos e Consultorias de Engenharia” (PCE) monitor erosion and sedimentation, and “Neotropical” monitor fish. The programmes have also had input from the Universidade Federal de Juiz de Fora, Universidade Federal do Rio de Janeiro, Universidade Federal de São Carlos, and Universidade Federal de Rondônia. Agência Nacional de Águas (ANA) regulate water quality.

There is some overlap between this topic and I-16 (Erosion and Sedimentation) which addresses all sediment related water quality issues. There is also overlap with I-18 (Waste, Noise and Air Quality) which addresses all construction site related water quality issues.

17.2 Detailed Topic Evaluation

17.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Water quality issues relevant to project implementation and operation have been identified through an assessment process utilising appropriate expertise; and monitoring is being undertaken during the project implementation stage appropriate to the identified issues.*

Hicon undertook one- and two-dimensional computer modelling to understand the potential impact of the reservoir impoundment on the water quality of the river. A two-dimensional model (CE-QUAL-W2) assessed the reservoir body; and a one-dimensional model (QUAL2-Kw) assessed the downstream reach. The models simulated the project’s impact on various parameters including water temperature, retention time, total suspended solids, dissolved oxygen, biological oxygen demand, nitrates and phosphates. Key areas of interests were the need to remove vegetation from the inundated area, and the risk of algal bloom caused by increased light availability following the expected reduction in turbidity. Modelling also considered potential increase in sewage from an increase in the area’s population.

Ecology execute the Limnological and Aquatic Macrophyte Monitoring Programmes which cover the Madeira River and four main tributaries. The programmes began in 2009 and will continue until the end of the second year of operation. Ecology sample water quality at 22 points over a 400km stretch from the Jirau dam to the Cuniã lake, with 16 points directly inside the project effected area, including two points in the Jaci-Paraná river.

Ecology have undertaken 26 monitoring campaigns in total, at three-month intervals with the exception of the reservoir filling and stabilisation period when the frequency of monitoring was intensified to monthly samples. During these campaigns field staff have carried out daily *in situ* measurements of transparency, current velocity, water temperature, dissolved oxygen, pH, conductivity, total dissolved solid and turbidity. They take water samples to the floating field laboratory for detailed analysis of sediment, phytoplankton, zooplankton, zoo-benthos, macrophytes, faecal coliform and the presence of lead, cadmium, chromium, zinc, manganese, iron, cobalt and nickel. Real time water quality monitoring at two points records temperature, oxygen level, pH, conductivity and turbidity every 30 minutes, up and downstream of the dam. The Ecology field team download the data from these stations each week for analyse in their laboratory. In addition the team have access to water quality monitoring data from similar stations operated by the Jirau project.

A separate team from the University of Rondônia and Fiocruz monitor levels of total mercury and methyl mercury in the environment and humans. This team has used univariate, multivariate and geo-statistical methods to analyse mercury levels during the pre-filling and post-filling phases. The monitoring covers river communities using dietary surveys, interviews and hair sampling to build an epidemiological profile. In addition biotic sampling covers fish, macrophytes, plankton, and activity of bacteria with methylation potential. A second round of sampling will be undertaken next year to assess if the project has affected mercury levels in humans and the environment.

CRA monitor groundwater to assess the impact of reservoir filling on level and quality. 55 wells were installed initially, arranged to comprehensively cover the project area and to pick up any point sources of pollution. CRA increased the number of wells to 66 in 2011 to increase coverage of new areas of interest. CRA assess a broad range of groundwater parameters annually during the dry season to avoid contamination from flooding. CRA also modelled the impact of the reservoir formation on groundwater depth and quality, incorporating the monitoring data with understanding of the areas geology.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of water quality issues during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

SAE sustainability managers regularly work with Ecology to review the results of the water quality-monitoring programmes to observe inter-relationships between changes in water quality and other environmental aspects that they monitor. The small core sustainability team of SAE is responsible for the range of water-quality-related monitoring programmes (Hydrogeological, Hydro-bio-geochemical, Limnological, Aquatic Macrophytes) so can pick up interrelationships as they emerge. In addition Ecology, together with the SAE team, hold an annual seminar bringing together project staff from different work areas to discuss water quality and variation in aquatic life.

The monitoring programme has adapted to new risks and opportunities that have become evident during the implementation. The project's water-quality management working plan is in its fifth revision and the PBAs have also been revised. Regular analysis of the data and ongoing monitoring has driven decisions to vary the frequency of monitoring and the number of stations – to observe a predicted drop in oxygen level in a tributary, for example.

In 2010, local people attributed the death of fish in a fish farm in Lago Madalena on the Jaci-Paraná River to a water quality issue caused by the project. In response SAE commissioned a full investigation by Ecology,

culminating in a 28-page report on the incident. The research did not find any link between the fish deaths and a change in water quality caused by the project, but the incident serves to demonstrate SAE's ability to respond to an emerging risk.

SAE have taken the opportunity with Ecology to develop and implement a floating water quality laboratory in the reservoir. The mobility of the lab means that it can move to an area of interest to carry out an intensive sampling campaign if required. SAE are also making innovative use of radar images to complement field observations to monitor the growth of aquatic macrophytes.

Criteria met: Yes

17.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to ensure management of identified water quality issues, and to meet commitments, relevant to the project implementation stage; and plans are in place for the operation stage for ongoing water quality issues management.*

The hydro-geochemical monitoring programme measures the level of mercury in the river, sediment, fish, fitoplancton, zooplankton, benthic macroinvertebrates and aquatic macrophytes. The hydro-bio-geochemical monitoring programme measures the concentration of mercury in humans living up and down stream of the project. The limnological and aquatic macrophytes monitoring programmes monitor the physical, chemical, and biologic variables in water, sediment and aquatic macrophytes. The water table monitoring programme monitors water quality and level of the aquifers in the project area.

The project design and siting helps to avoid unnecessary water quality issues which would require management. As a run-of-river project, with high flow rate and low retention time, there is low risk of potential issues like stratification, raised biological oxygen demand or algal bloom. In addition the river has no sources of pollution which require management.

SAE cleared the vegetation in an area corresponding to nearly 60% of the area to be flooded before reservoir filling, in order to reduce the risk of potential water-quality impacts. All vegetation in flooded tributaries was cleared, following modelling results which indicated a risk of impact on water quality. The PACUERA (Plano Ambiental de Conservação e Uso do Entorno do Reservatório Artificial - the conservation and environmental management plan for the project-affected area, described in full in I-19) provides a tool to prevent water-quality issues developing in the reservoir through appropriate land management of the margins.

A wide range of management measures are employed on the construction site to treat sewage, prevent water pollution from vehicles and trap sediments, these are discussed in I-18.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

The broad water quality monitoring programmes provides a comprehensive means for the project to identify emerging risks in the reservoir, tributaries and downstream. SAE have a number of PBAs in place to respond to potential emerging risks such as algal blooms or increase in cyanobacteria or macrophytes. If monitoring shows a reduction in oxygen availability, SAE have a plan in place to increase the water-oxygen level in a particular location using pumps.

There are no formal processes in place to anticipate and respond to opportunities to improve water quality, however SAE and external stakeholders confirm that there are no feasible opportunities available. Ecology have

taken the opportunity to publish a large body of work including 23 papers presented at Conferences, 5 PhD theses, 1 dissertation. Ecology is also planning a book and manual on the identification of aquatic macrophytes.

Criteria met: Yes

17.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in place to manage water quality issues have been and are on track to be met with no significant non-compliances or non-conformances, and water quality related commitments have been or are on track to be met.*

The project has had no significant non-compliances to date and has met all internal commitments. Requirements of the Installation licence such as continuous water quality monitoring, removal of vegetation from areas to be inundated and facilitating uninterrupted water supply to Porto Velho have all been met. Some groundwater samples have shown non-compliances for iron, aluminium, lead and manganese. However the presence of these metals is caused by the regional geology rather than the project.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

There are no non-conformance or non-compliances.

Criteria met: Yes

17.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Negative water quality impacts arising from project activities are avoided, minimised and mitigated with no significant gaps.*

Monitoring has shown there has not been any thermal stratification in the reservoir and the Madeira has vertical uniformity for oxygen. BOD has increased slightly in the reservoir since filling, and is predicted to remain elevated for the first few years of operation. There has been a small increase in dissolved oxygen downstream since the filling due to increased turbulence of the waters. Monitoring has shown an increase in phosphorous in its particulate form, but the concentration of total phosphorous has shown little variation before or after filling. Nitrogen shows a clear seasonal variation with a larger fraction of the total nitrogen in organic form, and some increase during the filling. There has been no significant change in turbidity. Groundwater monitoring has noted naturally high levels of iron and mercury but no contamination.

Monitoring recorded an increase in the concentration of total coliforms in the pre-filling stage, both upstream and downstream of the project. The values of E. coli did not differ between the hydrological periods, and was always compatible with the limits of CONAMA water-quality standard 357/2005. The values of E. coli on the beaches of Jaci-Paraná and Teotônio did not show significant variation and remained within the limits set by the standard.

Monitoring of mercury levels in people, prior to reservoir filling, in the project-affected areas showed that 42% of the population had higher than recommended levels. However, to date there has been no significant change in the mercury concentration in the river as a result of filling and stabilisation of the reservoir.

In terms of the impact on aquatic communities, there has been a reduction in diversity and volume of phytoplankton in the Madeira, but an increase in the tributaries. Levels of zooplankton have remained similar in

the Madeira and increased in the tributaries. There has been little variation in aquatic macrophytes or benthic invertebrates. Modelling found that the risk of algal bloom is low. Although the reservoir water is naturally very high in nutrients, the retention time is low, approximately one day, leaving insufficient time for significant amounts of algae to develop.

In 2008 an unexpected drop in oxygen levels during the dewatering of the cofferdams caused the death of a large number of fish. The project attribute the drop to an unexpected decrease in the air temperature which reduced the available oxygen in the water. As unpredictable climatic conditions caused this one off event, it is not considered a significant gap.

Ecology compared the monitoring results with those of the modelling and showed that the modelling had accurately predicted the small variation in water quality which occurred in practice. Over 6 years of monitoring Ecology have not noted any water quality concerns and no future changes are expected through the project's operation.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, negative water quality impacts arising from project implementation are avoided, minimised, mitigated and compensated with no identified gaps; and enhancements to pre-project water quality conditions or contribution to addressing water quality issues beyond those impacts caused by the project are achieved or are on track to be achieved.*

The high flow, low retention time and absence of sources of pollution mean that negative water quality impacts arising from project implementation are avoided, minimised, mitigated and compensated with no identified gaps.

The project has not made any enhancements to pre-project water quality conditions or contributed to water quality issues beyond those caused by the project. However, this is not considered a significant gap as SAE and external interviewees confirm there are no plausible opportunities to improve water quality. SAE were however, commended for their assistance to the regional water company, (CAERD) in helping to continue to supply water to Porto Velho through the flooding in early 2014.

Criteria met: Yes

17.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

17.3 Scoring Summary

Water quality issues relevant to project implementation and operation were identified through a broad water sampling campaign and by a number of computer modelling exercises. Monitoring of a range of biological and chemical water quality parameters is ongoing and there is a specific programme monitoring mercury and methyl mercury in the reservoir. In addition, monitoring of water quality issues takes into account inter-relationships amongst issues through common oversight of the environmental monitoring programmes by the same team

within SAE, and by a regular conference organised by Ecology. The monitoring programme has adapted to risks and opportunities that become evident during implementation, by increasing the number of monitoring stations and by making use of innovative technology like radar.

The reservoir was partially cleared of vegetation before inundation, and the PACUERA provides a management plan to ensure that reservoir margins do not create any water quality issues in the future. In general the project design and siting avoids creating unnecessary water quality issues which would require management. In addition, monitoring is in place to anticipate emerging risks and plans are prepared to respond to certain risks such as algal blooms. There is no clear process for anticipating areas for improvement in water quality, but this is not considered a gap as there are no opportunities for improvement.

All processes and objectives in place to manage water quality issues have been and are on track to be met and there are no non-compliances or non-conformances. The impoundment of the reservoir has caused some variation in water quality, such as an increase in BOD in the reservoir and increased dissolved oxygen downstream of the dam, but changes are not thought to be significant. There has been little impact on aquatic communities such as phytoplankton and the level of mercury in the water remains the same as in the pre filling conditions. The quality of groundwater has not been affected by the project.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

17.4 Relevant Evidence

Interview:	10, 18, 26, 33, 52, 64, 74
Document:	1 – 5, 10, 17, 21, 22, 58, 89, 92, 111, 114, 115, 129, 177, 221, 243, 254, 272 – 274, 279, 282, 284, 301, 341,
Photo:	157 – 160

18 Waste, Noise and Air Quality (I-18)

This topic addresses the management of waste, noise and air quality issues associated with the project. The intent is that noise and air quality in the vicinity of the project are of a high quality and not adversely impacted by project activities, and that project wastes are responsibly managed.

18.1 Background Information

The project produces a wide range of solid waste from both the construction site and the workers camps. The camps are the primary source of domestic wastewater and the concrete and crushing operations produce industrial wastewater. Vehicles, blasting and crushing are the key sources of noise and air pollution, but the construction site is located some distance from any significant settlements so there are few local people affected by the construction processes.

There is some overlap between this topic and I-16 (Erosion and Sedimentation) which addresses all non-construction related sediment issues. There is also overlap with I-17 (Water Quality) which addresses all non-construction site related water quality issues.

18.2 Detailed Topic Evaluation

18.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Waste, noise and air quality issues relevant to project implementation and operation have been identified through an assessment process utilising appropriate expertise; and monitoring is being undertaken during the project implementation stage appropriate to the identified issues.*

CCSA records the production of solid waste each month for inclusion in the monthly progress report. Wastes are separated, categorised, quantified and recorded as: burnt oil, contaminated oil, contaminated soil, sawdust, industrial wood, metal scrap, paper and cardboard, plastic and rubber, oil filter, cloth, paper and cotton waste, used and contaminated PPE, batteries, fluorescent lamps, tires, incineration ashes, non-recyclable waste, and organic waste.

The EIA identified sources of wastewater to be sewage from the toilets; industrial effluents from the workshops, washing ramps, vehicles lubrication areas, and crushing and concrete plant areas; and wastewaters containing fuels and lubricants from storage areas. Before the project commenced CCSA calculated the amount of wastewater that the project would generate based on the estimated number of workers on site. An estimate of the volumes of industrial wastewater to be treated was also made, based on estimates of the amount of concrete to be used, the processing volume of the crushing plant, and the use of vehicles. CSAC monitor effluent from the washing and lubrication ramp's oil and water separation traps, and the outflow from the camp wastewater treatment lagoon on a monthly basis. CSAC monitor water from the settling ponds of the concrete plant, water from the concrete curing of the powerhouses, and leachate from the landfill every 6 months. A number of PBAs monitor water quality of the Madeira River described in I17. Monitoring of the sediment load in the river is discussed in I16.

Before the project commenced CCSA assessed the potential noise impact that the project would create from equipment, blasting, transport, and the crushing plant. The assessment considered how each source could impact the surrounding environment or society. CSAC now measure project noise levels annually in accordance with the PBA, increasing in frequency at times when disturbance is predicted. Monitoring is done at six points, over a one-week period, focusing on communities near the construction site which could be affected by noise,

including the Santo Antônio community, a rural property near the entrance of Vila Princesa, and the Novo Engenho Velho community. CSAC also monitor noise level in the workplace, particularly focusing on the concreting areas and the “terra e rocha” area.

In the project’s preparation stage, potential sources of air pollution were examined, such as site vehicles, crushing, blasting. CSAC now monitor air quality on an annual basis, in and around the project site. Monitoring covers particulate matter, carbon monoxide, carbon dioxide, sulphur dioxide, ozone, nitrous oxides, hydrogen sulphide, hydro fluoro carbons and CFCs. CSAC also monitor ‘black smoke’ from the construction site vehicles using the Ringelmann scale on a monthly basis.

External actors also monitor air and noise in the workplace, including JGP/Exponent, ANEEL and the Regional Superintendent of Labour and Employment (Superintendências Regional do Trabalho, SRTE). In addition SAE and CSAC staff live and work close to the project site which provides informal human monitoring of noise and air quality.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of waste, noise and air quality issues during project implementation takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

SAE look for interrelationships between the monitoring of wastewater from treatment plants and the monitoring of water quality and aquatic macrophytes of the Madeira River. Effluent has been, in general of a high quality, and no negative impact on the river has been seen. Inclusion of the various monitoring streams in the monthly progress report also allows management to draw a connection between two separate considerations that are actually in a cause-effect relationship.

Monitoring programmes have adapted to new risks which have become apparent during the construction process. For example, the treatment of iron pipes with a new chemical presented a water pollution risk, CSAC identified this and developed a treatment station for the wastewater and put in place monitoring to ensure that the treatment was working. In addition, noise monitoring was increased during periods of intense blasting, following concerns that the activity could disturb local communities. Monitoring of river turbidity was increased when silt from dredging was released.

Criteria met: Yes

18.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to ensure management of identified waste, noise and air quality issues, and to meet commitments, relevant to the project implementation stage; and plans are in place for the operation stage for ongoing waste management.*

Environmental issues caused by the construction process are managed by the Environmental Programme for the Project Construction. The programme aims to prevent and control direct impacts arising from the execution of the works and implementation activities. Plans cover all aspects of construction, including new roads and bridges.

CCSA run a dedicated waste management centre on the project site where solid waste is segregated classified, quantified, and processed. Dedicated third parties recycle off-site 88% of the material collected. The project composts organic waste on site and uses the result for land rehabilitation. Contaminated soil is composted separately in windrows, allowing bacteria to break down contaminants, before it is combined with the mainstream compost. Material which cannot be recycled or composted (approximately 9% of the total amount

collected) is buried in an on-site landfill facility. The project also incinerates a small amount of hazardous medical waste and waste contaminated with petrochemicals. The ash from the incinerator, which is periodically analysed, is buried in the project landfill site. During operation SAE plan to operated a significantly reduced waste collection and recycling programme.

Spoil heaps are graded, drained and re-vegetated to avoid runoff and erosion. Top soil is conserved in the layers that it naturally occurred in to maintain fertility when it is reused.

The project uses two water-treatment facilities, one on the left bank and one on the right, to treat all sewage from the construction site and camps. Treatment consists of a grid, sand trap, secondary treatment in anaerobic pond and tertiary aerobic treatment in a maturation pond. The project uses treated sludge to improve the soil fertility in land reclamation areas. 14 oil and water separators clean water coming from vehicle lubrication and washing areas. CSAC use settling ponds to treat effluent from the crushing plant and a wastewater treatment tank to process water from the concrete plant. The landfill sites are lined and the effluent collected is channelled into the sewage wastewater treatment system. Runoff from the contaminated soil treatment area is passed through an oil separator, before going into the sewage wastewater treatment system. During the project's operation phase, a small permanent sewage treatment system will process SAE's office wastewater.

CSAC employ various measures to reduce the amount of noise disturbance caused by the project, such as weekly checks that vehicles comply with noise standards. The distribution of transport through the day has been organised to avoid concentration of activity in a single period and CSAC undertook blasting at the beginning and end of each shift to minimise workers exposure to noise. During operation project staff do not predict any noise issues.

To reduce dust creation, CSAC periodically spray with water all dirt roads that receive large amounts of traffic. The water used is recycled from the industrial wastewater treatment plant. The crushing plant uses a humidification system to reduce the amount of dust created. Vehicles undergo regular maintenance and checks to ensure their emissions are within the required levels. During operation SAE do not predict any issues with air quality.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

CSAC regularly monitor wastewater and solid waste production to anticipate emerging risks. CSAC have improved the ability of staff to identify emerging risks and opportunities by providing a wide range of waste management education courses covering: the identification of environmental impacts, dealing with oil or chemical products to soil or water, solid waste management, handling of chemicals, incineration of hazardous waste, composting of organic waste, and cleaning grease traps. Regular audits by JGP/Exponent, in accordance with the Equator Principles, also provides a means to identify risks and opportunities.

The monitoring programmes for noise and air are not sufficiently frequent to successfully identify all emerging risks, however, given the absence of project-affected people from the construction area, and the proximity of a large number of project staff to note emerging problems, this is not considered a significant gap.

Each year Odebrecht give awards for innovation which drives employees to seek new opportunities to improve the way they work. An example of the type of innovation which this award has incentivised is a shift from aluminium sulphate based water treatment, to a new system using tree bark. Aluminium sulphate is a toxic reagent which, when discarded, accumulates in the food chain. The replacement of this reagent with the bark of the Veta tree, has eliminated the impact that the disposal of aluminium sulphate would have caused. The effluent

and the sludge generated are now used as organic fertilizer for the Recovery of Permanent Preservation Area sub-programme.

Criteria met: Yes

18.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to waste, noise and air quality have been and are on track to be met with no significant non-compliances or non-conformances, and any related commitments have been or are on track to be met.*

Processes and objectives relating to waste, noise and air quality have been and are on track to be met with no significant non-compliances or non-conformances. Monitoring of the sanitary and oily wastewater shows that it has complied with CONAMA Resolutions 357 of 2005, and 397 of 2008 and CSAC have addressed minor non-compliances when they occurred. The waste generated at the construction site is segregated, collected, and disposed of as required by Law nº 12 305, 2010 - National Policy on Solid Waste. Monitoring showed a low concentration of air pollutants, and particulate matter, below the permitted levels under resolution CONAMA nº3 28/06/90.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

JGP/Exponent audits have observed a number of minor non-compliances, such as inadequate disposal of concrete, insufficient sewage trucks, minor chemical spills from supply trucks, minor oil spills. However, CSAC have put corrective actions in place to address these issues and IBAMA have not reported any current non-compliances so this is not considered a gap.

Criteria met: Yes

18.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Negative noise and air quality impacts arising from project activities are avoided, minimised and mitigated with no significant gaps, and project wastes managed responsibly.*

CSAC maintain a tidy, effective waste processing system which minimises the amount of waste which needs to be landfilled. Water effluent from the sewage and from the industrial wastewater treatment systems has generally been of good quality. Landfill leachate has met all requirements and the effluent is characterized as a stable compound with low chemical reactivity and high degradability.

Negative noise and air quality impacts arising from project activities are avoided, minimised and mitigated with no significant gaps. The project has caused an increase in noise and dust in the construction area, however these impacts are local, reversible and temporary. There have been no ongoing complaints about noise or air pollution, so the increase is not considered a significant gap.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, negative noise and air quality impacts arising from project activities are avoided, minimised, mitigated and compensated with no identified gaps; project wastes are managed responsibly; and the project contributes to addressing waste management issues beyond those impacts caused by the project.*

In addition, negative noise and air quality impacts arising from project activities are avoided, minimised, mitigated or compensated with no identified gaps. The project manage project waste responsibly and the project addresses waste management issues beyond the impacts caused by the project. Under the Environmental Education Programme PBA, SAE have conducted several workshops, lectures and meetings with communities, focused on environmental education, working on issues related to environment protection. Topics have included waste management, appropriate practices for burning waste, proper use of pesticides, and water management. SAE's 'festival of the Children' included a garbage collection and separation exercise to increase awareness of the importance of gathering and recycling waste.

Criteria met: Yes

18.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

18.3 Scoring Summary

Waste, noise and air quality issues were identified in the EIA and monitoring is now being undertaken. Solid waste production and processing is recorded each month, wastewater treatment effluent is monitored each month, and noise and air parameters are monitored annually. The monitoring programmes for noise and air are not sufficiently frequent to successfully identify all emerging risks, however, given the absence of project-affected people from the construction area, and the proximity of a large number of project staff to note emerging problems, this is not considered a significant gap. Monitoring of issues takes into account inter-relationships by, for example, looking for a relationship between the wastewater effluent monitoring and the aquatic macrophytes monitoring. Monitoring has adapted to risks and opportunities that have become apparent during the implementation by, for example, increasing the noise monitoring when blasting was occurring, and putting in place additional water quality monitoring to cover a new treatment process.

Processes are in place to manage identified issues. A dedicated waste treatment area processes solid waste, a number of ponds treat wastewater, and vehicles are regularly checked to ensure they remain within noise and air requirements. Monitoring is in place to anticipate emerging risks and staff have received broad training in waste management to help them identify and manage potential issues such as oil or chemical spills. Audits from JGP also serve to identify emerging risks and opportunities for the project.

The project has no significant non-compliances, and negative noise and air quality impacts arising from project activities are avoided and project wastes managed responsibly. The project contributes to addressing waste management issues beyond those impacts caused by the project by providing environmental and waste management education to project-affected communities and workers.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

18.4 Relevant Evidence

Interview:	25, 26
Document:	1 – 5, 10, 17, 21, 22, 61, 89, 129, 143, 165, 166, 221, 250, 254, 280, 281, 301,
Photo:	161 – 168

19 Reservoir Preparation and Filling (I-19)

This topic addresses management of environmental, social and economic issues within the reservoir area during project implementation, and planning for reservoir management for the operating hydropower facility. The intent is that reservoir preparation and filling is well managed, taking into account construction, environmental and social management requirements, and future power generation operation, maintenance and multi-purpose uses where relevant.

19.1 Background Information

Although the Santo Antônio project will operate with a true run-of-river regime, its dam has formed a large reservoir, following the impoundment of the river. The area of the reservoir will vary throughout the year, depending on the extent of the backwater affect, which in turn is related to the river's discharge. The total reservoir area, considering backwater effects, will be 559 km², at a flow of 36 200 m³/s. In pre-project conditions the affected area of the river covered 142 km², so the maximum area of land inundated by the reservoir is 417 km². The reservoir was originally designed to operate at 70.2 m.a.s.l. As a result of project expansion, this will be increased by 0.8 meters to 71.0 m.a.s.l. For altitude references, please see the explanation in the introductory section on page 8. Reservoir clearing began in 2009, and reservoir filling took place between 2011 and 2012. The total reservoir volume at full supply level is 2.71 x 10⁹ m³.

This topic covers many aspects of the project, so multiple PBAs are of relevance. The key PBA is the "Programma Gestão Sociopatrimonial" (PGSP) which is an asset-management plan used to guide the purchase and ongoing land management of the reservoir and surrounding areas. Within this plan sits the PACUERA (Plano Ambiental de Conservação e Uso do Entorno do Reservatório Artificial), which is the municipality's conservation and environmental management plan for the project-affected area, and inserts the reservoir into the region's legal context. Both plans make provision for a protected conservation area around the reservoir which will range from 30 to 500 meters' width.

Other relevant PBAs are the Climate Control Monitoring Programme; Limnological Monitoring Programme, Aquatic Macrophytes Monitoring Programme, Monitoring of Vegetation Succession at Reservoir Banks Subprogram; Water Table Monitoring Programme, Deforestation in the Area of Direct Influence Programme and the Fauna Rescue programme. There is some overlap with other topics, particularly issues surround public health (covered in I-14), the flora and fauna relocation operations (covered in I-15), erosion and sedimentation monitoring and analysis (covered in I-16), water quality and mercury monitoring (covered in I-17), and downstream flows regimes (covered in I-20).

The project contracts several companies to monitor and continuously re-assess issues. "Conestoga-Rovers and Associates" (CRA) monitor groundwater, "Ecology" monitor water quality, "Projetos e Consultorias de Engenharia" (PCE) monitor erosion and sedimentation, "Soluções e Tecnologia Ambiental" (SETE) monitor amphibian, reptiles, birds and mammals, "Probiota" monitor insects, "Hicon" was responsible for water-quality modelling, and "Neotropical" monitor fish.

19.2 Detailed Topic Evaluation

19.2.1 Assessment

Analysis against basic good practice

Scoring statement: *The important considerations prior to and during reservoir filling and during operations have been identified through an assessment process; and monitoring of implementation activities is being undertaken appropriate to any identified issues.*

The EIA, the stakeholder consultation process and the review by IBAMA all identified important considerations prior to reservoir filling, and ongoing monitoring continues to identify emerging issues. Under the PGSP, SAE made a full assessment of land titles, boundaries, and access routes in the project-affected area to support land purchases and compensation. An assessment of paleontological heritage discovered one site of interest and six fossils of note. The survey also found 58 archaeological sites including stone age engravings (see details under topic I-13).

The project assigned Hicon to undertake an extensive modelling in order to investigate the need to clear vegetation from the flooded reservoir area prior to filling, to avoid impacts on water quality. The exercise highlighted the importance of removing vegetation from tributaries as this is where vegetation decomposition could have the greatest negative impacts on water quality, discussed in more detail in I-17. The project also commissioned computer modelling during the reservoir filling, in order to understand the impacts of the new reservoir on groundwater levels and on erosion and sedimentation processes.

A number of PBAs are in place to monitor the environmental and social impacts of the reservoir (see the Background section above). Water quality in the river is monitored by Hydrogeological, Hydro-bio-geochemical, Limnological, and Aquatic Macrophytes monitoring programmes, discussed in I-17. PCE monitor erosion and sedimentation using gauging stations, telemetric stations, acoustic Doppler monitoring, point sampling and bathymetric surveys. They also monitor the location and characteristics of riverbanks, islands, and alluvial deposits on a regular basis, discussed more in I-16.

CRA measure groundwater levels every three months, and increased the frequency of measurements to monthly during the reservoir filling. CRA use 57 piezometers around the reservoir, 33 piezometers installed in the fauna and flora monitoring modules, and 19 piezometers in Jaci-Paraná and Joana D'Arc. There has been some variation in groundwater levels, particularly near the Santo Antônio dam, however, none of the variations was significant. Monitoring of groundwater level will continue through four years of operation.

In partnership with the state environment department, project staff have installed two climate-monitoring stations by the reservoir, at Vila Nova de Teotônio and Calama. The data is publically available on the Internet in real time, and will be used to assess if the reservoir has any impact on the local micro-climate.

Under the PGSP, six teams monitor the protected area around the reservoir, including changes to the environment, movement of livestock and activities of people. Two additional teams are also responsible for checking the river for wildlife, livestock and people. This monitoring began a month before filling and is ongoing.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of reservoir preparation and filling activities takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

Monitoring of reservoir preparation and filling activities takes into account inter-relationships amongst issues. The reservoir monitoring team circulate daily and weekly reports to the project's sustainability managers and phone in significant events immediately. Cause-and-effect relationships are analysed, for example CRA shared monitoring and modelling of groundwater level with the PGSP programme, the Relocation of Affected Population Programme and the Conservation and Use of Surrounding Areas of the Reservoir Plan to ensure that a change in the water table would not affect those programmes.

The monitoring programmes have also taken into account both risks and opportunities that become evident during implementation. For example the Water Table Monitoring Programme was adapted to provide greater certainty that the groundwater levels would not impact the settlement of Joana D'Arc, following concerns from local people about the planned increase in reservoir elevation as a result of the project expansion. The frequency of water-quality monitoring, particularly of dissolved oxygen, was intensified and locations revised during filling.

In terms of new opportunities, project staff have begun to use radar to monitor bank side erosion, deforestation and people moving into the protected area. The radar is more effective than aerial photos which the project used previously, as it can function through cloud, detect physical structures and fences in more detail, determine biomass density and quantify levels of erosion.

Criteria met: Yes

19.2.2 Management

Analysis against basic good practice

Scoring statement: *Measures are in place to address identified needs during reservoir preparation and filling; and plans are in place to manage the reservoir and any associated issues for the operating hydropower facility.*

The PGSP covers the 54 000 hectare reservoir, 30 0000 hectares of indirectly-affected land and 8 000 hectares of resettlement area. It makes provision for the purchase of land, fencing, asset monitoring, land management, communication with local communities, environmental education and environmental monitoring. The plan establishes a margin around the reservoir that forms a protected area for environmental conservation. IBAMA require the margin to be at least 30 meters wide in urban areas, 100 meters wide along the reservoir and tributaries, and 500 meters wide along the free-flowing Madeira. The project has purchased all the land around the reservoir required to form the conservation-area margin. The width varies in places for practical reasons (such as livestock access to water), but maintains the total required area of 32 000 hectares.

Before reservoir filling, the project cleared 12 000 hectares of forest in the reservoir area to reduce potential water-quality impacts and facilitate navigation. Seed and seedlings were removed and stored in the university of Rondônia's herbarium and germoplasm facilities (discussed in I-15), to support the Recovery of Permanent Preservation Area sub-programme in the margins. All the wood cut during this operation was removed from the reservoir area and sold or donated in Porto Velho. Some trees were purposely left standing in the flooded areas, to provide breeding habitat for fish in the river.

The project used dedicated teams, on land and in the river, to remove wildlife from the reservoir area during the clearing process. The clearing began in 2008 and has now relocated over 100 000 animals to sites away from the area of inundation. The project also established a wild-animal sorting centre to provide veterinary care to animals injured by the clearing operation.

The resettlement of people from the reservoir area began in April 2009 and was completed in December 2011. The project removed all infrastructure from the area to be inundated, and decontaminated potential sources of pollution such as septic tanks. The protected areas around the reservoir were fenced and signs were erected to prevent access.

Plans are in place for the operational phase (including expansion) of the project to manage the impacts of the project on water quality, erosion and sedimentation, public health, and the livelihood of local people. The reservoir will be operated at a constant level of 71.0 m.a.s.l., with the intention of maintaining an equal flow of water in and out of the reservoir, a so-called true run-of-river regime. As part of the operating procedure approved by ANEEL, the project management are required to lower the reservoir level to 70.2 m.a.s.l when the river flow exceeds 36 200 m³/s in order to minimise the upstream area affected by the backwater effect and protect the urban area of Jaci-Paraná. A log boom is in place to guide river debris away from the turbines to a dedicated log spillway (this is under construction – a drawing can be seen in “photo” 169, in Appendix D).

The permanent preservation areas surrounding the reservoir were a mix of forest, pasture and agriculture. These areas have been vegetated using the seeds and saplings collected during the reservoir-clearing process. Over 1 244 hectares have been planted to date, with 400 000 seedlings from 170 species of tree.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

The project has processes in place to anticipate and respond to emerging risks and opportunities. Extensive, wide-ranging monitoring programmes pick up issues regarding biodiversity, erosion and sedimentation, water quality, construction impacts, and livelihood impacts. The PACUERA sets out pathways to follow in the event of the identification of an emerging risk, the procedures to be followed and people to be contacted.

Each programme manager continually reviews their programme, looking for ways it can be improved, augmented or refined. Managers must also review opportunities for research and development projects, a process which led to the identification and implementation of the reservoir monitoring using radar. The cataloguing and storing of plant material cleared from the reservoir in the Herbarium at the University of Rondônia is another good opportunity taken by the project. Regular audits by JGP/Exponent in accordance with the Equator Principles and the IFC Performance Standards also provide a means to identify risks and opportunities.

Criteria met: Yes

19.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives in place for reservoir management have been and are on track to be met with no significant non-compliances or non-conformances, and reservoir management related commitments have been or are on track to be met.*

Processes and objectives for reservoir management have been and are on track to be met. There have been two minor non-compliances for which the project has received fines. The first was for a fire in the deforestation area, the second for burying some cleared organic material. However, project management have disputed both fines, the first as IBAMA could not attribute the fire to project-specific activities, and the second because the project did in fact have a permit to bury the material. As such, these events are not seen as having any significance to the scoring here.

The recent extremely high river discharge has created significant backwater effects, increasing the reservoir area beyond the level determined in the operational licence. However, the project has complied with everything that authorities have assigned to them in order to minimise the impacts of this unprecedented flood event, so this is not seen as a significant gap.

During the filling the project maintained the required minimum downstream flow regime of 3 293 m³/s.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

There are no non-compliances or non-conformances.

Criteria met: Yes

19.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

19.3 Scoring Summary

The EIA and public consultation process identified important considerations for the preparation, filling and operation of the reservoir. The assessment included a number of computer-modelling exercises which looked at the potential impacts on water quality, sedimentation and groundwater levels.

Monitoring of reservoir preparation and filling activities takes into account inter-relationships amongst issues by sharing monitoring data between managers responsible for different aspects of the reservoir. Monitoring has adapted to emerging risks, such as elevated groundwater levels, and new opportunities such as the use of radar to monitor illegal deforestation and other reservoir-relevant issues.

Multiple PBAs were in place to address identified needs during reservoir preparation and filling, such as flora and fauna rescue, resettlement and land rehabilitation. The PGSP and PACUERA are in place to manage the reservoir through its operation, covering all aspects of environmental and social management. Ongoing monitoring provides a means to anticipate emerging risks, and response processes are set out in the PACUERA. Regular audits by JGP/Exponent in accordance with the Equator Principles and IFC Performance Standards also provide a means to identify risks and opportunities.

Whilst there have been some disputed minor non-conformances, all processes and objectives in place for reservoir management have been and are on track to be met, with no significant non-compliances or non-conformances.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

19.4 Relevant Evidence

Interview:	6, 26, 40, 50, 62
Document:	1 – 5, 10 – 13, 16, 17, 21, 22, 35, 53, 74, 89, 90, 95, 96, 106, 108, 113, 116 – 118, 129, 221, 254, 301,
Photo:	138- 169

20 Downstream Flow Regimes (I-20)

This topic addresses the flow regimes downstream of project infrastructure during the project implementation stage. The intent is that flow regimes downstream of project infrastructure are planned and delivered with an awareness of and measures incorporated to address environmental, social and economic objectives affected by those flows.

20.1 Background Information

Santo Antônio is essentially a true run-of-river project, with a mean maximum annual flow of 38 550 m³/s. The reservoir has a short retention time and the project will aim at maintaining the outflows equal to the inflows. As such, the flow regime downstream of the project should be essentially unaffected by its operation. During the diversion for the project's construction, the entire river flow was diverted around the project, so the downstream flow regime was effectively unaffected. The reservoir was filled slowly from 2011 to 2012, so again, the process had little effect on downstream flows.

Two PBAs are of particular relevance to this topic: the Downstream Activities programme and the Monitoring of Sediment Behaviour Downstream sub-programme. This topic has some overlap with I-19, Reservoir Preparation and Filling, with I-17 Water Quality and with I-16 Erosion and Sedimentation.

20.2 Detailed Topic Evaluation

20.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Issues in relation to flow regimes downstream of project infrastructure during the project implementation stage have been identified and assessed; and monitoring is undertaken to assess effectiveness of flow management measures or any emerging issues during project implementation.*

PCE (see below under Management) have undertaken computer modelling to understand how various types of operation could affect the downstream flow regime. This analysis looked at the opening and closing of the spillways and at forced shutdowns. PCE also forecasted stream flow and water levels of the Madeira River to investigate the impact on downstream communities of Porto Velho, Cujubim, São Carlos, Vila Nazaré, Vila Papagaio, Calama and Humaitá. Regular statistical analysis of the hydrological monitoring data allowed PCE to predict water levels at the major downstream communities.

PCE modelled the risk of erosion in the downstream reach focusing on the increased erosive capacity of the river following sediment deposition in both the Jirau and Santo Antônio reservoirs. They undertook one-dimensional modelling of sediment flow from the Jirau reservoir to Humaitá, incorporating monitoring data from the stretch to understand the project's medium to long-term impacts. PCE also undertook two-dimensional modelling of the Madeira immediately up and downstream of the dam, to improve understanding of the characteristics of sediment transport around and through the new structure.

PCE's monitoring of the downstream area to Humaitá is ongoing. They operate gauging stations and telemetric stations, and regularly do acoustic Doppler monitoring and point sampling. PCE undertake bathymetric surveys to monitor how the project is influencing the shape of the river sections downstream of the dam. They also monitor the location and characteristics of river banks, islands, and alluvial deposits. The monitoring programme attempts to measure the movement of the riverbed and sandbanks, but the dynamic nature of the environment has made this very challenging. PCE visually inspect riverbanks annually to observe the impact of erosion. This is discussed in more detail in I-16.

Under the Downstream Activities programme, the project monitor agriculture and leisure activities in downstream communities to identify socio-economic impacts, particularly focusing on the districts of Calama, São Carlos and Vila Nazaré. SAE mapped productive areas, and undertook a soil-fertility study of the floodplains between Porto Velho and the Calama district. This is discussed in more detail in I-9, Project-affected Communities and Livelihoods.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, monitoring of downstream flow issues takes into account inter-relationships amongst issues, and both risks and opportunities that become evident during implementation.*

In addition, monitoring of downstream flow issues takes into account inter-relationships amongst issues. PCE share all monitoring data with the various SAE sustainability managers who can identify cause and effect relationships between different aspects which they monitor. The Monitoring of Sediment Behaviour in Downstream sub-programme has a close relationship with the Limnology Monitoring Programme (described in I-17), and results are regularly shared. The project engineers have also made use of bathymetry data to understand how the lowering of the downstream riverbed could increase power generation by increasing overall head. The telemetric gauging station network is linked with Furnas, so staff within that organisation can observe emerging trends and link to their operations.

The sediment-monitoring programme uses innovative approaches to risk and opportunities identification of relevance to the downstream area and the project's potential impacts there, see topic I-16 for details.

Criteria met: Yes

20.2.2 Management

Analysis against basic good practice

Scoring statement: *In the case that a need to address downstream flow regimes has been identified, measures are in place to manage identified downstream flow issues; and where formal commitments have been made, these are publicly disclosed.*

The project has contracted the monitoring of erosion and sediment out to PCE the engineering firm responsible for a number of aspects of the project. PCE employ 50 members of staff at various levels on the erosion and sediment-monitoring programme. SAE have a management plan in place to guide the opening and closing of spillway gates to ensure smooth up- and down-ramping of the flow. Gates will be opened one at a time, at a rate no greater than 30 mm per minute, which corresponds to a change in discharge of approximately 90 m³/s per minute.

Various PBAs will maintain water quality in the downstream reach, including: the Limnological and Aquatic Macrophytes Monitoring Programmes which monitor the physical, chemical, and biologic variables in water, sediment and aquatic Macrophytes, and the Hydro-bio-geochemical Monitoring Programme which measures the concentration of mercury in humans.

All PBAs are formal commitments and are publically disclosed. Based on a ruling by Agência Nacional de Águas (ANA), the Brazilian regulatory agency for water resources, SAE formally committed to maintaining a downstream flow of no less than 3 293 m³/s during the filling period.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

The environmental and social monitoring undertaken through the PBAs provide a means to anticipate emerging risks such as increased riverbank erosion, changes in water quality or impacts on the livelihoods of people living in downstream communities. Each SAE programme manager is required to continually review their programme to find ways in which it can be improved or made more efficient. Managers must also review opportunities for research and development projects, a process which led to the identification and implementation of monitoring of downstream riverbank erosion using radar. Regular audits by JGP/Exponent in accordance with the Equator Principles also provides a means to identify risks and opportunities.

Criteria met: Yes

20.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *In the case that a need to address downstream flow regimes has been identified, processes and objectives in place to manage downstream flows have been and are on track to be met with no significant non-compliances or non-conformances, and downstream flow related commitments have been or are on track to be met.*

SAE have maintained the downstream flow regime very close to that of pre-project conditions and always within the limits set by ANA's rulings. Processes and objectives in place to manage flows are on track to be met with no significant non-compliances or non-conformances.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances*

There are no non-compliances or non-conformances.

Criteria met: Yes

20.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *In the case that a need to address downstream flow regimes has been identified and commitments to downstream flow regimes have been made, these take into account environmental, social and economic objectives, and where relevant, agreed transboundary objectives.*

SAE are committed to maintaining outflows from the reservoir equal to the inflows, so the downstream flow regimes during project operation will be essentially unchanged from pre-project conditions. The operating rules in place for opening and closing the spillways will result in a slow up- and down-ramping of releases into the downstream, so will have no effect on navigation conditions or the stability of river banks and banks around the reservoir. Determination of the minimum flow releases during reservoir filling accounted for environmental, social and economic objectives.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In the case that a need to address downstream flow regimes has been identified and commitments to downstream flow regimes have been made, in addition these represent an optimal fit amongst environmental, social and economic objectives within practical constraints of the present circumstances.*

The downstream flow regime will be essentially unchanged from pre-project conditions, which can be seen as an optimal fit between environmental, social and economic objectives.

20.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

20.3 Scoring Summary

SAE have assessed and identified issues relating to flow regimes downstream of project infrastructure for the construction and operational stages. No significant impacts are foreseen but the project will continue to monitor downstream flows, erosion and sedimentation, as well as the livelihoods of downstream communities. Monitoring of downstream flow issues takes into account inter-relationships amongst issues though the widespread sharing of data between SAE teams, and with Furnas.

Operating rules are in place to govern the opening and closing of spillway gates to ensure that there will only ever be a negligible change in the reservoir or river level. The downstream actions programme aims to improve the livelihoods of people living below the project. All formal commitments made in the various PBAs are publically disclosed. Monitoring is in place to anticipate emerging risks and ongoing reviews of management programmes look for new opportunities to improve the operations.

The project has no non-conformances or non-compliances regarding downstream flow regimes. SAE are committed to maintaining outflows from the reservoir equal to the inflows, so the downstream flow regimes during project operation will be essentially unchanged from pre-project conditions. This can be seen as an optimal balance between environmental, social and economic objectives.

There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

20.4 Relevant Evidence

Interview:	26
Document:	1 – 5, 10, 17, 21, 22, 69, 89, 129, 186, 187, 221, 254, 301
Photo:	None

Appendix A: Written Support of the Project Developer



Porto Velho, June 10th 2014.

Mr. Richard Taylor
Executive Director
International Hydropower Association
Nine Sutton Court Road
London Borough of Sutton
SM1 4SZ - United Kingdom

Nº. Ref.: Santo Antônio Energia / PVH: 0317/2014

Assunto: IHA Sustainability Protocol Assessment – Santo Antonio Hydro Project

Dear Mr. Richard Taylor,

Santo Antonio Energia S.A. ("SAE"), concessionary company responsible for the construction and operation of Santo Antonio Hydropower Plant, located in Porto Velho, Rondonia State, North Brazil, commissioned the International Hydropower Association ("IHA") to undertake an official assessment based on the Hydropower Sustainability Assessment Protocol ("HSAP") on Santo Antonio HPP. The assessment will use the implementation stage tool of the HSAP and will be preceded of a training section for SAE's personnel on the methodology and criteria defined by the HSAP.

This letter confirms that SAE is fully supportive of this assessment and will cooperate fully and provide information and arrangements, as required by the IHA assessors, to allow a comprehensive evaluation of the project against HSAP criteria.

SAE is therefore committed to continuous improvement of its socioenvironmental practices.

Kind regards,

Eduardo de Melo Pinto
President

São Paulo, SP - Av. das Nações Unidas, 4777 - Ed. Vila Lobos - 6º andar. . CEP 05477-000 . Tel +551137022804
Porto Velho, RO - Rua Dom Pedro II, 637 - 5º andar - sala 510 - Centro Empresarial - Calari . CEP 76.801-910 . Tel
+55 69 3216 3301
www.santoantonioenergia.com.br

Appendix B: Verbal Evidence

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
1	Opening meeting, project presentation to full assessment team	SAE	2014-04-23	São Paulo - VC link Porto Velho	All	All
2	José Carlos, economist Maria Cristina Mendonça de Barros, economist	MB Consultoria	2014-04-23	São Paulo	Aida Khalil	7
3	Luiz Fernandes, regulatory manager Rodrigo Orestes, regulatory and commercial analyst	Santo Antônio Energia	2014-04-23	Porto Velho	Aida Khalil	7
4	Ivan Silveira, coordinator of resettlement Guilherme Abbad Silveira, Manager of Sustainability Carlos Hugo Annes de Araújo, Director of Sustainability; Clibas Pacheco, Lawyer; Rafaela Phytton Ribeiro, Lawyer; Jaime Flavio Pimenta, professor	Santo Antônio Energia Universidade de São Paulo - USP	2014-04-23	São Paulo	Aida Khalil	9, 13, 16
5	Leo Torresan, president	AMARRIBO	2014-04-23	São Paulo	Bernt Rydgren	2
6	Delfino Gambetti, Manager of Engineering Sander Davird Cardoso, Coordinator of Civil Engineer; João Bosco Nogueira Jr, Cartograph Engineer João Salgado, Project manager	Santo Antônio Energia PCE	2014-04-23	São Paulo	Bernt Rydgren	5, 19
7	Ana Maria Iverson, director Fernanda Teixeira, doctor, biologist Gustavo Faustini, environmental and HSE engineer Alejandro Dorado, doctor, biologist Christopher Wells, Environmental and social risk manager Alessandro Farinaccio, Socio-environmental risk consultor	JGP Santander Santander	2014-04-23	São Paulo	Bernt Rydgren	2, 3, 10, 11, 12
8	Ana Paula Romantini, financial planning manager Fabiana Reimer, financial coordinator Daniel Zagatto, financial analyst Andrea Oliveira, fiscal manager Odair Varollo Junior, financial capture coordinator	Santo Antônio Energia	2014-04-23	São Paulo	Doug Smith	6

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
9	Cristopher Wells, Environmental and social risk manager Alessandro Farinaccio, Socio-environmental risk consultant Edson Nogawa, energy department chief	Santander	2014-04-23	São Paulo	Doug Smith	6, 10
10	Carolina F Mariani, Coordinator of sustainability Amanda Moraes, Hicon Michele Lima, Ecology Dario Pires, Ecology	Santo Antônio Energia Hicon Ecology	2014-04-23	São Paulo	Simon Howard	17
11	Delfino Luiz Gouveia Gambetti, Management of Engineering; Sander Cardoso, Coordinator of Engineering Leonardo Moraes, engineer Amauri Alvarez, Manager of Operation and Maintenance João Bosco Nogueira Jr, Cartographic Engineer Celso Pires, Manager; Maria do Carmo Reis Cavalcanti, Geo-technician Rogério Piovesan, Design Manager	Santo Antônio Energia FURNAS PCE	2014-04-24	São Paulo	Bernt Rydgren	5
12	Rogério Baltista, Shareholders' Board representative	FIPE	2014-04-24	São Paulo	Bernt Rydgren	2
13	Carlos Hugo Annes de Araújo, director of Sustainability Guilherme Abbad Silveira, Manager of Sustainability Alexandre Queiroz, Coordinator of Sustainability Ivan Silveira, Coordinator of Resettlement Carolina F Mariani, Coordinator of Environment Euclides Ricardo Ferreira, Coordinator Naiara Florencio, Socio-environmental analyst Nubia Cristina Morais, Socio-environmental analyst	Santo Antônio Energia	2014-04-24	Porto Velho	Bernt Rydgren	3
14	Antônio de Pádua, Technical Director Afonso Jurandir de Moraes, Advisor of Technical Director Nelson Caproni, Gerente Geral de Obras; Delfino Gouveia, Manager of Engineering André Morello, supply coordinator Delio Galvão, Contract Superintendent-Director Antonio Sergio Barbin, Contract Director Fernando Barini, Contract Director Wilson Rodrigues, Project Director Jair Frabetti,	Santo Antônio Energia CCSA	2014-04-24	São Paulo	Doug Smith	4

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
15	André Morello Alves, supply coordinator Carolina F Mariani, Coordinator of sustainability Welson Corrêa, Manager of Engineering; Milton Munhoz, Manager of Electro-mechanical installation; Artur Freire, Manager of Construction Bruno Feitosa, quality manager Tomaz Duarte, planning coordinator Otávio Morais, electrical installation coordinator José Tomaz, concrete coordinator Jeovane Cordeiro, Manager of Planning and Interface	Santo Antônio Energia Furnas CCSA	2014-04-24	São Paulo	Doug Smith	4, 8
16	Euclides Ricardo Ferreira, Coordinator Barbara Tem Catem, Socio-environmental Analyst; Maximilian Strasser, engineer	Santo Antônio Energia PCE	2014-04-24	Porto Velho	Simon Howard	16
17	Neidiane Reis, Socio-environmental analyst Antônio Laffayette, professor Dr. Carolina Doria	Santo Antônio Energia UNIR	2014-04-24	UNIR	Simon Howard	15
18	Marcio Topo Miranda, responsible	Hydro-bio-geochemical Lab - UNIR	2014-04-24	UNIR	Simon Howard	15, 17
19	Rodrigo Pellegrini, Socioenvironment Analyst Lilian Campana, Socio-environmental Analyst Juliane Cales, former Coordinator of Social Communication; Paulo Damião, Director of Institutional Relations José Carlos de Sá, Coordinator of Institutional Relations; Mauricio Vasconcelos, Socio-environmental Analyst Carla Nascentes, Institutional Relations Dina Borges, Director	Santo Antônio Energia CPPT Cuniã	2014-04-25	Porto Velho	Aida Khalil	1
20	Deolindo Carvalho Neto, superintendent Barbara Tem Catem, Socio-environmental analyst Euclides Ricardo Ferreira, Coordinator	DNPM Santo Antônio Energia	2014-04-25	Porto Velho	Aida Khalil	9
21	Ariosmar Weiss, vice-president Valdenir de Brito, gold miner Ezequiel, gold miner Rodrigo Luciano, gold miner lawyer	Coogarima - Gold miners association Coogarima lawyer	2014-04-25	Porto Velho	Aida Khalil	9

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
22	Thais Soares, ESBR Verissimo Alves dos Santos Neto, ESBR	Energia Sustentável do Brasil - ESBR	2014-04-25	Porto Velho - Escritório ESBR	Bernt Rydgren	3
23	Chico Lata, alderman Jurandir Bengala, alderman	Alderman - Jaci-Parana representatives	2014-04-25	Porto Velho	Doug Smith	10
24	Luiz Flávio, Superintendent	INCRA	2014-04-25	Porto Velho	Doug Smith	10
25	Rozângela Bezerra, Environmental engineer; Carolina F Mariani, Coordinator of Sustainability; Tarciso Camilo Souza, Responsible for Program; Sergio Eduardo Scarpim, Contract Manager; Guilherme Todt Cardoso de Faro, Responsible for Program Walmir Guerra, HSE manager	Santo Antônio Energia CCSA	2014-04-25	Porto Velho	Simon Howard	18
26	PBA presentation	SAE sustainability staff	2014-04-25	Porto Velho	All	All
27	José Rozeno de Lima, indemnified	Affected community	2014-04-26	Porto Velho - Resettlement neighbourhood	Aida Khalil	9
28	Marcelo Freire, editor in chief Andrea Gonzales, coordinator Leo Ladeia, journalist	Diário da Amazônia Portal G1 TV Calendária	2014-04-26	Porto Velho	Aida Khalil	1
29	Frei Phillip, Consultant Alexandre Queiroz, Coordinator of Sustainability Rodrigo Pellegrini, Socio-environmental Analyst Dina Borges, Director	Santo Antônio Energia CPPT Cuniã	2014-04-26	Porto Velho	Aida Khalil	1, 9
30	Cleo Oliveira, manager of procurement Max Paulo Corneau, administrative analyst Sergio Scarpim, Manager of Procurement Marcelo Reis, financial administrative manager	Santo Antônio Energia CCSA	2014-04-26	Porto Velho	Doug Smith	8
31	Welson Correa, Manager of Engineering; Edson Ferreira dos Santos, Coordinator of Engineering, Planning and Control; André Morello Alves, supply coordinator Milton Munhoz, Manager of Electro-mechanical installation; Jeovane Cordeiro, Manager of Planning and Interface	Santo Antônio Energia CCSA	2014-04-26	Porto Velho	Doug Smith	4

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
	Artur Freire, Manager of Construction Otávio Morais, Owner's Engineering Bruno Feitosa, quality manager	Engevix CCSA				
32	Ronaldo Barthem, Professor Marina Granai, Neotropical biologist Gustavo Hallwass, Neotropical biologist Lucas Fries, Neotropical biologist	Museu Paraense Emílio Goeldi Neotropical	2014-04-26	Porto Velho	Simon Howard	15
33	Marcela Velludo Tognetti, Socioenvironmental Analyst Jaime Brum, Director Aloísio Ferreira, Pacu Project Alexandre Marçal, former-Analyst SAE	Santo Antônio Energia Instituto Peixes do Brasil Projeto Pacu	2014-04-26	Porto Velho	Simon Howard	15, 17
34	Jansen Zoanon, researcher	Instituto de Pesquisa da Amazônia - INPA	2014-04-27	Porto Velho	Bernt Rydgren	3, 15
35	Maurício Chiecco, Director Janderson Dalazen, researcher Aldenora Lustosa, researcher Adimari Carvalho, Director	Planu's EMATER Multiplik	2014-04-27	Porto Velho	Doug Smith	10
36	Ivan Silveira, Coordinator of Resettlement Guilherme Abbad Silveira, Manager of Sustainability João Bosco Nogueira Jr, Cartograph Engineering Marta Beserra, Socio-environmental analyst Priscilla Guerrero Ortiz, Socio-environmental analyst	Santo Antônio Energia	2014-04-27	Porto Velho	Doug Smith	10
37	Paulo Afonso, Socio-environmental Analyst; Lia dos Santos, Socio-environmental Analyst; Guilherme Abbad Silveira, Manager of Sustainability;	Santo Antônio Energia	2014-04-27	Porto Velho	Doug Smith	11
38	Adriano Karipuna, Indigenous Leadership Adriano Cassupa, Indigenous Leadership Renato Karitiana, Indigenous Leadership	Indigenous representatives	2014-04-27	Porto Velho	Doug Smith	11
39	Guilherme Abbad Silveira, Manager of Sustainability; Nubia Cristina, Socioenvironmental Analyst; Ricardo Marques, Socio-environmental Analyst; Max Paulo Corneau, Socio-environmental Analyst; Roberto Salles, Coordinator of Health and Safety Amauri Alvarez, Manager of Operation and Maintenance;	Santo Antônio Energia	2014-04-27	Porto Velho	Doug Smith	3, 4, 6

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
40	Neidiane Reis, Socio-environmental Analyst; Euclides Ricardo Ferreira, Coordinator; Pedro Gomes, Socio-environmental Analyst Felipe Azevedo, Socioenvironmental Analyst;	Santo Antônio Energia	2014-04-27	Porto Velho	Simon Howard	15, 19
41	Monica Castro, superintendent Renato Kipinis, director; Paulo Ramos, president Carlos Bennesby, vice-president	IPHAN Scientia Consultoria Científica Associação dos amigos da EFMM	2014-04-28	Porto Velho	Aida Khalil	13
42	Márcia Aurora, Governor Special Assessor; Williames Pimentel, Secretary for Public Health;	State Government	2014-04-28	Porto Velho	Aida Khalil	7, 14
43	Helena Campanari, ceremonial department Abdoral Cardoso, chief editor Meiri Santos, vice-coordenadora de comunicação;	State Government Local Government	2014-04-28	Porto Velho	Aida Khalil	1
44	Dra Maria Berenice Alho da Costa Tourinho, President	UNIR	2014-04-28	Porto Velho	Aida Khalil	7, 9, 15
45	People who participated in the ACREDITAR program	Individuals	2014-04-28	Porto Velho	Bernt Rydgren	12
46	Antônio Ferreira, Superintendent	Superintendência do Patrimônio da União - SPU	2014-04-28	Porto Velho	Bernt Rydgren	12
47	Representative of Workers' Committee (anonymous)	Sindicato	2014-04-28	Porto Velho	Bernt Rydgren	12
48	Michele Spolador, human resources Roberto Salles, coordinator of HSE Vanessa da Silva, nurse; Marcelo Reis, financial administrative manager Jean Carlos Ferreira de Freitas, administrative manager Tenorio Reis Chaves Borges, human resources	Santo Antônio Energia CCSA	2014-04-28	Porto Velho	Bernt Rydgren	12
49	Jeovane Cordeiro, Manager of Planning and Interface	Administration Council	2014-04-28	Porto Velho	Donal O'Leary	4
50	Felipe Azevedo, Socio-environmental Analyst Neidiane Reis, Socio-environmental Analyst Javier Cisneros, Socio-environmental Analyst Ricardo Marques, Socio-environmental Analyst; Dario Campana, Socio-environmental Analyst	Santo Antônio Energia	2014-04-28	Porto Velho	Simon Howard	19

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
	João Bosco Nogueira Jr, cartograph engineer Carolina F Mariani, Coordinator of Sustainability; Claudio Stopassoli, Coordinato of Vegetation Supression	PCE				
51	Márcia Vera Grandezi, chemestry Carolina F Mariani, Coordinator of Sustainability;	Ecology Santo Antônio Energia	2014-04-28	Laboratório Flutuante	Simon Howard	15
52	Flodoaldo Pontes Pinto, director Barbara Tem Catem, Socio-environmental Analyst Euclides Ricardo Ferreira, coordinator Guilherme Abbad Silveira, Manager of Sustainability Marcos Araújo, Geologist José Ângelo, coordinator	Placam Santo Antônio Energia Tetrattech	2014-04-28	Porto Velho	Simon Howard	17
53	Carlos Hugo Annes Araújo, director of sustainability Euclides Ricardo Ferreira, coordinator Max Paulo Corneau, Socio-environmental Analyst Guilherme Abbad Silveira, Manager of Sustainability Clibas Pacheco, lawyer	Santo Antônio Energia	2014-04-28	Porto Velho	Simon Howard	15
54	Márcia Leal, chief of energy department	BNDES	2014-04-29	Porto Velho - Skype	Aida Khalil	6, 7
55	Sheila Rodvalho, malaria program coordinator	Ministério da Saúde	2014-04-29	Porto Velho - Skype	Aida Khalil	14
56	Guilherme Abbad Silveira, Manager of Sustainability	Santo Antônio Energia	2014-04-29	Porto Velho	Aida Khalil	14
57	Coronel Caetano, coordinator	State Civil Defense	2014-04-29	Porto Velho	Aida Khalil	5, 9
58	Maria Ceicilene, chief of special assessment of environment Rita Alvez, advisor	Ministério de Minas e Energia - MME	2014-04-29	Brasília - MME	Bernt Rydgren	2, 3
59	Rosane Amaral, environmental management	Fundação Nacional do Índio – FUNAI	2014-04-29	Brasília - FUNAI	Bernt Rydgren	11
60	Thomaz Toledo, licensing director Leonora Milagre de Sousa, environmental analyst Frederico Amaral, hydropower coordinator	IBAMA	2014-04-29	Brasília - IBAMA	Bernt Rydgren	2, 3, 10
61	Sérgio Leão, sustainability director Luiz Gabriel Todt, sustainability director	Odebrecht	2014-04-29	Brasília - Restaurante	Bernt Rydgren	2
62	Javier Cisneros, Socio-environmental Analyst; William Magnusson, Professor; Albertina Lima, Professor	Santo Antônio Energia INPA	2014-04-29	Porto Velho	Simon Howard	15, 19

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
	Eduardo Sabato, SETE Marco Granzinolli, PROBIOTA	SETE PROBIOTA				
63	Marcela Velludo Tognetti, Socio-environmental Analyst Javier Cisneros, Socio-environmental Analyst Jader Clei, Socio-environmental Analyst Ivonete Gomes, Socioenvironmental Analyst	Santo Antônio Energia	2014-04-29	Porto Velho	Simon Howard	15
64	Sandra Hacon, researcher	FIOCRUZ	2014-04-29	Porto Velho - Skype	Simon Howard	17
65	Mr. Antônio Ms. Claudeci	Fisherman	2014-04-29	Porto Velho	Simon Howard	15
66	Newton Gurgel, indemnified	Indemnified Jaci-Paraná	2014-04-30	Porto Velho	Aida Khalil	9
67	Ivan Silveira, coordinator of resettlement, and Naelha Sarmiento, Forest Engineer	Santo Antônio Energia	2014-04-30	Porto Velho	Doug Smith	9, 10, 11
68	Gisela Forattini, director Márcia Coimbra, critical-events manager	Agência Nacional de Águas - ANA	2014-04-30	Brasília - ANA	Bernt Rydgren	2, 3, 4, 5, 8
69	Odenir José dos Reis, superintendent of hydropower studies	ANEEL - SGH	2014-04-30	Brasília - ANEEL	Bernt Rydgren	2, 3, 4, 5, 8
70	Eduardo de Melo Pinto, president Luis Pereira, Diretor of Finance and P&O; Alexandre Britto, Director of Legal;	Santo Antônio Energia	2014-04-30	Brasília - Escritório CNO	Bernt Rydgren	2
71	Gustavo Esteves Murad, regulation specialist	ANEEL - SFG	2014-04-30	Brasília - ANEEL	Bernt Rydgren	2, 3, 4, 5, 8
72	Two men, heads of households amongst population resettled from Triangulo	(Former residents of Triangulo)	2014-04-30	Porto Velho	Doug Smith	9, 10, 13
73	Iacira Azamor, President	CAERD	2014-04-30	Porto Velho	Simon Howard	17
74	Ricardo Lopes, Superintendente substituto	Ministério da Pesca	2014-04-30	Porto Velho	Simon Howard	15, 17
75	José Maria Silva Mendes, indemnified	Affected community	2014-04-26	Porto Velho – Rural Resettlement near the site	Aida Khalil	9, 10
76	Joan Batista, resident of Santo Antônio; Ester Rodrigues Fonseca, resident of Santo Antônio	Santo Antônio community	2014-04-27	Santo Antônio	Aida Khalil	9
77	Maria Anonieta Rodrigues Gamo, director; Sergio Pereira, nurse	São Cosme Children's Hospital	2014-04-27	Porto Velho	Aida Khalil	14

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
78	Hospital nurse	Hospital de Base	2014-04-27	Porto Velho	Aida Khalil	14
79	Alexandre Marcos Queiroz, Coordinator of Sustainability Euclides Ricardo Ferreira, Coordinator Barbara Tem Catem, Socio-environmental analyst	Santo Antônio Energia	2014-04-27	Porto Velho	Aida Khalil	9, 13, 14
80	Renato Kipinis, director; Francisco de Chagas, assistant	Scientia Consultoria Científica	2014-04-27	Scientia's lab in Porto Velho	Aida Khalil	13
81	Joan Batista, resident of Santo Antônio; Ester Rodrigues Fonseca, resident of Santo Antônio	Santo Antônio community	2014-04-27	Santo Antônio	Aida Khalil	9
82	Ricardo Pianta, Coordinator	São Lucas University	2014-04-28	Porto Velho	Aida Khalil	14
83	Elsa Ronsoni Mendes Pereira, director	SESAI	2014-04-28	Porto Velho	Aida Khalil	7, 9
84	Gilberto Siqueira	Gilberto Siqueira Consultoria	2014-04-29	Porto Velho - Skype	Aida Khalil	7
85	Marcela Velludo Tognetti, Socioenvironmental Analyst	Santo Antônio Energia	2014-04-29	Porto Velho	Aida Khalil	9
86	Andrea Maria Oliveira	SAE Finance Department	2014-04-23	São Paulo	Doug Smith	6
87	Gabriella Mendes, Manager of Risk and Insurance	SAE Finance Department	2014-04-24	São Paulo	Doug Smith	4, 6
88	Josenios André de Macedo, President of Association	Teotônio APMVNT (Community Association)	2014-04-28	Teotônio	Doug Smith	10
89	Christiane Aparecida Oliveira Mascimento (adviser) and 4-5 members of the Mãos de Teotônio women's jewelry/handicrafts cooperative	Mãos de Teotônio	2014-04-28	Teotônio	Doug Smith	10
90	Commercial Fisherman	Teotônio	2014-04-28	Teotônio	Doug Smith	10
91	Priscilla Defreitas-Silva, Secretary	Novo Engenho Community Association	2014-04-28	Novo Engenho	Doug Smith	10
92	Group of women from Costureiras do Madeira, a women's costume-making cooperative	Costureiras do Madeira	2014-04-28	Novo Engenho	Doug Smith	10
93	Neuraci Monteriro do Mascimento, Ex-president of ASPRAZUL and cassava farmer, Francisca Brito Sales, President of ASPRAZUL and school headteacher	Riacho Azul ASPRAZUL (Farmers' Association)	2014-04-28	Riacho Azul	Doug Smith	10

Ref	Interviewee/s, Position	Organisation	Date	Location	Lead Interviewer	Topics
94	Helga Cristina Rodrigues Lisboa, President of AMPDB (Community Association), and Kelly Jesus Felix, Treasurer	AMPDB Parque dos Buritis Community Association	2014-04-29	Parque dos Buritis	Doug Smith	10
95	Enoque Cassimiro do Abreu, member of ASPROJANAS (Farmers' Association)	ASPROJANAS (Farmers' Association), Santa Rita	2014-04-29	Santa Rita	Doug Smith	10
96	Arthur Duarte Raposo, President of ARESANTA (Farmers' Association)	ARESANTA (Farmers' Association), Santa Rita	2014-04-29	Santa Rita	Doug Smith	10
97	Domingos Mendes da Silva, Fish Farmer	Pisciculture Demonstration project	2014-04-29	Santa Rita	Doug Smith	10
98	Francisco da Silva Braga, President of ASDAMOR, Amauri Monteiro Almeida, ASDAMOR member and school teacher	ASDAMOR Farmers' Association	2014-04-29	Morrinhos	Doug Smith	10
99	Andrea Maria Oliveira, Controls Officer, Procurement Department, Cleo Oliveira, Manager of Procurement, Guilherme Abbad Silveira, Manager of Sustainability	Santo Antônio Energia	2014-05-16	Teleconference	Doug Smith	8

Appendix C: Documentary Evidence

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
1	FURNAS/ Odebrecht	EIA/RIMA	2006	Portuguese	1, 2, 3, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
2	MESA	PBA	2008	Portuguese	1, 2, 3, 5, 9, 12, 13, 14, 15, 16, 17, 18, 19, 20
3	IBAMA-Bsb	Licença Prévia	2007	Portuguese	1, 2, 3, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
4	IBAMA-Bsb	Licença de Instalação nº 540/2008	2008	Portuguese	1, 2, 3, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
5	IBAMA-Bsb	Licença de Operação nº 1044/2011	2011	Portuguese	1, 2, 3, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
6	SAE	Lista de NTs, Pareceres, etc		Portuguese	2, 3, 12
7	SAE	Relatório de Hidrologia		Portuguese	3, 5
8	DNPM	Bloqueio de Área para novas Lavras		Portuguese	2, 3
9	SAE	Tabela de Controle de Condicionantes		Portuguese	2, 3
10	SAE	4º Relatório Semestral de Acompanhamento dos Programas Ambientais Pós LO		Portuguese	2, 3, 5, 10, 11, 15, 16, 17, 18, 19, 20
11	ANEEL	DUP (Canteiro e reservatório)	2008	Portuguese	2, 3, 19
12	ANEEL	DUP (Reserva Legal e áreas complementares)	2013	Portuguese	2, 3, 19
13	ANA	Resolução ANA 466/2008	2008	Portuguese	2, 3, 5, 19
14	ANA	Resolução ANA nº 465/2008, Resolução ANA nº 167/2011 (Cota de segurança Jaci-Paraná) e Parecer Técnico	2012	Portuguese	2, 3, 5

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
15	Ministério da Saúde	Certificado de Sanidade (Canteiro)	2008/2013	Portuguese	14
16	SAE	Lista dos Relatórios periódicos IBAMA (fases de LI e LO; atendimento de Programas e condicionantes) com datas	From 2008	Portuguese	2, 3, 9, 10, 11, 13, 14, 15, 19
17	JGP	Último Relatório de Monitoramento Socioambiental - Auditoria dos Bancos		Portuguese	1, 2, 3, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
18	SAE, Prefeitura Municipal, Governo Estadual	Protocolo de Intenções	2008	Portuguese	2, 3, 7, 9, 14
19	MB Consultoria/SAE	Relatório de Alternativas de Desenvolvimento Regional		Portuguese	2, 3, 7
20	Gilberto Siqueira Consultoria/SAE	Proposta para Plano Pluriannual do Governo do Estado de Rondônia		Portuguese	2, 3, 7
21	SAE	Lista dos RSAPs e Relatórios de Monitoramento Socioambiental		Portuguese	2, 3, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20
22	SAE	Lista de Programas Voluntários		Portuguese	1, 3, 7, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20
23	SAE	Exemplos de Processos de Termos de Entrega e Recebimento de Obras Concluídas (TEROCs)		Portuguese	7, 9, 14
24	Ministério da Saúde	Programa de Controle de Malária (estatísticas mostrando redução)		Portuguese	7, 14
25	SAE	Lista de TEROCS		Portuguese	7, 9
26	SAE (Comunicação Social)	Planilha de Controle de Demandas	From 2008	Portuguese	1, 9
27	SAE (Comunicação Social)	Formulários de registro de demandas - FED	From 2009	Portuguese	1, 9
28	SAE	Mecanismo de Consulta e Demanda - Seção 8 do RSAP		Portuguese	1

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
29	SAE (Comunicação Social)	Últimos 3 Informativos	From 2008	Portuguese	1, 9
30	SAE	Plantões Sociais - Seção 8 do RSAP		Portuguese	
31	SAE	Exemplos de Informativos - exemplos da mudança das comunidades		Portuguese	
32	SAE (Comunicação Social)	Lista de Programas de Radio		Portuguese	1, 9
33	SAE (Comunicação Social)	Exemplo de Programa de rádio	From 2009	Portuguese	1, 9
34	SAE	Lista de reuniões e atendimentos semanais e exemplo de uma memória de reunião sobre temas de interesse da comunidades reassentadas - durante o processo de negociação e últimas 12 meses		Portuguese	10
35	SAE	Estudo de Remanso		Portuguese	16, 19
36	SAE (Comunicação Social)	2 ou 3 exemplos últimas + Lista memórias de reuniões públicas e periódicas - Reassentamento	From 2008	Portuguese	1, 10
37	SAE (Comunicação Social)	Exemplos + Lista Memórias de Reuniões públicas - comunidades NÃO afetadas pelo projeto		Portuguese	1, 9
38	CCSA	Filme Institucional - Projeto Acreditar		Portuguese	8, 12
39	SAE (Comunicação Social)	Registros Oficinas de Manual de Conduta	From 2009	Portuguese	1, 10
40	SAE	Último Relatório de Controle de Vetores		Portuguese	14
41	SAE (Comunicação Social)	Lista de Campanhas Informativas com breve descrição	From 2008	Portuguese	1, 10
42	SAE (RI)	Matriz de Risco de Imagem		Portuguese	1, 4
43	SAE (RI)	IQEM - Índice de Qualidade de Exposição na Mídia	From 2009	Portuguese	1

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
44	SAE (RI)	Último Relatório mensais de atividades de imprensa	From 2008	Portuguese	1
45	SAE (RI e Comunicação Social)	Matriz de Partes Interessadas	2008	Portuguese	1
46	SAE (RI)	Último Relatório mensal de clipping	From 2008	Portuguese	1
47	SAE (RI)	Banco de dados do Programa de Visitas	2010	Portuguese	1
48	SAE (RI e Comunicação Social)	Lista e exemplo de publicações da empresa (livro e cartilhas)	From 2008	Portuguese	1, 7
49	SAE (RI)	Lista e exemplo de Documentários (Vozes do Madeira, STP, Reassentamentos, Áreas de remanso, pesca da burra, entre outros)	From 2008	Portuguese	1, 9, 10
50	SAE	Lista de Reuniões e Exemplo de Ata de Reunião da Comissão de Gestão e Acompanhamento do Programa de Saúde Pública		Portuguese	14
51	SAE	Lista de Melhorias no sistema de saúde em decorrência de ações da SAE		Portuguese	14
52	SAE	Lista de Campanhas Informativas		Portuguese	14
53	SAE (Comunicação Social e RI)	Planos de Comunicação para o Enchimento do Reservatório	2011	Portuguese	1, 9, 19
54	SAE (Comunicação Social)	Registros de eventos SAE e Cidadania	2009 and 2010	Portuguese	1
55	SAE (RI)	Registro de workshops de relacionamento (desvio do rio, comercialização de energia)	2011 and 2012	Portuguese	1
56	SAE (RI)	Lista de Boletins Especiais e um exemplo	From 2008	Portuguese	1
57	SAE (RI)	Lista de Expresso Santo Antônio		Portuguese	1
58	SAE (Comunicação)	Premiação (POP Programa de Comunicação, POP Saúde Pública, Prêmio Destaque Odebrecht)	2010	Portuguese	1, 7, 17
59	SAE	Lista da participação em congressos (Seminário de Grandes Barragens, Global Mercury, Controle de Malária por meio da distribuição de MILDs, Ictiofauna, etc) e de publicações científicas		Portuguese	15

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
60	PERRY JOHNSON REGISTRARS CARBON EMISSIONS SERVICES, INC	CDM Validation Report - Santo Antônio Energia S.A. - Santo Antônio Hydropower Project in Brazil	2012	English	3, 6
61	EQAO / Bureau Veritas	Audit report for validation of the compliance report assessing application of article 11 b (6) of emissions trading directive to hydroelectric project activities exceeding 20 MW - WCD	2013	Portuguese	3, 6, 18
62	SAE	Project design document form for CDM project activities (F-CDM-PDD) - Santo Antônio Hydropower Project	2012	English	3, 6
63	SAE (Comunicação Social)	Lista e registro de outros eventos (ex SAE e Cinema, feiras, São Lucas Solidário)		Portuguese	1, 10
64	SAE (Fundário)	Especificação Técnica de ATES		Portuguese	10
65	SAE (Fundário)	Especificação Técnica de Monitoramento de Reinserção Social		Portuguese	10
66	Sae (Fundário/EMATER)	Último Relatório semestral de ATES de cada reassentamento	From 2010	Portuguese	10
67	SAE (Fundário/Consultoria Plenu's)	Relatório de Origem e último relatório semestral de Monitoramento de Reinserção Social de cada reassentamento	From 2010	Portuguese	10
68	SAE	Lista de Ajuda Humanitária aos atingidos pela cheia do Madeira e apoio ao Município e Defesa Civil		Portuguese	9
69	SAE	Programa de Ações a Jusante		Portuguese	9, 20
70	SAE	Plano e Monitoramento de Desmobilização de Mão-de-Obra		Portuguese	9, 12
71	SAE	Relatório de conclusão do processo do bairro Triângulo		Portuguese	9, 13, 16
72	MPE	Termo de Ajustamento de Conduta para o bairro Triângulo	2012	Portuguese	9, 13
73	SAE (Fundário)	Quadro Geral com número de reassentados, indenizados, processos, etc		Portuguese	10
74	SAE (Fundário)	Lista dos projetos de Geração de Renda, Fertilidade do Solo, Gênero		Portuguese	10, 19

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
75	SAE (Sae)	Relatório Final das Indenizações realizadas e Modelos de Processos por opção de remanejamento (reassentados, carta de crédito, remanescentes, indenização) - 3 exemplos de cada modalidade		Portuguese	1, 10
76	Associações de Moradores / SAE	Lista de ofícios emitidos por Associações de Moradores dos Reassentamentos		Portuguese	10
77	SAE	Jornal Mural - Exemplo de edição		Portuguese	1
78	SAE	Projeto Casa da Informação de Jaci-Paraná		Portuguese	1, 10
79	SAE	Plantas, Cadernos "A casa é sua", Escritura declaratoria de posse - por reassentamento e registro fotográfico - um exemplar representativo desta campanha		Portuguese	1, 10
80	SAE	Escrituras Comprobatórias sobre a aquisição das áreas para implantação dos reassentamentos rurais e urbanos		Portuguese	10
81	SAE	Lista de acordos e termos de parcerias		Portuguese	10
82	SAE	Exemplo de Planos Anuais de Ação de Desenvolvimento das Comunidades Reassentadas - PDR Plano de desenvolvimento rural e PUF's Plano da unidade familiar		Portuguese	10
83	SAE	Produtos resultantes do Programa de Educação Ambiental - Amazônia BR e CPPT Cuniã		Portuguese	9
84	SAE	Caderno de Valores		Portuguese	10
85	SAE	Plano de Mobilidade Urbana		Portuguese	10
86	SAE	Monitoramentos de População e Migração em Porto Velho		Portuguese	9
87	SAE	Ações em São Sebastião em apoio a comunidades a jusante		Portuguese	9
88	SAE	Programa de Apoio a Atividade Pesqueira - Vila Teotonio e entorno e Jaci-Paraná - Memórias das reuniões realizadas pela Fister, relatório das atividades. Comprovante de pagamento de financiamentos impactados pela redução das atividades. Cursos de Capacitação, comprovantes de pagamento do auxílio aos pescadores		Portuguese	9, 10, 15
89	SAE	Pacuera		Portuguese	15, 16, 17, 18, 19, 20
90	SAE	Último Relatório do PGSP		Portuguese	19
91	SAE	Último Relatório do Acompanhamento de Margens		Portuguese	15, 16
92	SAE	Último Monitoramento Hidrossedimentológico		Portuguese	16, 17
93	SAE	Modelo Hidrossedimentológico		Portuguese	16

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
94	SAE	Apresentações do Seminário de Hidrossedimentologia		Portuguese	16
95	SAE	PRAD - canteiro - Seção 5.3 do RSAP		Portuguese	19
96	SAE	PRAD - reservatório		Portuguese	19
97	SAE	Relatório Fotográfico da Restauração da EFMM		Portuguese	13
98	SAE	Relatório Consolidado de Arqueologia e Paleontologia		Portuguese	13
99	SAE	Relatório Fotográfico da Revitalização do entorno da Igreja de Santo Antônio		Portuguese	13
100	SAE	Relatório sobre remoção de campos santos		Portuguese	13
101	SAE	Termos de Referência para Revitalização da EFMM		Portuguese	13
102	SAE	Último Relatório do monitoramento do STP		Portuguese	
103	SAE	Metodologia PPBio		Portuguese	15
104		Relatório final de resgate de flora		Portuguese	15
105	SAE	Relatório Consolidado de Resgate de Germoplasma		Portuguese	15
106	SAE	Último Relatório de Monitoramento da Sucessão Vegetacional		Portuguese	15, 19
107	IBAMA-Bsb	OF 02001.000944/2014-14 CCOMP/IBAMA - Compensação Ambiental - UHE Santo Antônio		Portuguese	15
108	SAE	Apresentações do Seminário do Meio Bióticos (IBAMA, SAE, ESBR)		Portuguese	15, 19
109	SAE	Relatório Final de Resgate de Fauna		Portuguese	15
110	SAE	Último Relatório de Monitoramento de Fauna		Portuguese	15
111	SAE	Último Relatório de Monitoramento Limnológico e de Macrófitas Aquáticas		Portuguese	15, 17
112	SAE	Último Relatório de Monitoramento da Ictiofauna		Portuguese	15
113	SAE	Relatório Final de Acompanhamento do Desmatamento - 1º Relatório de Acompanhamento dos Programas Ambientais após a emissão da Licença de Operação		Portuguese	15, 19
114	SAE	Último Relatório de Monitoramento de Qualidade do Lençol Freático		Portuguese	17
115	SAE	Modelagem de Qualidade de Água		Portuguese	17
116	SAE	Plano de Enchimento do Reservatório		Portuguese	19
117	SAE	Gráfico do Enchimento do Reservatório com as cotas diárias		Portuguese	19

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
118	SAE	Cartas Enviadas aos órgãos ambientais e intervenientes para informar o enchimento do reservatório		Portuguese	19
119	SAE	Planilha de Controle de Royalties		Portuguese	7
120	SAE	Lista de Instruções Normativas	From 2009	Portuguese	2
121	SAE	IN-DP-001-11 Código de Conduta da empresa		Portuguese	2
122	SAE	Relatório da Empresa de 2010		English and Portuguese	2
123	SAE	Site interno da empresa (Intranet)	2009	Portuguese	1, 2, 12
124	SAE	Visão, Missão, Valor		Portuguese and English	1, 2, 13
125	SAE	Site externo da empresa	2008	Portuguese and English	1, 2
126	SAE	Diretrizes de Apoio e Patrocínio	2013	Portuguese	1, 2
127	CCSA	Código de Conduta		Portuguese	2, 8
128	SAE	Último Relatório de Situação para o Conselho de Administração		Portuguese	2
129	SAE	Último protocolo de recebimento do Relatório de Acompanhamento dos Programas Ambientais do IBAMA junto ao MPE / MPF		Portuguese	2, 15, 16, 17, 18, 19, 20
130	SAE	Exemplo de ata de Reunião de Conselho		Portuguese	2
131	SAE	GESPLAN e Megawatt (Oracle software)		Portuguese	6
132	CCSA	Inventário de emissão de gases		Portuguese	3
133	SAE	Pacto Empresarial contra a Exploração Sexual Infantil		Portuguese	2, 7, 12
134	CCSA	Último Relatório de Formatura do Acreditar e Acreditar Junior		Portuguese	2, 7, 12
135	SAE / CCSA	Porcentagem de Mão de Obra de Porto Velho e Mão de Obra feminina e com Deficiência		Portuguese	2, 12
136	CCSA	Certificado OHSAS		Portuguese	2, 12
137	SAE	Último Relatórios do Subprograma de Qualificação da População		Portuguese	7, 12
138	SAE	Contrato EPC		Portuguese	4, 6, 8, 12
139	CCSA	Certificados ISSO Odebrecht		Portuguese	3, 4

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
140	SAE / CCSA	Lista de SGI e Procedimentos SAE e CCSA		Portuguese	3, 4
141	CCSA	Workflow da Tramitação de Documentos do CITADON		Portuguese	4
142	SAE / CCSA / EP	Reunião de certificação de documentos - exemplo de ata		Portuguese	4
143	CCSA	Último Relatório de Progresso		Portuguese	4, 18
144	SAE / CCSA	Reuniões de coordenação do empreendimento - exemplo de ata		Portuguese	4
145	CCSA	Reuniões de interface entre consorciados - exemplo de ata		Portuguese	4
146	SAE / CCSA	Reuniões de comissionamento - exemplo de ata		Portuguese	4
147	SAE	Acompanhamento da Obra - Seção 3 do RSAP		Portuguese	4
148	SAE	Último Relatório Gerencial de Obra		Portuguese	4
149	SAE	Macroestrutura da SAE		Portuguese	4
150	CCSA	Macroestrutura do CCSA		Portuguese	4
151	SAE	Último Relatórios Monitoramento Sismológico		Portuguese	5
152	SAE	PAE - 1a fase - Minuta		Portuguese	
153	SAE	Último Relatório de Instrumentação		Portuguese	
154	ANEEL	Último Relatório de Auditoria da ANEEL		Portuguese	
155	SAE	Modelo Financeiro		Portuguese	6
156	SAE	Oracle			6
157	PWC	Santo Antônio Energia S.A. Demonstrações financeiras em 31 de dezembro de 2012 e relatório dos auditores independentes	2013	Portuguese	6
158	SAE	Planejamento Financeiro		Portuguese	6
159	SAE	Sistema de Gestão Financeira		Portuguese	6
160	SAE	Orçamento do Programas Ambientais		Portuguese	
161	Big Four	Auditorias Financeiras - "Big Four" Companies		Portuguese	6
162	SAE	Relatório de Entrega e Instalação de Mosquiteiros Empregados - Subcredito F		Portuguese	14

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
163	SAE / BNDES	Contrato de Financiamento e aditivos		Portuguese	6
164	CCSA	PRAD - canteiro - Seção 5.3 do RSAP		Portuguese	
165	CCSA	Último Relatório de Monitoramento de Qualidade do Ar - Ambiental		Portuguese	18
166	CCSA	Último Relatório de ruído ambiental		Portuguese	18
167	SAE	Registros de Treinamentos - Seções 5.1 e 5.2 do RSAP		Portuguese	5, 12
168	SAE	Simulados de Evacuação e Salvamento		Portuguese	5, 12, 15
169	SAE / CCSA	Modelos/ Contratos de Subcontratados e fornecedores		Portuguese	
170	CCSA	Procedimento de Contratação do CCSA		Portuguese	
171	SAE	Inspeções para o PAC - Seção 5.3 do RSAP		Portuguese	
172	SAE / CCSA	Histograma de mão de obra		Portuguese	4, 12
173	SAE	Mapeamento de Mão de Obra		Portuguese	4, 12
174	SAE / CCSA	Lista de Procedimentos de SST		Portuguese	4, 12
175	SAE / CCSA	Lista de ações da CIPA e exemplo de ata de reunião de posse e ordinária		Portuguese	12
176	Odebrecht	Premiação - Ciclo Fechado Rampa		Portuguese	
177	Odebrecht	Premiação Odebrecht - ETA		Portuguese	17
178	SAE	Seção 5 do RSAP		Portuguese	12
179	CCSA	Último Relatório do CSAC de SSTMA e indicadores		Portuguese	4, 12
180	SAE / CCSA	Exemplos de Relatórios de Acidentes		Portuguese	12
181	SAE / CCSA	Relatórios de Investigação de Acidentes Fatais		Portuguese	12
182	CCSA	Relatório PCMSO 2013		Portuguese	12
183	SAE / CCSA / CNO	Plano de Monitoramento de Saúde Ocupacional - PCMSO 2014		Portuguese	12
184	SAE	Políticas de Contratação e EHS da SAE e subcontratados		Portuguese	12
185	SAE	Ensaio no Modelo Reduzido - Lista de ensaios realizados		Portuguese	
186	SAE	Plano de Operação de Comportas		Portuguese	20
187	PCE	Relatório de Sistema de previsão de vazões e níveis d'água do rio Madeira nas principais comunidades a jusante da UHE Santo Antônio		Portuguese	20

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
188	SAE / Sindicato dos Trabalhadores nas Indústrias Urbanas RO	Acordo Coletivos de Trabalho		Portuguese	12
189	SAE (índios)	Termo de Cumprimento do Programa de Apoio às Comunidades Indígenas		Portuguese	11
190	FUNAI-Bsb/SAE (índios)	Convênio SAE/ FUNAI Fase 01		Portuguese	11
191	FUNAI-Bsb	Plano Emergencial de Proteção Territorial Karitiana		Portuguese	11
192	FUNAI-Bsb	Plano Emergencial de Proteção Territorial Karipuna		Portuguese	11
193	FUNAI-Bsb	Plano de Trabalho Emergencial para Índios Isolados		Portuguese	11
194	FUNAI-Bsb	Ofício 208 2013 DPDS-FUNAI-MJ		Portuguese	11
195	Funai-Bbs / DOU	Publicação da Ampliação do Território da Terra Indígena Jacareuba-Katawixi		Portuguese	11
196	FUNAI-Bsb	Relatório da execução do FASE 01 Índios Isolados e Proposta do Plano de Trabalho Fase 02		Portuguese	11
197	FUNAI-Bsb	Apresentação da FUNAI no Seminário à SAE sobre a Temática Índios Isolados - Metodologia, Referências sob influência da UHE Santo Antônio		Portuguese	11
198	SAE	Correspondência SAE de entrega de obra concluída Posto de Vigilância		Portuguese	11
199	SAE	Diagnóstico Cassupá e Salamãï _Volume_1		Portuguese	11
200	SAE	Mapas Temáticos Cassupá e Salamãï _Volume_2		Portuguese	11
201	SAE	Plano Básico Ambiental Componente Indígena PBA-CI Cassupá e Salamãï _Volume_3		Portuguese	11
202	SAE	Diagnóstico Sociambiental Karipuna		Portuguese	11
203	SAE	Diagnóstico Sociambiental Karitiana		Portuguese	11
204	SAE (índios)	Revisão do PBA-CI das Terras Indígenas Karipuna e Karitiana		Portuguese	11
205	SESAI/DSEI-PVH e SAE	Plano Integrado de Ações de Saúde Indígena		Portuguese	11
206	CONDISI e Índios Karitiana e Karipuna	ATA de aprovação da comunidade indígena e Conselho local do Plano Integrado de Saúde Indígena		Portuguese	11

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
207	SAE/APK	Termos de Cooperação com a Associação do Povo Indígena Karitiana - APK, em 2010, 2012 e 2013		Portuguese	11
208	SAE/ ABYTUCU	Termos de Cooperação com a Associação do Povo Indígena Karipuna - ABYTUCU, em 2010, 2012 e 2013		Portuguese	11
209	SAE/Estado de Rondônia	Termo de entrega e recebimento de Obra da Escola na Terra Indígena Karipuna		Portuguese	11
210	SAE/Prefeitura Porto Velho	Termo de entrega e recebimento de Obra da Escola na Terra Indígena Karitiana		Portuguese	11
211	SAE	Lista de Reuniões com povos indígenas e Funai		Portuguese	11
212	APK/SAE	Ata da Assembleia Geral do povo Karitiana		Portuguese	11
213	SAE	Plano Estratégico Plurianual de investimentos em P&D		Portuguese	3, 7
214	SAE	Projetos de P&D aprovados pela comissão		Portuguese	7
215	SAE	Carta SAE 3107/12 Atendimento ao Ofício Circular nº 308/2012-SFG/ANEEL. Enquadramento para proteção de barragem		Portuguese	5
216	ONS	Despachos de Operação Comercial		Portuguese	
217	CCSA	Processo de Avaliação de Fornecedores e Contrados		Portuguese	
218	CCSA	Integração de Fornecedores e Treinamento Básico - Material Didático e exemplo de lista de presença		Portuguese	12
219	SAE	Requisitos de SST - modelo inserido nos contratos de terceiros		Portuguese	12
220	SAE/ ONS/ ELETROSUL	Contrato de Conexão à Transmissão		Portuguese	
221	SAE	Último Relatório Mensal de Acompanhamento para a ANEEL		Portuguese	15, 16, 17, 18, 19, 20
222	SAE	Reavaliação das estruturas civis da barragem para implantação do PBCA		Portuguese	5
223	SAE	Critérios Gerais de Projeto		Portuguese	5
224	SAE	Rede Telemétricas aprovadas pela ANA		Portuguese	
225	SAE	Efetivo de Março de 2014		Portuguese	12
226	SAE	IN-DP-006-09 Gestão de Pessoas		Portuguese	8, 12
227	SAE	Política de Contratações		Portuguese	8, 2

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
228	SAE	Master Plan		Portuguese	4
229	SAE	Cronograma Detalhado - Primavera		Portuguese	4
230	SAE	Relatório/ Informação das datas do enchimento		Portuguese	
231	CCSA	Ouvidoria CCSA - Seção 8 do RSAP		Portuguese	2,12
232	CCSA	Código de Ética		Portuguese	2, 8, 12
233	CCSA	Código de Conduta		Portuguese	2, 8, 12
234	CCSA	Compromisso Nacional para Aperfeiçoamento das condições de trabalho		Portuguese	2,12
235	SAE	Lista de Projetos do Subcrédito - F		Portuguese	
236	SAE / Instituto Fecomercio	Últimos 3 relatórios de monitoramento das atividades do Programa de Agricultura Familiar		Portuguese	7
237	SAE	Projeto de Implantação da Casa Familiar Rural de Porto Velho		Portuguese	7
238	SAE	Guia de Fauna		Portuguese	15
239	SAE	Livro Peixes do Madeira	2013	Portuguese	15
240	SAE	Site Herbário Rondoniense - RON		Portuguese	15
241	SAE	Mapa de coletas Herbário RON		Portuguese	15
242	SAE	Reportagem Herbario RON		Portuguese	15
243	SAE	Apresentação da Modelagem de Qualidade de Água ao IBAMA E SBRH		Portuguese	17
244	SAE	Relatório 4 de Limnologia Ecology - Consolidado		Portuguese	15
245	SAE	Relatório Final WCD		Portuguese	
246	SAE	Modelo Financeiro base do PDD		Portuguese	6
247	SAE	PDD e Validation Report		Portuguese	6
248	SAE	Apresentação Oracle		Portuguese	4, 6
249	SAE	Apresentação Gesplan		Portuguese	4, 6
250	SAE	Relatórios Auditores Externos (Willis, JGP e Concremat)		Portuguese	18
251	SAE	Demonstrações Financeiras 2013		Portuguese	6
252	SAE	Contratos de Financiamento		Portuguese	6

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
253	SAE	Contrato de Venda de Energia no ACL (Cemig e Termo de Concessão Usiminas)		Portuguese	
254	SAE	Apresentação do Projeto		Portuguese	15, 16, 17, 18, 19, 20
255	SAE	Relatórios Agências de Rating (Fitch Ratings, S&P)		Portuguese	6
256	SAE	Fotos sequenciais da construção da barragem		Portuguese	5
257	SAE	Apresentações Programas ambientais		Portuguese	All
258	SAE	Relatório do TCE		Portuguese	
259	SAE	Matriz de responsabilidade Infraestrutura da barragem no Governo		Portuguese	5
260	SAE	EP contrato com SAE		Portuguese	
261	SAE	Exemplos de notas técnicas EP		Portuguese	
262	INCRA	Relatórios do INCRA		Portuguese	10
263	CSAC	Cópia de grandes contratos		Portuguese	
264	SAE	Matriz de elegibilidade		Portuguese	10
265	SAE	Instruções normativas reassentamento		Portuguese	10
266	SAE	Planilha de acompanhamento das famílias		Portuguese	10
267	SAE	Linha do tempo das ações indígenas		Portuguese	11
268	SAE	Documentação do SGI das definições das próximas etapas - ações		Portuguese	4
269	SAE	Contrato com DNV - Treinamento auditoria		Portuguese	
270	SAE	Apresentação feita pela DNV para a diretoria		Portuguese	
271	SAE	Apresentação da Ecology		Portuguese	15
272	SAE	Proposta técnica Limnologia		Portuguese	15, 17
273	SAE	Relatório sobre morte de peixes no Lago Madalena		Portuguese	15, 17
274	SAE	Último relatório Ecology		Portuguese	15, 17
275	SAE	Filmes do Relatório da Modelagem		Portuguese	16
276	SAE	Resposta PT 19 e 282		Portuguese	
277	SAE	Apresentação IBAMA Modelagem		Portuguese	

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
278	SAE	Apresentações Simpósio ABRH		Portuguese	
279	SAE	Apresentação Hidrobiogeoquímica		Portuguese	17
280	CSAC	Avaliação dos resíduos para planejamento das estruturas		Portuguese	18
281	CSAC	Lista/Planilha de atividades geradoras de resíduos e impactos		Portuguese	18
282	SAE	Monitoramento semanal Ecology		Portuguese	17
283	SAE	Relação de empresas prestadoras de serviço por programa ambiental		Portuguese	
284	SAE	Apresentação Hg		Portuguese	17
285	SAE	Atas e documentações de SGI		Portuguese	3
286	SAE	Acompanhamento das condicionantes		Portuguese	3
287	SAE	Currículo Lattes Jansen		Portuguese	
288	SAE	Estatísticas comparativas de acidentes (RSAP)		Portuguese	12
289	SAE	Exemplo de Ata da Comissão de P&D		Portuguese	7
290	SAE	Relatório Contábil de Janeiro/2014		Portuguese	7
291	SAE	Registro do acompanhamento e retirada Triângulo		Portuguese	9, 10
292	SAE	Contrato MADECON		Portuguese	9
293	SAE	Cópia do estudo da USP indicando melhorias nos equipamentos		Portuguese	9
294	SAE	Proposta de negociação para garimpeiros manuais		Portuguese	9
295	SAE	Apresentações de trabalhos de Arqueologia e Paleontologia publicados em congresso		Portuguese	13
296	SAE	Relatórios de monitoramento dos Programas de Arqueologia e Paleontologia		Portuguese	13
297	SAE	Relatórios/Evidências da realização das atividades de Educação Patrimonial com a comunidade e trabalhadores da obra		Portuguese	13
298	SAE	Parecer do DNPM que analisa o Programa de Preservação do Patrimônio Paleontológico		Portuguese	13
299	SAE	Mapeamento das partes interessadas e versão recente indicando datas e atualizações		Portuguese	2
300	SAE	Ata de reunião da comissão de projetos de patrocinador		Portuguese	2
301		Apresentação Programas Ambientais		Portuguese	3, 15, 16, 17, 18, 19, 20

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
302	SAE	Gestão de um problema complicado, de preferência onde os peritos técnicos e sócio-ambientais têm de ser envolvidos		Portuguese	3
303	SAE	Apresentação com Escopo de trabalho da DNV no sistema integrado de gestão de energia		Portuguese	3
304	SAE	Apresentações em Powerpoint mostrados em entrevistas: (i) fornecidos pelo VC em 24 de Abril, (ii) o PPT apresentado no dia 25, (iii) apresentação de André fornecido no dia 26, (iv) a apresentação fornecida pela Jeovane Cordeiro no dia 26.		Portuguese	4, 10, 11
305	SAE	Durante o VC no dia 24 de abril, uma política unificada sobre a qualidade / ISO 9001 foi referido		Portuguese	4
306	SAE	NT ANEEL nº288 (Aprovação PBC SAE)		Portuguese	5
307	SAE	Existe uma estimativa de custo do projeto consolidado por ano e por componentes principais		Portuguese	
308	SAE	Última ata da reunião da comissão de P & D		Portuguese	7
309	SAE	Último relatório enviado à ANEEL em 1% necessidades de investimento		Portuguese	7, 15
310	SAE	Relatório de acompanhamento Últimas da SAE ao BNDES em projetos de progresso voluntário		Portuguese	7
311	SAE	Proposta feita ao BNDES sobre potenciais projetos de voluntariado, decisão formal e evidência de envolvimento das comunidades locais		Portuguese	7
312	SAE	Acordo com o SENAI		Portuguese	7
313	SAE	Comprovação de acordos e / ou compromissos divulgados publicamente estabelecidas no protocolo de intenções, R & D, o investimento de 1% exigido pela ANEEL e Royalties (evidência pode ser na forma de links da web, artigos de imprensa)		Portuguese	7
314	SAE	Lista dos maiores 22 contratos adquiridos pela CSAC, totalizando R 1,5 bilhão; o valor dos contratos com fornecedores locais.		Portuguese	
315	SAE	Relatório anual de DNPM		Portuguese	9
316	SAE	Parecer da Procuradoria Geral do DNPM sobre atividade mineradora e geração de energia elétrica - PARECER/PROGE N500/2008-FMM-LBTL-MP-SDM		Portuguese	9
317	SAE	Número de pessoas que compensaram perdas terra / empresas não fisicamente realocados (atualmente e com a expansão)		Portuguese	9
318	SAE	Número de acordos alcançados até o momento e para ser alcançado (incluindo a expansão) com proprietários de terra (não reassentados)		Portuguese	9
319	SAE	UNIR - acordos com SAE para Museu de Arqueologia		Portuguese	13
320	SAE	Relatório de síntese sobre monitoramento e ações para pescadores		Portuguese	9

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
321	SAE	Tabela do número de famílias selecionando as diferentes opções de compensação de reassentamento		Portuguese	9, 10
322	SAE	Imóveis Rurais indenizados los área total		Portuguese	10
323	SAE	Imóveis Urbanos indenizados los área total		Portuguese	10
324	SAE	Tabela por (i) a sua localização pré-projeto , (ii) os números , que eram proprietários vs não-proprietários , e (iii) o seu novo local de reassentamento seguintes (para a linha de 484 optando por casas construídas pela SAE).		Portuguese	10
325	SAE	Comprovação de SAE incentivando as pessoas a escolher a opção de compensação em espécie, em vez de carta de crédito ou indenização		Portuguese	
326	SAE	Relatório sobre o acompanhamento das famílias que escolheram a letra da opção de crédito		Portuguese	
327	SAE	Descrição da seqüência de eventos no Triângulo, e os números de famílias e tempo de compensação prevista		Portuguese	
328	SAE	Triangulo - planilha (censo), acordo de modelo, critérios de avaliação , apresentações de entrevista, acordo entre SAE e Ministério , acordo entre SAE e IPHAN		Portuguese	9, 13
329	SAE	Os custos estimados do reassentamento adicional que será necessário para o projeto de expansão.		Portuguese	10
330	SAE	Relatórios de oficinas comunitárias e de trabalhadores - Educação patrimonial		Portuguese	13
331	SAE	Exemplo de planilha de registro do trabalho de prospecção		Portuguese	13
332	SAE	Exemplos de artigos apresentados no congresso de arqueologia / paleontologia		Portuguese	13
333	SAE	Proposta enviada ao IPHAN para o museu na UNIR		Portuguese	13
334	SAE	Carta de aprovação de DNPM do programa de paleontologia		Portuguese	13
335	SAE	Apresentações de Scentia		Portuguese	13
336	SAE	Acordo com COOTRAFER		Portuguese	13
337	SAE	Acordo entre SAE e IPHAN em relação ao incidente no Triangulo		Portuguese	10, 13
338	SAE	Acordo com o município no centro cultural indígena na igreja Santo Antônio		Portuguese	13
339	SAE	Últimas atas de reuniões do comitê de saúde		Portuguese	14
340	SAE	Resultados da reunião de 2012 com Ministério da Saúde, especialistas em saúde e Jirau sobre o mercúrio		Portuguese	14

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
341	SAE	Comprovação de campanhas para promover dietas saudáveis (para evitar a bioacumulação de mercúrio)		Portuguese	14, 17
342	SAE	Um plano para lidar com o sedimento de corrente acumulação a jusante da barragem		Portuguese	16
343	SAE	Qualquer evidência de "melhoramentos" à erosão e sedimentos		Portuguese	16
344	SAE	Ata reunião gerencial		Portuguese	
345	SAE	Ofício Encaminhamento Parecer 6103/2013		Portuguese	2, 3
346	SAE	Parecer 6103/2013 IBAMA		Portuguese	3
347	SAE	Resposta Parecer 6103/2013 IBAMA		Portuguese	3
348	SAE	Exemplo de Clipping		Portuguese	1, 3
349	SAE	1º Relatório Gestão de cumprimento do Termo de Cooperação - 2013		Portuguese	
350	SAE	OFÍCIO 028ABYTUCU- Relatório atividades Karipuna		Portuguese	11
351	SAE	OFICIO Nº 015 CTL I PROTECAO FUNAI PVH RO		Portuguese	11
352	SAE	Relatório de investimentos recursos SAE - Completo		Portuguese	11
353	SAE	Relatório SEBRAE - Cursos Associação Indígena		Portuguese	11
354	SAE	Eixos do Programa Indígena da UHE Santo Antônio		Portuguese	11
355	SAE	Obras realizadas pela SAE no ambito do Programa Indígena da UHE Santo Antônio		Portuguese	11
356	SAE	OFÍCIO Nº 123 2014 DPT FUNAI MJ - Relatório e Análise da FUNAI sobre os Projeto de Vigilância - Plano Emergencial		Portuguese	11
357	SAE	Portaria Interministerial 419_2011. Atuação dos órgão envolvidos no licenciamento ambiental - descartado em amarelo a questão indígena		Portuguese	11
358	SAE	Termo de Cooperação de Saúde -Secretária Especial de Saúde Indígena - SESAI e SAE		Portuguese	11
359	SAE	OFICIO No 016 CTL 1 PROTEÇÃO FUNAI PVH RO		Portuguese	11
360	SAE	Relatório FUNAI outubro 2012- Karitiana e Plano de Manejo Florestal Sustentável – PMFS		Portuguese	11
361	SAE	DSEI de PVH atendimento à Saúde dos Povos Indígenas Karipuna, Karitiana e Cassupá		Portuguese	11, 14
362	SAE	Gráfico da Análise do Desmatamento das Terras Indígenas Karipuna e Karitiana		Portuguese	11
363	SAE	Workshop Fornecedores 2013		Portuguese	

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
364	SAE	Lista Presenca WS Fornecedor_13.03.13 Tarde		Portuguese	
365	SAE	Lista Presença WS Fornecedor_13.03.13 Manhã		Portuguese	
366	SAE	Ficha Cadastral SAE - Pessoa Fisica		Portuguese	
367	SAE	Ficha MAR E AR		Portuguese	
368	SAE	FICHA PREQUALIFICA SAE		Portuguese	
369	SAE	Fichas GUAPORÈ		Portuguese	
370	SAE	Aprovação do PBCA e Linha de transmissão 230 kv		Portuguese	
371	SAE	Oficio 042 GAB SEMEPE		Portuguese	
372	SAE	Parecer 026 2011 - COHID CGENE DILIC IBAMA - Análise dos Relatórios Andamento 7° e 8°		Portuguese	
373	SAE	Apresentação da Ecology		Portuguese	
374	Furnas	Demonstrações Financieras, 2013 (Furnas, financial annual report)	2014	Portuguese	2, 3, 6
375	Furnas	Relatório de Sustentabilidade, 2012 (Furnas sustainability report)	2013	Portuguese	2, 3
376	Odebrecht	Sustainable Growth, 2013 (Odebrecht annual report)	2014	English	2, 3
377	Andrade Gutierrez	Annual Report 2012 (Andrade Gutierrez)	2013	English	2, 3
378	Cemig	Cemig Annual and Sustainability Report, 2013	2014	English	2, 3
379	SAE	Relação de Normas de Serviço da Diretoria de Sustentabilidade, SAE (standard instructions and steering documents for SAE's sustainability department)		Portuguese	2, 3
380	IFC	IFC review of Odebrecht's sustainability	2014	English	2, 3, 12
381	IFC	IFC review of some Odebrecht projects	2014	English	2, 3, 12
382	Brazilian Government	Brazilian securities and exchange commission at www.cvm.gov.br	2014	Portuguese	2, 3
383	IPCC	Atlas of Global and Regional Climate Projections, IPCC 5, The Intergovernmental Panel on Climate Change	2014	English	3
384	Brazilian Government	Brazilian energy research corporation at www.epe.gov.br	2014	Portuguese	3
385	SAE	Registro do atendimento a situação de emergencia		Portuguese	5

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
386	SAE	Matriz Risco e Dano Potencial - UHE SA		Portuguese	5
387	SAE	Relatório de ações e cronograma do plano de segurança de barragens - UHE SA		Portuguese	5
388	SAE	Power Point presentation of Emergency Action Plan (viewed under confidentiality)		Portuguese and English	5
389	Furnas	Serviços de Segurança de Barragens		Portuguese	5
390	Portal Rondonia	Santo Antônio Energia na Expovel : Traga seu filho para conhecer os trabalhos de Paleontologia e Arqueologia no nosso estande; Available at: http://www.portalrondonia.com/site/santo,antonio,energia,na,expovel,,traga,seu,filho,para,conhecer,os,trabalhos,de,,paleontologia,e,arqueologia,no,nosso,estande,22482.htm	2010	Portuguese	1, 13
391	Imagem News	Oficinas de paleontologia e educação patrimonial gratuitas Available at: http://www.imagemnews.com.br/noticias.asp?cd=11184	2011	Portuguese	13
392	IGBE	Statistics of Rondônia Available at: http://www.ibge.gov.br/estadosat/perfil.php?sigla=ro	2013	Portuguese	1
393	Ministério Público do Parana	População municipal de pessoas não alfabetizadas com 15 anos ou mais de idade e Taxa municipal de analfabetos com 15 anos ou mais de idade Available at: http://www.educacao.caop.mp.pr.gov.br/arquivos/File/dwnld/analfabetismo/dados_estatisticos/populacao_analfabeta_por_municipio_brasil.pdf	2005	Portuguese	1
394	ANEEL	Financial compensation for the use of water resources Available at: http://www.aneel.gov.br/aplicacoes/cmpf/gerencial/	2014	Portuguese	1, 7
395	Gente de Opiniao	Usina Hidrelétrica Santo Antônio completa um ano de geração Available at: http://www.gentedeopiniao.com.br/energiameioambiente/conteudo.php?news=110102	2013	Portuguese	1, 7
396	SENAI	Alunos de cursos do SENAI em parceria com Santo Antônio Energia recebem certificado Available at: http://www.ro.senai.br/portal/app/webroot/index.php?option=com_content&view=article&id=2439:alunos-de-cursos-do-senai-em-parceria-com-santo-antonio-energia-recebem-certificado&catid=17:noticias&Itemid=163	2014	Portuguese	7, 9

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
397	SAE	Available at: http://www.santoantonioenergia.com.br/en/desenvolvimento/pesquisa-desenvolvimento/	2014	Portuguese	7
398	G1 news	Trabalhadores da Usina Santo Antônio entram em greve em Porto Velho Available at: http://g1.globo.com/ro/rondonia/noticia/2014/04/trabalhadores-da-uhe-santo-antonio-entram-em-greve-em-porto-velho.html	2014	Portuguese	1, 12
399	SAE	Document establishing the Ethics Committee	2014	Portuguese	8
400	SAE	Normative IN- DP -001 -10- REV02	2014	Portuguese	8
401	SAE	Nortmative IN- DP -009 -09	2014	Portuguese	8
402	SAE	Implantação Subestação Provisória	2014	Portuguese	6
403	SAE	RCA 18.03.11.	2014	Portuguese	6
404	SAE	Terms of Compliance of the Protection Program of the Peoples, References and Indigenous Lands of the Madeira Hydroelectric Complex –Santo Antonio and Jirau Hydroelectric Plants- Agreement Phase 1- Annexes 2.1.1, 2.1.2 and 3.1-Program of Support to the Indigenous Communities – Referenced in Section 20 of the PBA	2011	Portuguese	11
405	FUNAI	Letter (Communication 1006/2011/DPDS-FUNAI-MJ) from FUNAI, Brasilia to SAE in reference to the Karipuna IT Emergency Protection Plan	2011	Portuguese	11
406	SAE	Table showing assistance provided concerning 4 vehicles over 07/01/2012-5/12/2013	Undated	Portuguese	11
407	CTLPT	Letter (Communication # 001) from FUNAI (CTL/PROTECAO/FUNAI/ PVH/RO) to SAE, requesting permission of SAE to free 400 litres for use by a specific vehicle to investigate a complaint by the Federal Public Ministry and the Federal Police of Guajara Mirim	2014	Portuguese	11
408	CTLPT	Letter to SAE (Communication # 004) from FUNAI (CTL/PROTECAO/FUNAI/ PVH/RO) requesting SAE to provide fuel to enable FUNAI staff to visit TI Karipuna and TI Karitiana	2014	Portuguese	11
409	CTLPT	Letter to SAE (Communication # 008) from FUNAI (CTL/PROTECAO/FUNAI/ PVH/RO) requesting SAE to provide fuel to enable FUNAI staff to conduct field trips.	2018	Portuguese	11
410	CTLPT	Letter to SAE (Communication # 013) from FUNAI (CTL/PROTECAO/FUNAI/ PVH/RO), requesting permission of SAE to provide fuel, spare parts etc to enable FUNAI to conduct field trips.	2018	Portuguese	11
411	FUNAI / Karitiana / Karipuna / Cassupa	Letter with annexes reports by Ips on surveillance activities implemented by contracted indigenous teams under Phase I agreements	2014	Portuguese	11

Ref	Author/ Organisation	Title	Year	Language	Evidence for topics
412	CTLPT	Letter (Communication # 5) from FUNAI (CTL/PROTECAO/FUNAI/ PVH/RO) to SAE, acknowledges provision of fuel by SAE to support a planning activity (report provided) to Karipuna for the period of February 19-21, 2014.	2014	Portuguese	11
413	CTLPT	Letter (Communication # 10) from FUNAI (CTL/PROTECAO/FUNAI/ PVH/RO) to SAE, acknowledging provision of fuel by SAE to support a planning activity (report provided) to Karipuna for the period of April 8-10, 2014.	2014	Portuguese	11
414	CTLPT	Letter from FUNAI (CTL/PROTECAO/FUNAI/PVH/RO) to SAE, provides information on supervision/control missions at Karipuna and Karitiana in 2013 and 2014.	2014	Portuguese	11

Appendix D: Visual Evidence



Photo 1: Visitors Training Unit by the site gate



Photo 2: Communications board at site offices



Photo 3: Porto Velho with Santo Antônio dam in background



Photo 4: High-voltage transmission towers elevated to avoid impact on forest



Photo 5: Management procedures for the central kitchen



Photo 6: Management manual, central kitchen







	
<p>Photo 7: Construction in late April 2014, from the air, note the addition to the coffer dam due to the 2014 floods</p>	<p>Photo 8: Construction in late April, 2014, note the addition to the coffer dam due to the 2014 floods</p>
	
<p>Photo 9: Control room</p>	<p>Photo 10: Santo Antônio dam and spillway in late April, 2014, from the air</p>
	
<p>Photo 11: Santo Antônio spillway, late April, 2014</p>	<p>Photo 12: Santo Antônio spillways at 48 000 m³/s</p>



Photo 13: Emergency services centre refurbished by SAE in Porto Velho



Photo 14: Medical centre refurbished by SAE in Porto Velho



Photo 15: Women's centre built by SAE in Porto Velho



Photo 16: Primary school refurbished by SAE in Porto Velho



Photo 17: Primary school refurbished by SAE in Porto Velho



Photo 18: Boats used for tourist tours moored next to the EFMM

	
<p>Photo 19: Municipal School Antônio Augusto Vasconcelos in Porto Velho</p>	<p>Photo 20: Santo Antônio Village School</p>
	
<p>Photo 21: View of Santo Antônio village cemetery</p>	<p>Photo 22: EFMM railway line covered in vegetation at Santo Antônio village</p>
	
<p>Photo 23: Notice of the restauration programme of the EFMM at Santo Antônio Village</p>	<p>Photo 24: Oca at the indigenous cultural centre in Santo Antônio Village</p>

	
<p>Photo 25: Oca entrance at the indigenous cultural centre in Santo Antônio Village</p>	<p>Photo 26: View of Santo Antônio Village Church and cultural centre</p>
	
<p>Photo 27: View of the indigenous cultural centre in Santo Antônio Village</p>	<p>Photo 28: Jaci-Parana, houses affected by recent flooding, in area to be included in additional resettlement programme</p>
	
<p>Photo 29: Jaci-Parana, illegal settlement of households who previously accepted compensation or letter-of-credit</p>	<p>Photo 30: Jaci-Parana, illegal settlement of households who previously accepted compensation or letter-of-credit</p>



Photo 31: Jaci-Parana, municipal park now affected by recent flooding



Photo 32: Jaci-Parana, waters remain higher than previous due to the recent floods



Photo 33: Morrinhos, farmers association building



Photo 34: Morrinhos, school classroom



Photo 35: Morrinhos, school



Photo 36: Novo Engenho Velho, Cassava crop



Photo 37: Novo Engenho Velho, community building



Photo 38: Novo Engenho Velho, community centre



Photo 39: Novo Engenho Velho, health clinic



Photo 40: Novo Engenho Velho, aquaculture



Photo 41: Novo Engenho Velho, school



Photo 42: Novo Engenho Velho, typical house



Photo 43: Novo Engenho Velho, Women's Seamstresses business



Photo 44: Parque dos Buritis, football sand pitch







	
<p>Photo 45: Parque dos Buritis, illegally-settled displaced people</p>	<p>Photo 46: Parque dos Buritis, poorly maintained childrens play area</p>
	
<p>Photo 47: Parque dos Buritis, poorly maintained football pitch</p>	<p>Photo 48: Parque dos Buritis, street view</p>
	
<p>Photo 49: Parque dos Buritis, typical house</p>	<p>Photo 50: Parque dos Buritis, typical house</p>



Photo 51: Parque dos Buritis, typical house



Photo 52: Parque dos Buritis, typical street



Photo 53: Parque dos Buritis, cracking tiling in several houses










Photo 54: Parque dos Buritis, cracking tiling in several houses









Photo 55: Parque dos Buritis, cracking tiling in several houses



Photo 56: Riacho Azul, welcome arch

	
<p>Photo 57: Richao Azul, tractor and machinery belonging to farmers association</p>	<p>Photo 58: Richao Azul, school</p>
	
<p>Photo 59: Sabor do Campo market in Port Velho</p>	<p>Photo 60: Santa Rita, barn with equipment provided to farmers association</p>
	
<p>Photo 61: Santa Rita, community centre housed in the former house of a compensated large landowner</p>	<p>Photo 62: Santa Rita, fish culture project</p>
	
<p>Photo 63: Santa Rita, fruit orchards</p>	<p>Photo 64: Santa Rita, health centre</p>

	
<p>Photo 65: Santa Rita, tractor and implements provided by SAE</p>	<p>Photo 66: Santa Rita, typical house</p>
	
<p>Photo 67: Santa Rita, welcome arch</p>	<p>Photo 68: Santa Rita, women's textiles business</p>
	
<p>Photo 69: Teotonio school</p>	<p>Photo 70: Teotonio welcome board to encourage tourism</p>
	
<p>Photo 71: Teotonio, artificial beach for tourism</p>	<p>Photo 72: Teotonio, artificial beach for tourism</p>

	
<p>Photo 73: Teotonio, community buildings</p>	<p>Photo 74: Teotonio, decked walkways for tourism</p>
	
<p>Photo 75: Teotonio, health clinic</p>	<p>Photo 76: Teotonio, limited municipal waste collection services</p>
	
<p>Photo 77: Teotonio, water treatment plant</p>	<p>Photo 78: Teotonio, women's jewellery business</p>







	
<p>Photo 79: Triangulo, abandoned properties (note railway line in foreground of abandoned properties)</p>	<p>Photo 80: Triangulo, protection works (now covered in silt)</p>
	
<p>Photo 81: General view of Cassupa area in Porto Velho</p>	<p>Photo 82: Traditional house in Cassupa area in Porto Velho</p>
	
<p>Photo 83: View of housing of Cassupa people in the Cassupa area in Porto Velho</p>	<p>Photo 84: Ambulance at the on-site hospital</p>



Photo 85: Cooking vessel in central kitchen

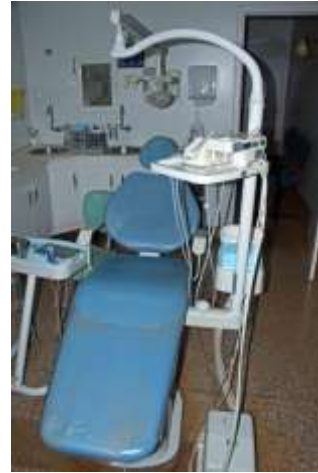


Photo 86: Dentist's clinic at the on-site hospital



Photo 87: Emergency contacts, signage



Photo 88: Evacuation route and on-site ambulances



Photo 89: Face mask with oxygen for rescue operations



Photo 90: Fire extinguisher inside power house



Photo 91: Health poster, anti-smoking, in on-site hospital



Photo 92: Hospital bed



Photo 93: HS&E poster



Photo 94: Occupational health poster



Photo 95: Occupational health poster



Photo 96: Reassembly point for evacuation

	
<p>Photo 97: Protective equipment used during bread preparation</p>	<p>Photo 98: Risk identification chart for the main kitchen</p>
	
<p>Photo 99: Safety signage for evacuation route</p>	<p>Photo 100: Safety signage inside power house</p>
	
<p>Photo 101: Safety signage inside power house</p>	<p>Photo 102: Safety signage inside power house</p>
	
<p>Photo 103: Safety signage on construction site</p>	<p>Photo 104: Safety signage on construction site</p>



Photo 105: Stretcher for emergencies in the power house



Photo 106: Workers' accommodation from the air



Photo 107: Workers' accommodation



Photo 108: Workers' showers



Photo 109: X-ray equipment in on-site hospital



Photo 110: Archaeological Site in Santo Antônio village



Photo 111: Archaeological Site in Teotonio



Photo 112: EFMM administration building



Photo 113: EFMM after the floods



Photo 114: EFMM historic building used by the cooperative of railway workers



Photo 115: EFMM Station



Photo 116: Historic warehouse EFMM after the floods







	
<p>Photo 117: Historical landmark restored by SAE at Santo Antônio Village</p>	<p>Photo 118: Historical landmark restored by SAE at Santo Antônio Village</p>
	
<p>Photo 119: Notice of restoration of the EFMM</p>	<p>Photo 120: Palaeontological findings provided by miners</p>
	
<p>Photo 121: Poster on a pre colonial archaeological site</p>	<p>Photo 122: Poster on palaeontology findings</p>



Photo 123: Remains of a historic boat next to the EFMM site



Photo 124: Scentia's archaeology lab in Porto Velho



Photo 125: SEMDESTUR fair signs at EFMM



Photo 126: The 3 caixas historical landmark of Porto Velho



Photo 127: Vases found in the project area



Photo 128: View of the EFMM trains and warehouses after the floods







	
<p>Photo 129: View of the Madeira-Mamore railway and warehouses after the floods</p>	<p>Photo 130: View of the railway turning point after the floods</p>
	
<p>Photo 131: View of warehouses with trains - to be used as a museum</p>	<p>Photo 132: View of the EFMM station and railway engine</p>
	
<p>Photo 133: Health Centre in Porto Velho</p>	<p>Photo 134: São Cosme children's hospital in Porto Velho</p>



Photo 135: São Cosme children's hospital register

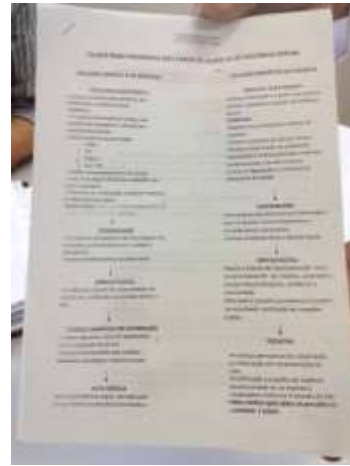


Photo 136: São Cosme children's hospital service process in cases of sexual violence



Photo 137: São Cosme children's hospital service process in cases of sexual violence



Photo 138: Trees left to provide habitat on reservoir shore



Photo 139: Animal treatment centre



Photo 140: Fish collection



Photo 141: Fish collection



Photo 142: Fish specimen



Photo 143: Fish specimen



Photo 144: Part of fish passage with antenna for registering tagged fish on left



Photo 145: Fish tracking



Photo 146: Aerial view of the right bank of construction site showing fish passage in foreground



Photo 147: Rescued Jaguar



Photo 148: Leaf of new species discovered



Photo 149: Rescued ocelot



Photo 150: Rescued Jaguar



Photo 151: Herbarium



Photo 152: River-sediment probe



Photo 153: Sediment laboratory



Photo 154: Sediment samples



Photo 155: Sediment analysis



Photo 156: Aerial view of Triangulo



Photo 157: Floating laboratory



Photo 158: In situ water-quality monitoring



Photo 159: Equipment for analysis of mercury



Photo 160: Water samples



Photo 161: Water treatment ponds



Photo 162: Composting



Photo 163: Example of rehabilitated land



Photo 164: Recycling centre



Photo 165: View of seedling nursery



Photo 166: Aerial view of spoil heap



Photo 167: Example of bins used for waste segregation



Photo 168: Waste treatment area



Photo 169: Drawing of log booms and log spillway.