

SANTO ANTÔNIO DO JARI HYDROELECTRIC POWER PLANT.

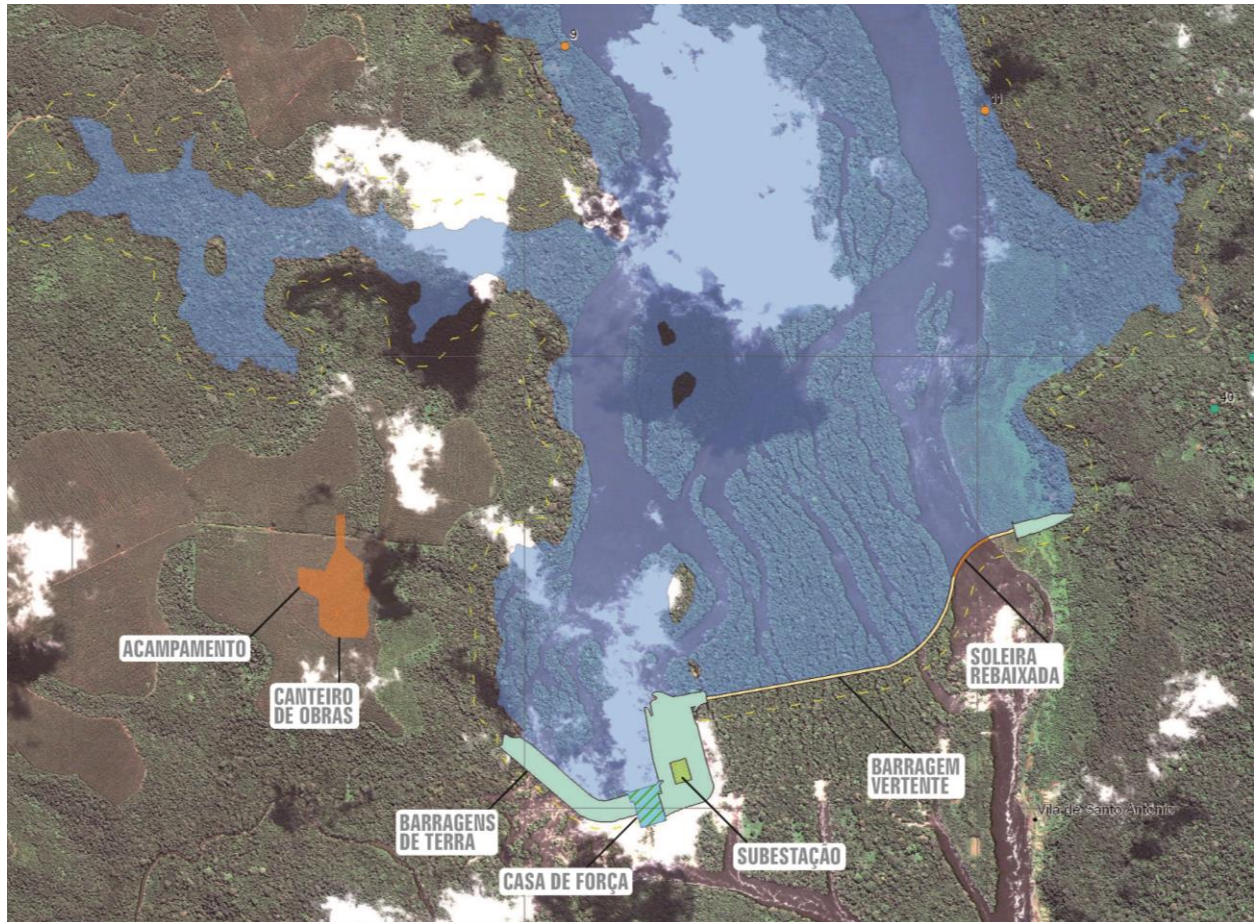


Figure 01: General map of the project./ Source - Environmental Impact Report - RIMA (Relatório de Impacto Ambiental), developed by Ecology Brazil

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1. PROJECT INTRODUCTION

The present evaluation assess the sustainability of the Santo Antônio do Jari Hydroelectric Power Plant project. This facility is located at the Jari River, a watercourse dividing the Brazilian States of Amapá and Pará in the Amazon region. This analysis was based on the infrastructure sustainability assessment methodology developed by the Zofnass Program at Harvard University, using *Envision Rating System for Sustainable Infrastructure, Version 2.0*¹ as a framework.

The Jari Hydropower plant project has evolved significantly over time, since its first inception in the late 1960's. The implementation of the "Projeto Jari"² as a large-scale project oriented for the production of cellulose and the extraction of other resources, fostered by the American tycoon Daniel Ludwig in 1967 led to the development of the "first studies to use the hydropower potential of the Jari River".³ Since then, a vast number of assessments and projects have been developed for the hydroelectric facility.⁴

Throughout these versions and revisions the project changed from being conceived as an isolated energy plant that would provide electricity to the aforementioned industrial complex. The project was then designed with an installed capacity of 68 MW. Later on, Jari dam was reassessed as a hydropower facility that would attend the needs of the Amapá State, with an installed capacity of 100 MW.⁵

The present version of the project – currently under construction– conceives the Jari Hydropower Plant as a part of the Brazilian National Interconnected energy System (Sistema Interligado Nacional, SIN). The project is designed to achieve 373 KW of installed capacity and reduce environmental impacts.

The connectivity with the national network will be done by means of a 20 km long, 230 KV High Tension Line that is also part of the project. This 230 KV HTL will connect Jari Hydroelectric dam with the Laranjal do Jari Substation, and with the High tension Lines of the System Tucuruí-Macapá-Manaus.⁶

The connectivity with the SIN will enable the use of energy produced at Jari hydroelectric dam at the cellulose and kaolin⁷ industrial complex in Port Munguba, in large regional centers like Macapá,⁸ and also in other regions of the country.

¹ This study uses *Envision* as a framework to rate the project. The *Envision* system has been developed by the Zofnass Program at Harvard University, in collaboration with the Institute of Sustainable Infrastructure (ISI). *Envision* is available online for public use. However, this case study does not constitute an official certification or rating. The ISI as an organization oversees the official verification process in the United States for US infrastructure projects.

² "Projeto Jari" was a large-scale project oriented to the production of cellulose and the extraction of other resources. An article in *Nature Magazine* states that: "In the 1960s, US billionaire Daniel Ludwig purchased 1.7 million hectares of almost undisturbed forest and used about 10% of it to plant trees for paper." (Logging: The New Conservation - NATURE|Vol 446|5 April 2007.- page 610). The scale of the initiative was impressive: the surface of Projeto Jari was as big as Belgium, or as the Brazilian State of Sergipe. The initiative was highly controversial for a number of reasons, including concerns about sustainability and Brazilian National sovereignty. Projeto Jari resulted in negative environmental impacts and never produced the expected economic results. Finally, in 1997 a pool of investors and Brazilian banks acquired the facilities. The company is now called Jari Celulose Papel e Embalagens, and it is owned by the Orsa Holding.

³ Estudo de Impacto Ambiental (EIA). – UHE Santo Antônio do Jari – Chapter 2 – Introdução e histórico - Page 3.

⁴ The aforementioned studies includes – among others- the following: Eletronorte, 1973; TAMS-Tippetts-Abbott-McCarthy-Stratton, 1974-1975; Leme Engenharia, 1986-1987; Bechtel Civil, 1989; Leme Engenharia, 1999-2000; Jari Energética, 2007.

⁵ A possible expansion of the installed capacity up to 200 MW was also considered in this scenario. The expansion should take place according to regional energy demands. Source: Estudo de Impacto Ambiental (EIA). – UHE Santo Antônio do Jari – Chapter 2 – Introdução e histórico - Page 5

⁶ The HTL's of the System Tucuruí-Macapá-Manaus will allow the connection of the cities of Manaus and Macapá to the SIN.

⁷ The Kaolin is extracted, processed and exported through the port of Munguba, by a Company called CADAM (Caulim da Amazonia S.A.). CADAM is currently controlled by an American Company called KaMin Performance Minerals. More info is available at: <http://www.kaminllc.com/CADAM.php>

2. PROJECT DESCRIPTION & LOCATION

Santo Antônio do Jari Hydropower Plant is located on the Jari River, 150 Km upstream from its estuary on the left bank of the Amazon River. The EIA (Chapter 8 – Environmental Diagnosis)⁹ states that the 845 km long Jari River, is the main tributary of the Amazonian basin north watershed with its source springs located at the Tumucumaque range 656 m above sea level. Its estuary is 300 km from the Atlantic Ocean and its basin of approximately 51,343 Km² in area, is upstream from the Santo Antônio Falls.

The dam borders the municipalities of Almerim in the State of Pará, and Laranjal do Jari in the State of Amapá. The project is fostered by the consortium Consorcio Amapá Energia that is composed of two companies: ECE Participações and Jari Energética.

ECE Participações, a company owned by the group EDP (Energias do Brasil) holds 90% of the shares. Jari Energética, a company of the Orsa Group, which also owns Jari Celulose Papel e Embalagens, holds the remaining 10% of the shares. Thus, the same group that acquired the cellulose plant, initially developed by Daniel Ludwig, is now a minor shareholder of the hydroelectric facility.¹⁰

In December 2012, in order to build the Hydroelectric Dam, the Consorcio Amapá Energia received a credit of 736.8 million Brazilian Reais (approximately 360 million US\$) from the Banco Nacional de Desenvolvimento Econômico e Social (BNDES);¹¹ it was also granted with a concession until December 2044.¹²

The final version of the project preserves the regional natural heritage of the Santo Antônio Falls, by designing the dam further upstream. Construction started in August of 2011, and the artificial reservoir is expected to be filled in the first semester of 2014. This project is also part of the Brazilian Program for the Acceleration of Growth (Programa de Aceleração do Crescimento – PAC), and should be fully operational by 2015.¹³

The Installation License granted by the Brazilian Environmental Institute (Instituto Brasileiro do Meio Ambiente – IBAMA) describes Jari Hydropower plant as a project with a total installed capacity of 373.4 MW.¹⁴ Upon completion, the Hydroelectric Dam will consist of 3 Francis-type generating units with an installed capacity of 370 MW and one Bulb-type generating unit with an installed capacity of 3.4 MW.

When the Jari Hydropower plant becomes fully operational, it will allow for the reduction of fossil fuel dependent thermal energy use in the regional energy matrix. Thermal energy currently represents 70% of the regional Matrix (including Vila Munguba and Macapá), and thanks to the contribution of the hydroelectric dam, this percentage will be reduced to 25.9% by the year 2016.¹⁵ Jari's installed capacity

⁸ Capital city of the State of Amapá, pop.: 0.36 Million in 2010.

⁹ Estudo de Impacto Ambiental (EIA). – UHE Santo Antônio do Jari – Chapter 8 – Diagnóstico Ambiental - Page 2.

¹⁰ At the moment of writing this Report, **Jari Celulose Papel e Embalagens** is closed for production. The magazine *Valor Econômico* published an article in August 2013, stating that: “*Jari suspended the production of 400 thousand tons of eucalypt cellulose at the beginning of this year, as a result of high production costs and the lack of eucalypt wood with adequate age to be used as raw material. With the investment [of 450 million R\$], Jari aims to produce another kind of cellulose, the soluble one, used at the textile and food industries, among others*”. The factory should be operational again in the first trimester of 2014. More info available at: <http://www.valor.com.br/empresas/3298144/jari-confirma-mudanca-na-producao#ixzz2iPOcdTFx>

¹¹ <http://www.dams-info.org/pt/dams/view/santo-antonio-do-jari/>

¹² Aproveitamento Hidrelétrico Santo Antônio do Jari. Os desafios da Gestão Ambiental. – EDP, June 2013. – Page 17

¹³ Aproveitamento Hidrelétrico Santo Antônio do Jari. Os desafios da Gestão Ambiental. – EDP, June 2013. – Page 22

¹⁴ Licença de Instalação 798/2011.

¹⁵ Relatório de Impacto Ambiental (RIMA) – UHE Santo Antônio do Jari – Page 11.

Santo Antonio do Jari Hydroelectric Power Plant, Brazil.

could supply the demands of a city with 3,000,000 inhabitants, which is equivalent to ten times the Macapá's current population.



Figure 02: Map locating the project in the Region

Source - Environmental Impact Report - RIMA (Relatório de Impacto Ambiental), developed by Ecology Brazil, page 13.

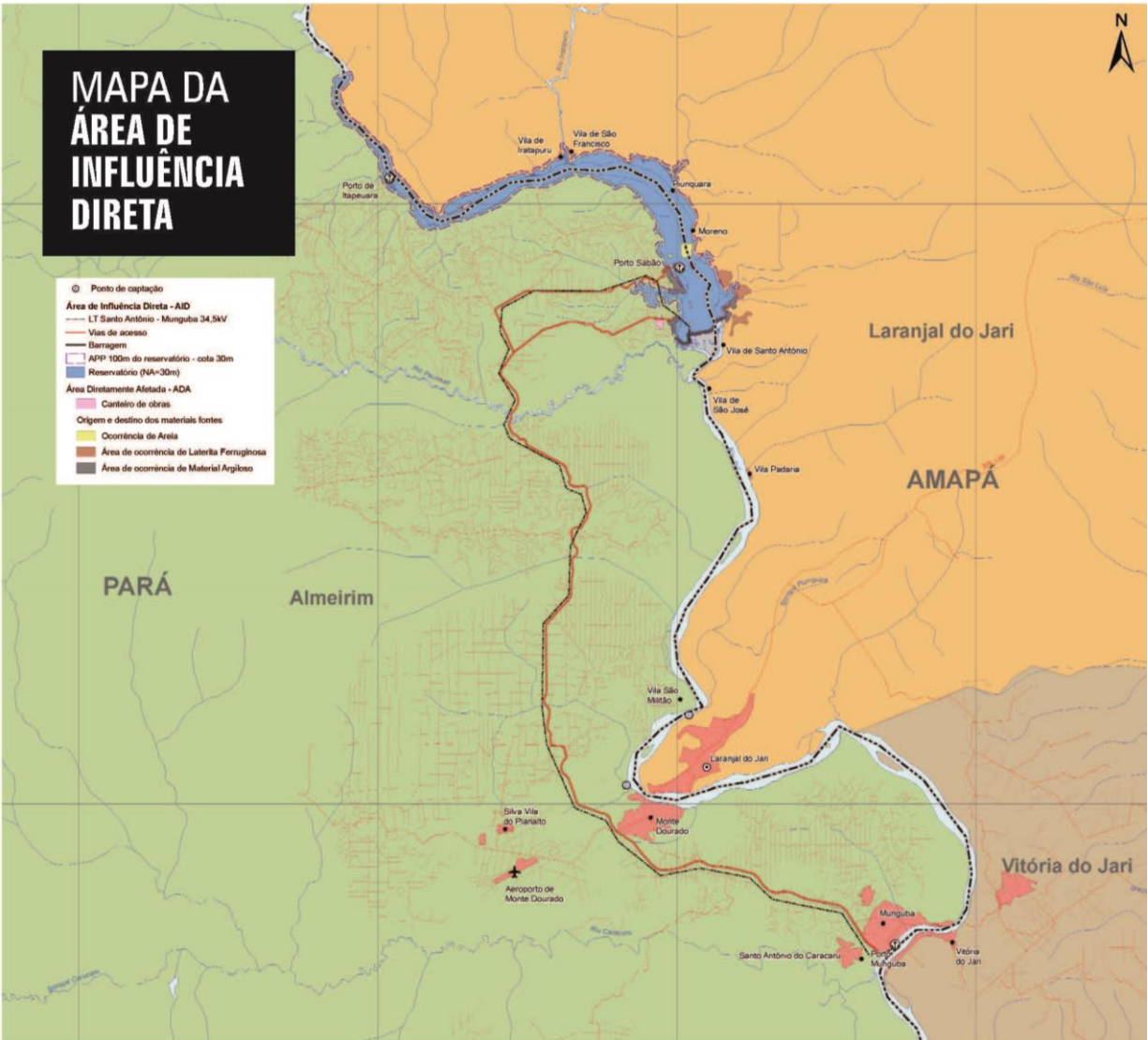


Figure 03: Map showing the project's direct area of influence

Source - Environmental Impact Report - RIMA (Relatório de Impacto Ambiental), developed by Ecology Brazil, page 13.

3. APPLICATION OF THE ENVISION RATING SYSTEM¹⁶

The *Envision* rating system is a set of criteria that assess and evaluate any specific piece of infrastructure. In this case the infrastructure to be assessed is the Jari Hydroelectric Power plant. The main intent this report is to assess the contributions towards sustainability derived of the deployment of this project, as well as the impacts on the environment and local communities associated with it.

Envision consists of 60 credits grouped into five categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. Each credit pertains to a specific indicator of sustainability such as reducing energy use, preserving natural habitat, or reducing greenhouse gas emissions. Those credits are rated on a five-point scale referred to as a ‘level of achievement’: improved, enhanced, superior, conserving, and restorative. Evaluation criteria are provided to determine if the qualifications for each level of achievement has been met for a particular credit. In each of the five categories there is a specific credit called “Innovative or exceed credit requirements”. This is an open window to reward exceptional performance or the application of innovative methods.

The criteria for the levels of achievement vary from credit to credit but generally an ‘improved’ level of achievement is awarded for performance that slightly exceeds regulatory requirements. ‘Enhanced’ and ‘superior’ levels indicate gradual improvement, while ‘conserving’ often indicates performance that achieves a net-zero or neutral impact. ‘Restorative’ is the highest level and is typically reserved for projects that produce an overall positive impact for the given credit criteria. The *Envision* system weighs the relative value of each credit and level of achievement by assigning points. Credit criteria are documented in the *Envision Guidance Manual*, which is available to the public on the ISI¹⁷ and Zofnass Program¹⁸ websites.

Appendix C provides a table with the detailed project assessment, specifications for each of the credits, and recommendations for the project.

¹⁶ Anthony Kane, Zofnass program research director, and Salmaan Khan, research assistant, wrote most parts of this section.

¹⁷ www.sustainableinfrastructure.org

¹⁸ www.zofnass.org

4. EVALUATION CATEGORIES

4.1. Quality of life

The first category of *Envision* rating system is Quality of Life. The assessment here mainly refers to the impact of the project on the surrounding communities and their well-being. As stated in the *Envision* manual, “*Quality of Life particularly focuses on assessing whether infrastructure projects are in line with community goals, incorporated into existing community networks, and will benefit the community long term.*”¹⁹ It also determines if the project is aligned with the community needs.

This category is divided into 3 subcategories and 12 credits: Purpose (QL 1.1, QL 1.2 and QL 1.3), Community (QL 2.1, QL 2.2, QL 2.3, QL 2.4, QL 2.5, and QL 2.6) and Well-Being (QL 3.1, QL 3.2 and QL 3.3).

CREDIT SCORING

			IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
1	QUALITY OF LIFE	PURPOSE	2	5	10	20	25
2		QL1.1 Improve community quality of life					
3		QL1.2 Stimulate sustainable growth and development	1	2	5	13	16
4	COMMUNITY	QL1.3 Develop local skills and capabilities	1	2	5	12	15
5		QL2.1 Enhance public health and safety	2				16
6		QL2.2 Minimize noise and vibration	1			8	11
7		QL2.3 Minimize light pollution	1	2	4	8	11
8		QL2.4 Improve community mobility and access	1	4	7	14	
9		QL2.5 Encourage alternative modes of transportation	1	3	6	12	15
10	WELLBEING	QL2.6 Improve site accessibility, safety and wayfinding		3	6	12	15
11		QL3.1 Preserve historic and cultural resources	1		7	13	16
12		QL3.2 Preserve views and local character	1	3	6	11	14
		QL3.3 Enhance public space	1	3	6	11	13
Maximum points possible:							181

Figure 04: Quality of life category, credits distribution.

4.1.1. Purpose

In the **Purpose sub-category**, Jari Hydroelectric Dam has performed well, with one credit evaluated as Restorative (QL1.3 Develop local skills and capabilities), one evaluated as Conserving (QL1.2 Stimulate sustainable growth and development) and one credit assessed as Superior (QL1.1 Improve community quality of life).

Jari Hydropower Plant will result in several improvements in the quality of life (QL 1.1) of nearby communities. The last version of the project - currently under construction - has reduced negative impacts. For example, the dam has been located upstream from the Santo Antônio do Jari Falls, thus preserving this regional natural heritage.

¹⁹ *Envision* Guidance Manual, p.30



Figure 05: Santo Antônio Falls.

Source: Environmental Impact Report - RIMA (Relatório de Impacto Ambiental), developed by Ecology Brazil, page 31.

According to documents provided by the developers of the project, only 94 families will be affected by flooding. Regarding the population that will be displaced by the construction of the Dam, the Basic Environmental Project²⁰ (Projeto Básico Ambiental) states that it will relocate the affected families and offer them equal or better living conditions. A clear example of this is the Agreement signed by ECE and the State of Amapá.²¹ In the referred agreement, ECE Participações assumed the responsibility of relocating all 34 families at the Vila de São Francisco do Iratapuru,²² even when only 13 families were actually affected by the flooding.²³

The project will stimulate sustainable growth and development (QL 1.2) in the region. The increase in available and reliable renewable energy will very likely improve economic conditions. Regarding this topic, the Report on Environmental Impacts²⁴ (RIMA) states that the project will diminish local deficits and better the quality of life by reducing costs and increasing the regional energy supply system.

It is also relevant to highlight that a significant barrier for sustainable growth in the region is related to the severe lack of infrastructure in important cities in the area, like Laranjal do Jari and Vitoria do Jari.²⁵

²⁰ Projeto Basico Ambiental (PBA) - Chapter 6.5.6 - Programa de Indenização e Remanejamento da População. Page 5/52.

²¹ Termo de Convênio ECE x Estado do Amapá Título 4. Descrição. - Pages 6,7 e 9

²² Aproveitamento Hidrelétrico Santo Antônio do Jari. - Os desafios da Gestão Ambiental. - Junho 2013. Page 11

²³ Informativo 52 - Nova Vila Iratapuru.

²⁴ Relatório de Impacto Ambiental (RIMA). Page 11, Page 33

²⁵ On this topic, the aforementioned RIMA affirms that: *“The cities in the area of influence [of the project] are characterized by irregular settlements in the river margins, especially in the left bank. Those settlements are composed of huts and pile-dwellings, which constitute one of the biggest social and environmental challenges for the region. The precariousness sanitary and health conditions results in populations that are vulnerable to diseases and also frail vis à vis floods, fires, etc.”*



Figure 06: City of Laranjal do Jari.

Source: <http://casteloroeger.blogspot.com.br/2011/06/imagens-de-laranjal-do-jari-videos.html>



Figure 07: Pile dwellings in Laranjal do Jari.

Source: Environmental Impact Report - RIMA (Relatório de Impacto Ambiental), developed by Ecology Brazil, page 33.

In this context, the efforts developed by the project to help the cities of Vitoria do Jari, Laranjal do Jari, and Almerim in creating or updating regulatory plans are extremely important.²⁶ This could be a relevant contribution to face problems connected to years of unplanned growth.

Prior to and throughout the construction phase, professional training will be offered in several areas determined according to the requirements of the endeavor,²⁷ with the intention to develop local skills and capabilities (QL 1.3).²⁸ The project established the goal of hiring up to 68% of the total number of workers in local communities. This goal is raised to 100% when considering positions for non-qualified workers.²⁹

4.1.2. Community:

In the **Community sub-category**, there was a considerable dispersion in the results. One credit was evaluated as Superior (QL2.6 Improve Site Accessibility, Safety and Wayfinding), one was assessed as Enhanced (QL2.4 Improve Community Mobility and Access), and one credit was qualified as Improved (QL 2.5 Encourage Alternative Modes of Transportation). Three credits were determined as No score (QL2.1 Enhance Public Health and Safety, QL2.2 Minimize Noise and Vibration and QL2.3 Minimize Light Pollution), opening opportunities for improvement.

Regarding Public Health and Safety the project team have assessed the specific risks and exposures created by the construction of the Jari Hydroelectric Dam.³⁰ Brazilian researchers have assessed which

²⁶ Projeto Básico Ambiental (PBA) Capítulo 6.5.8 Programa de Apoio aos Municípios. Page 1/23

²⁷ Informativo 52 - Programa Jovem Aprendiz.

²⁸ Training will also be offered in fields of economic activity for which an expansion is expected as result of the project. Such fields include the sector of commerce and services in the cities of Laranjal do Jari, Vitoria do Jari, and the District of Monte Dourado. There is also a sub-program developed to support local businesses, in order to build capacities and turn them into providers of services and consumable goods for the project.

²⁹ Programa de Capacitação de Mão de Obra Local dos Municípios - Plano Básico Ambiental (PBA) Capítulo: Capítulo Qualificação da Mão de Obra. Página: 7/16 - Fomento à Contratação de Fornecedores Locais. Page:10/16.

³⁰ On this topic, the Environmental Basic Project (Projeto Básico Ambiental - PBA) states that: "Hydroelectric (...) generate impacts on the health and quality of life of people (...) Jari Hydroelectric Dam will produce impacts on health – common to all

public health issues are most commonly associated with such projects to face such complex challenges, the Health program was divided into four subprograms: a) Subprogram for population health, b) Subprogram to control vectors³¹, c) Subprogram of epidemiological surveillance, and d) Subprogram of health education.³² Aspects related with occupational health and safety, are contemplated in the Programa Ambiental para Construção – PAC (Construction Environmental Program), Subprogram PAC6.³³ Furthermore, project developers have committed themselves to strengthen local health facilities, through partnerships with local governments.³⁴ We have found no evidence that this project includes new materials, technologies or methodologies that may result in health and safety issues.

While analyzing the Minimize Noise and Vibration credit (QL2.2), it is worth to remember that a hydroelectric dam project tends to have the greatest impact during construction phase, while the operation phase tends not to cause major impacts. Thus, developers of the hydroelectric dam have stated that baseline studies for existing levels of noise and vibration were not performed. They have also stated that future levels of noise, based on the project, were not predicted.³⁵

Regarding light pollution, none of the documentation provided states that the project team has conducted an overall assessment of lighting needs for the project, or that appropriate measures were considered to prevent light spillover and glare.

Mobility, access and transportation have been taken into consideration on the project. The relocation of the engine house on the right bank of the Jari River was based on both logistic and environmental considerations, which allow the use of the existing network of roads previously developed by the cellulose industry, thus increasing overall efficiency and reducing - if not, urban sprawl - the need to cut down new areas of forest.³⁶ That same network of existing roads provides access to important transportation hubs in the region, such as the port of Mungubá and the Airport at Monte Dourado³⁷. According to the team efforts to encourage alternative modes of transportation, the project has developed a multi-modal system of collective transport, by bus and boat³⁸, for the exclusive use of workers. The long distances from the project to nearest urban areas, approximately 40 km, non-motorized transport and pedestrian access unfeasible.³⁹ The site accessibility and wayfinding have been improved through proper signage⁴⁰ and educational efforts regarding how to drive safely in dirt roads⁴¹.

hydroelectric dams – but beyond that, is located on the region of Amazônia Legal, which has specific characteristics regarding ecology, economy, culture and health services. Thus, the initiative is especially vulnerable to such impacts.”

³¹ Referring to the monitoring of vectors, see also: Convênio ECE Participações – IEPA. Controle de Vetores.

³² Programa de Saúde - Plano Básico Ambiental (PBA). Page 2/38

³³ Programa Ambiental para Construção - Plano Básico Ambiental (PBA). Chapter 6.2.3. – Subprograma PAC6.

³⁴ Parceria ECE Participações e Município de Laranjal do Jari – Reforço assistência à saúde.

³⁵ EDP Relatório de Evidências, Page 6.

³⁶ Estudo de Impacto Ambiental (EIA). Capítulo 2: Introdução e histórico. Page 2/11.

³⁷ Aproveitamento Hidrelétrico Santo Antônio do Jari Os desafios da Gestão Ambiental. - Junho 2013. Page 9

³⁸ Barco de Transporte Rápido. Picture provided by EDP.

³⁹ EDP Relatório de Evidências, Pages 9 and 10.

⁴⁰ Imagem - Vias de Acesso as comunidades sinalizadas. - Picture provided by EDP. / Imagem de sinalização - Picture provided by EDP.

⁴¹ Informativo 31 - Blitz Educativa. - Informativo Online - Novembro 2012

Efforts to improve security have been developed such as the construction of a new police station in the New Vila Iratapuru⁴².

4.1.3. Wellbeing:

In the **Wellbeing sub-category**, the project also achieved good results: two credits were assessed as Superior (QL 3.1 Preserve Historical and Cultural Resources and QL 3.3 Enhance Public Space) while one was evaluated as Conserving (QL 3.2 Preserve Views and Local Character).

A specific program⁴³ for the preservation of archaeological heritage was developed in the context of this project. This program aims to perform in-depth studies to identify areas of archeological heritage importance, in order to avoid them in the project.⁴⁴ Through preventive archaeological studies, developed in the context of the project 14 sites were found.



Figure 08: Archaeological Studies.

Source: Aproveitamento Hidrelétrico Santo Antônio do Jari – Os Desafios da Gestão Ambiental. Page 44.

Analyzing the views and local character reservation, it is possible to find a number of significant efforts that have been deployed by the developers regarding project sitting. Such efforts were done both during design and construction phases, thus preserving landscapes of great scenic value. This is the case of the Santo Antônio falls, a regional natural heritage, preserved by changes in the project. The preservation was achieved by means of transferring the dam upstream from the falls. Also, all temporary and permanent constructions were concentrated on the right bank of the river – previously developed, avoiding the disruption of the left bank. The height of the dam was also designed considering the preservation of the flow necessary for the waterfall. It is important to highlight that previous versions of the project did not considered the preservation of views.

Furthermore, the project developed a *Program of Documentation and preservation of the Landscape heritage and Natural heritage*.⁴⁵

⁴² Information on actions of Corporate Social Responsibility. - Available at EDP's website: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/meio-ambiente/responsabilidade_social/Paginas/default.aspx

⁴³ Programa de Prospecção, Resgate e Monitoramento Arqueológico - Projeto Básico Ambiental (PBA).

⁴⁴ Idem. Chapter 6.5.13 - Page 1/24.

⁴⁵ Programa de Documentação e Preservação do Patrimônio Natural e Paisagístico. – Projeto Básico Ambiental (PBA), Chapter 6.5.15. – Pages 3/11 and 4/11. The aforementioned program aims to: “(...)Stimulate the participation of local community members in the knowledge and dissemination [of awareness] regarding their natural heritage and landscape heritage (...) [and] Promote the documentation and preservation of the local natural heritage and landscape heritage (...)”

To evaluate activities that aim to enhance public space, the project has fostered the creation of new spaces, such as the ones at the new Vila Iratapuru project - including a soccer field, a roofed sports center and a square.⁴⁶ However, probably the most significant action regarding public space is the preservation of the Santo Antônio Falls due to the relocation of the dam. As a result of this sensitive design decision, a highly relevant natural heritage area was protected and can continue to be enjoyed by the community.

4.1.4. Summary of results for the Quality of Life Category.

The table below shows the distribution of credits as well as the level of achievement reached in each credit (figure 9)

JARI HYDROPOWER PLANT. BRAZIL				PT	Performance	% Total	max
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life	10	Superior	40.0%	25
2			QL1.2 Stimulate Sustainable Growth & Development	13	Conserving	81.3%	16
3			QL1.3 Develop Local Skills And Capabilities	15	Restorative	100.0%	15
4		COMMUNITY	QL2.1 Enhance Public Health And Safety	0	No Score	0.0%	16
5			QL2.2 Minimize Noise And Vibration	0	No Score	0.0%	11
6			QL2.3 Minimize Light Pollution	0	No Score	0.0%	11
7			QL2.4 Improve Community Mobility And Access	4	Enhanced	28.6%	14
8			QL2.5 Encourage Alternative Modes of Transportation	1	Improved	6.7%	15
9			QL2.6 Improve Site Accessibility, Safety & Wayfinding	6	Superior	40.0%	15
10		WELLBEING	QL3.1 Preserve Historic And Cultural Resources	7	Superior	43.8%	16
11			QL3.2 Preserve Views And Local Character	11	Conserving	78.6%	14
12			QL3.3 Enhance Public Space	6	Superior	46.2%	13
QL0.0 Innovate Or Exceed Credit Requirements				0	N/S		
QL				73		40.3%	181

Figure 09: Quality of Life Category – Summary of Results.

The biggest opportunities for improvement of this category can be found at the Community subcategory. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 40.3%, or 73 points out of 181.

⁴⁶ Information on actions of Corporate Social Responsibility. - Available at EDP's website: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/meio-ambiente/responsabilidade_social/Paginas/default.aspx

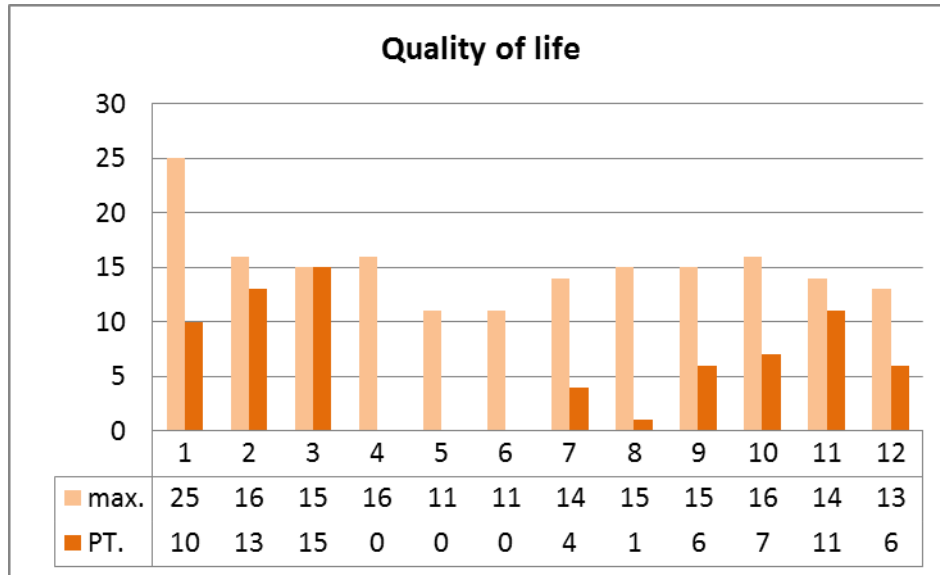


Figure 10: Quality of Life Category – Summary of Results.

4.2. LEADERSHIP

Envision’s Leadership category evaluates the collaboration, management and planning of the project’s team, as well as its stakeholders. *Envision states that “communicate and collaborate early on, involve a wide variety of people in creating ideas for the project, and understand the long-term, holistic view of the project and its life cycle.”*⁴⁷

The 12 credits in this category are: collaboration (LD 1.1, LD 1.2, LD 1.3, LD 1.4), management (LD 2.1, LD 2.2) and planning (LD 3.1, LD 3.2, LD 3.3).

CREDIT SCORING

			IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE	
13	LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	2	4	9	17	
14			LD1.2 Establish a sustainability management system	1	4	7	14	
15			LD1.3 Foster collaboration and teamwork	1	4	8	15	
16			LD1.4 Provide for stakeholder involvement	1	5	9	14	
17	MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	1	3	6	12	15	
18		LD2.2 Improve infrastructure integration	1	3	7	13	16	
19	PLANNING	LD3.1 Plan for long-term monitoring and maintenance	1	3		10		
20		LD3.2 Address conflicting regulations and policies	1	2	4	8		
21		LD3.3 Extend useful life	1	3	6	12		
Maximum points possible:							121	

Figure 11: Leadership category, credits distribution.

⁴⁷ Envision Guidance Manual, p.60

4.2.1. Collaboration:

In the **Collaboration Sub-category**, Jari Hydroelectric Dam project performed well. Two credits were assessed as Enhanced (LD 1.3 Foster collaboration and teamwork and LD 1.4 Provide for stakeholder involvement) while two received the qualification of Superior (LD 1.1 Provide effective leadership and commitment, and LD 1.2 Establish a sustainability management system).

On the matter of Leadership and commitment, the project developers have defined clearly their pledge. At EDP, project's major shareholding company, the Senior Management assumes the responsibility of defining strategies for innovation and sustainability. To guide the operations of the company, EDP has developed a number of specific policies including the following: 1) Ethics Code, 2) Sustainability Policy, 3) Commitment to Stakeholders, 4) Integrated Policy for the Environment, Health and Safety, 5) Policy to fight corruption and bribery, 6) Policy for external social investment, 7) Biodiversity policy, and 8) Policy for diversity valorization.⁴⁸

The EDP's Ethics Code⁴⁹ states that EDP respects the environment, affected communities and complies with environmental legislation. Furthermore, the company's Vision and Mission⁵⁰ state clear commitments to the environment.

Assessing the issue of sustainability management systems, it is possible to recognize efforts developed on a general level by EDP, and activities that are specific to Jari project. On a broad organizational level EDP, is committed since 2008 to foster a Corporate Environmental Management System for all its operations. EDP's has received an ISO 14001 certification issued by the Lloyd's Register Quality Assurance.⁵¹ Additionally, information found at EDP's website state that by 2012, 81% of the installed generating capacity, including 4 hydroelectric dams were certified.

⁴⁸ Relatório Anual de Sustentabilidade EDPBR 2012 - Capítulo Modelo de Negócio - Subcapítulo: Valores. - Página: 31

⁴⁹ EDP - Código de ética. Available at: <http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/empresa/codigo-de-etica/Paginas/default.aspx#5>

⁵⁰ EDP - Mission and Vision. Available at: <http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/empresa/visao-missao-e-valores/Paginas/default.aspx>.

The vision of EDP is to *"Be recognized as a company of excellence in the field of energy generation, by the technology used, the valorization of the team members and the respect to the communities around the reservoir."* EDP's mission statement expresses that the company aspires to *"Create electric energy with quality, social and environmental responsibility, thus contributing to the sustainable development of the Country and the Region"*

⁵¹ Information about EDP's Environmental Management System available at:

http://www.edp.pt/pt/sustentabilidade/ambiente/gestaoambiental/Pages/Certificacao_Ambiental.aspx

On its website the company states that: *"This certification frames and strengthen publicly assumed commitments regarding the integration of environmental aspects in the processes of planning and decision making, at all levels of the value chain. Special care will be given to the evaluation of negative impacts that may arise as a consequence of the activities of the company, as well as the evaluation of options to avoid or minimize such impacts. The certification also promotes continuous improvement and the goal of keeping and extending the process of environmental certification of its facilities and activities, through ISO 14001:2004 and the Community system for eco-management and environmental Audit (EMAS)."*



Figure 12: EDP ISO 14001:2004 Certificate.
source:

www.edp.pt/pt/sustentabilidade/ambiente/gestaoambiental/Pages/Certificacao_Ambiental.as

Focusing specifically on the Jari Hydroelectric Project, a robust system of sustainability management is in place for construction phase. The Environmental Construction Plan (Plano Ambiental para Construção - PAC) states the developer and constructing consortium responsibility with preventing, minimizing and mitigating social and environmental damages during construction. The PAC is composed of 6 subprograms, including the Subprogram for the environmental control of constructive actions (Subprograma de Controle Ambiental de Ações Construtivas)⁵²

Regarding collaboration and teamwork, documentation provided by the developers proves that the project has been done following a systemic conception. Responsibilities regarding sustainability are clearly stated for the construction phase.⁵³ Jari HD has been designed with careful consideration of the natural and infrastructural systems into which it is inserted and with which it is integrated. Although, there is a commitment to develop a collaborative environment between local governments and surrounding communities has been clearly stated in several of the company's Corporate Social Responsibility actions, the cooperation among working teams seems to be on a basic level.⁵⁴ Team meetings are documented through minutes that define goals and deadlines.⁵⁵

The project team has provided for stakeholder involvement on the project by creating permanent channels of communication with community members, local governments and relevant actors are established. Several subprograms of the Basic Environmental Project rely heavily on the involvement of the community (development of local skills, health and safety, awareness of cultural and environmental heritage, etc.).

A contact center was inaugurated in December 2011 in the city of Laranjal do Jari. A toll free line that answers questions regarding the project is also available.⁵⁶

⁵² Plano Ambiental Para Construção (PAC) - Subprograma de Controle Ambiental de Ações Construtivas PAC1.

This subprogram "(...) establishes the principles that must be followed by the contractors during the construction process (...) selecting constructive methods that aspire to minimize impacts on the environment and improve the quality of life of its employees and involved communities."

⁵³ Subprograma de Controle Ambiental de Ações Construtivas (PAC1) – Page 2/3.

⁵⁴ Information on actions of Corporate Social Responsibility. - Available at EDP's website: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/meio-ambiente/responsabilidade_social/Paginas/default.aspx

⁵⁵ ATA de Reuniões Mensais de Equipe Documento Completo.

⁵⁶ Revista ON Brasil - EDP jun jul 2012 Documento: EDP Na Floresta Amazônica Documento: Mais perto da comunidade. Página: 8 – The magazine states that: "Between August and May, the Center received over 700 calls. Most of these calls referred to the training courses linked to job opportunities. Beyond that, the dialogue with the community takes place through meetings and

4.2.2. Management:

Opportunities for improvement can be found at the **Management Sub-category**. One credit was assessed as No score (LD 2.1 Pursue by-product Synergy opportunities), while one was evaluated as Superior (LD2.2 Improve Infrastructure Integration).

In pursuing by-product synergy, it is worth mentioning that consistent efforts have been made by project leaders to reduce waste and foster recycling⁵⁷, thus increasing efficiency and sustainability. There are two programs related to waste: the Program for the Recovery of Degraded Areas (Programa para a Recuperação de Áreas Degradadas - PRAD)⁵⁸ and the Environmental Construction Plan (Plano Ambiental para Construção).⁵⁹ Environmental education initiatives involving workers and communities also contribute to the reduction of waste. However, no documentation was found describing the use of unwanted by-products or discarded materials and resources from nearby operations.

Regarding the improvement of Infrastructure integration, the project team has developed actions to improve social and urban amenities in nearby communities⁶⁰. However, it is clear that the biggest contribution of the project to the regional and national infrastructural integration is the connection of Jari Hydroelectric Dam with the National Interconnected System (Sistema Interligado Nacional - SIN). Connectivity to the national network will be achieved via a 20 km long, 230 KV High Tension Line⁶¹ (HTL) that is part of the Jari project. Synergies at regional and national levels will be created with the 230 KV HTL connecting the Jari Hydroelectric dam with the Laranjal do Jari Substation, and with the high tension lines of the System Tucuruí-Macapá-Manaus.

4.2.3. Planning:

The project achieved a good performance in the **Planning Sub-category**, but there are still significant opportunities to amend the evaluation. Two credits were assessed as Improved (LD 3.1 Plan for Long-Term monitoring and LD 3.3 Extend Useful Life) and one was qualified as Enhanced (LD 3.2 Address Conflicting regulations and policies).

Planning for long term monitoring and maintenance is addressed in an addendum of the concession contract signed in December 2008⁶² that extends the concession until the year 2037. More recent publications reveal that the concession has been extended again, until the year 2044 (see link to the electronic magazine *Valor Econômico* – January, 2011⁶³).

personal interviews, flyers with info about the project and even a radio show transmitted in local stations. Thus a transparent and open relationship with the community is established”.

⁵⁷ Imagem - Coleta seletiva de resíduos sólidos Documento: Imagem da área de coleta seletiva de resíduos sólidos.

⁵⁸ Programa de Recuperação de Áreas Degradadas (PRAD) - Chapter 6.3.7 Projeto Básico Ambiental PBA., page 3/30

⁵⁹ Subprograma de Controle da Poluição durante as Obras (PAC 3) Documento completo. - Projeto Básico Ambiental PBA.

⁶⁰ Parceria ECE e o Município de Laranjal do Jari Documento: Reforço Financeiro as Ações de Saúde do Município de Laranjal do Jari. Capítulo: Descrição Páginas: 3 Capítulo Identificação do Objeto. Páginas: 3 / Termo de Convênio ECE e Secretária Estado da Justiça e Segurança Pública Amapá. / Mapa da Construção da Estrada Documento: Construção de uma estrada com o Estado-Município. / Convênio ECE com o Município de Laranjal do Jari – Educação Documento. Termo de Convênio ECE com o Município de Laranjal do Jari. Capítulo Melhoria da Infraestrutura Educacional do Município de Laranjal do Jari.

⁶¹ Projeto Básico Ambiental - Chapter1 - Descrição da Evolução do Projeto Básico, Page 3.

⁶² Contrato de Concessão - Primeiro Aditivo: Cláusula Segunda - Prazo da Concessão do contrato Subcapítulo.

⁶³ <http://www.valor.com.br/brasil/1120194/ministerio-prorroga-concessao-da-usina-santo-antonio-de-jari-ate-2044>

Project developers have also presented a document - dated April 2013 - proving that a recruitment process to assemble an O&M⁶⁴ (operation and maintenance) team has started. Furthermore, the project team has presented a number of plans regarding long-term monitoring of several aspects⁶⁵ such as sediments, fauna, weather conditions, river flow conditions, etc. At this point, all of these plans seem to be in the process of deployment.

Regarding efforts to address conflicting regulations and policies, fluid communication with authorities was necessary to overcome several challenges. It is important to note that the process of obtaining an environmental license in Brazil is complex and extensive. Three licenses issued by IBAMA are required for a project such as Jari⁶⁶: a Preliminary License (Licença Previa - LP) that certifies the environmental feasibility of the project; an Installation License (Licença de Instalação - LI) which authorizes the beginning of construction; and finally, an Operation License (Licença de Operação - LO) authorizing filling of the reservoir and the beginning of energy production.

In the case of Jari Hydroelectric Dam, project developers have identified all applicable regulations. Several meeting minutes and documents presented prove that project developers have assessed potential conflicts, working closely with regulating organizations, specifically the aforementioned IBAMA and IPHAN (Instituto do Patrimônio Histórico e Artístico Nacional, or Institute for the National Historic and Artistic Heritage).⁶⁷

Finally, on the matter of extending the infrastructure's useful life, the performance of the project can also be amended. No specific documents or evidence regarding consistent efforts to improve flexibility or resilience of the dam have been found.

⁶⁴ O&M Jari Documento: Recrutamento interno: EDP forma 1ª equipe de O&M em Jari (Operação e Manutenção).

⁶⁵ Programa de Monitoramento Climato – Meteorológico / Programa de Monitoramento de Fauna Terrestre, aquática y semiacuática - Projeto Básico Ambiental (PBA).

⁶⁶ Aproveitamento Hidrelétrico Santo Antônio do Jari Os desafios da Gestão Ambiental. - Junho 2013. Page 24.

⁶⁷ One clear example of policies that may have unintentionally created barriers to sustainability is documented. IBAMA requested an assessment of the need to implement a fish ladder to allow navigation of the dam. The construction of fish ladders is a normal policy in the case of hydroelectric dams. A study developed by the University of São Paulo (USP) proved that in this specific case, the implementation of such a device could have generated a negative impact on the environment considering that fish in the Jari river are naturally separated by the barrier of the Santo Antonio Falls, in two different ecosystems. Thanks to the dialog with the regulating organization and the contribution of academic institutions, project developers could overcome this potential conflict.

For more details see: *Parecer Técnico do Professor Dr. Flávio Bockmann - Universidade de São Paulo - Departamento de Biologia - Laboratório de Ictiologia - Setor de Zoologia dos Vertebrados. - Pages 1 to 5.*

4.2.4. Summary of results for the Leadership category.

The table below shows the distribution of credits as well as the level of achievement reached in each credit (figure 13)

JARI HYDROPOWER PLANT. BRAZIL			PT.	Performance	% Total	max.	
13	LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	9	Superior	52.9%	17
14			LD1.2 Establish A Sustainability Management System	7	Superior	50.0%	14
15			LD1.3 Foster Collaboration And Teamwork	4	Enhanced	26.7%	15
16			LD1.4 Provide For Stakeholder Involvement	5	Enhanced	35.7%	14
17	LEADERSHIP	MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	0	No Score	0.0%	15
18			LD2.2 Improve Infrastructure Integration	7	Superior	43.8%	16
19	LEADERSHIP	PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	1	Improved	10.0%	10
20			LD3.2 Address Conflicting Regulations & Policies	2	Enhanced	25.0%	8
21			LD3.3 Extend Useful Life	1	Improved	8.3%	12
			LD0.0 Innovate Or Exceed Credit Requirements	0	N/S		
		LD	36		29.8%	121	

Figure 13: Leadership Category – Summary of Results.

The biggest opportunities for performance improvement in this category can be found at the Management subcategory. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 29.8%, or 36 points out of 121.

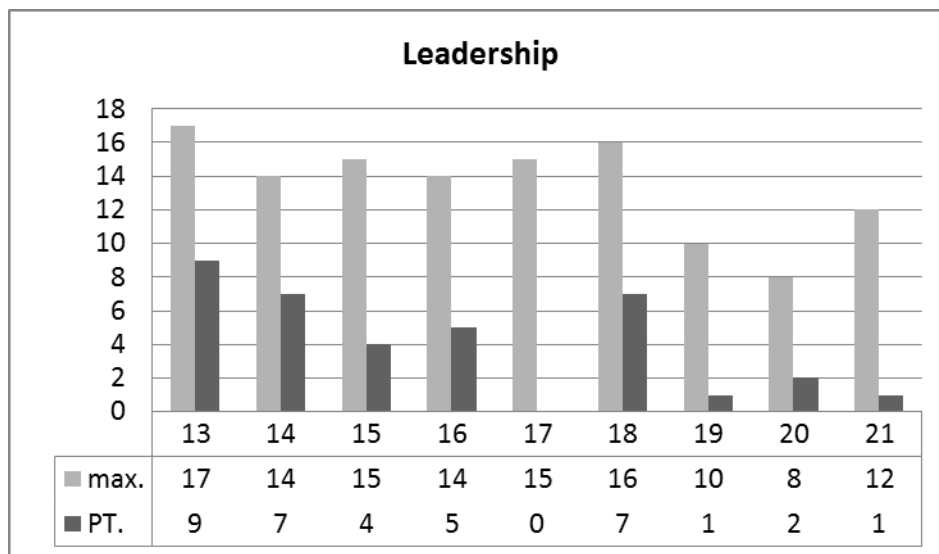


Figure 14: Leadership Category – Summary of Results.

4.3 RESOURCE ALLOCATION

The Resource Allocation (RA) category deals with the quality and source of the materials used in the project during its construction and operation phases. Use and allocation of materials and other resources has a great impact on the overall sustainability of the project. The RA category is divided into 13 credits: materials (RA 1.1, RA 1.2, RA 1.3, RA 1.4, RA 1.5, RA 1.6, RA 1.7), energy (RA 2.1, RA 2.2, RA 2.3) and water (RA 3.1, RA 3.2, RA 3.3).

CREDIT SCORING

			IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE	
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce net embodied energy	2	6	12	18	
23			RA1.2 Support sustainable procurement practices	2	3	6	9	
24			RA1.3 Use recycled materials	2	5	11	14	
25			RA1.4 Use regional materials	3	6	9	10	
26			RA1.5 Divert waste from landfills	3	6	8	11	
27			RA1.6 Reduce excavated materials taken off site	2	4	5	6	
28			RA1.7 Provide for deconstruction and recycling	1	4	8	12	
29	ENERGY	RA2.1 Reduce energy consumption	3	7	12	18		
30		RA2.2 Use renewable energy	4	6	13	16	20	
31		RA2.3 Commission and monitor energy systems		3		11		
32	WATER	RA3.1 Protect fresh water availability	2	4	9	17	21	
33		RA3.2 Reduce potable water consumption	4	9	13	17	21	
34		RA3.3 Monitor water systems	1	3	6	11		
						Maximum points possible:	182	

Figure 15: Resource Allocation category, credits distribution.

4.3.1. Materials:

Some credits at this subcategory obtained good results, while opportunities for improvement can also be found. Two credits were assessed as No Score (RA 1.1 Reduce Net embodied energy and RA 1.7 Provide for deconstruction and recycling). Four credits were evaluated as Improved (RA 1.3 Use Recycled Materials, RA 1.4 Use Regional Materials, RA 1.5 Divert waste from landfills and RA 1.6 Reduce excavated materials taken off site). Finally, one credit was assessed as Superior (RA 1.2 Support sustainable procurement practices).

Referring to reducing net embodied energy, there are clear opportunities to raise the project's performance. Based on answers provided by the project developers,⁶⁸ no evidence could be found that efforts to reduce net embodied energy of project materials were carried out.

However, significant efforts were deployed to support sustainable procurement practices. In Jari Hydroelectric Dam, and all projects developed by EDP, the purchase of all materials and equipment must follow the guidelines of the Corporate Normative System⁶⁹ (Sistema Corporativo Normativo). A specific procedure is in place to qualify and evaluate service suppliers (PR.SU.05.00.0002 Qualificação e avaliação de fornecedores de serviço), and a second procedure is in place to qualify and evaluate material suppliers (PR.SU.05.00.0001 Qualificação e avaliação de fornecedores de materiais).⁷⁰

⁶⁸ EDP - Relatório de Evidências. CE - Page 1

⁶⁹ Sistema Normativo Corporativo Documento: Sistema Normativo Corporativo Capítulo: Definições Página:5

⁷⁰ The stated objective of the aforementioned documents is to: "Establish procedures to verify and qualify, register, and hire suppliers committed with the values and principles of the group regarding health and safety, the environment and social

Based on information provided and found, it appears that the project team has implemented a strong set of supplier evaluation practices. According to information found in the press,⁷¹ EDP subcontracted Alstom for engineering services, supplying the electric equipment and constructing the dam. Alstom has had a sustainable sourcing policy⁷² in place since 2007 and has developed a thorough assessment of suppliers⁷³ that utilizes documented evaluations and on-site audits.

Around 5% of the project materials are recycled or reclaimed,⁷⁴ according to statements made by the project team. No specific data supporting this claim has been provided yet.⁷⁵

According to statements by the project team, around 10% of the materials used on the project are locally sourced.⁷⁶ The Improved Basic project⁷⁷ (Projeto Básico Otimizado) describes that three main materials will be locally sourced: rocks, sands and clay.⁷⁸

On diverting waste from landfills, the project team has developed consistent efforts. A specific subprogram regarding pollution control⁷⁹ is in place (Subprograma de Controle da Poluição durante as Obras - PAC3), which establishes procedures for minimizing waste, appropriate classification and destination of residues, recycling, etc. According to the developers, approximately 25% of all waste generated was recycled or reused.⁸⁰



Figure 16: Recycling Station.

Source: Aproveitamento Hidrelétrico Santo Antônio do Jari – Os Desafios da Gestão Ambiental. Page 29

responsibility, capable of providing [services and materials] of the demanded quality, for a fair price, through a partnership and healthy commercial relationship in the long term”

⁷¹ G1.globo.com: Alstom ganha contrato para construção de hidrelétrica no Brasil.

<http://g1.globo.com/economia/noticia/2011/09/alstom-ganha-contrato-para-construcao-de-hidreletrica-no-brasil.html>

⁷² Alstom Sustainable Sourcing Policy available at: <http://www.alstom.com/Sustainability/A-sustainable-sourcing-policy/>

⁷³ Assessment of Alstom’s suppliers: <http://www.alstom.com/Sustainability/A-sustainable-sourcing-policy/The-assessment-of-Alstoms-suppliers/>

⁷⁴ EDP Relatório de Evidências CE - Page 3

⁷⁵ It is also relevant to highlight that a subprogram for pollution control during construction is in place (PAC 3 - Subprograma de controle da poluição durante as obras). This subprogram sets management guidelines for all categories of residues, including categories A (construction and demolition waste) and B (recyclable waste). For more details see: Sub Programa de Controle de Poluição durante as obras. - PAC 3- Pages 4/28 and 5/28.

⁷⁶ EDP Relatório de Evidências CE - Page 4.

⁷⁷ Projeto Básico Otimizado Capítulo: Áreas de Empréstimo, Bota-foras e Outras Fontes de Materiais para Construção
Página: 10

⁷⁸ The aforementioned document states that: “Rocks will be mainly obtained in the excavations that must be made for the construction of the powerhouse. Volume to be excavated is enough for the production of concrete and protection rockfill (...) There is clay on the right bank, estimated on 1,200,000 m3 and the volume estimated on the left bank is 1,800,000 m3. These volumes are far superior to the requirements of the project (...), the deposit of sand located on the bed of the Jari River, next to Vila da Padaria (...) was assessed (...) and its volume is many times superior to what is required by the project: 170,000 m3”.

⁷⁹ Plano Básico Ambiental - PBA - Subprograma de Controle da Poluição durante as Obras - PAC 3, Page 2.

⁸⁰ EDP Relatório de Evidências CE - Page 5.

On the reduction of excavated material taken off site, the developers have declared that the project is designed to balance the volume of soil extracted and reused to build the dams. Excavated soil was also used in the construction and improvement of access roads. Approximately 40% of the materials excavated were reused on site.⁸¹

Deconstruction and recycling opportunities can improve the project's performance. Based on statements made by the developers,⁸² there is no evidence that efficiency in disassembly, or deconstruction at the end of the dam's lifespan were considered.

4.3.2. Energy:

The **Energy subcategory** also provides opportunities for improvement. Two credits were assessed as No Score (RA 2.1 Reduce Energy Consumption and RA 2.3 Commission and monitor energy systems), while one was qualified as Restorative (RA 2.2 Use Renewable Energy).

The project team has stated that feasibility studies and cost analyses to determine energy consumption reduction methods⁸³ are yet to be implemented.

Regarding the use of renewable energy, the project will produce positive impacts: with an installed capacity of 373.48 MW⁸⁴ Jari Hydroelectric Dam is clearly a net positive source of renewable energy, capable of providing electricity to approximately 3,000,000 citizens. It is worth remembering that this region was supplied with energy obtained from thermoelectric units running on fossil fuels. Jari Hydroelectric dam fulfills the requirements of the Clean Development Mechanism (CDM) under the Kyoto Protocol⁸⁵ (see Credit CR1.1 for more details).

Beyond this, renewable energy sources were also deployed in projects such as the new Vila Iratapuru⁸⁶. There, solar energy systems will contribute in providing electricity to the houses and streets.

Some efforts have been done to commission and monitor energy systems. The project team has stated that external audits will be performed on electromechanical equipment⁸⁷, but the frequency of such evaluations has not been defined. At this point, any other evidences regarding monitoring by third parties were found. Documents presented prove that currently, an internal operation and maintenance team (O&M) is being recruited.⁸⁸ It is worth mentioning that at the moment of this evaluation, the project is still in construction phase.

⁸¹ EDP Relatório de Evidências CE - Page 6.

⁸² Plano Básico Ambiental - PBA - Subprograma de Controle da Poluição durante as Obras - PAC 3, Page 2.

⁸³ EDP Relatório de Evidências CE - Page 4

⁸⁴ Aproveitamento Hidrelétrico Santo Antônio do Jari, Os Desafios da Gestão Ambiental. Page 17

⁸⁵ MECANISMO DE DESENVOLVIMENTO LIMPO (CLEAN DEVELOPMENT MECHANISM) DOCUMENTO DE FORMULÁRIO DE PROJETO DE DESENHO (MDL-DPC) - Atividade de Projeto MDL UHE Santo Antônio do Jari.

⁸⁶ Informativo 52, Nova Vila Iratapuru.

⁸⁷ EDP Relatório de Evidências CE - Page 10

⁸⁸ O&M Jari Documento: Recrutamento interno: EDP forma 1ª equipe de O&M em Jari (Operação e Manutenção)

4.3.3. Water:

The **water subcategory** obtained good results. One credit was assessed as Improved (RA 3.1 Protect fresh water availability) and one was evaluated as Enhanced (RA 3.3 Monitor water systems), while the last credit was qualified as No Score (RA 3.2 Reduce Potable Water Consumption).

The potential impact of hydroelectric dams on freshwater availability is not strongly correlated with water consumption, but rather with alterations in water quality and flow. Alteration in the flow of a river can produce impacts on water availability downstream, while the formation of a lake upstream can result in accumulation of sediments or organic matter, which in turn can affect water quality.

Regarding these concerns, the EIA⁸⁹ states that if current conditions are maintained, the Jari River can provide good water quality and most of the volume required for the dam's reservoir considering the sparse water use in the region and the absence of obvious pollution sources. The EIA has assessed the location, type, quantity, and quality of water resources available to the project. Based on the documentation provided, it seems valid to conclude that Jari Hydroelectric Dam will have a net neutral impact on water quality and availability.

The project team has stated that feasibility studies and cost analyses to determine potable water consumption reduction methods have not been implemented yet.⁹⁰ Furthermore, in the guidelines listed within the Subprogram for the Environmental Control of Construction Works⁹¹ (PAC 1), there are no references about the reuse of graywater or strategies oriented towards reduction of potable water consumption.

Internal water monitoring processes were planned and are currently being deployed. The Basic Environmental Project (Projeto Básico Ambiental - PBA) defines two detailed monitoring programs regarding water quality: a program of limnological⁹² (inland water) monitoring and a program to assess impacts on sections of reduced flow.⁹³ The information produced by these monitoring programs will be consolidated in a database. IBAMA, will act as an independent third party auditing institution, according to the terms of the Environmental Licenses.



Figure 17 – Collecting samples for the program of limnological monitoring.

Source: Aproveitamento Hidrelétrico Santo Antônio do Jari – Os Desafios da Gestão Ambiental. Page 36

⁸⁹ Estudo de Impacto Ambiental. (EIA) - 8.3- Meio Biótico - Ecossistemas Aquáticos, Capítulo 8.3.1: Qualidade da Água Pages: 5, 6.

⁹⁰ EDP Relatório de Evidências CE - Page 12.

⁹¹ Subprograma de Controle Ambiental de Ações construtivas PAC 1.

⁹² Plano Básico Ambiental - PBA. Programa de Monitoramento Limnológico.

⁹³ Plano Básico Ambiental - PBA. Programa de Monitoramento dos Impactos no Trecho de Vazão Reduzida - TVR

4.3.4. Summary of results for the Resource Allocation category.

The table below shows the distribution of credits as well as the level of achievement reached in each credit (figure 18)

		JARI HYDROPOWER PLANT. BRAZIL	PT.	Performance	% Total	max.	
22	RESOURCE ALLOCATION	RA1.1 Reduce Net Embodied Energy	0	No Score	0.0%	18	
23		RA1.2 Support Sustainable Procurement Practices	6	Superior	66.7%	9	
24		RA1.3 Used Recycled Materials	2	Improved	14.3%	14	
25		RA1.4 Use Regional Materials	3	Improved	30.0%	10	
26		RA1.5 Divert Waste From Landfills	3	Improved	27.3%	11	
27		RA1.6 Reduce Excavated Materials Taken Off Site	2	Improved	33.3%	6	
28		RA1.7 Provide for Deconstruction & Recycling	0	No Score	0.0%	12	
29		RA2.1 Reduce Energy Consumption	0	No Score	0.0%	18	
30		RA2.2 Use Renewable Energy	20	Restorative	100.0%	20	
31		RA2.3 Commission & Monitor Energy Systems	0	No Score	0.0%	11	
32		WATER	RA3.1 Protect Fresh Water Availability	2	Improved	9.5%	21
33			RA3.2 Reduce Potable Water Consumption	0	No Score	0.0%	21
34			RA3.3 Monitor Water Systems	3	Enhanced	27.3%	11
		RA0.0 Innovate Or Exceed Credit Requirements	0	N/S			
		RA	41		22.5%	182	

Figure 18: Resource Allocation category, credits distribution.

Opportunities to amend performance at this category can be found at the all three subcategories. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 22.5%, or 41 points out of 182.

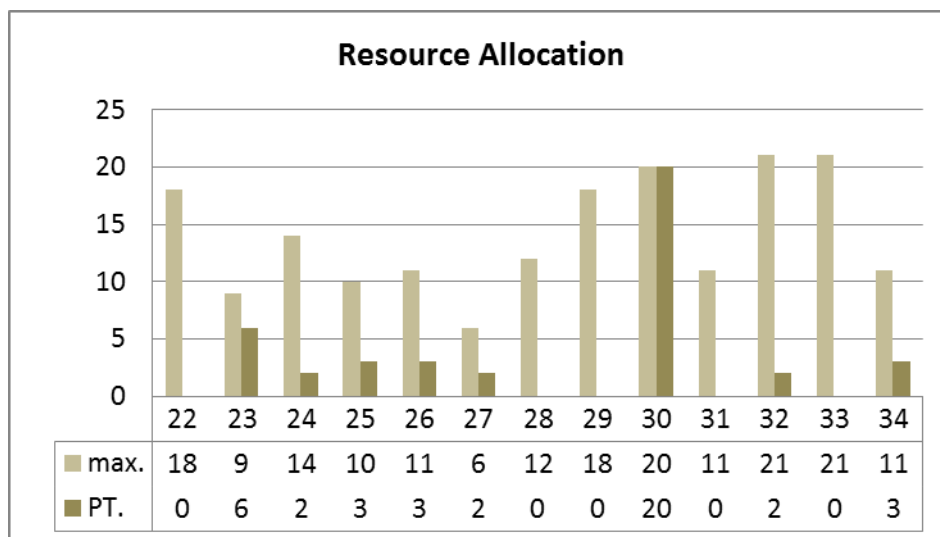


Figure 19: Resource Allocation category, credits distribution.

4.4. NATURAL WORLD

The Natural World category addresses “how to understand and minimize negative impacts while considering ways in which the infrastructure can interact with natural systems in a synergistic, positive way.”⁹⁴ The NW category is divided into 14 credits related to project siting (NW 1.1, NW 1.2, NW 1.3, NW 1.4, NW 1.5, NW 1.6, and NW 1.7), impacts on land and water (NW 2.1, NW 2.2, NW 2.3) and biodiversity (NW 3.1, NW 3.2, NW 3.3, NW 3.4).

CREDIT SCORING

			IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE	
35	NATURAL WORLD	SITING	NW1.1 Preserve prime habitat			9	14	18
36			NW1.2 Protect wetlands and surface water	1	4	9	14	18
37			NW1.3 Preserve prime farmland			6	12	15
38			NW1.4 Avoid adverse geology	1	2	3	5	
39			NW1.5 Preserve floodplain functions	2	5	8	14	
40			NW1.6 Avoid unsuitable development on steep slopes	1		4	6	
41			NW1.7 Preserve greenfields	3	6	10	15	23
42	NATURAL WORLD	LAND & WATER	NW2.1 Manage stormwater		4	9	17	21
43			NW2.2 Reduce pesticide and fertilizer impacts	1	2	5	9	
44			NW2.3 Prevent surface and groundwater contamination	1	4	9	14	18
45	NATURAL WORLD	BIODIVERSITY	NW3.1 Preserve species biodiversity	2			13	16
46			NW3.2 Control invasive species			5	9	11
47			NW3.3 Restore disturbed soils				8	10
48			NW3.4 Maintain wetland and surface water functions	3	6	9	15	19
Maximum points possible:							203	

Figure 20: Natural World category, credits distribution

4.4.1. Siting:

The **siting subcategory** obtained good results, but also provides opportunities for improvement. One Credit was assessed as Enhanced (NW 1.5 Preserve floodplain functions), while three were qualified as Conserving (NW 1.3 Preserve Prime Farmland, NW 1.4 Avoid Adverse Geology and NW 1.6 Avoid unsuitable development on steep slopes). The remaining three credits were qualified as No Score (NW 1.1 Preserve Prime Habitat, NW 1.2 Protect Wetlands and Surface Water and NW 1.7 Preserve Greenfields)

The siting for building the artificial reservoir for the dam takes place in a greenfield, which will result in the suppression of native forest. Additionally, efforts made by the project team to preserve prime habitat are not sufficient. Notwithstanding all efforts, the artificial lake will produce impacts upstream from the dam, including damages to forested areas of high environmental value. According to IBAMA, 1,706 hectares of native forest will be suppressed and would result in destruction of habitats, reduction of local biodiversity, and an its impact has been assessed as local, direct, permanent, non-accumulative, non-reversible, of medium importance and small intensity.⁹⁵ The buffer zone of the Jari Ecologic Station (Estação Ecológica do Jari) will also be affected by the formation of the lake.

It is worth mentioning that compensation measures are properly established within the environmental license and the program for the recovery of degraded areas (Programa de Recuperação de áreas

⁹⁴ Envision Guidance Manual, p.116

⁹⁵ Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.) Page 4, Page 90.

degradadas - PRAD). A new environmental buffer zone of 100 meters (approximately 330 feet) will be established around the lake.

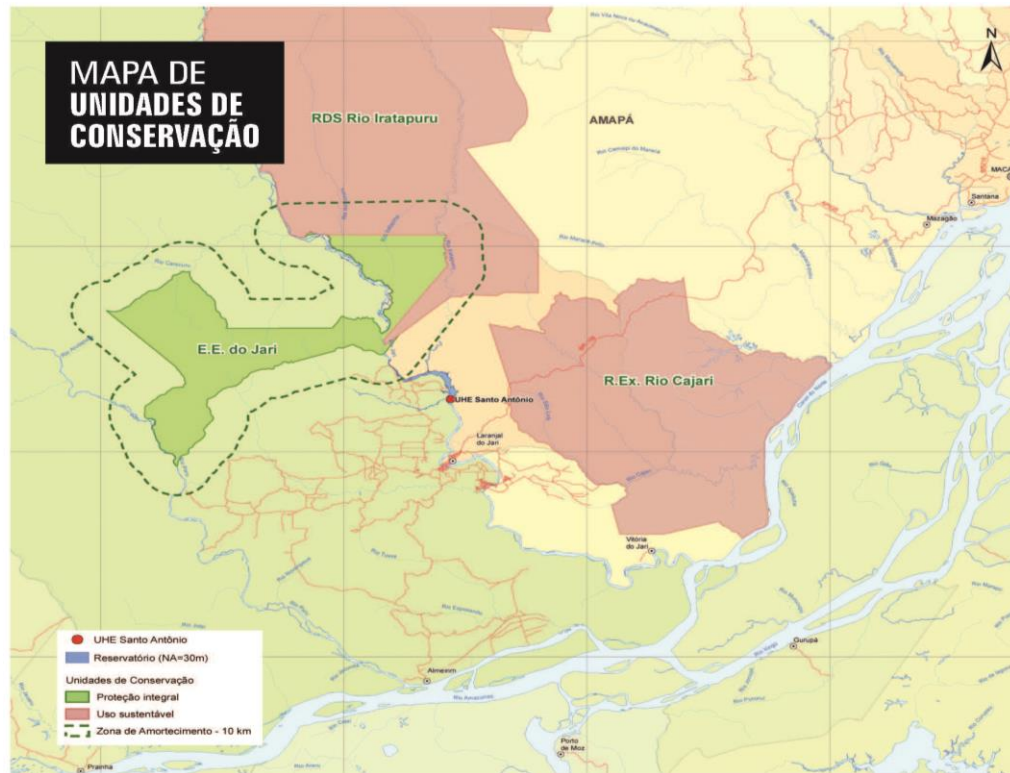


Figure 21: Conservation Units in the area of the project. / Source - Environmental Impact Report – RIMA (Relatório de Impacto Ambiental), developed by Ecology Brazil, page 35.

Wetlands and surface water were not preserved considering that a hydroelectric dam project must interfere with a water body. Although, significant efforts were implemented to minimize negative impacts on water resources and the landscape such as locating the dam upstream from the Santo Antônio do Jari Falls to preserve the region’s natural heritage. Furthermore, all temporary and permanent structures were concentrated on the right bank of the river⁹⁶ – which was previously disturbed by anthropogenic activity - in order to avoid disruption of the left bank.

Based on the evidence presented, development took place on land not considered prime farmland or relevant for agricultural purposes. The site area has not been described as a location highly relevant for agricultural purposes in any document presented by the developers.⁹⁷ Regarding this topic IBAMA, through its multidisciplinary team, stated that there was scarce agricultural activity because of the low fertility in soils.⁹⁸

Adverse geology was avoided, according to the numerous studies carried out since the 1970s and IBAMA, by building in the massif that presented good geological conditions, plus it meets the conditions

⁹⁶ Relatório de Impacto Ambiental (RIMA) Page 12.

⁹⁷ Estudo de Impacto Ambiental (EIA) - Mapa de Vegetação ADA 1, and Mapa de Vegetação ADA 2

⁹⁸ Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.) Page 19

of stability and security required for the construction of the dam.^{99,100, 101} Moreover, the EIA also states that supplementary geologic and geotechnical surveys in 1992 proved the quality of the massif for siting the spillway and the engine house.

Consistent efforts were developed to preserve floodplain functions. The project limits the use of impervious surfaces, restricted basically to the engine house and the dam, and does not have a significant impact on water infiltration. A new lake with a surface of 31.7 Squares kilometers will be formed by the dam, thus changing the floodplain areas. A program for the recovery of degraded areas (Programa de Recuperação de Áreas Degradadas - PRAD)¹⁰² is being implemented, with the intention of recovering all areas affected by the project, including floodplains. Furthermore, a legal buffer zone of 100 meters around the lake and by river margins was designated as Area of Permanent Protection (Area de Proteção Permanente - APP).

The project has also taken into consideration habitat connectivity and sediment transport: A Program for Control and monitoring of erosive processes (Programa de controle e Monitoramento de Processos Erosivos)¹⁰³, and a program for monitoring sediments in the water flow (Programa de Monitoramento Hidrossedimentológico)¹⁰⁴ are in place.

There are efforts to avoid unsuitable development on steep slopes. Working closely with the team of the IBAMA, developers have adjusted the location of the project. Jari Hydroelectric Dam is now sited in a location with no hillsides or steep slopes. As previously explained, this adjustment in the project site also allowed to preserve the Santo Antônio falls, an important natural heritage for the region.¹⁰⁵

4.4.2. Land and water:

The performance at **land and water sub-category** was good in general terms. Two credits were assessed as Enhanced (NW 2.1 Manage Stormwater and NW 2.3 Prevent Surface and Groundwater Contamination). One credit was qualified as No score (NW 2.2 Reduce Pesticides and Fertilizers Impacts).

Significant efforts have been put in place by project developers in order to **manage stormwater** and reduce the generation of stormwater runoff. A Program for the Recovery of Degraded Areas¹⁰⁶ (Programa de Recuperação de Áreas Degradadas - PRAD) and a Program to Control and Monitor Erosive

⁹⁹ Estudo de Impacto Ambiental (EIA) Chapter 2 - Introdução e Histórico - Page 4

¹⁰⁰ According to IBAMA: "Geological surveys in the location began in 1974 in the context of the preliminary studies for the hydroelectric use of Santo Antônio Falls. In 1986, studies connected with the development of the project were resumed, analyzing existing data and performing new surveys. Other studies were conducted in 1992. At this stage [2009 - process to obtain the Environmental Preliminary License] supplementary field research was implemented in the year 2007, aiming to complete the revision of the Basic Project (...)" For further details see: Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.) Page 16

¹⁰¹ Ibid

¹⁰² Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas (PRAD). Page 3

¹⁰³ Projeto Básico Ambiental (PBA) - Programa de Controle e Monitoramento de Processos Erosivos. Page 3.

¹⁰⁴ Projeto Básico Ambiental (PBA) - Programa de Monitoramento Hidrossedimentológico. Pages 2, 3

¹⁰⁵ In explaining the long process of design and licensing the project, the EIA states that: "The resumption of the licensing project for Jari Dam in 2007, included a major reformulation of the original concepts, and important changes, with the intention of preserving Santo Antônio Falls, and avoid the creation of new paths that would induce access and un-planned occupation in the left margin [of the river.]" For more details see: Estudo de Impacto Ambiental (EIA) Chapter 2 - Introdução e Histórico - Page 2

¹⁰⁶ Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas - PRAD. Page 3

Processes¹⁰⁷ (Programa de Controle e Monitoramento de Processos Erosivos) are in place. A key aspect of both of these programs is the process to restore vegetation using native species, which helps preserve conditions of infiltration and evapotranspiration.

There are any operational policies or programs designated to control the application of pesticides and fertilizers so as to avoid over-applying were found.

Some actions are being taken to prevent surface and groundwater contamination. A program for monitoring the water table¹⁰⁸ (Programa de Monitoramento do Lençol Freático) is in place. This program is expected to begin one year prior to the filling of the lake, and will be in place for four years after that event. The level of the water table and the quality of underground water will be monitored. Regarding surface water, the dam may critically affect two aspects: water flow and water quality.¹⁰⁹ In order to assess possible impacts, a detailed Internal Monitoring process has been planned and is currently being deployed.

The Basic Environmental Project (Projeto Básico Ambiental - PBA) defines two monitoring programs regarding surface water quality: Program of Limnological Monitoring and Program to Assess Impacts of Reduced Flow.¹¹⁰ The information produced in these monitoring programs will be consolidated in a database. IBAMA, the Brazilian Federal Environmental Agency, will act as an independent third-party auditing institution for this monitoring process, in accordance with the terms of the Environmental Licenses.

Regarding spill and leak prevention and response plans, the following procedures are in place: Subprogram for Pollution Control During Construction Work¹¹¹ and a Subprogram for Risk Management and Emergency Actions.¹¹²

4.4.3. Biodiversity:

In the **Biodiversity sub-category**, Jari Hydroelectric project obtained good results. One credit was qualified as Improved (NW 3.1 Preserve Species Biodiversity), two were assessed as Superior (NW 3.2 Control Invasive Species and NW 3.4 Maintain Wetland and Surface Water Functions), and a last one was qualified as Conserving (NW 3.3 Restore Disturbed Soils).

Regarding preserving species biodiversity, a number of programs is being developed. The project team has worked throughout the extended licensing process with several public entities at the federal, state and local levels in order to identify special habitat areas in and near the project site.

In spite of significant efforts to avoid damage, the artificial lake will produce impacts upstream from the dam, including forest suppression in areas of high environmental value. According to IBAMA,¹¹³ 1,706 hectares of native forest will be suppressed and this will reduce local biodiversity and destruct habitats.

¹⁰⁷ Projeto Básico Ambiental (PBA) - Programa de Controle e Monitoramento de Processos Erosivos. Page 3

¹⁰⁸ Plano Básico Ambiental - PBA. Programa de Monitoramento do Lençol Freático. Page 2.

¹⁰⁹ Licença de Instalação 798/2011

¹¹⁰ Plano Básico Ambiental - PBA. Programa de Monitoramento dos Impactos no Trecho de Vazão Reduzida - TVR

¹¹¹ Plano Básico Ambiental - PBA - Subprograma de controle da poluição durante as obras - PAC 3

¹¹² Plano Básico Ambiental - PBA - Subprograma de Gerenciamento de Riscos e de Ações de Emergência - PAC 7

¹¹³ Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.). Page 90.

This impact has been assessed as local, direct, permanent, non-accumulative, non-reversible, and of medium importance and small intensity.

It is worth mentioning that compensation measures are properly established in the environmental license¹¹⁴ and in the Program for the Recovery of Degraded Areas.¹¹⁵ A new environmental buffer zone of 100 meters (approximately 330 feet) will be established around the lake. Based on information available at this point, it has been concluded that net habitat quality will very likely be maintained.

The developers have been especially careful in regards to controlling invasive species. Documents submitted, such as the Program for the Recovery of Degraded Areas (Programa de Recuperação de Áreas Degradadas - PRAD), or the Environmental Licence issued by IBAMA, certify that the project team has worked with state agencies to identify and use only native vegetation following completion of construction and commencement of operations. The PRAD¹¹⁶ states that for vegetation recovery regional vegetation diversity must be considered. However, no documents regarding measures to control or eliminate pre-existing invasive species in the project site have been provided.

The PRAD¹¹⁷ and the Program to Control and Monitor Erosive Processes (Programa de Controle e Monitoramento de Processos Erosivos) are in place to restore disturbed soils. It is clear from the documents presented (including the License issued by IBAMA) that all soils disturbed as a result of the project implementation, will be restored. However, further documentation could clarify the percentage of soils disturbed as result of previous development that will be or has been restored by the Jari Hydroelectric Dam project.

In Maintaining wetland and surface water functions, based on documentation provided, the Jari Hydroelectric Dam appears to maintain the following ecosystem functions:

- Hydrologic connections: the main concern in this project was the section with reduced flow. A Program to Assess Impacts on Sections of Reduced Flow (TVR) was developed in conjunction to IBAMA's recommendations to maintain a minimum flow of 45 m³/s in order to preserve ecosystem functions.
- Water quality: The Basic Environmental Project (PBA) defines two monitoring programs regarding surface water quality: Program of Limnological Monitoring and Program to Assess Impacts on Sections of Reduced Flow. IBAMA, will act as independent third-party auditing institution for this monitoring process, in accordance with the terms of the Environmental Licenses.
- Habitat: Although significant efforts were developed to reduce impacts, the construction of the lake will result in the suppression of native forest, but the net habitat quality will be maintained by the project. Still, compensation measures are properly established in the environmental licenses.

Finally, regarding sediment transport, a Program for Monitoring Sediments in the Water Flow (Programa de Monitoramento Hidrossedimentológico) is in place, but at this moment (end of construction phase)

¹¹⁴ Licença de Instalação 798/2011

¹¹⁵ Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas - PRAD. Page 3

¹¹⁶ Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas. PRAD. Page 7

¹¹⁷ The aforementioned PRAD states that: *"All areas altered by activities related to the deployment of the project must be recovered according to the environmental guidelines presented [in this Program], including areas of excavation and disposal, even if they were already in place prior to the endeavor (...) For the construction of the Santo Antônio do Jari Dam, the use of existing roads must be encouraged, minimizing the need to open new roads. All areas around locations used during the construction of the project (...), and affected by it in any way, must also be recovered."*

there is no available data to assess the real effects of the dam on the transport of sediments, even when all proper preventive and corrective measures (such as recovery of degraded areas and monitoring of erosion) are being taken.

4.4.4. Summary of results, Natural World category:

The table below shows the distribution of credits as well as the level of achievement reached in each credit (figure 22)

JARI HYDROPOWER PLANT. BRAZIL			PT.	Performance	% Total	max	
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	0	No Score	0.0%	18
36			NW1.2 Preserve Wetlands and Surface Water	0	No Score	0.0%	18
37			NW1.3 Preserve Prime Farmland	12	Conserving	80.0%	15
38			NW1.4 Avoid Adverse Geology	5	Conserving	100.0%	5
39			NW1.5 Preserve Floodplain Functions	5	Enhanced	35.7%	14
40			NW1.6 Avoid Unsuitable Development on Steep Slopes	6	Conserving	100.0%	6
41			NW1.7 Preserve Greenfields	0	No Score	0.0%	23
42	L & W	NW2.1 Manage Stormwater	4	Enhanced	19.0%	21	
43		NW2.2 Reduce Pesticides and Fertilizer Impacts	0	No Score	0.0%	9	
44		NW2.3 Prevent Surface and Groundwater Contamination	4	Enhanced	22.2%	18	
45	BIODIVERSITY	NW3.1 Preserve Species Biodiversity	2	Improved	12.5%	16	
46		NW3.2 Control Invasive Species	5	Superior	45.5%	11	
47		NW3.3 Restore Disturbed Soils	8	Conserving	80.0%	10	
48		NW3.4 Maintain Wetland and Surface Water Functions	9	Superior	47.4%	19	
NW0.0 Innovate or Exceed Credit Requirements			0	N/S			
NW			60		29.6%	203	

Figure 22: Natural World category, credits distribution

Opportunities for improvement at this category can be found in the Sitting and Land and Water Subcategories. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 29.6%, or 60 points out of 203.

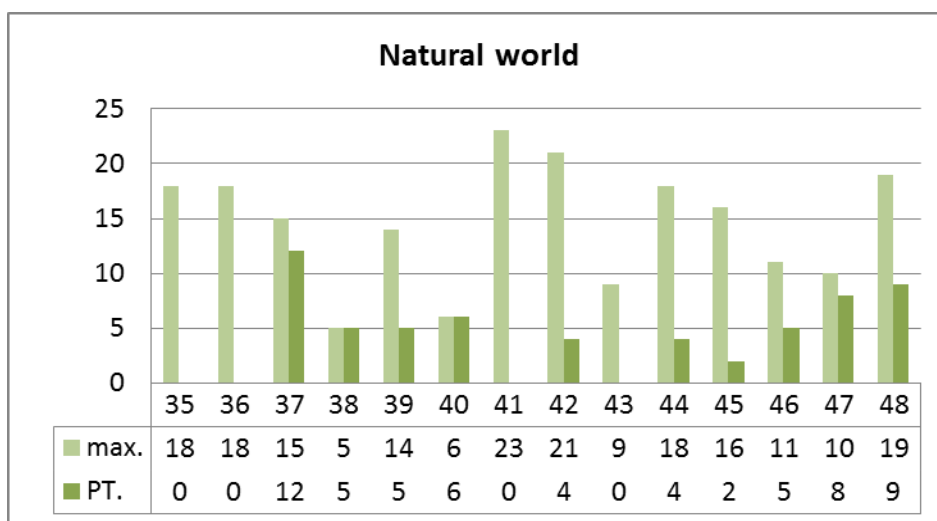


Figure 23: Natural World category, credits distribution

4.5. CLIMATE AND RISK

Envision’s Climate and Risk category is divided in two main sub-categories, emissions and resilience. The main goals of the category are to “minimize emissions that may contribute to increased short and long-term risks” and “to ensure infrastructure projects are resilient to short-term hazards or long-term altered future conditions.”¹¹⁸ The credits are distributed as: Emissions (CR.1.1, CR. 1.2) Resilience (CR.2.1, CR. 2.2, CR.2.3, CR. 2.4, CR. 2.5).

CREDIT SCORING

			IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
49	CLIMATE & RISK	EMISSIONS					
50		CR1.1 Reduce greenhouse gas emissions	4	7	13	18	25
51		CR1.2 Reduce air pollutant emissions	2	6		12	15
52	RESILIENCE	CR2.1 Assess climate threat				15	
53		CR2.2 Avoid traps and vulnerabilities	2	6	12	16	20
54		CR2.3 Prepare for long-term adaptability				16	20
54		CR2.4 Prepare for short-term hazards	3		10	17	21
55		CR2.5 Manage heat islands effects	1	2	4	6	
Maximum points possible:							116

Figure 24: Climate and Risk, credit distribution.

4.5.1. Emissions

At the **Emissions Subcategory**, Jari Hydroelectric Dam has achieved an outstanding performance. One credit was assessed as Conserving (CR 1.2 Reduce Air Pollutant Emissions) and one was qualified as Restorative (CR 1.1 Reduce greenhouse gas emissions).

There are negligible Greenhouse Gas emissions. According to documentation provided by the project developers, Jari Hydroelectric Dam is a net carbon negative endeavor. The project fulfills the requirements of the Clean Development Mechanism (CDM)¹¹⁹ under the Kyoto Protocol. Additionally, through the construction of Jari HD and the connection with the National Interconnected Systems, the region - especially the capital cities of Manaus and Macapá - will be able to reduce CO₂ emissions associated with isolated thermo-electric generating units that run on fossil fuels.

The report “Contribution of the CDM Project Santo Antônio do Jari Hydroelectric Dam towards Sustainable Development” states that Brazilian fossil fuel dependence will decrease with Jari Hydroelectric Dam and contribute to the global reduction of greenhouse gases emissions.¹²⁰ Overall reduction in emissions has been estimated at 352,648 tons of CO₂ equivalent per year, and a total of 2,468,535 tons of CO₂ equivalent over a period of 7 years.¹²¹

¹¹⁸ Envision Guidance Manual, p.150

¹¹⁹ MECANISMO DE DESENVOLVIMENTO LIMPO (CLEAN DEVELOPMENT MECHANISM) DOCUMENTO DE FORMULÁRIO DE PROJETO DE DESENHO (MDL-DCP) - Atividade de Projeto MDL UHE Santo Antônio do Jari.

¹²⁰ Anexo III da Resolução nº1 da CIMGC - Contribuição da Atividade de Projeto do MDL da UHE Santo Antônio do Jari para o desenvolvimento sustentável.

¹²¹ According to documents submitted, the following methodology and tools were deployed in the aforementioned assessment:

- Consolidated baseline methodology for grid-connected electricity generation from renewable sources (V. 12.3.0).
- Tool to calculate the emissions factor for an electricity system. (V. 2.2.1);
- Tool for the demonstration and assessment of interventions. (V. 6.0.0);
- Tool to calculate projected leakage of CO₂ emissions from fossil fuel combustion. (V. 02)
- Combined tool to identify the baseline scenario and demonstrate interventions.

Jari Hydroelectric Dam will also contribute significantly, both in local and regional scales to reduce air pollutants emissions. Since the emission of all criteria pollutants¹²² - with the exception of lead - is related with the consumption of gasoil, it is valid to conclude that the contribution of this Hydroelectric Dam will be highly relevant.

Currently the energy produced at the local level is generated on thermoelectric units that run on gasoil. For instance, the Report on Environmental Impacts (Relatório de Impacto Ambiental - RIMA)¹²³ states that all of the project's Area of Direct Influence electric energy is produced in generators that use gasoil with fuel provided by the Electric Company of Amapa.

4.5.2. Resilience

In the **Resilience Subcategory**, Jari HD has several opportunities for improvement. Four credits received a No Score evaluation (CR 2.1 Assess Climate Threat, CR 2.2 Avoid Traps and Vulnerabilities, CR 2.3 Prepare for Long Term Adaptability and CR 2.5 Manage Heat Island Effects), while only one was assessed as Conserving (CR 2.4 Prepare for Short Term Hazards).

In assessing climate threats, the project team has presented the Program for climatic and meteorological monitoring¹²⁴ as evidence that a network of climatic monitoring stations will be deployed to assess only if the Dam will affect micro-climatic conditions. There is no further evidence that a comprehensive climate impact assessment and adaptation plan has been developed.

At this moment, and after consulting the documents provided, such as the Program for Climatic and Meteorological Monitoring, no evidence has been found to support that efforts to avoid possible vulnerabilities related with climate change were part of the conceptual framework of the designers.¹²⁵

The documents provided by the project team, present no proof of initiatives regarding long-term adaptability *vis à vis* to the effects of climate change.

Jari Hydroelectric dam received a good evaluation in preparation for short-term hazards. Documentation presented by the project team states that the infrastructure has been designed considering once in 100-year hazards. The key design considerations considered are floods, rain and water flow in the Jari River.

There are any considerations to manage heat island effects mostly because the Jari Hydroelectric dam is located in an area almost entirely devoid of consolidated urban settlements, large areas of rooftops and pavement.

¹²² Criteria pollutants include: particulate matter, ground level ozone, carbón monoxide, sulfur oxides, nitrogen oxides, lead and noxious odors.

¹²³ Relatório de Impacto Ambiental (RIMA), page 34.

¹²⁴ Programa de Monitoramento Climato-Meteorológico - Projeto Básico Ambiental (PBA) - Page 2.

¹²⁵ Envision Manual, Page 158

4.5.3 Summary of results: Climate and Risk category.

The table below shows the distribution of credits as well as the level of achievement reached in each credit (figure 25)

JARI HYDROPOWER PLANT. BRAZIL		PT.	Performance	% Total	max.	
49	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	25	Restorative	100.0%	25
50		CR1.2 Reduce Air Pollutant Emissions	12	Conserving	80.0%	15
51	RESILIENCE	CR2.1 Assess Climate Threat	0	No Score	0.0%	15
52		CR2.2 Avoid Traps And Vulnerabilities	0	No Score	0.0%	20
53		CR2.3 Prepare For Long-Term Adaptability	0	No Score	0.0%	20
54		CR2.4 Prepare For Short-Term Hazards	17	Conserving	81.0%	21
55		CR2.5 Manage Heat Island Effects	0	No Score	0.0%	6
		CR0.0 Innovate Or Exceed Credit Requirements	0	N/A		
		CR	54		44.3%	122

Figure 25: Climate and Risk category – Summary of Results.

The biggest opportunities for improvement at this category can be found at the Resilience subcategory. Considering all credits and the maximum possible values for each indicator, the percentage of achievement adds to 44.3%, or 54 points out of 122.

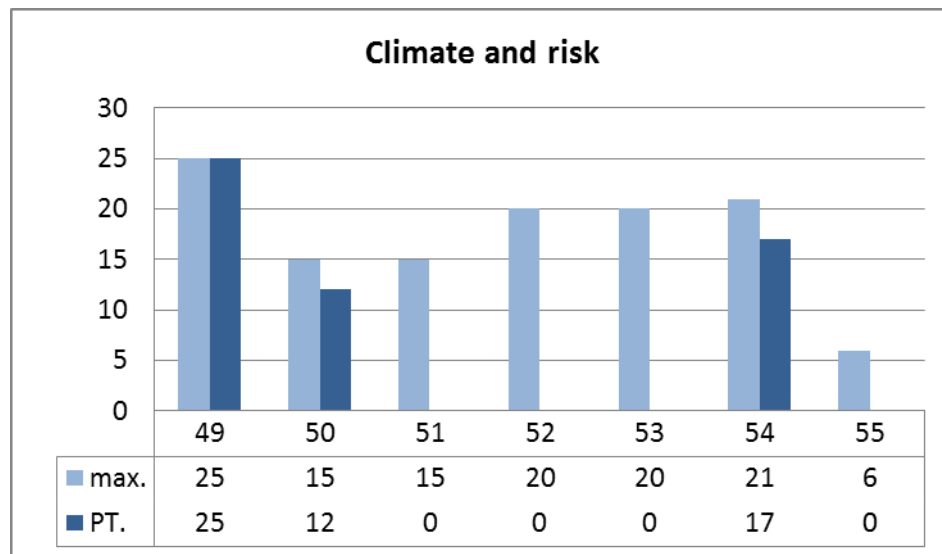


Figure 26: Climate and Risk category – Summary of Results.

5. RESULTS AND CONCLUSION

The project has obtained a total of 264 points, out of 809 possible. This represents a percentage of achievement of 32.6%. In the **Quality of Life category**, the project obtained 73 points out of 181 possible, equals to 40.3%. This is the 2nd best performance for the project considering the five categories of the *Envision* rating system. The **Leadership category**, achieved the 3rd best performance for this project, with 36 points out 121, equivalent to 29.8%.

The **Resource Allocation category** provides significant opportunities for improvement. **RA** obtained 41 points out of 182, achieving a performance of 22.5%. The **Natural World category** is the 4th best performance for this project, with 60 points out of 203 possible, equivalents to 29.6%. The last category **Climate and Risk** obtained 54 points out of 122, equals to the 44.3%. This is the best performance of the Jari Hydroelectric Dam project.

Jari Hydroelectric Dam, is located in the Amazon, one of the most important and delicate ecosystems of the world. Furthermore, the history of economic and infrastructural development in this region, on the last decades of the 20th century, is as fascinating as its natural features. Thus, the challenges faced by a project such as Jari Hydroelectric Dam are restricted with building a large infrastructural project in a place of high environmental value. The negative externalities of previous projects must also be dealt with.

The Report on Environmental Impacts (Relatório de Impacto Ambiental – RIMA) states that most cities within the project’s area of influence are irregular settlements-made of huts and pile-dwellings- located in the river’s left margins with precarious sanitary and health conditions that render the population vulnerable to diseases and natural hazards. Examples of these cities are Laranjal do Jarí (pop. 40,000) and Vitoria do Jari (pop. 11,000). Both cities have severe infrastructural needs for potable water, sewers, collection and disposal of waste. This need makes the strengthening of local governments and communities a priority for the Brazilian Environmental Institute (IBAMA) and for developers a like.

Aside from these social and environmental challenges, the discussion around Jari Hydroelectric project portrays an evolution in the way infrastructural projects are conceived and discussed. The first design for Jari was only a generator for an industrial process, the cellulose production. Then, it was re-conceived as an energy source on a regional level, aiming to attend the energetic needs of the Amapá State. In its present configuration, Jari Hydroelectric Dam is a project that will provide renewable energy to the Amazon Region, and to the entire Brazilian territory, through the National Interconnected System (Sistema Interligado Nacional – SIN). Jari Hydroelectric Dam will contribute to reduce carbon emissions and to increase the reliability of energy supply.

Improvements on the design allowed preserving valuable landscapes that are also environmentally relevant, as is the case of the Santo Antônio Falls. Moving the dam and the engine house upstream preserved this regional landmark. The design also allowed for reductions in the area of flooding, resulting in a lake of high energetic density, in other words a lake that produces a relevant quantity of watts per square meter of flooded area (W/m²).¹²⁶ By concentrating all permanent and temporal

¹²⁶ The energetic density for Jari project is 17.65 W/m², according to the EIA. As a reference, hydroelectric projects whit a density of less than 5 W/m² cannot apply as Clean Development Mechanisms. Hydroelectric projects with an energetic density

facilities on the right bank, the project could take benefit of an existing road network, thus avoiding the disruption of the left bank, where native forest can be found.

The process of obtaining environmental licenses in Brazil is long and thorough, and allows for democratic discussion with local governments and communities. Three licenses must be obtained from IBAMA: a Preliminary License (LP) that certifies the environmental feasibility of the project; an Installation License (LI) which authorizes the beginning of construction; and finally, an Operation License (LO) authorizing filling of the reservoir and the beginning of energy production.

Project developers have gone through that process, and IBAMA and other governmental institutions will monitor all obligations under the licenses on long-term basis. Thus, it must be highlighted that the project has achieved compliance with all legal requirements, and had exceed that threshold in several cases. One case is the agreement for the relocation all 34 families at the Vila de São Francisco do Iratupuru, even when only 13 families were actually affected by the flooding. This agreement was made with participation of the community and is signed by ECE participações and the Government of the State of Amapá.

However, and in spite of all these efforts, the question standing is whether an overall benefit effect is achieved, and whether the impacts of the development are properly mitigated or compensated. According to IBAMA, 1,706 hectares of native forest habitat will be suppressed to form the creation of the new lake. This will result in reduction of local biodiversity and the destruction of habitats. It is worth mentioning that compensation measures are properly established within the environmental licenses and in the program for the recovery of degraded areas (Programa de Recuperação de áreas degradadas - PRAD). A new environmental buffer zone of 100 meters (approximately 330 feet) will be established around the lake.

The project did not score in some of the credits. The project team is encouraged to carefully analyze credits that received 'No Score', as those topics can provide with opportunities for improvement at the levels of project design, construction, operation and decommissioning. Evaluation methodologies as Envision can bring awareness to topics that are many times not yet considered by communities, local authorities and developers.

Significant challenges lies ahead. As mentioned before, the negative externalities of previous cycles of development are an undeniable reality, and project developers should assess in which ways the project will contribute to local development on the long term.

Another set of challenges is related with the role of large infrastructural projects as *indirect inducers* of urban development. IBAMA and the project developers have explicitly recognized this. There are no simple answers for both sets of problems – the preexisting ones, and the ones that may arise as an indirect consequence of the project - but in a way, solutions for both of them are connected –at least in part - with supporting local communities and local governments. Only through this support will be possible to translate economic growth into sustainable development. In this context, the efforts developed by the project to help the cities of Vitoria do Jari, Laranjal do Jari, and Almerim in creating or

above 10 W/m² (such as Jari) are so efficient that only require a simplified process before obtaining carbon credits from the World Bank. (Estudo de Impacto Ambiental. Usina Hidrelétrica Santo Antônio do Jari, page 33).

updating regulatory plans are extremely important. This could be a relevant contribution to face problems connected to years of unplanned growth.

What is interesting in endeavors such as Jari, is that project developers have done more than what is their legal obligation and willingly have included dimensions that were not considered in infrastructural projects just a few decades back. This aspiration of raising standards while dealing with complex socio-environmental problems is perhaps, one of the keys for a more sustainable future. Based on all the documents presented it can be concluded that Jari Hydroelectric Dam will have a significant overall positive effect for the region, and for Brazil, provided that the efforts for long term monitoring and continuous performance improvement are sustained. This is of course, a goal that can only be achieved through concerted efforts of the project team, public officials and local communities.

The graphs below demonstrate the project's performance under the three Infrastructure 360^o Awards. The **People and Leadership Award** (figure 42) represents the QL and LD categories from the Envision™ Rating System. The project received a score of 109 points out of a total of 302 combined points within these categories, which equates to a 36.1% level of achievement. The **Climate and Environment Award** (figure 43) represents the RA, NW and CR categories within the Envision™ Rating System. The project received a score of 155 points out of a total of 507 combined points within these categories, which equates to a 30.5% level of achievement. Thus, the overall achievement of the Santo Antonio do Jari Hydroelectric Power Plant project under the **Infrastructure 360 Award** (figure 44) is 264 out of 809 points, or 32.6% of the total score.

This report evaluates the sustainability performance of the Santo Antonio do Jari Hydroelectric Power Plant project according to the Envision™ Rating System. The report identifies areas in which the project scored highly, as well as low-scoring areas that represent opportunities for which the project team can learn and improve on in future projects, as they strive to achieve sustainable project design and construction methodologies.

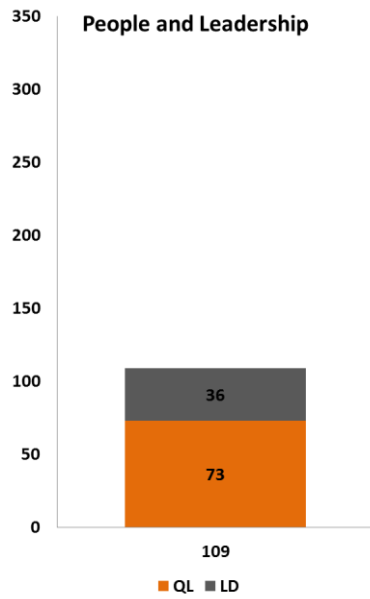


Figure 42: People and Leadership.
Score distribution

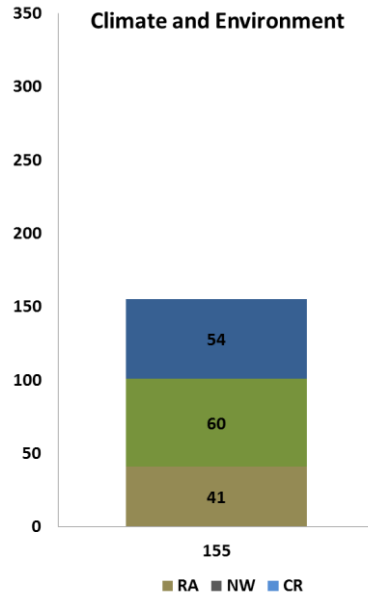


Figure 43: Climate and Environmental.
Score distribution

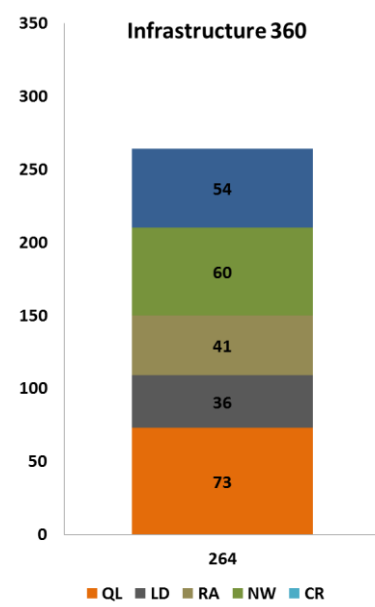


Figure 44: Infrastructure 360.
Score distribution



APPENDIX A: PROJECT PICTURES AND DRAWINGS

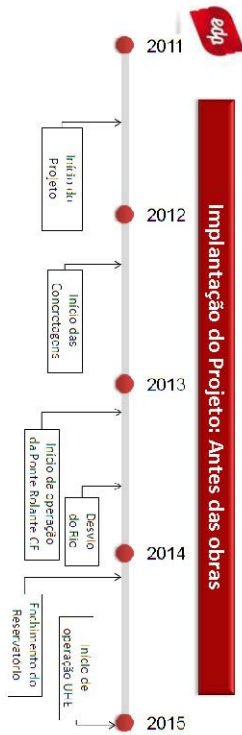
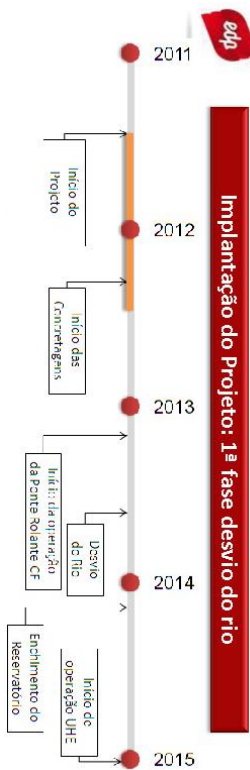


Figure 29: Jari HD – Construction Sequence.
Source: Aproveitamento Hidrelétrico Santo Antônio do Jari – Page 18.

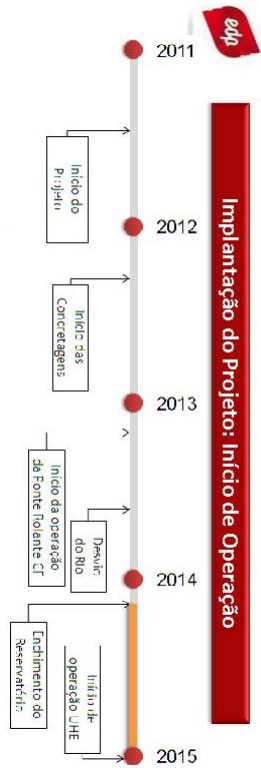


Ago-2011
↓
Ago-2012

Figure 30: Jari HD – Construction Sequence - 2.
Source: Aproveitamento Hidrelétrico Santo Antônio do Jari – Page 19.



Figure 31: Jari HD – Construction Sequence - 3.
Source: Aproveitamento Hidrelétrico Santo Antônio do Jari – Page 20.



Após
Fev-2014

Figure 32: Jari HD – Construction Sequence - 4.
Source: Aproveitamento Hidrelétrico Santo Antônio do Jari – Page 21.

APPENDIX B: ENVISION POINTS TABLE

CREDIT SCORING

			IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE	
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve community quality of life	2	5	10	20	25
2			QL1.2 Stimulate sustainable growth and development	1	2	5	13	16
3			QL1.3 Develop local skills and capabilities	1	2	5	12	15
4		COMMUNITY	QL2.1 Enhance public health and safety	2			16	
5			QL2.2 Minimize noise and vibration	1			8	11
6			QL2.3 Minimize light pollution	1	2	4	8	11
7			QL2.4 Improve community mobility and access	1	4	7	14	
8			QL2.5 Encourage alternative modes of transportation	1	3	6	12	15
9			QL2.6 Improve site accessibility, safety and wayfinding		3	6	12	15
10		WELLBEING	QL3.1 Preserve historic and cultural resources	1		7	13	16
11			QL3.2 Preserve views and local character	1	3	6	11	14
12			QL3.3 Enhance public space	1	3	6	11	13
							Maximum points possible:	181
13	LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	2	4	9	17	
14			LD1.2 Establish a sustainability management system	1	4	7	14	
15			LD1.3 Foster collaboration and teamwork	1	4	8	15	
16			LD1.4 Provide for stakeholder involvement	1	5	9	14	
17		MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	1	3	6	12	15
18			LD2.2 Improve infrastructure integration	1	3	7	13	16
19			LD3.1 Plan for long-term monitoring and maintenance	1	3		10	
20		PLANNING	LD3.2 Address conflicting regulations and policies	1	2	4	8	
21			LD3.3 Extend useful life	1	3	6	12	
							Maximum points possible:	121
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce net embodied energy	2	6	12	18	
23			RA1.2 Support sustainable procurement practices	2	3	6	9	
24			RA1.3 Use recycled materials	2	5	11	14	
25			RA1.4 Use regional materials	3	6	9	10	
26			RA1.5 Divert waste from landfills	3	6	8	11	
27			RA1.6 Reduce excavated materials taken off site	2	4	5	6	
28			RA1.7 Provide for deconstruction and recycling	1	4	8	12	
29		ENERGY	RA2.1 Reduce energy consumption	3	7	12	18	
30			RA2.2 Use renewable energy	4	6	13	16	20
31			RA2.3 Commission and monitor energy systems		3		11	
32			RA3.1 Protect fresh water availability	2	4	9	17	21
33			RA3.2 Reduce potable water consumption	4	9	13	17	21
34	WATER	RA3.3 Monitor water systems	1	3	6	11		
							Maximum points possible:	182
35	NATURAL WORLD	SITING	NW1.1 Preserve prime habitat			9	14	18
36			NW1.2 Protect wetlands and surface water	1	4	9	14	18
37			NW1.3 Preserve prime farmland			6	12	15
38			NW1.4 Avoid adverse geology	1	2	3	5	
39			NW1.5 Preserve floodplain functions	2	5	8	14	
40			NW1.6 Avoid unsuitable development on steep slopes	1		4	6	
41			NW1.7 Preserve greenfields	3	6	10	15	23
42		LAND & WATER	NW2.1 Manage stormwater		4	9	17	21
43			NW2.2 Reduce pesticide and fertilizer impacts	1	2	5	9	
44			NW2.3 Prevent surface and groundwater contamination	1	4	9	14	18
45		BIODIVERSITY	NW3.1 Preserve species biodiversity	2			13	16
46			NW3.2 Control invasive species			5	9	11
47			NW3.3 Restore disturbed soils				8	10
48			NW3.4 Maintain wetland and surface water functions	3	6	9	15	19
							Maximum points possible:	203
49	CLIMATE & RISK	EMISSIONS	CR1.1 Reduce greenhouse gas emissions	4	7	13	18	25
50			CR1.2 Reduce air pollutant emissions	2	6		12	15
51			CR2.1 Assess climate threat				15	
52		RESILIENCE	CR2.2 Avoid traps and vulnerabilities	2	6	12	16	20
53			CR2.3 Prepare for long-term adaptability				16	20
54			CR2.4 Prepare for short-term hazards	3		10	17	21
55			CR2.5 Manage heat islands effects	1	2	4	6	
							Maximum points possible:	116
								803

*The five innovation credits are bonus points and not included in total point tallies

APPENDIX C: CREDIT DETAILS

CATEGORY I, PEOPLE AND LEADERSHIP (PL)		
SUB CATEGORY: QUALITY OF LIFE		
	JARI HYDROPOWER PLANT. BRAZIL	RECOMMENDATIONS
PL1.1 Improve Community Quality of Life	<p>Superior</p> <p>Jari Hydropower Plant will result in several improvements in the quality of life of nearby communities. The last version of the project - currently under construction - has reduced negative impacts. For instance, the dam has been located upstream from the Santo Antônio do Jari Falls, thus preserving this regional natural heritage. According to documents provided by the developers of the project, only 94 families will be affected by flooding.</p> <p>Regarding the population that will be displaced by the construction of the Dam, the Basic Environmental Project (Projeto Básico Ambiental) states that: “The objective of the relocation is to transfer the affected population from the areas that will be directly affected by the construction of the Santo Antônio do Jari Hydropower Plant, minimizing the negative effects on the aforementioned population, giving to them conditions that are equal or - whenever possible - better than those in which they were before.(...)” A clear example of this is the Agreement signed by ECE and the State of Amapa, after extensive consultation with local governments and local inhabitants. In the referred agreement, ECE Participações (the holder of 90% of the shares in the consortium developing Jari HD) assumed the responsibility of relocating all 34 families at the Vila de São Francisco do Iratapuru, even when only 13 families were actually affected by the flooding.</p> <p>The construction of Jari HD will result in a reduction of CO2 emissions, since hydroelectric power will replace thermal generation based on fossil fuels.</p> <p><u>Sources:</u> - Aproveitamento Hidrelétrico Santo Antônio do Jari. - Os desafios da Gestão Ambiental. - Junho 2013. Page 11 - Projeto Basico Ambiental (PBA) - Chapter 6.5.6 - Programa de Indenização e Remanejamento da População. Page 5/52 - Termo de Convênio ECE x Estado do Amapá Título 4. Descrição. - Pages 6,7 e 9 Informativo 52 - Nova Vila Iratapuru.</p>	<p>The developers of the project have provided documents proving a clear commitment to improve the quality of life in communities directly affected by the project. A great next step would be to implement partnerships with local governments and develop actions of Corporate Social Responsibility in the cities of Laranjal do Jari (pop. 40,000) and in Vitoria do Jari (pop. 11,000). Both cities have severe infrastructural needs (potable water, sewers, collection and disposal of waste, etc.). Laranjal do Jari has been described as the world largest slum made of pile-dwellings.</p>
	10	

<p>PL1.2 Stimulate Sustainable Growth & Development</p>	<p>13</p>	<p>Conserving</p> <p>The project will stimulate sustainable growth in the region. The increase in available and reliable renewable energy will very likely improve economic conditions. Regarding this topic, the Report on Environmental Impacts (RIMA) states that: “The installation of the Power Plant will allow the reduction of costs and an increase in the reliability of the regional energy supply system, thus reducing local deficits and contributing to increase the quality of life of the population.”</p> <p>It is also relevant to highlight that a significant barrier for Sustainable Growth in the region is related to the severe infrastructural needs that are faced by important cities in the area, like Laranjal do Jari and Vitoria do Jari. On this topic, the aforementioned RIMA affirms that: “ The cities in the area of influence [of the project] are characterized by irregular settlements in the river margins, especially in the left bank. Those settlements are composed of huts and pile-dwellings, that constitute one of the biggest social and environmental challenges for the region. The precarity of the sanitary and health conditions results in populations that are vulnerable to diseases and also frail vis à vis floods, fires, etc.”</p> <p>In this context, the efforts developed by the project to help the cities of Vitoria do Jari, Laranjal do Jari, and Almerim in creating or updating regulatory plans are extremely important. This could be a relevant contribution to face problems connected to years of unplanned growth.</p> <p><u>Sources:</u> - Projeto Básico Ambiental (PBA) Capítulo 6.5.8 Programa de Apoio aos Municípios. Page 1/23 - Relatório de Impacto Ambiental (RIMA). Page 11, Page 33</p>	<p>In order to improve performance in this credit, the project team could identify existing community assets (infrastructure, recreational centers, etc) in need of restoration</p>
<p>PL1.3 Develop Local Skills and Capabilities</p>	<p>15</p>	<p>Restorative</p> <p>Prior to and throughout the construction phase, professional training will be offered in several areas determined according to the requirements of the project. Furthermore, training will also be offered in economic fields for which an expansion is expected as a result of the project. Such fields include the sector of commerce and services in the cities of Laranjal do Jari, Vitoria do Jari, and the District of Monte Dourado.</p> <p>The project established the goal of hiring up to 68% of the total number of workers in local communities. This goal is increased to 100% when positions for non-qualified workers are considered. In addition, a sub-program has been developed to support local businesses, in order to build capacities and turn them into providers of services and consumable goods for the project. Regarding this, the PBA states that: “This line of action aims to establish a policy of inclusion, with strategies oriented towards the companies of Almerim, Vitoria do Jari and Laranjal do Jari, so that they may become providers of services and goods. Different organizations of the productive sector, including cooperatives, associations or companies can qualify as Providers”</p>	

	<p><u>Sources:</u> - Programa de Capacitação de Mão de Obra Local dos Municípios - Plano Básico Ambiental (PBA) Capítulo: Capítulo Qualificação da Mão de Obra. Página: 7/16 - Fomento à Contratação de Fornecedores Locais. Página:10/16. - Informativo 52 - Programa Jovem Aprendiz.</p>	
<p>PL2.1 Enhance Public Health And Safety</p>	<p>0</p> <p>No Score</p> <p>The project team has assessed the specific risks and exposures created by the construction of the Jari Hydroelectric Dam. In regards to this, the Basic Environmental Project (Projeto Básico Ambiental - PBA) states that: Hydroelectric projects have great relevance for social and economic development (...). Hydroelectric energy represents a good alternative when compared to other energy sources. At the same time, these projects generate impacts on the health and quality of life of people (...) Jari Hydroelectric Dam will produce impacts on health – common to all hydroelectric dams – but beyond that, it is located on the region of Amazônia Legal, which has specific characteristics regarding ecology, economy, culture and health services. Thus, the initiative is especially vulnerable to such impacts.”</p> <p>Brazilian researchers have assessed the greatest public health issues most commonly associated with projects such as Jari. On this, the aforementioned PBA asserts that: “main health problems related to this type of project [include] the increase of communicable diseases, especially vector-borne diseases (...), water-spread diseases (...), and sexually transmitted diseases. (...).”</p> <p>To face such complex challenges, the Health program was divided into four subprograms: a) Subprogram for population health, b) Subprogram to control vector-borne diseases, c) Subprogram of epidemiological surveillance, and d) Subprogram of health education. Aspects related with occupational health and safety are contemplated in the Programa Ambiental para Construção – PAC (Construction Environmental Program). Chapter 6.2.3 - Subprogram PAC6, which is also part of the PBA. Furthermore, project developers have committed themselves to strengthen local health facilities, through partnerships with local governments.</p> <p>However, after analyzing all documents presented there is no evidence that this project includes new materials, technologies or methodologies that may result in health and safety issues. For this reason the project is non achieving under this credit.</p> <p><u>Sources:</u> - Programa de Saúde - Plano Básico Ambiental (PBA). Page 1/38, 2/38 - Programa Ambiental para Construção - Plano Básico Ambiental (PBA). Chapter 6.2.3. – Subprograma PAC6. - Parceria ECE Participações e Município de Laranjal do Jari – Reforço assistência à saúde. - Convênio ECE Participações – IEPA. Controle de Vetores. Source</p>	

PL2.2 Minimize Noise And Vibration	0	No Score	Develop an assessment of noise and vibration levels produced by the project during operation phase (in strict sense, a baseline study is not possible at this point since the project is already in construction phase). Explore possible mitigation measures of noises produced by operation phase, if applicable.
		A project such as this tends to have the greatest impact in terms of noise and vibration during the construction phase, while the operation phase tends not to cause major impacts. The developers of the hydroelectric dam have stated that baseline studies for existing levels of noise and vibration were not performed. They have also stated that future levels of noise, based on the project, were not predicted.	
		<u>Sources:</u> - EDP Relatório de Evidências, Page 6. - Envision Manual. Page:40	
PL2.3 Minimize Light Pollution	0	No Score	The project team could develop a holistic assessment of lighting needs for the project. The team could also submit documents or evidence regarding efforts to reduce light pollution. Considering the specificities of the project location, in the Amazon region, these efforts could be a very positive contribution.
		The developers of Jari have stated that “the project contemplates the use of equipment with “A” energy seals (...), as well as fluorescent lamps which are economic and efficient, both at its facilities and at the construction company accommodations”. However, no documentary proof of this has been provided to date. Furthermore, none of the documentation provided states that the project team has conducted an overall assessment of lighting needs for the project, or that appropriate measures were considered to prevent light spillover and glare.	
		<u>Sources:</u> - EDP Relatório de Evidências, Page 7, 8 - Envision Manual. Page:42	
PL2.4 Improve Community Mobility And Access	4	Enhanced	Project team should consider expanding levels of input sought from operators of adjacent facilities, amenities and transportation hubs.
		The project was designed in consideration of mobility and access. The relocation of the engine house on the right bank of the Jari River was based on both logistic and environmental considerations, and allowed use of the existing network of roads previously developed by the Cellulose industry, thus increasing overall efficiency and reducing - if not urban sprawl - the need to cut down new areas of forest. That same network of existing roads provides access to important transportation hubs in the region, such as the port of Mungubá and the Airport at Monte Dourado.	
		<u>Sources:</u> - Aproveitamento Hidrelétrico Santo Antônio do Jari Os desafios da Gestão Ambiental. - Junho 2013. Page 9 - Estudo de Impacto Ambiental (EIA). Capítulo 2: Introdução e histórico. Page 2/11. - Envision Manual - Page 44	
PL2.5 Encourage Alternative Modes of Transportation	1	Improved	Foster initiatives to encourage the use of public or collective transportation systems for long distance displacements. Encourage the use of non-motorized transportation systems were feasible (for
		The project has developed a multi-modal system of collective transport, by bus and boat, for the exclusive use of workers. The distances involved in the project (40 kilometers from the nearest urban area to the construction site) make the option for non-motorized transport and pedestrian access unfeasible.	

		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - EDP Relatório de Evidências, Pages 9 and 10. - Barco de Transporte Rápido. Picture provided by EDP. - Envision Manual. Page:46 	<p>instance bicycles for workers acting on urban areas). Encourage alternatives modes of transportation in the planning process related to the cities in the area of influence of the project. (See Credit QL 1.2).</p>
<p>PL2.6 Improve Site Accessibility, Safety & Wayfinding</p>	<p>6</p>	<p>Superior</p> <p>Site accessibility and wayfinding have been improved through proper signage and educational efforts regarding how to drive safely on dirt roads. Efforts to improve security have been developed and include the construction of a new police station in the New Vila Iratapuru. Pictures of road signage were presented as evidence by the developers, along with a copy of Informativo Number 31, containing information and images regarding educational activities on the topic of driving safely in dirt roads. Informativo is a flyer oriented to employees and communities.</p>	<p>In order to increase performance, the project team could provide evidence /or develop plans, showing effective design for emergency situations. The objective is to improve the ability of emergency personnel to access the facility and find their way in the event of an emergency.</p>
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Information on actions of Corporate Social Responsibility. - Available at EDP's website: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/meio-ambiente/responsabilidade_social/Paginas/default.aspx - Imagem - Vias de Acesso as comunidades sinalizadas. - Picture provided by EDP. - Imagem de sinalização - Picture provided by EDP. - Informativo 31 - Blitz Educativa. - Informativo Online - Novembro 2012 - Envision Manual - Page 48. 	
<p>PL3.1 Preserve Historic And Cultural Resources</p>	<p>7</p>	<p>Superior</p> <p>A specific program for the preservation of archaeological heritage was developed in the context of this project. The program aims to: "perform in depth studies about areas affected by the construction of the Santo Antônio do Jari Hydroelectric Dam, in the states of Amapá and Pará (...) [and] identify and locate other areas relevant in terms of archaeological heritage, that may be affected by engineering works related to the project." Thus, the project team developed the Programa de Prospecção, Restage e Monitoramento Arqueológico (Program for Archaeological Prospection, Rescue and Monitoring), chapter 6.5.13 of the PBA.</p>	<p>The project team could assess the feasibility of rehabilitation efforts in the sites that were found, following IPHAN guidelines</p>
		<p>Through preventive archaeological studies, developed in the context of the project 14 sites were found. In compliance with requirements established by the Brazilian Institute for the Environment (Instituto Brasileiro do Meio Ambiente - IBAMA) the archeological studies were coordinated with the Institute for the National Historic and Artistic Heritage (Instituto do Patrimonio Histórico e artístico Nacional - IPHAN).</p> <p>A Program for Heritage Education for Material and Intangible Culture (Programa de educação patrimonial para a cultura material e imaterial intangível) was also developed complying with requirements established by IBAMA, and under the supervision of IPHAN. This program included the explicit objective of "Stimulating participation of local community members in the knowledge and dissemination of its cultural heritage".</p>	

		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Programa de Prospecção, Resgate e Monitoramento Arqueológico - Projeto Básico Ambiental (PBA). Chapter 6.5.13 - Page 1/24. - Envision Manual - Page 50. - Programa de educação patrimonial para a cultura material e imaterial intangível - Page 6. 	
<p>PL3.2 Preserve Views And Local Character</p>	<p>11</p>	<p>Conserving</p> <p>A number of significant efforts have been deployed by the developers regarding project siting. Such efforts were undertaken both during design and construction phases, thus preserving landscapes of great scenic value. This is the case of the Santo Antônio falls, a regional natural heritage area which has been preserved by changes in the project. The preservation was achieved by means of transferring the dam upstream from the falls. Also, all temporary and permanent constructions have been concentrated on the right bank of the river – which was previously affected by anthropic activity - thus, avoiding disruption of the left bank. The height of the dam was also designed considering preservation of the flow necessary for the waterfall. It is important to highlight that previous versions of the project did not consider the preservation of views.</p> <p>Furthermore, the project developed a Program of Documentation and Preservation of the Landscape Heritage and Natural Heritage. (Chapter 6.5.15 of the PBA). The aforementioned program aims to: “(...) Stimulate the participation of local community members in the knowledge and dissemination [of awareness] regarding their natural heritage and landscape heritage (...) [and] Promote the documentation and preservation of the local natural heritage and landscape heritage (...)”</p>	<p>The project team could foster a program for monitoring and enforce the preservation of the Santo Antônio falls, in coordination with local authorities and IBAMA.</p>
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Programa de Documentação e Preservação do Patrimônio Natural e Paisagístico. – Projeto Básico Ambiental (PBA), Chapter 6.5.15. – Pages 3/11 and 4/11. - Envision Manual. Page:52 	
<p>PL3.3 Enhance Public Space</p>	<p>6</p>	<p>Superior</p> <p>Urban public spaces, such as the new Vila Iratapuru project - which will include a soccer field, a roofed sports center and a square, will be created as a result of the project. However, probably the most significant action regarding public space is the preservation of the Santo Antônio Falls due to the relocation of the dam. As a result of this sensitive design decision, a highly relevant natural heritage area was protected and can continue to be enjoyed by the community.</p>	<p>Restoration efforts of existing plazas, parks, recreational areas or wildlife refuges, could also be considered by the project team.</p>
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Information on actions of Corporate Social Responsibility. - Available at EDP’s website: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/meio-ambiente/responsabilidade_social/Paginas/default.aspx - Envision Manual - Page 54. 	
<p>PL0.0 Innovate Or Exceed Credit Requirements</p>	<p>0</p>	<p>N/S</p>	
	<p>73</p>		

SUB CATEGORY: LEADERSHIP			
	JARI HYDROPOWER PLANT. BRAZIL	RECOMMENDATIONS	
LD1.1 Provide Effective Leadership And Commitment	9	<p>Superior</p> <p>At EDP, the project’s major shareholding company, the responsibility of defining strategies for innovation and sustainability is assumed by the Senior Management. To guide the operations of the company, EDP has developed a number of specific policies including the following: 1) Ethics Code, 2) Sustainability Policy, 3) Commitment to Stakeholders, 4) Integrated Policy for the Environment, Health and Safety, 5) Policy to fight corruption and bribery, 6) Policy for external social investment, 7) Biodiversity policy, and 8) Policy for the valorization of diversity.</p> <p>Regarding the environment, the Ethics Code states that: “EDP develops its activities on the energy sector, respecting the environment, the communities where it acts, and complying with environmental legislation.” Furthermore, the company’s Vision and Mission state clear commitments to the environment. The vision of EDP is to “Be recognized as a company of excellence in the field of energy generation, by the technology used, the valorization of the team members and the respect to the communities around the reservoir.” EDP’s mission statement expresses that the company aspires to “Create electric energy with quality, social and environmental responsibility, thus contributing to the sustainable development of the Country and the Region”</p> <p><u>Sources:</u> - Relatório Anual de Sustentabilidade EDPBR 2012 - Capítulo Modelo de Negócio - Subcapítulo: Valores. - Página: 31 - EDP - Código de ética. Available at: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/empresa/codigo-de-etica/Paginas/default.aspx#5 - EDP - Mission and Vision. Available at: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/empresa/visao-missao-e-valores/Paginas/default.aspx</p>	<p>The commitment of the organization towards the environment is clear and consistent. In order to improve in this specific credit, the project team could consider providing more specific evidence of performance vis à vis the goals that have been assumed</p>

<p>LD1.2 Establish A Sustainability Management System</p>	<p>7</p>	<p>Superior</p>	<p>Provide documents describing strategies of environmental management for operation phase.</p>
		<p>On a broad organizational level, EDP, the majority shareholder of Jari Hydroelectric Dam, has been committed since 2008 to foster a Corporate Environmental Management System for all its operations. EDP has received an ISO 14001 certification issued by the Lloyd's Register Quality Assurance. On its website the company states that: "This certification frames and strengthens publicly-assumed commitments regarding the integration of environmental aspects in the processes of planning and decision making, at all levels of the value chain. Special care will be given to the evaluation of negative impacts that may arise as a consequence of the activities of the company, as well as the evaluation of options to avoid or minimize such impacts. The certification also promotes continuous improvement and the goal of keeping and extending the process of environmental certification of its facilities and activities, through ISO 140001:2004 and the Community system for eco-management and environmental Audit (EMAS)."</p> <p>Information found at EDP's website states that by 2012, 81% of the installed generating capacity and 4 hydroelectric dams were certified.</p> <p>Focusing specifically on the Jari Hydroelectric Project, a robust system of sustainability management is in place for construction phase. The Environmental Construction Plan (Plano Ambiental para Construção - PAC) states that: The developer and the constructing consortium are responsible for preventing, minimizing and mitigating damage to the physical, biotic, and socio-economic aspects of the environment, during the construction phase. (...) The PAC is composed of 6 subprograms, including the Subprogram for the environmental control of constructive actions (Subprograma de Controle Ambiental de Ações Construtivas) which "(...) establishes the principles that must be followed by the contractors during the construction process(...) selecting constructive methods that aspire to minimize impacts on the environment and improve the quality of life of its employees and involved communities" .</p>	
<p><u>Sources:</u> - Plano Ambiental Para Construção (PAC) - Subprograma de Controle Ambiental de Ações Construtivas PAC1 Documento: Plano Básico Ambiental Documento Completo. - Information about EDP's Environmental Management System available at: http://www.edp.pt/pt/sustentabilidade/ambiente/gestaoambiental/Pages/Certificacao_Ambiental.aspxSource</p>			

<p>LD1.3 Foster Collaboration And Teamwork</p>	<p>4</p>	<p>Enhanced</p> <p>Documentation provided by the developers proves that the project has been done following a systemic conception. Jari Hydroelectric Dam has been designed with careful consideration of the natural and infrastructural systems into which it is inserted and with which it is integrated. Responsibilities regarding sustainability are clearly stated for the construction phase, but at this point - and based on the evidence presented - cooperation among working teams seems to be on a basic level. Team meetings are documented through minutes that define goals and deadlines. Furthermore, a commitment to develop a collaborative environment with local governments and surrounding communities has been clearly stated in several of the company's Corporate Social Responsibility actions.</p> <p><u>Sources:</u></p> <p>- Subprograma de Controle Ambiental de Ações Construtivas PAC1 Documento: Plano Básico Ambiental - Page 2/3 - Information on actions of Corporate Social Responsibility. - Available at EDP's website: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/meio-ambiente/responsabilidade_social/Paginas/default.aspx - ATA de Reuniões Mensais de Equipe Documento Completo.</p>	<p>To improve performance in this credit, the project owner and the project team should document efforts, working together as a team to achieve high levels of sustainable performance.</p>
<p>LD1.4 Provide For Stakeholder Involvement</p>	<p>5</p>	<p>Enhanced</p> <p>Permanent channels of communication with community members, local governments and relevant stakeholders are established. Several subprograms of the Basic Environmental Project rely heavily on the involvement of the community (development of local skills, health and safety, awareness of cultural and environmental heritage, etc.)</p> <p>A contact center was inaugurated in December 2011 in the city of Laranjal do Jari. A toll free line that answers questions regarding the project is also available. ONBrasil Magazine (published by EDP) states that: "Between August and May, the Center received over 700 calls. Most of these calls referred to the training courses linked to job opportunities. Beyond that, the dialogue with the community takes place through meetings and personal interviews, flyers with info about the project and even a radio show transmitted in local stations. Thus a transparent and open relationship with the community is established".</p> <p><u>Sources:</u></p> <p>- Revista EDP jun jul 2012 Documento: EDP Na Floresta Amazônica Documento: Mais perto da comunidade. Página: 8 - Envision Manual, Page 68.</p>	<p>Project leaders should pay special attention to foster community involvement in the planning processes that will take place in the cities of Vitoria do Jari, Laranjal do Jari, and Almerim for the creation or update of regulatory plans, as a way to democratically discuss a more sustainable future for the region (see credit QL 1.2)</p>

<p>LD2.1 Pursue By-Product Synergy Opportunities</p>	<p>No Score</p> <p>Consistent efforts have been made by project leaders to reduce waste and foster recycling, thus increasing efficiency and sustainability. There are two programs related to waste: the Program for the Recovery of Degraded Areas (Programa para a Recuperação de Áreas Degradadas - PRAD) and the Environmental Construction Plan (Plano Ambiental para Construção). Environmental education initiatives involving workers and communities also contribute to the reduction of waste. However, at this point, we have not found any documents regarding the use of unwanted by-products or discarded materials and resources from nearby operations.</p> <p><u>Sources:</u> - <i>Imagem - Coleta seletiva de resíduos sólidos Documento: Imagem da área de coleta seletiva de resíduos sólidos.</i> - <i>Subprograma de Controle da Poluição durante as Obras (PAC 3) Documento completo.</i> - <i>Projeto Básico Ambiental PBA.</i> - <i>Programa de Recuperação de Áreas Degradadas (PRAD) - Chapter 6.3.7 Projeto Básico Ambiental PBA., page 3/30</i></p>	<p>Assess the possibility of use discarded materials from the main nearby operations, such as the Munguba Port, Jari Celulose or CADAM. A possible collaboration with Jari Celulose would be especially relevant, considering that ORSA group (owner of Jari Celulose) is a minority shareholder in Jari Hydroelectric Dam.</p>
<p>LD2.2 Improve Infrastructure Integration</p>	<p>Superior</p> <p>The project team has developed actions to improve social and urban amenities in nearby communities. However, it is clear that the biggest contribution of the project to the regional and national infrastructural integration, is the connection of Jari Hydroelectric Dam with the National Interconnected System (Sistema Interligado Nacional - SIN). Connectivity to the national network will be achieved via a 20 km long, 230 KV High Tension Line (HTL) that is included in the Jari project. This 230 KV HTL will connect Jari Hydroelectric dam with the Laranjal do Jari Substation, and with the High tension Lines of the System Tucuruí-Macapá-Manaus. This will allow for the creation of synergies at regional and national levels.</p> <p><u>Sources:</u> - <i>Parceria ECE e o Município de Laranjal do Jari Documento: Reforço Financeiro as Ações de Saude do Município de Laranjal do Jari. Capítulo: Descrição Páginas: 3 Capítulo Identificação do Objeto. Páginas: 3</i> - <i>Termo de Convênio ECE e Secretária Estado da Justiça e Segurança Pública Amapá.</i> - <i>Mapa da Construção da Estrada Documento: Construção de uma estrada com o Estado/Município.</i> - <i>Convênio ECE com o Município de Laranjal do Jari – Educação Documento. Termo de Convênio ECE com o Município de Laranjal do Jari. Capítulo Melhoria da Infraestrutura Educacional do Município de Laranjal do Jari.</i> - <i>Projeto Básico Ambiental - Chapter1 - Descrição da Evolução do Projeto Básico, Page 3</i></p>	<p>Project leaders could assess the possibility of new infrastructural integration initiatives, in the local or regional level. These integration projects could be fostered in partnership with key stakeholders from the private or public sectors such as the port of Munguba, CADAM, Jari Celulose, the State governments of Amapá or Para, Municipal Governments in the area, etc.</p>

<p>LD3.1 Plan For Long-Term Monitoring & Maintenance</p>	<p>1</p>	<p>Improved</p> <p>As a way to show their commitment to long-term maintenance, project developers have provided an addendum of the concession contract signed in December 2008. The aforementioned addendum extends the concession until the year 2037; however, research into more recent publications reveals that the concession has been extended until the year 2044 (see link to the electronic magazine Valor Economico 2011). Project developers have also presented a document - dated April 2013 - showing that an internal recruitment process to organize an O&M (operation and maintenance) team have started.</p> <p>Furthermore, the project team has presented a number of plans regarding long-term monitoring of several aspects such as sediments, fauna, weather conditions, river flow conditions, etc. However, at this point, all of these plans seem to be in the process of deployment.</p> <p><u>Sources:</u></p> <ul style="list-style-type: none"> - <i>Contrato de Concessão - Primeiro Aditivo Documento. Contrato de Concessão Capítulo: Cláusula Segunda - Prazo da Concessão e do contrato Subcapítulo: Subcláusula Primeira Páginas 3 Paragr 1 - O&M Jari Documento: Recrutamento interno: EDP forma 1ª equipe de O&M em Jari (Operação e Manutenção).</i> - http://www.valor.com.br/brasil/1120194/ministerio-prorroga-concessao-da-usina-santo-antonio-de-jari-ate-2044 - <i>Programa de Monitoramento Climato - Meteorologico. - Projeto Básico Ambiental (PBA)</i> - <i>Programa de Monitoramento de Fauna Terrestre, aquática y semiacuática - Projeto Básico Ambiental (PBA).</i> 	<p>The project owner needs to provide sufficient resources and personnel to implement a long term monitoring plan. In order to do so, persons or organizations must be designated and this seems to be a process currently being implemented. Beyond the designation, it is also important to explain how funding will be allocated and maintained at sufficient levels to fund the necessary monitoring and maintenance.</p>
<p>LD3.2 Address Conflicting Regulations & Policies</p>	<p>2</p>	<p>Enhanced</p> <p>It is important to note that the process of obtaining an environmental license in Brazil is complex and extensive. Three licenses issued by IBAMA (Instituto Brasileiro do Meio Ambiente, or Brazilian Institute for the Environment) are required for a project such as Jari: a Preliminary License (Licença Previa - LP) that certifies the environmental feasibility of the project; an Installation License (Licença de Instalação - LI) which authorizes the beginning of construction; and finally, an Operation License (Licença de Operação - LO) authorizing filling of the reservoir and the beginning of energy production.</p> <p>In the case of Jari Hydroelectric Dam, project developers have identified all applicable regulations. Furthermore, several meeting minutes and documents presented state that project developers have assessed potential conflicts, working closely with regulating organizations, specifically the aforementioned IBAMA and IPHAN (Instituto do Patrimônio Histórico e Artístico Nacional, or Institute for the National Historic and Artistic Heritage).</p> <p>One clear example of policies that may have unintentionally created barriers to sustainability is documented. IBAMA requested an assessment of the need to implement a fish ladder to allow navigation of the dam. The construction of fish ladders is a normal policy in the case of hydroelectric dams. A study developed by the University of São Paulo (USP) proved that in this specific case, the implementation of such a device could have generated a negative impact on the environment considering that fish in the Jari river are naturally separated by the barrier of the Santo Antonio Falls, in two different ecosystems. Thanks to the</p>	<p>Keep fluid communication with regulating authorities in the following stages of the project (finishing construction phase, throughout the process of obtaining the Operation License, and during operation phase), in order to carefully assess when regulation and policies may unintentionally create barriers to sustainability.</p>

		<p>dialog with the regulating organization and the contribution of academic institutions, project developers could overcome this potential conflict.</p> <p><u>Sources:</u></p> <p>- <i>Aproveitamento Hidrelétrico Santo Antônio do Jari Os desafios da Gestão Ambiental</i>. - Junho 2013. Page 24. - <i>Parecer Técnico do Professor Dr. Flávio Bockmann - Universidade de São Paulo - Departamento de Biologia - Laboratorio de Ictiologia - Setor de Zoologia dos Vertebrados</i>. - Page 1 to 5. - <i>Envision Manual</i> - Page 76</p>	
LD3.3 Extend Useful Life	1	<p>Improved</p> <p>As a way to show their commitment to the extension of the useful life of the Dam, project developers have provided an addendum to the concession contract signed in December 2008. This addendum extends the concession until the year 2037; research into more recent publications reveals that the concession has been extended until the year 2044 (see link to the electronic magazine Valor Economico 2011). However, at this point no specific documents or evidence regarding consistent efforts to improve flexibility or resilience of the dam have been found. These aspects seem to have had minimal consideration.</p> <p><u>Sources:</u></p> <p>- <i>Contrato de Concessão - Primeiro Aditivo Documento. Contrato de Concessão Capítulo: Cláusula Segunda - Prazo da Concessão e do contrato Subcapítulo: Subcláusula Primera Páginas 3 Para 1</i> - http://www.valor.com.br/brasil/1120194/ministerio-prorroga-concessao-da-usina-santo-antonio-de-jari-ate-2044 - <i>Envision Manual</i> - Page 76.</p>	<p>Project developers could foster feasibility studies in order to identify key areas where increasing investment in extending useful life will offer a reasonable payback.</p>
LD0.0 Innovate Or Exceed Credit Requirements	0	N/S	
	36		

CATEGORY II: CLIMATE AND ENVIRONMENT (CE)			
RESOURCE ALLOCATION			
	JARI HYDROPOWER PLANT. BRAZIL	RECOMMENDATIONS	
RA1.1 Reduce Net Embodied Energy	0	<p>No Score</p> <p>Based on answers provided by the project developers, no evidence could be found that efforts to reduce net embodied energy of project materials were carried out.</p> <p><u>Sources:</u> - Envision Manual, Page 86. - EDP - Relatório de Evidências CE. - Page 1</p>	<p>An estimate of the net embodied energy of project materials is required, carried out by means of a life cycle assessment (LCA). Considering that the project is in the advanced construction phase, project developers should give special consideration to the assessment of embodied energy in replacement parts. An infrastructural project like a hydroelectric dam has a relatively long lifespan, and improvements in the selection of replacement parts/ materials may result in relevant energy savings.</p>
		<p>Superior</p> <p>The purchase of all materials and equipment must follow the guidelines of the Corporate Normative System (Sistema Corporativo Normativo). A specific procedure is in place to qualify and evaluate service suppliers (PR.SU.05.00.0002 Qualificação e avaliação de fornecedores de serviço), and a second procedure is in place to qualify and evaluate material suppliers (PR.SU.05.00.0001 Qualificação e avaliação de fornecedores de materiais). The stated objective of the aforementioned procedures is to: “Establish procedures to verify and qualify, register, and hire suppliers committed with the values and principles of the group regarding health and safety, the environment and social responsibility, capable of providing [services and materials] of the demanded quality, for a fair price, through a partnership and healthy commercial relationship in the long term”</p> <p>According to information found in the press, EDP subcontracted Alstom for “Engineering services, supply of electric equipments and the construction of the Hydroelectric Dam” . Alstom has had a sustainable sourcing policy in place since 2007 and has developed a thorough assessment of suppliers that utilizes documented evaluations and on-site audits. Based on information provided and found, it appears that the project team has implemented a strong set of supplier evaluation practices.</p>	
RA1.2 Support Sustainable Procurement Practices	6		

		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Sistema Normativo Corporativo Documento: Sistema Normativo Corporativo Capítulo: Definições Página:5 - G1.globo.com: Alstom ganha contrato para construção de hidrelétrica no Brasil. http://g1.globo.com/economia/noticia/2011/09/alstom-ganha-contrato-para-construcao-de-hidreletrica-no-brasil.html - Alstom Sustainable Sourcing Policy available at: http://www.alstom.com/Sustainability/A-sustainable-sourcing-policy/ - Assessment of Alstom’s suppliers http://www.alstom.com/Sustainability/A-sustainable-sourcing-policy/The-assessment-of-Alstoms-suppliers/ 	
RA1.3 Used Recycled Materials	2	<p>Improved</p> <p>According to statements made by the project team, around 5% of the project materials are recycled or reclaimed, but no specific data supporting this claim has been provided to date. It is worth noting that a subprogram for pollution control during construction is in place (PAC 3 - Subprograma de controle da poluição durante as obras). This subprogram sets management guidelines for all categories of residues, including categories A (construction and demolition waste) and B (recyclable waste).</p>	To support its claim, and eventually improve performance, the project team should provide design documents showing the source location and weight or volume of reused structures or materials. In determining weight or volume, the project teams may refer to standard equivalents.
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, Page 90. - Sub Programa de Controle de Poluição durante as obras. - PAC 3- Pages 4/28 and 5/28. - EDP Relatório de Evidências CE - Page 3 	
RA1.4 Use Regional Materials	3	<p>Improved</p> <p>According to statements by the project team, around 10% of the materials used on the project are locally sourced. The Optimized Basic project (Projeto Básico Otimizado) describes that three main materials will be locally sourced: rocks, sands and clay. The aforementioned document states that: “Rocks will be mainly obtained from excavations that must be made for the construction of the powerhouse. The volume to be excavated is enough for the production of concrete and protection rockfill (...) There is clay on the right bank, estimated on 1,200,000 m3 and the volume estimated on the left bank is 1,800,000 m3. These volumes are far superior to the requirements of the project (...), the deposit of sand located on the bed of the Jari River, next to Vila da Padaria (...) was assessed (...) and its volume is many times superior to what is required by the project: 170,000 m3”.</p>	The following parameters can be considered to assess what is locally sourced: - soils and mulches: 80 km - aggregates, sand: 80 km - concrete: 160 km - plants: 400 km - and other materials: 800 km.
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, page 92. - EDP Relatório de Evidências CE - Page 4. - Projeto Básico Otimizado Capítulo: Áreas de Empréstimo, Botas-foras e Outras Fontes de Materiais para Construção Página: 10 	

RA1.5 Divert Waste From Landfills	3	<p>Improved</p> <p>A specific subprogram regarding pollution control is in place (Subprograma de Controle da Poluição durante as Obras - PAC3), which establishes procedures for minimizing waste, appropriate classification and destination of residues, recycling, etc. According to the project team, approximately 25% of all waste generated was recycled or reused.</p>	Provide more accurate data and evidence regarding percentages of total waste reduction, and percentage of materials diverted to recycling or reuse. Calculations may be done by weight or volume but must remain consistent.
		<p><u>Sources:</u> Envision Manual, page 94. EDP Relatório de Evidências CE - Page 5. Plano Básico Ambiental - PBA - Subprograma de Controle da Poluição durante as Obras - PAC 3, Page 2.</p>	
RA1.6 Reduce Excavated Materials Taken Off Site	2	<p>Improved</p> <p>The envision manual states that: "Transporting soil is economically expensive and environmentally damaging." Thus, a reduction in the extraction of excavated materials from construction site(s) can contribute to economic and environmental aspects of a project. According to the developers, the project is designed to balance the volume of soil extracted and reused to build the dams. Excavated soil was also used in the construction and improvement of access roads. Approximately 40% of the materials excavated were reused on site.</p>	Provide evidence and more accurate estimations of the excavated material removed from or reused on the site.
		<p>A specific subprogram regarding pollution control is in place (Subprograma de Controle da Poluição durante as Obras - PAC3). One of its objectives is to reduce waste generation.</p> <p><u>Sources:</u> - Envision Manual, page 96. - EDP Relatório de Evidências CE - Page 6. - Plano Básico Ambiental - PBA - Subprograma de Controle da Poluição durante as Obras - PAC 3, Page 2.</p>	
RA1.7 Provide for Deconstruction & Recycling	0	<p>No Score</p> <p>A specific subprogram regarding pollution control is in place (Subprograma de Controle da Poluição durante as Obras - PAC3), which establishes procedures for the minimization of waste, appropriate classification and destination of residues, and recycling, etc.</p>	Project team could assess materials that can be easily recycled or reused after the useful life of the project has ended.
		<p>However, based on statements made by the project team, there is no evidence that efficiency in disassembly or deconstruction at the end of the dam's lifespan were considered.</p> <p><u>Sources:</u> - Envision Manual, page 98. - EDP Relatório de Evidências CE - Page 7. - Plano Básico Ambiental - PBA - Subprograma de Controle da Poluição durante as Obras - PAC 3, Page 2.</p>	
RA2.1 Reduce Energy Consumption	0	<p>No Score</p> <p>The project team has stated that feasibility studies and cost analyses to determine energy reduction methods have yet to be implemented.</p>	Energy consumption during operation and maintenance must be calculated for the project's lifespan. From that baseline the project team should conduct feasibility and cost analyses to determine

		<p><u>Sources:</u> - Envision Manual, page 100. - EDP Relatório de Evidências CE - Page 4</p>	effective methods for energy reduction.
RA2.2 Use Renewable Energy	20	<p>Restorative</p> <p>With regards to the goal of moving society towards net zero energy, the project will produce positive impacts: With an installed capacity of 373.48 MW Jari Hydroelectric Dam is clearly a net positive source of renewable energy, capable of providing electricity to approximately 3,000,000 citizens. It is worth remembering that this region was supplied with energy obtained from thermoelectric units running on fossil fuels. Jari Hydroelectric dam fulfills the requirements of the Clean Development Mechanism (CDM) under the Kyoto Protocol. (see Credit CR1.1 for more details).</p>	
		<p>Beyond this, renewable energy sources were also deployed in projects such as the new Vila Iratapuru. Solar energy systems will contribute to providing electricity to power homes and streetlights.</p> <p><u>Sources:</u> - Envision Manual, Page 102 - Aproveitamento Hidrelétrico Santo Antônio do Jari, Os Desafios da Gestão Ambiental. Page 17 - Informativo 52, Nova Vila Iratapuru. - MECANISMO DE DESENVOLVIMENTO LIMPO (CLEAN DEVELOPMENT MECHANISM) DOCUMENTO DE FORMULÁRIO DE PROJETO DE DESENHO (MDL-DCP) - Atividade de Projeto MDL UHE Santo Antônio do Jarí.</p>	
RA 2.3 Commission & Monitor Energy Systems	0	<p>No Score</p> <p>Long term monitoring developed by independent authorities can help significantly to improve the performance of energy systems on the long term.</p> <p>The project team has stated that external audits will be performed on electromechanical equipment, but the periodicity of such evaluations was not defined. Documents presented prove that currently, an internal operation and maintenance team (O&M) is being recruited. It is worth mentioning that at the time of this evaluation, the project is still in the construction phase.</p>	Increased comprehensiveness of the initial commissioning effort. State specifically which parts of the energy systems will be audited by independent authorities, and the periodicity of such processes.
		<p><u>Sources:</u> - Envision Manual, Page 104 - EDP Relatório de Evidências CE - Page 10 - O&M Jari Documento: Recrutamento interno: EDP forma 1ª equipe de O&M em Jari (Operação e Manutenção).</p>	

<p>RA3.1 Protect Fresh Water Availability</p>	<p>2</p>	<p>Improved</p> <p>The potential impact of hydroelectric dams on freshwater availability is not strongly correlated with water consumption, but rather with alterations in water quality and flow. Alteration in the flow of a river can produce impacts on water availability downstream, while the formation of a lake upstream can result in accumulation of sediments or organic matter, which in turn can affect water quality.</p> <p>Regarding these concerns, the EIA states that: “Jari River, if water quality conditions remain similar to current conditions, will provide most of the volume of the reservoir of the Jari Hydroelectric Dam, both at the moment of filling, and throughout operation. Considering the sparse water use in the region, and the absence of obvious sources of pollution (...) it can be asserted that water quality near the Hydroelectric Dam is not prone to deterioration.” The EIA has assessed the location, type, quantity, and quality of water resources available to the project.</p> <p>Therefore, based on the documentation provided, it seems valid to conclude that Jari Hydroelectric Dam will have a net neutral impact on water quality and availability.</p> <p><u>Sources:</u> - Estudo de Impacto Ambiental. (EIA) - 8.3- Meio Biótico - Ecossistemas Aquáticos, Capítulo 8.3.1: Qualidade da Água Pages: 5, 6. - Envision Manual, Page 106.</p>	<p>Project team could consider implementing techniques for water reuse at operational facilities, and developing a more comprehensive assessment of long-term needs.</p>
<p>RA3.2 Reduce Potable Water Consumption</p>	<p>0</p>	<p>No Score</p> <p>The project team has stated that feasibility studies and cost analyses to determine water consumption reduction methods have not been implemented yet. Furthermore, in the guidelines listed within the Subprogram for the Environmental Control of Construction Works (PAC 1), there are no references about the reuse of graywater or strategies oriented towards reduction of potable water consumption.</p> <p><u>Sources:</u> - Envision Manual, page 108. - EDP Relatório de Evidências CE - Page 12. - Subprograma de Controle Ambiental de Ações constr PAC1.</p>	<p>Project developers should foster a sound and comprehensive planning and design review that identifies potable water use reduction strategies.</p>
<p>RA3.3 Monitor Water Systems</p>	<p>3</p>	<p>Enhanced</p> <p>The Envision Manual states that two aspects are key for this credit: first is the presence of a monitoring system, and second, the contribution of an independent entity “(...) to oversee the monitoring of the whole system or periodically check the monitoring of the project (...)”</p> <p>Internal Monitoring processes were planned and are currently being deployed. The Basic Environmental Project (Projeto Básico Ambiental - PBA) defines two detailed monitoring programs regarding water quality: a program of limnological (inland water) monitoring and a program to assess impacts on sections of reduced flow. The information produced by these monitoring programs will be consolidated in a database.</p> <p>IBAMA, the Brazilian Federal Environmental Agency, will act as an independent third party auditing institution, according to the terms of the Environmental Licenses.</p>	<p>Project team should assess the possibility of increasing the extent and comprehensiveness of the commissioning effort. At this point, and according to documents presented, monitoring is planned for three years after the beginning of the operations.</p>

		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, Page 110. - Plano Básico Ambiental - PBA. Programa de Monitoramento Limnológico. - Plano Básico Ambiental - PBA. Programa de Monitoramento dos Impactos no Trecho de Vazão Reduzida - TVR 	
RA0.0 Innovate Or Exceed Credit Requirements	0	<i>N/S</i>	
	41		

NATURAL WORLD			
	JARI HYDROPOWER PLANT. BRAZIL		RECOMMENDATIONS
NW1.1 Preserve Prime Habitat	0	No Score	In order to mitigate impacts related to the filling of the lake, compensatory planting of trees and adequate monitoring of the buffer zone must be implemented, following the terms of the environmental licenses.
		<p>Construction activities, noise, light pollution, removal of vegetation and other practices connected with the deployment of Infrastructure projects, can result in negative impacts on areas of high ecological value. Referring to this, the Envision Manual states that: "(...) Siting infrastructure projects to prevent and minimize direct and indirect impacts is crucial. Problems associated with a poorly sited project are very difficult to correct after construction; preventing impacts by selecting appropriate sites during planning is significantly more effective."</p> <p>As previously explained in this study, Santo Antônio falls, a regional natural heritage site, was preserved by changes to the project design, specifically by relocating the dam upstream from the falls. Also, all temporary and permanent structures (such as engine houses) were concentrated on the right bank of the river which was previously altered by man-made eucalyptus plantations - that belong to Jari Cellulose and Paper - thus avoiding the disruption of the left bank.</p> <p>The Brazilian Institute for the Environment (IBAMA), through its multidisciplinary team, stated that: "Previous versions of the project conceived the main dam structures in the center of the river, and temporary structures on the left bank. The revision of the project required relocation of the structures to the right bank, thus transferring equipment and support infrastructure to that side [of the river] The prior design to locate temporary structures on the left bank would have necessitated new roads connecting Laranjal do Jari to the village of Santo Antônio that would have required the clearing of well-preserved forests and vegetation."</p> <p>However, notwithstanding all these efforts, the artificial lake will produce impacts upstream from the dam, including damages to forested areas of high environmental value. According to IBAMA, 1,706 hectares of native forest will be suppressed and would result "in reduction of local biodiversity and the destruction of habitats. (...) The impact has been assessed as local, direct, permanent, non-accumulative, non-reversible, of medium importance and small intensity".</p> <p>It is worth mentioning that compensation measures are properly established within the environmental license and the program for the recovery of degraded areas (Programa de Recuperação de áreas degradadas - PRAD). A new environmental buffer zone of</p>	

		<p>100 meters (approximately 330 feet) will be established around the lake.</p>	
		<p><u>Sources:</u> - Envision Manual, Page 118 - Licença de Instalação (LI 798-2011). - Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.) Page 4, Page 90. - Programa de Recuperação de Áreas Degradadas (PRAD) - Mapa de Vegetação ADA 1, Mapa de Vegetação ADA 2.</p>	
<p>NW1.2 Preserve Wetlands and Surface Water</p>	<p>0</p>	<p>No Score</p> <p>Significant efforts were implemented to minimize negative impacts on water resources and the landscape such as locating the dam upstream from the Santo Antônio do Jari Falls to preserve the region’s natural heritage. Furthermore, all temporary and permanent structures were concentrated on the right bank of the river – which was previously disturbed by anthropogenic activity - in order to avoid disruption of the left bank.</p> <p>However, considering that the project comprises a hydroelectric dam, this credit has been assessed as non-applicable.</p> <p><u>Sources:</u> - Envision Manual, page 120 - Relatório de Impacto Ambiental (RIMA) Page 12.</p>	
<p>NW1.3 Preserve Prime Farmland</p>	<p>12</p>	<p>Conserving</p> <p>Prime Farmland is a designation established by the Soil Conservation Service, part of the United States Department of Agriculture (USDA-SCS). Prime Farmland “ is land which has the best combination of physical and chemical characteristics for the production of crops. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed, including water management, according to current farming methods.” Presently, Brazil has no equivalent designation within its environmental or agricultural normative framework.</p> <p>Aside from this difference in frameworks and terminology, this area has not been described as a location highly relevant for agricultural purposes in any document presented by the developers. Regarding this topic the Brazilian Institute for the Environment (IBAMA), through its multidisciplinary team, stated that: “Low fertility of the soils is the main reason behind the scarce presence of agricultural activities in the region”.</p> <p>Based on this evidence it can be concluded that no development took place on prime agricultural land. Thus, this credit has been assessed as conserving.</p>	<p>Even though the soil is not highly relevant for agricultural purposes, this region is one of the most valuable environmental assets of the planet. All measures for recovering degraded areas and avoiding erosion must be carefully put in place, following the mandates of the environmental licenses.</p>

		<p><u>Sources:</u> - Definition of Prime Farmland available at: http://soils.usda.gov/technical/handbook/contents/part622.html - Envision Manual, Page 122. - Estudo de Impacto Ambiental (EIA) - Mapa de Vegetação ADA 1, and Mapa de Vegetação ADA 2 - Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.) Page 19</p>	
<p>NW1.4 Avoid Adverse Geology</p>	<p>5</p>	<p>Conserving</p> <p>Considering that the Jari Hydroelectric Dam project has been evaluated several times since the 1970's, there is a rich set of geological information available. According to the Brazilian Institute for the Environment (IBAMA): "Geological surveys in the location began in 1974 in the context of the preliminary studies for the hydroelectric use of Santo Antônio Falls. In 1986, studies connected with the development of the project were resumed, analyzing existing data and performing new surveys. Other studies were conducted in 1992. At this stage [2009 - process to obtain the Environmental Preliminary License] supplementary field research was implemented in the year 2007, aiming to complete the revision of the Basic Project (...)"</p> <p>Based on the aforementioned data, IBAMA states that: "Studies [developed] with the intention of understanding the geological and geotechnical characteristics of the site for the main structures (...) concluded that the massif on which the project will be built presents good geological conditions (...) and meets the conditions of stability and security required for the construction of the dam" On this topic, the EIA also states that: "(...) supplementary geologic and geotechnical surveys developed at the end of 1992 proved the excellent quality of the massif (...) both in the site of the spillway and the engine house."</p> <p>Moreover, a specific program to control and monitor erosive processes is in place. Based on the information submitted, it is possible to conclude that the project team has located the project in a safe area that has no adverse geological features.</p> <p><u>Sources:</u> - Envision Manual, Page 124. - Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.) Page 16 - Projeto Básico Ambiental - Program de Controle e Monitoramento de Processos Erosivos., page 5. - Estudo de Impacto Ambiental (EIA) Chapter 2 - Introdução e Histórico - Page 4</p>	

<p>NW1.5 Preserve Floodplain Functions</p>	<p>Enhanced</p> <p>The project limits the use of impervious surfaces, restricted basically to the engine house and the dam, and does not have a significant impact on water infiltration. A new lake with a surface of 31.7 km² will be formed by the dam, thus modifying floodplain areas. A Program for the Recovery of Degraded Areas (Programa de Recuperação de Áreas Degradadas - PRAD) is being implemented, with the intention of recovering all areas affected by the project, including floodplains.</p> <p>The aforementioned PRAD states that: “Among the main actions of this program, the recovery of vegetation is an important component (...) Protection of degraded areas and riparian areas prevents (...) erosive processes [while] the increase in diversity of vegetative species implies in more food capacity and floodwater taken up by local fauna” The project has taken into consideration habitat connectivity and sediment transport: A Program for Control and Monitoring of Erosive Processes (Programa de Controle e Monitoramento de Processos Erosivos) and a Program for Monitoring Sediments in the water Flow (Programa de Monitoramento Hidrossedimentológico) are in place.</p> <p>Furthermore, a buffer zone of 100 meters around the lake and riparian areas was designated as an Area of Permanent Protection (Area de Proteção Permanente - APP)</p> <p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, page 126. - Projeto Básico Ambiental (PBA) - Programa de Controle e Monitoramento de Processos Erosivos. Page 3. - Projeto Básico Ambiental (PBA) - Programa de Monitoramento Hidrossedimentológico. Pages 2, 3 - Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas (PRAD). Page 3 	<p>The project team could provide data showing estimates of pre-development floodplain infiltration capacity and estimates of post-development floodplain infiltration capacity.</p>
<p>NW1.6 Avoid Unsuitable Development on Steep Slopes</p>	<p>Conserving</p> <p>Working closely with the team from the Brazilian institute for the Environment (IBAMA), developers have adjusted the location of the project. Jari Hydroelectric Dam is now sited in a location with no hillsides or steep slopes. This adjustment to the project siting also allowed the preservation of Santo Antônio falls, an important natural heritage site for the region.</p> <p>In explaining the long process of design and licensing the project, the EIA states that: “ The resumption of the licensing project for Jari Dam in 2007, included a major reformulation of the original concepts, and important changes, with the intention of preserving Santo Antônio Falls, and avoiding the creation of new paths that would result in access to and un-planned occupation of the left margin [of the river.]”</p> <p>The project has specific programs to control and monitor erosion: a Program for Control and Monitoring of Erosive Processes (Programa de controle e Monitoramento de Processos Erosivos), and a Program for the Recovery of Degraded Areas (Programa de Recuperação de Áreas Degradadas - PRAD) are in place.</p>	

		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, page 128. - Projeto Básico Ambiental (PBA) - Programa de Controle e Monitoramento de Processos Erosivos. Page 3. - Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas (PRAD). Page 3 - Estudo de Impacto Ambiental (EIA) Chapter 2 - Introdução e Histórico - Page 2 	
NW1.7 Preserve Greenfields	0	<p>No Score</p> <p>The project team has developed significant efforts to preserve greenfields. All temporary and permanent structures (such as engine houses) were concentrated on the right bank of the river – which was previously altered by man-made eucalyptus plantations that belong to Jari Cellulose and Paper - thus avoiding the disruption of the left bank, where native forests still exist.</p> <p>The Brazilian Institute for the Environment (IBAMA), through its multidisciplinary team, stated that: “Previous versions of the project envisioned the main dam structures in the center of the River, and temporary structures on the left bank. The revision of the project resulted in the relocation of the structures to the right bank, thus transferring equipment and support infrastructure to that side [of the river]. The former scenario that located temporary structures on the left bank would have required new roads connecting Laranjal do Jari to the village of Santo Antônio. New roads would facilitate forest suppression. Furthermore, locating temporary buildings and infrastructure on the left bank would have suppressed vegetation in a currently well preserved location”</p> <p>However, inspite of these efforts, the lake that will be formed as a consequence of the dam will affect a significant area of greenfields, and result in the suppression of native forest. For this reason, the project is considered non-achieving under this credit.</p>	<p>In order to compensate impacts related to the filling of the lake, compensatory planting of trees and adequate monitoring of the buffer zone must be implemented, following the terms of the environmental licenses.</p>
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, page 130 - Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.) Page 4 	
NW2.1 Manage Stormwater	4	<p>Enhanced</p> <p>Significant efforts have been put in place by project developers in order to manage stormwater and reduce the generation of stormwater runoff. A Program for the Recovery of Degraded Areas (Programa de Recuperação de Áreas Degradadas - PRAD) and a Program to Control and Monitor Erosive Processes (Programa de Controle e Monitoramento de Processos Erosivos) are in place. A key aspect of both of these programs is the process to restore vegetation using native species, which helps preserve conditions of infiltration and evapotranspiration.</p>	<p>The project team could assess the feasibility of increasing storage capacities in the dam facilities, using Low Impact Development (LDI) measures.</p>

		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, Page 132. - Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas - PRAD. Page 3 - Projeto Básico Ambiental (PBA) - Programa de Controle e Monitoramento de Processos Erosivos. Page 3 	
NW2.2 Reduce Pesticides and Fertilizer Impacts	0	<p>No Score</p>	
		<p>Any operational policies or programs designated to control the application of pesticides and fertilizers, so as to avoid over-applying were found.</p>	
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, page 134. - EDP Relatório de Evidências CE - Pages 22, 23 	
NW2.3 Prevent Surface and Groundwater Contamination	4	<p>Enhanced</p>	<p>Submit information regarding water quality monitoring programs to the International Stormwater Best Management Practices Database. More info available at: http://www.bmpdatabase.org/data-entry.html</p>
		<p>A program for monitoring the water table (Programa de Monitoramento do Lençol Freático) is in place. This program will begin one year prior to the filling of the lake, and is expected to be in place for four years after that event. The level of the water table, and the quality of underground water will be monitored. Regarding surface water two aspects may be critically affected by the dam: water flow and water quality. In order to assess possible impacts, a detailed Internal Monitoring process has been planned and is currently being deployed.</p>	
		<p>The Basic Environmental Project (Projeto Básico Ambiental - PBA) defines two monitoring programs regarding surface water quality: Program of Limnological Monitoring (Programa de Monitoramento Limnológico) and Program to Assess Impacts of Reduced Flow (Programa de monitoramento dos impactos no trechos de vazão reduzida). The information produced in these monitoring programs will be consolidated in a database.</p>	
		<p>IBAMA, the Brazilian Federal Environmental Agency will act as an independent third-party auditing institution for this monitoring process, in accordance with the terms of the Environmental Licenses.</p>	
		<p>Regarding spill and leak prevention and response plans, the following procedures are in place: Subprogram for Pollution Control During Construction works (Subprograma de controle da poluição durante as obras - PAC 3) and Subprogram for Risk Management and Emergency Actions (Subprograma de Gerenciamento de Riscos e de Ações de Emergência - PAC 7)</p>	
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, page 136. - Plano Básico Ambiental - PBA. Programa de Monitoramento do Lençol Freático. Page 2. - Plano Básico Ambiental - PBA. Programa de Monitoramento Limnológico. - Plano Básico Ambiental - PBA. Programa de Monitoramento dos Impactos no Trecho de Vazão Reduzida - TVR - Plano Básico Ambiental - PBA - Subprograma de controle da poluição durante as obras - PAC 3 - Plano Básico Ambiental - PBA - Subprograma de Gerenciamento de Riscos e de Ações de Emergência - PAC 7 - Licença de Instalação 798/2011 	

<p>NW3.1 Preserve Species Biodiversity</p>	<p>2</p>	<p>Improved</p> <p>The project team has worked throughout the extended licensing process with several public entities at the federal, state and local levels in order to identify special habitat areas in and near the project site. As previously explained, this process is being developed under the supervision of the Brazilian Institute for the Environment (Instituto Brasileiro do Meio Ambiente - IBAMA).</p> <p>In spite of significant efforts to avoid damage, the artificial lake will produce impacts upstream from the dam, including forest suppression in areas of high environmental value. According to IBAMA 1706 hectares of native forest will be suppressed and this will result “in reduction of local biodiversity and the destruction of habitats. The impact has been assessed as local, direct, permanent, non accumulative, non reversible, and of medium importance and small intensity”.</p> <p>It is worth mentioning that compensation measures are properly established in the environmental license and in the Program for the Recovery of Degraded Areas (Programa de Recuperação de áreas degradadas - PRAD). A new environmental buffer zone of 100 meters (approximately 330 feet) will be established around the lake.</p> <p>Based on information available at this point, it has been concluded that a net habitat quality will very likely be maintained.</p> <p><u>Sources:</u> - Envision Manual, Page 138 - Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.). Page 90. - Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas - PRAD. Page 3 - Licença de Instalação 798/2011</p>	<p>Assess the feasibility of developing efforts to improve and expand wildlife corridors, by linking areas that hold special relevance as habitats.</p>
<p>NW 3.2 Control Invasive Species</p>	<p>5</p>	<p>Superior</p> <p>Documents submitted, such as the Program for the Recovery of Degraded Areas (Programa de Recuperação de Áreas Degradadas - PRAD), or the Environmental Licence issued by IBAMA certify that the project team has worked with state agencies to identify and use only native vegetation following completion of construction and commencement of operations. The PRAD states that “(...) the project for recovery of vegetation (...) must consider (...) the characteristics and diversity of regional vegetation in order to select the native species that will be used.”</p> <p>However, no documents regarding measures to control or eliminate pre-existing invasive species in the project site have been provided.</p> <p><u>Sources:</u> - Envision Manual, Page 140 - Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas. PRAD. Page 7 - Licença de Instalação (LI 798-2011).</p>	<p>In order to improve performance in this credit, the project team could consider implementing measures regarding control of invasive/ non native species.</p>

NW3.3 Restore Disturbed Soils	8	<p>Conserving</p> <p>A number of efforts have been deployed to restore disturbed soils. A Program for the Recovery of Degraded Areas (Programa de Recuperação de Áreas Degradadas - PRAD) and a Program to Control and Monitor Erosive Processes (Programa de Controle e Monitoramento de Processos Erosivos) are in place.</p> <p>The aforementioned PRAD states that: “All areas altered by activities related to the deployment of the project must be recovered according to the environmental guidelines presented [in this Program], including areas of excavation and disposal, even if they were already in place prior to the endeavor (...) For the construction of the Santo Antônio do Jari Dam the use of existing roads must be encouraged, minimizing the need to open new roads. All areas around locations used during the construction of the project (...), and affected by it in any way, must also be recovered.”</p> <p>It is clear by the documents presented (including the License issued by IBAMA) that all soils disturbed as a result of the project will be restored. However, further documentation could clarify the percentage of soils disturbed as result of previous development that will be or has been restored by the Jari Hydroelectric Dam project.</p>	Provide detailed information about restoration of areas disturbed as a result of previous development, in order to assess Jari’s project contribution.
		<p><u>Sources:</u></p> <ul style="list-style-type: none"> - Envision Manual, Page 142. - Projeto Básico Ambiental (PBA) - Programa de Recuperação de Áreas Degradadas. PRAD. Page 11 - Licença de Instalação (LI 798-2011). 	
NW3.4 Maintain	9	Superior	Assess the need for developing

<p>wetland and surface water functions.</p>	<p>The evaluation of this credit is based on how well the project contributes to maintaining or enhancing four basic ecosystem functions: hydrologic connections, water quality, habitat and sediment transport.</p> <p>Based on documentation provided, Jari Hydroelectric Dam appears to maintain the following ecosystem functions:</p> <ul style="list-style-type: none"> - Hydrologic connections: the main concern in this project was the section with reduced flow. A Program to Assess Impacts on Sections of Reduced Flow (Programa de Monitoramento dos Impactos no Trecho de Vazão Reduzida - TVR) was developed. The Installation License -paragraph 2.3- issued by IBAMA has determined that the minimum flow in the aforementioned section must be 45 m³/s, in order to preserve ecosystem functions. - Water quality: The Basic Environmental Project (Projeto Básico Ambiental - PBA) defines two monitoring programs regarding surface water quality: Program of Limnological Monitoring (Programa de Monitoramento Limnológico) and Program to Assess Impacts on Sections of Reduced Flow (Programa de monitoramento dos impactos no trechos de vazão reduzida). The information produced by these monitoring programs will be consolidated in a database. <p>IBAMA, the Brazilian Federal Environmental Agency will act as independent third-party auditing institution for this monitoring process, in accordance with the terms of the Environmental Licenses. Furthermore, the Installation License has specifically mandated the obligation to preserve water quality “to levels similar to the ones that existed prior to the construction of the project”, even in the sections of reduced flow (see item 2.4 of the aforementioned document)</p> <ul style="list-style-type: none"> - Habitat: As explained in previous credits (see NW 1.1, NW 1.7 and NW 3.1) net habitat quality will be maintained by the project. Significant efforts were developed to reduce impacts, but the formation of the lake will result in the suppression of native forest. However, compensation measures are properly established in the environmental licenses. <p>Finally, regarding sediment transport, a Program for Monitoring Sediments in the Water Flow (Programa de Monitoramento Hidrossedimentológico) is in place, but at this moment (end of construction phase) there is no available data to assess the real effects of the dam on the transport of sediments, even when all proper preventive and corrective measures (such as recovery of degraded areas and monitoring of erosion) are being taken.</p> <p><u>Sources:</u></p> <ul style="list-style-type: none"> - Licença de Instalação (LI 798-2011). - item 2.3, item 2.4- - Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.). Page 90. - Plano Básico Ambiental - PBA. Programa de Monitoramento Limnológico. - Plano Básico Ambiental - PBA. Programa de Monitoramento dos Impactos no Trecho de Vazão Reduzida - TVR - Plano Básico Ambiental - PBA. Programa de Monitoramento Hidrossedimentológico. 	<p>a restoration plan regarding sediments transport, according to the results of the monitoring process.</p>
	<p>0 N/S</p>	
<p>60</p>		

CLIMATE AND RISK			
	JARI HYDROPOWER PLANT. BRAZIL	RECOMMENDATIONS	
CR1.1 Reduce Greenhouse Gas Emissions	<p>Restorative</p> <p>According to documentation provided by the project developers, Jari Hydroelectric Dam is a net carbon negative endeavor, and fulfills the requirements of the Clean Development Mechanism (CDM) under the Kyoto Protocol. Through the construction of Jari HD and the connection with the National Interconnected Systems, the region - especially the capital cities of Manaus and Macapá - will be able to reduce CO2 emissions associated with isolated thermo-electric generating units that run on fossil fuels.</p> <p>The report “Contribution of the CDM Project Santo Antônio do Jari Hydroelectric Dam towards Sustainable Development” states that: “With this project it is possible to reduce Brazilian dependence on fossil fuels, which are less socio-environmentally sustainable than endeavors like Santo Antônio do Jari Dam. Hydroelectric generation, such as the one conceived in this project, produces energy with negligible amounts of CO2, thus contributing to the reduction of global emissions of greenhouse gases into the atmosphere.”</p> <p>Overall reduction in emissions has been estimated at 352,648 tons of CO2 equivalent per year, and a total of 2,468,535 tons of CO2 equivalent over a period of 7 years.</p> <p>The following methodology and tools were deployed in the aforementioned assessment:</p> <ul style="list-style-type: none"> - Consolidated baseline methodology for grid-connected electricity generation from renewable sources (V. 12.3.0). - Tool to calculate the emissions factor for an electricity system. (V. 2.2.1); - Tool for the demonstration and assessment of interventions. (V. 6.0.0); - Tool to calculate projected leakage of CO2 emissions from fossil fuel combustion. (V. 02) - Combined tool to identify the baseline scenario and demonstrate interventions. <p><u>Sources:</u></p> <ul style="list-style-type: none"> - MECANISMO DE DESENVOLVIMENTO LIMPO (CLEAN DEVELOPMENT MECHANISM) DOCUMENTO DE FORMULÁRIO DE PROJETO DE DESENHO (MDL-DCP) - Atividade de Projeto MDL UHE Santo Antônio do Jarí. - Anexo III da Resolução nº1 da CIMGC - Contribuição da Atividade de Projeto do MDL da UHE Santo Antônio do Jari para o desenvolvimento sustentável - Envision Manual, Page 152 	25	

<p>CR1.2 Reduce Air Pollutant Emissions</p>	<p>12</p>	<p>Conserving</p> <p>Jari Hydroelectric Dam will contribute to reducing emissions of air pollutants, both on the local and regional scales. Since the emission of all criteria pollutants - with the exception of lead - is related to the consumption of gasoil, it is valid to conclude that the contribution of this Hydroelectric Dam will be significant.</p> <p>It is important to remember that today the energy at the local level is generated from thermoelectric units that run on gasoil. Regarding this point, the Report on Environmental Impacts (Relatorio de Impacto Ambiental - RIMA) states that: “ provision to the Isolated systems of Laranjal do Jari is achieved by a purely thermic set of generators (...) At (...) Iratapuru, São Francisco, São José, Santo Antônio and Padaria (...) and even in the urban areas of Laranjal do Jari and Monte Dourado - all in the project’s Area of Direct Influence - electric energy is produced in generators that use gasoil. The fuel is provided by the Electric Company of Amapa (Companhia de Energia Elétrica do Estado do Amapá - CEA.)</p> <p>On a regional level, the energy produced at Jari, will be transmitted to the National Interconnected System, allowing the decommissioning of isolated thermoelectric systems in Manaus and Macapá.</p> <p><u>Sources:</u> - Relatorio de Impacto Ambiental (RIMA), page 34. - Envision Manual, page 154.</p>	<p>The project team could consider the following reference as a standard for air quality: US National Ambient Air Quality Standards (NAAQS), set by the Environmental Protection Agency, under the Clean Air Act.</p>
<p>CR2.1 Assess Climate Threat</p>	<p>0</p>	<p>No Score</p> <p>For the purposes of this credit, the assessment of climate threat, refers to “a comprehensive climate impact assessment and adaptation plan [already] developed.” This study should include a vulnerability assessment, a risk assessment, and an adaptation assessment.</p> <p>In the answers to this credit, the project team has presented the Program for climatic and meteorological monitoring (Programa de Monitoramento Climato-Meteorológico) as an evidence. The aforementioned program states that a network of climatic monitoring stations will be deployed, but the objective stated for the referred network is to asses if micro-climatic conditions will be affected by the Dam. At this moment, and after consulting the documents provided, we have not found any evidence that a Climate impact assessment and adaptation plan has been developed.</p> <p><u>Sources:</u> - Envision Manual, Page 156 - Programa de Monitoramento Climato-Meteorológico - Projeto Básico Ambiental (PBA) - Page 2.</p>	<p>An assessment on climate threat impacts exceed current obligations under the extensive Brazilian environmental legislation. However, to foster efforts in this direction is specially relevant in the context of climate change, and in relationship with relevant infrastructures of long lifespan as in the case of Jari. A plan has such as this, should meet the following requirements:</p> <ul style="list-style-type: none"> - Calculates or locates expected changes in flood elevations, - develop inventories of structures in the areas of possible inundation that are important to successful operation of proposed project, - Plans for proposed project to address expected changes in inundation, including the adaptation required because of the impact on other critical existing infrastructure in the area.

CR2.2 Avoid Traps And Vulnerabilities	0	No Score	Designers should assess the effect of the project on the community infrastructure as a whole. Considerations could include the assessment of possible vulnerabilities such as: - Configuration traps: infrastructure projects that create configurations highly vulnerable to extreme weather events and natural disasters, or: - Standards traps: infrastructure projects delivered according to design standards and methodologies that are not in alignment with changing environmental or operating conditions. This is especially relevant for infrastructures of long lifespan, such as Hydroelectric Dams.
		In response to this credit, the project team has presented the Program for Climatic and Meteorological Monitoring (Programa de Monitoramento Climato-Meteorológico) as evidence. The program states that a network of climatic monitoring stations will be deployed, but the objective stated for the referred network is to asses if micro-climatic conditions will be affected by the Dam. At this moment, and after consulting the documents provided, no evidence has been found that efforts to avoid possible vulnerabilities related with climate change were part of the conceptual framework of the designers. <u>Sources:</u> - Envision Manual, Page 158 - Programa de Monitoramento Climato-Meteorológico - Projeto Básico Ambiental (PBA) - Page 2.	
CR2.3 Prepare For Long-Term Adaptability	0	No Score	Analyze possible strategies to deal with long term changes. Such strategies may include: Structural changes, which expand the range of conditions in which the system can function or develop adaptive capabilities – including ways for the system to “learn” or change over time to be more prepared to deal with altered weather conditions.
		After consulting the documents provided by the project team, no proof of initiatives regarding long-term adaptability vis à vis the effects of climate change or other long-term change scenarios has been found. <u>Sources:</u> - Envision Manual, Page 160.	
CR2.4 Prepare For Short-Term Hazards	17	Conserving	Project developers could assess ways of using environmental restoration as a mitigation strategy vis à vis short term hazards.
		Documentation presented by the project developers states that Jari Hydroelectric Dam has been designed considering once in 100-year hazards. The key design considerations in this case are floods, rain and water flow in the Jari River. <u>Sources:</u> - Estudo de Impacto Ambiental (EIA) - Meio Fisico - Page 45 - Relatorio de Evidências - CE, page 33. - Envision Manual, Page 162	
CR2.5 Manage Heat Island Effects	0	No Score	
		It is our understanding that this Credit is not applicable to the project, due to the specific conditions of the Jari Hydroelectric Dam, which is located in an area almost entirely void of consolidated urban settlements, large areas of rooftops and pavement. <u>Sources:</u> - Envision Manual, Page 164	
CR0.0 Innovate Or Exceed Credit Requirements	0	N/A	
54			

OVERALL:	264	JARI HYDROPOWER PLANT. BRAZIL
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APPENDIX D: SOURCES

DOCUMENTACION ENTREGADA. (PORTUGUÊS, ESPAÑOL)
Información general
Aproveitamento Hidrelétrico Santo Antônio do Jari. - Os desafios da Gestão Ambiental. - Junho 2013
Projeto Basico Ambiental (PBA)
Termo de Convênio ECE x Estado do Amapá
Programa de Capacitação de Mão de Obra Local dos Municípios - Plano Básico Ambiental (PBA)
Informativo 52 - Programa Jovem Aprendiz.
Relatório de Impacto Ambiental (RIMA)
Projeto Básico Ambiental (PBA) Capítulo 6.5.8 Programa de Apoio aos Municípios.
Programa Ambiental para Construção - Plano Básico Ambiental (PBA). Chapter 6.2.3. – Subprograma PAC6
Programa de Saúde - Plano Básico Ambiental (PBA)
Parceria ECE Participações e Município de Laranjal do Jari – Reforço assistência à saúde
Convênio ECE Participações – IEPA. Controle de Vetores.
EDP Relatório de Evidências
Envision Manual
Estudo de Impacto Ambiental (EIA)
Barco de Transporte Rápido. Picture provided by EDP.
Imagem - Vias de Acesso as comunidades sinalizadas. - Picture provided by EDP.
Imagem de sinalização - Picture provided by EDP.
Informativo 31 - Blitz Educativa. - Informativo Online - Novembro 2012
Programa de Prospecção, Resgate e Monitoramento Arqueológico - Projeto Básico Ambiental (PBA).
Programa de educação patrimonial para a cultura material e imaterial intangível
Programa de Documentação e Preservação do Patrimônio Natural e Paisagístico. – Projeto Básico Ambiental (PBA)
Relatório Anual de Sustentabilidade EDPBR 2012
EDP - Código de ética. Available at: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/empresa/codigo-de-etica/Paginas/default.aspx#5
EDP - Mission and Vision. Available at: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/empresa/visao-missao-e-valores/Paginas/default.aspx
Plano Ambiental Para Construção (PAC)
Information about EDP's Environmental Management System available at: http://www.edp.pt/pt/sustentabilidade/ambiente/gestaoambiental/Pages/Certificacao_Ambiental.aspxSource

Subprograma de Controle Ambiental de Ações Construtivas PAC1
ATA de Reuniões Mensais de Equipe Documento
Revista EDP jun jul 2012 Documento: EDP Na Floresta Amazônica Documento: Mais perto da comunidade
Imagem - Coleta seletiva de resíduos sólidos
Subprograma de Controle da Poluição durante as Obras (PAC 3)
Programa de Recuperação de Áreas Degradadas (PRAD)
Termo de Convênio ECE e Secretária Estado da Justiça e Segurança Pública Amapá.
Mapa da Construção da Estrada Documento: Construção de uma estrada com o Estado/Município.
Convênio ECE com o Município de Laranjal do Jari – Educação Documento. Termo de Convênio ECE com o Município de Laranjal do Jari. Capítulo Melhorias da Infraestrutura Educacional do Município de Laranjal do Jari.
Contrato de Concessão - Primeiro Aditivo Documento
O&M Jari Documento: Recrutamento interno
http://www.valor.com.br/brasil/1120194/ministerio-prorroga-concessao-da-usina-santo-antonio-de-jari-ate-2044
Programa de Monitoramento Climato - Meteorologico. - Projeto Básico Ambiental (PBA)
Programa de Monitoramento de Fauna Terrestre, aquática y semiacuática - Projeto Básico Ambiental (PBA).
Parecer Técnico do Professor Dr. Flávio Bockmann - Universidade de São Paulo - Departamento de Biologia - Laboratório de Ictiologia - Setor de Zoologia dos Vertebrados
EDP - Relatório de Evidências
Sistema Normativo Corporativo
G1.globo.com: Alstom ganha contrato para construção de hidrelétrica no Brasil. http://g1.globo.com/economia/noticia/2011/09/alstom-ganha-contrato-para-construcao-de-hidreletrica-no-brasil.html
Projeto Básico Otimizado
Informativo 52, Nova Vila Iratapuru.
MECANISMO DE DESENVOLVIMENTO LIMPO (CLEAN DEVELOPMENT MECHANISM) DOCUMENTO DE FORMULÁRIO DE PROJETO DE DESENHO (MDL-DCP) - Atividade de Projeto MDL UHE Santo Antônio do Jarí.
Plano Básico Ambiental - PBA. Programa de Monitoramento Limnológico.
Plano Básico Ambiental - PBA. Programa de Monitoramento dos Impactos no Trecho de Vazão Reduzida - TVR
Licença de Instalação (LI 798-2011)
Parecer Técnico 120/2009 - COHID/CGENE/IDILIC/IBAMA (Instituto Brasileiro do Meio Ambiente - Brazilian Institute for the Environment.)
Mapa de Vegetação ADA 1, Mapa de Vegetação ADA 2.
Anexo III da Resolução nº1 da CIMGC - Contribuição da Atividade de Projeto do MDL da UHE Santo Antônio do Jari para o desenvolvimento sustentável
Estudo de Impacto Ambiental (EIA) - Meio Físico

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General Information.
Information on actions of Corporate Social Responsibility. - Available at EDP's website: http://www.edp.com.br/geracao-renovaveis/geracao/amapa-para/uhe-santo-antonio-de-jari/meio-ambiente/responsabilidade_social/Paginas/default.aspx
Alstom Sustainable Sourcing Policy available at: http://www.alstom.com/Sustainability/A-sustainable-sourcing-policy/
Assessment of Alstom's suppliers http://www.alstom.com/Sustainability/A-sustainable-sourcing-policy/The-assessment-of-Alstoms-suppliers/
Definition of Prime Farmland available at: http://soils.usda.gov/technical/handbook/contents/part622.html