

**Advice on  
Terms of Reference for SEA  
Rio Madera**

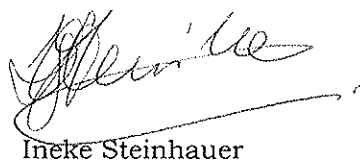
**-Bolivia-**

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Advice on Terms of Reference for SEA  
Río Madera  
-Bolivia-

Advice submitted to the Viceministerio de Biodiversidad, Recursos Forestales y Medio Ambiente, by a working group of the Commission for Environmental Assessment in the Netherlands.

the technical secretary



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Utrecht, 21 January 2008

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# 1. INTRODUCTION

## 1.1 Strategic Environmental Assessment in Bolivia

The Vice Ministry of Biodiversity, Forests and Environment (VBRFMA) of the Ministry of Rural Development, Agriculture and Environment (MDRAyMA) is the National Competent Authority for Environment in Bolivia. In its multi-annual plan 2007-2011, the Vice Ministry expresses its intention to continue with the consolidation of Strategic Environmental Assessment (SEA) in Bolivia. These efforts started in 2004, under the former Ministry of Sustainable Development. The Netherlands Commission for Environmental Assessment (NCEA) contributed to several SEA initiatives<sup>1</sup>, upon request of the Ministry. Recently, the NCEA received a request from VBRFMA to discuss possibilities to continue SEA activities in Bolivia. During a visit in July 2007, it was agreed that the NCEA will assist in three areas (i) providing comments on adapted versions of the draft SEA regulation, (ii) assisting in two SEA capacity building workshops and (iii) assistance in drafting Terms of Reference for an SEA for the Madera river basin, in relation to hydropower activities in Brazil and Bolivia. For 2008 other SEA's have been proposed. The activities have been described in a project proposal and also an MoU has been drafted which specifies the areas of cooperation between the Vice Ministry and the NCEA.

Given the urgency of information required for decision making on the Madera river, it was decided to give priority to advising on ToR for an SEA for plans related to the Madera river.

This SEA is designed as a joint activity of the NCEA and the Bolivian environmental authorities, mobilising their expertise in the practice of impact assessment and providing a possibility for 'training-on-the-job' in SEA.

## 1.2 Background information on Río Madera

In 2004, Odebrecht S.A. Sucursal Bolivia submitted a request for a provisional license to undertake a study on the implementation of hydropower plants in the rivers Mamoré, Madera and Beni. The 'Superintendencia de Electricidad' refused the license based on observations made by various institutions. A Decree was issued in 2005, stating that it was of national interest to define a policy for the integrated use of river basin areas in Bolivia, with a priority for studies on the Mamoré, Madera and Beni rivers. Requests for licences in relation to hydropower generation will not be considered, until the Bolivian Government has developed and finalized these studies for the Mamoré, Madera and Beni basins.

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<sup>1</sup> - Advice on Terms of Reference SEA Polo de Desarrollo (Puerto Busch), Bolivia, 30 September 2004  
- Supplementary Advice on Terms of Reference for SEA Polo de Desarrollo (Puerto Busch), Bolivia, 4 February 2005  
- Advice on Terms of Reference for SEA Gran Salar de Uyuni, Bolivia, 24 December 2004  
- SEA capacity building 28 February-5 March 2005

In 2006 and 2007, the Bolivian Minister of Foreign Affairs has expressed Bolivia's concern on possible negative impacts as a result of the construction of two hydropower dams on Brazilian territory near the Bolivian border. The Jirau and San Antonio dams on the Madeira river would have an installed generating capacity of 6,450 MW, and studies have shown they could have serious impacts on fish resources and aquatic life, on the health of the local populations, and due to sediment build-up could cause flooding in Bolivia. The dams were granted preliminary conditional approval in July 2007 by the Brazilian environmental authorities (IBAMA).

In Bolivia, a Technical Committee has been formed, which is led by the VBRFMA. This Committee has elaborated several documents in relation to the potential environmental and social impacts of the hydropower project (Jirau and San Antonio) to substantiate the Bolivian standpoint on these dams. This has resulted in a series of recommendations to the Ministerial Cabinet.

In August 2007, several high level meetings took place between Bolivia and Brazil. A decision was made to form three bi-national working groups to study the dam's potential impact on Bolivia: on sedimentation, fish, and health related problems. Bolivia also sent a questionnaire to Brazil, comprising 20 questions and concerns. At the moment, these bi-national working groups have not yet been established, and no answer has been received yet on the questionnaire. However, time is pressing, as Brazil will start the tender procedure by the end of November<sup>2</sup>.

### 1.3 Request of the VBRFMA and involvement of the NCEA

In July 2007, the VBRFMA invited the NCEA (see appendix 1, part of MOU), to assist in defining the ToR for the execution of an SEA for the integrated use of the Madera basin, including potential transboundary impacts of the proposed Jirau and San Antonio hydropower dams in Brazil.

The NCEA wants to emphasise that it has no opinion on the feasibility of the Jirau and San Antonio hydropower dams. The NCEA never judges the acceptability of projects, but tries to guarantee that all essential environmental (and socio-economic) information has been provided for sound and well balanced decision-making.

### 1.4 Why would SEA be useful?

One of the recommendations of the Technical Committee to the Cabinet was to undertake an integrated (socio-economic and environmental) study on the river Madera basin with the aim of:

- Identifying the development potentials in different areas like energy generation, transport and infrastructure, fisheries, tourism etc.; and
- Developing an integrated development plan for the Madera basin.

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<sup>2</sup> The tender for San Antonio was granted in December 2007

The purpose of the SEA could be to assess all these potentials in their mutual relationship. The exact scope and objectives of this SEA, however, will be elaborated further in this advisory report.

## 1.5 Approach taken by the NCEA

In order to prepare an advisory report on the above mentioned requests, the NCEA formed a working group of experts, representing the NCEA, which comprises the following disciplines: water resource management, hydraulic engineering, biodiversity and ecosystems, social impacts, rural development, participatory approaches and planning, EIA and SEA application. The working group members of the NCEA are listed in appendix 2.

As 'training on the job' in the practice of SEA is one of the objectives of this SEA, a Bolivian counterpart team was formed, made up of representatives of VBRFMA. Their team composition is mentioned in appendix 3.

The NCEA visited Bolivia from 8-13 October 2007 (see appendix 4, working programme). The purpose of this visit was to:

- Collect project- and site specific information (see appendix 6, list of documents) and discuss matters with several government authorities and non-government organisations and institutes;
- Agree on the scope and objectives of this SEA to reach a common vision on which planning/policy process is at stake, on problems that need a solution, and define possible alternatives/scenarios for decision-making; and
- Elaborate advisory ToR for this SEA and agree on next steps.

## 1.6 Outline of this advisory report

The NCEA defines SEA as a decision aiding tool, which *complements* planning with:

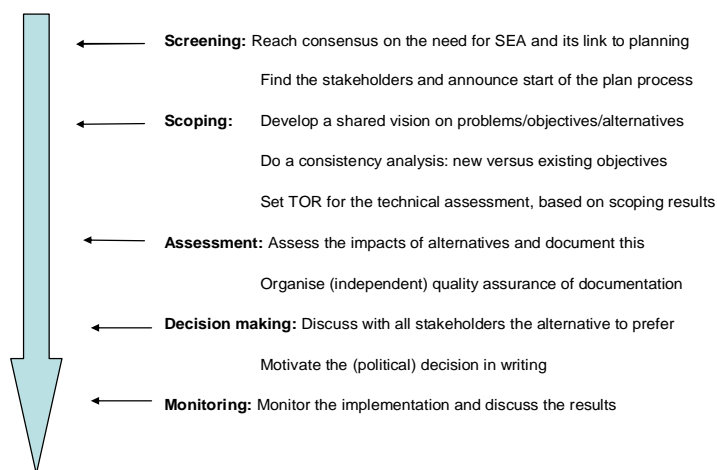
- a solid **assessment** of environmental and other issues;
- a well structured public and government **debate** on these issues; and
- a **mechanism** to take the results of assessment and debate into account in decision-making.

There is not one way to do an SEA, but it will always be tailor-made depending on context. For example, is the SEA done for an abstract policy or concrete plan or is there no plan at all? Are there three years or three months available? And what about data availability?

Therefore, also for the SEA for the Río Madera, the NCEA has developed a tailor-made ToR in close collaboration with the VBRFMA. The NCEA has set up this advisory ToR on the basis of 'General guidelines for SEA application' which have been developed based upon the practical experience of the NCEA

and on international experience like the OECD/DAC SEA guidance<sup>3</sup>. In summary, the SEA process can be divided in 10 steps. The vertical arrow represents the planning process (see scheme).

## 10 crucial SEA steps



Therefore, the NCEA chose to structure this advisory report along these steps. The last chapter gives recommendations for the institutional capacity needed to undertake this pilot SEA, including financial issues. This chapter does not give ToR for assessing the institutional capacity needed to deal with consequences or enforce regulation related to the plan implementation. This could part of further NCEA involvement: to identify institutional strengthening requirements where systems fail.

## 2. SCREENING (OR PREPARATORY) PHASE

*The purpose of this phase is to agree with all stakeholders in a transparent way on the process part of the SEA, i.e. on the goal of the SEA, how SEA is integrated in the plan process and how and what has been decided in relation to stakeholder and public involvement. Review and approval mechanisms and moments should have been secured at this stage.*

### 2.1 Objective of plan, objective of the SEA and link with planning

The proposal to undertake an SEA for the Madera basin is a result of the recommendations made by the Technical Committee to the Cabinet to develop an 'integrated development plan for the Madera river basin'. However, it was not precisely clear to the NCEA what kind of decisions would be taken in this

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<sup>3</sup> OECD DAC Guidelines and Reference Series Strategic Environmental Assessment: Applications in Development Co-operation, [www.seataskteam.net](http://www.seataskteam.net).

plan. Therefore, during the course of the visit, the NCEA tried to get insight in:

- What is the stage of planning: is the planning process just starting, half way or is a draft plan already available?
- What are the problems that need to be solved through the plan or in other words: what are the general and specific objectives (social, economic, environmental, technical, institutional) which justify the proposal of undertaking this integrated development plan?
- Who is/are the responsible agencies, in other words: 'the owners/developers of the planning process'?
- Which are the decisions to be taken in the planning process and when will these be made?
- Spatial and time horizon; is the plan geographically defined (if yes, how?)
- Which information (data) is available?
- In which social and political context the decision making on and implementation of the plan is foreseen?
- What is the budget and time-line of the plan process?<sup>4</sup>

The answers to these questions helped to define the level and scope of this SEA. Below an overview is given of the possible levels, showing a continuum from 'project level' to the 'highest strategic level' (no. 5)

<b>Optional levels of environmental assessment (theoretical)</b>	
Strategic level 5	SEA at the level of IIRSA (regional infrastructure development of Eje 6, Peru-Bolivia-Brazil)
Strategic level 4	SEA for integrated development plan Cuenca Río Madera (= 2/3 of Bolivian territory)
Strategic level 3	SEA for integrated development plan for the area of the Norte Amazónico (Northern Amazon)
Strategic level 2	SEA for integrated river basin plan (functions and use of the Madera river and its tributaries)
Strategic level 1	SEA of hydropower potential (sectoral SEA for the energy sector)
Project level	EIA of project (transboundary impacts of San Antonio and Jirau)

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<sup>4</sup> Note, this is not about the time horizon of the plan itself but about the time required to make the plan; will the planning process take e.g. 3 months or 3 years? Is a budget of 3000 or 30.000 Us \$ available? This information determines budget and time line of the SEA.



### **2.1.1 Selection of the level of the plan and SEA**

All relevant stakeholders should agree on:

- Which level (1, 2, 3, 4, 5 or a combination of levels) will be chosen and What is the decision about? Level 5 concerns e.g. the selection of ‘the best possible combination of infrastructure, energy and transport projects to enhance regional development at international level’, level 4 and 3 concern selecting ‘the best possible regional development within Bolivia’, level 2 deals with the selection for ‘the best possible use of Río Madera’ and level 1 concerns selecting ‘the amount, types and location of hydropower dams’.

In consultation with VBRFMA and on basis of many stakeholder contributions, the NCEA is of the opinion that the SEA can best be undertaken combining level 3 and 1. However, the final selection of the level of the plan and the SEA rests with VBRFMA. The reasons for selecting these two levels are:

- The trigger for undertaking this SEA is the possible construction of the two dams in Brazil. Bolivia urgently needs information on whether or not these dam related impacts will affect Bolivia. This at the same time raises questions as to the hydropower potential in Bolivian territory and its interaction (possible sediment trap function in Bolivia, which is an advantage for Brazil) with the dams in Brazil. This leads to selecting level 1: SEA for hydropower potential in Bolivia;
- However, the NCEA felt that an SEA at this level would need to be focused on a geographically well defined area, as an SEA for the energy sector or hydropower potentials for the whole of Bolivia would be beyond the scope of what VBRFMA had in mind. Moreover, VBRFMA is not the competent authority for leading an SEA for this sector, nor has a mandate to take decision on an energy or hydropower policy or plan;
- The VBRFMA is involved in an initiative of the Ministry of the Presidency, who is promoting and designing a Strategic Plan for the Development of the Macro Región Amazónica. This is meant to reflect a regional vision on development, based on the National Development Plan (PND). A first meeting has been held in June 2007, which has led to the Guayaramerín Declaration. The Declaration defines the priorities for regional development of the area. The sustainable use of energy potential has been defined as one of the four priority areas;
- Decisions on hydropower potentials will have direct implications for the kind of regional development and vice-versa, regional development options will imply different energy requirements; and
- For these reasons the NCEA felt that the SEA could best be undertaken for decision making on the hydropower potential, but directly related to the Northern Amazon Region. In other words: the SEA could be linked to the Strategic Plan for the Development of the Macro Región Amazónica and should focus, within this plan, on how to most sustainably use the hydropower potential of the river Madera. Note that this is slightly different from the purpose of the SEA mentioned in earlier paragraph 1.4

### **2.1.2 Objective of the SEA and link with planning**

Resuming (taking into consideration again the questions at the start of paragraph 2.1), the NCEA recommends the following:

- Generally, the purpose of an SEA can be to (i) assess a draft plan and develop mitigating and compensatory measures (e.g. in the form of a strategic action plan) or (ii) pro-actively improve planning and deci-

sion-making. In this case, as to the **planning stage**, this plan/SEA is just starting and therefore an example of the second category. However, an analysis should be made what kind of plans are already available in the area and other sectors, that may set conditions for this plan (paragraph 3.2. will elaborate further on this issue);

- Make an inventory of plan **objectives** in plans/strategies already available for the region, such as the Guayaramerin Declaration<sup>5</sup>, For example in this Declaration the following objectives are stated:
  - Productive transformation of forests
  - Sustainable use of biodiversity for social beneficence
  - Sustainable development and use of energy potential 'para vivir bien'
  - Integrated development of transport infrastructure and basic services

Other relevant plans include the Regional Development Plans for Pando ('Pando Sostenible') and Beni and the Strategic Action Plan belonging to the SEA for the Northern Corridor;

- It is important to clarify upfront **the initiator of the plan** for which the SEA is carried out. This could be (but has to be decided and agreed upon by all relevant agencies together) the Ministry of the Presidency, who intends to translate the National Development Plan (PND) into a regional strategy, in which the VBRFMA plays an important role. As the focus of this SEA will be on energy, also the Vice Ministry of Electricity and Alternative Energy will have to be closely involved, as well as regional governments (Prefectura de Pando and Beni). Therefore, the above mentioned stakeholders have to take a joint decision on issues like who runs this SEA/plan process (preferably the VBRFMA, with a mandatory consultation role for the other stakeholders), commitments for uptake of the SEA results and inter sector co-ordination;
- This SEA would have to generate environmental information for **decision making** on different scenarios for the development and use of the energy potential, to enable the desired regional development. This implies that this SEA does not will not directly look at the impacts of the Brazilian dams as to fishery, health and flooding, but will take these into consideration indirectly (see paragraph 3.1.2);
- The **geographical boundary** for the plan could be the Northern Amazon Region, as defined by the PNUD Human Development Report and the Corredor Norte SEA, among others. This region comprises the Pando department and the Madre de Dios province that forms part of the Beni department. In this region, social, economic and cultural features are closely related to natural and geographic features that permitted and/or restricted the development of economic activities of a certain kind of inhabitants. Common features are the abundance of natural forest resources, both timber and non-timber (castaña or Brazil nut), that are the local economy's basis, a history of geographical, infrastructural and administrative distance and isolation from the rest of the country and the presence of traditional indigenous people and peasant communities dedicated to agro-forestry;

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<sup>5</sup> Foro Amazónico, 19 de Junio 2007

- The advantage is that this geographical region has been thoroughly studied in the past years so that a great amount of **information** is already available on most topics that will have to be considered in this SEA. Using this information means that precious time can be dedicated to a few other topics on which new data have to be found (see appendix 6, which at the end mentions information gaps);
- **Social and political context:** Bolivian national and regional governments have different visions on how the Northern Amazon Region should develop and how to solve the energy problem in the region. Within these governments and their repartitions and also among other stakeholders these different visions co-exist at the moment. Because of these internal contradictions at all levels, it is impossible to predict the (political) decisions that will be taken. The NCEA is of the opinion that the SEA will present both objective information and the expectations of all stakeholders will be an important contribution to clarify the benefits and consequences of whatever option will be chosen; and
- **Plan time line:** In the absence of an already established process to establish an energy/hydropower policy, or to develop a regional development plan for the Northern Amazon Region, the SEA process will be used as the plan process. The NCEA recommends to undertake this SEA for planning purposes on the longer term (e.g. desired socio-economic future development in the Northern Amazon Region in 15-25 years time).
- **Duration of the plan/SEA process: this process** could be undertaken within a time span of approximately one year, assuming all needed parties cooperate and the absence of major budget constraints.
- **Required budget:** see chapter 4

## 2.2 Find the stakeholders and announce the start of the process

The decision to undertake this SEA has been made by VBRFMA based on Article 20 of the Regulation on Environmental Prevention and Control, which states that the National Environmental Competent Authority can decide to undertake an SEA.

The activities undertaken during the one week visit of the NCEA already comprise first steps in the major elements of a good practice SEA. The most important stakeholders in the process have been brought together (see working programme, appendix 4, which includes organizations/names), the VBRFMA has made its plan/SEA process known and transparent and a first introduction on the objectives and possible benefits of SEA has been given. A site visit has been paid to Cobija (capital of Pando department).

The NCEA noticed that most stakeholders know about the future construction of the Brazilian dams in the Madera River, as an intensive information campaign has been undertaken by environmental organizations, the VBRFMA and other local stakeholders. This information is mostly worst case scenario, and partly unconfirmed, and has been used to mobilize local organizations against construction of the Brazilian dams, especially for environmental reasons. That is why social movements and other sectors of the whole Northern Amazon Region are now strongly inclined to reject and protest the construction of these dams, and also construction of dams on Bolivian territory, for considering these harmful to their own and other inhabitants' interests.

To supplement the existing 'worst case' information, the NCEA recommends:

- to develop a 'realistic' scenario;
- to obtain reliable information about interests, worries and expectations of all stakeholders on the basis of this 'realistic' scenario; and
- to carry out a careful information and consultation process on the basis of this information.

This process, together with the results of the earlier information campaign will enable a well balanced government decision.

The SEA will have the potential to provide this accurate quality information on possible impacts of scenarios. Especially in this case where there is a lot of concern on what might happen in the Bolivian territory as a result of the construction of the dams in Brazil, it is essential to design a sound stakeholder participation plan. This plan should contain information on:

- 1) Formal stakeholders related to the SEA/plan process (institutional actors). The NCEA gives some recommendations on the potential roles of these stakeholders, as well as on when they should come together in chapter 4.
- 2) Informal stakeholders (social context, general public). The SEA should further elaborate on instances, subjects and methods of participation.

Main findings of stakeholder meetings (such as the ones held in La Paz and in Cobija during the NCEA visit), both in terms of process and contents should be well documented to enhance transparency and be distributed to all relevant stakeholders to show appreciation for participating in the process.

### 2.3 Review and approval mechanisms of SEA process and contents

It is up to VBRFMA, in consultation with key stakeholders to decide on when to insert review moments for (independent) quality assurance of the SEA contents and process. The quality assurance can be organised at regular intervals during the undertaking of the SEA, especially as this is a learning process for all parties involved. The NCEA is willing to assist in this process.

### **3. SCOPING**

*The purpose of scoping is to draft Terms of Reference (ToR) on the basis of a vision on problem analysis, goals, alternatives and a 'consistency analysis' (see 3.2), on which all relevant stakeholders should reach agreement. Based on these ToR, the SEA can then be executed.*

#### **3.1 Develop a shared vision on problems/objectives and alternatives**

##### **3.1.1 Integrated development of the Northern Amazon region**

###### **Problems/objectives**

As one of the inputs in the recommended joined problem analysis/objectives setting, below the NCEA provides below a first analysis on problems and objectives for the Northern Amazon Region, which should be further elaborated and verified in the SEA.

Currently, in Bolivia there are roughly two opposing views on strategies for development for the Amazon Region. The first one is the environment movement, related to ethnical groups, who consider the Amazon Region as natural and cultural heritage of great importance for the environment and their livelihoods. For this reason they oppose any intervention that affects the area as it is. The other movement represents the economic, political but also social interests, who would like to use the potentials of the region to enhance social and economical development and who are not afraid of interventions, even if these may affect the area as it is.

The first group gives an accurate and detailed view on the risks and dangers of interventions in the river (canalization, sluices, dams), but does not recognize the potential positive impacts on the living standards of people. They pay less attention to the fact that the majority of the population lives in miserable conditions, lacking minimal services with a high rate of child mortality, malnutrition, a low literacy rate etc.. And moreover, originating to a great extent from other parts of Bolivia (Altiplano), without much notion how to live in harmony with a, for them, hostile environment.

The second movement consists of representatives of clear economic interest groups, especially the regional economic elite, private enterprises, amongst which the national electricity company ENDE, and also the (international) construction companies interested in the execution of the interventions. A great part of the urban population belongs to this movement (representing the majority of the population of the region), and now are being considered as invaders by the first group. The urban population, however, is to a great extent equally distressed, and comes from the area originally. This group is of the opinion that big projects in the area will offer employment, and create a basis for the extension of current or new activities in the area. This group also is aware of the need to protect the Amazon, but this is not their primary goal.

###### **Alternatives**

The SEA can have different approaches as to developing alternatives, presented in appendix 7. For this specific SEA, a 'scenario' approach is recommended.

For the Northern Amazon Region, 3 hypothetical socio-economic development options for the next 25 years can be elaborated in the SEA. They all have to comply, in a stricter or lesser extent, with the explicit and implicit social, economic and ecological criteria formulated in the National Development Plan (PND) and applied in the Guayaramerin Declaration, which are based on the concept of 'Vivir Bien'.

'Vivir bien' emphasizes reciprocity, equal distribution in social and political terms, with sustainable use of natural resources rather than conservation of protected nature ('taking from nature what is needed, without destroying it').

Simplified criteria (which have to be defined more precisely in the SEA) are for example:

Environmental criteria:

Environmental impact is 100% mitigated and compensated. Processes which are unsustainable or irreversible are prohibited. This implies zero extinction of species and ecosystems, compensation for affected or flooded areas through e.g. (i) recuperation of areas which are degraded by fires and/or (ii) declaration of protected areas, without restricting access to forest resources for the inhabitants, but agreed with and for local communities such as 'reservas comunitarias con planes de manejo concertados'.

In relation to the fish species (ichthyofauna), advanced technology has to be implemented to prevent extinction of endemic species, e.g. through effective fish passes or re-population of fish species, complemented with mitigation programmes in relation to mercury contamination and solving the problems of illegal fishing by Brazilians and the 'paiche' (invasive fish species, destroying endemic fish species).

Concerning intensive agriculture, this has to be adjusted into environmentally sustainable systems, with maximum erosion control and controlling the use of fertilizers and pesticides and 'chaqueos'.

In case of deforestation, compensation for the liberation of CO<sub>2</sub> has to take place, apart from compensation for the loss of the CO<sub>2</sub> storage function in the framework of climate change.

Socio-economic criteria:

Already approved compensation of displaced inhabitants is guaranteed, in terms of improved living conditions (for this economic compensation is important, but not enough). Sustainable mechanisms for equal distribution of the benefits of developments and works (e.g. potential hydropower plants in Bolivia) have to be guaranteed, for instance through making the affected population (or rural population of Pando?) shareholders of the works, thus receiving a negotiated percentage of the energy yields generated through the works.

The three socio-economic development scenarios to be elaborated are more or less consistent with the PND. The less consistent scenarios can still comply with the PND, but require a larger budget for mitigation and compensation, either in environmental, socio-economic and political terms (e.g. strengthening of organizations and participation in decision making by local civil society) or through stricter rules for distribution of income of activities to be developed. For each scenario environmental and socio-economic criteria have to be defined in the SEA.

The suggested scenarios are:

1) Extensive forest-dependent development Scenario

This development option is based on maintaining as much as possible the existing situation in Pando. It may be considered an extensive development mode, where conservation of forest biodiversity, productivity and ecological services are important. Economic activity is based on extraction of non timber forest products, mainly, although not exclusively, Brazil nut, with little energy input for mechanization. Timber for local market or (certified) logging for export, is a complementary product, mainly without possibilities of transformation for added value.

Fishery constitutes an important input for subsistence of some communities and income generation through commercialization with Brazil for others. Payment for ecosystem functions, especially for maintaining forest cover, constitutes an additional income opportunity, within or outside the Kyoto protocol.

In relation to environment, e.g. a reasonable level of extinction of species is accepted, but not more than the current rate of extinction, nor species which are economically relevant or characteristic.

2) Diversified agro-forestry practice Scenario

In this socio-economic option, still forest related activities are predominant, but non-timber forest products are more diversified, transformed and commercialized with added value for regional and export markets (fruit pulp, medicinal herbs, etc). Energy is used for transformation and refrigeration of the end products.

The forest cover is still predominant, but an extended road system forms a mosaic with patches of other land uses (cattle, other crops) on a small scale. Forestry concessions are managed with certification and timber manufacturing gives added value to commercialization of the products.

Eco-tourism potential has been developed and several communities are benefiting from this activity, power generation is not export oriented and fisheries is still an important resource for rural communities.

3) Intensive agro-industrial development Scenario

In this development option, perennial crops for bio-fuel have been adapted to regional soil and climate conditions, and are predominant crops cultivated in high technology and nutrient input dependent agricultural systems. Bio-fuel export as well as power export to Brazil generates income for the region and the country.

The road system has been intensified, population may have grown. Forest cover has been reduced to (i) protected areas interconnected through biological corridors, where some forest extractive activities still occur and (ii) forest concessions where timber industry together with other agro-industrial activities have been developed. Fisheries from the rivers and lagoons has diminished, but aquaculture has taken its place.

### 3.1.2 Using potential for hydropower generation

#### **Problems/objectives**

In paragraph 2.1, a short overview is already given on the current situation in relation to hydropower generation. The SEA should give more detailed information (including cost estimates).

#### **Alternatives**

The NCEA suggests to develop 4 scenarios for development of the energy sector in the Northern Amazon Region. These scenarios are described briefly in the following and should be further elaborated in the SEA.

##### 1) Autonomous development

This scenario takes into account plans that have been developed for the energy sector that are likely to be executed. The 3 diesel plants in Cobija, Riberalta and Guayaramerin will be used to their potential (3.4, 4.8 and 7 MW respectively) and will be interconnected. The small hydro power plant in the Río Yata (2 (or 6?) MW) will be operational. A large part of the region will remain unconnected to the power net.

In the autonomous development scenario it is also foreseen that plans to improve road connections in the area (Corridor Norte and the connection between Cobija and Ixiamas) and rural roads in Pando department will be effectuated.

##### 2) Regional self sufficiency in energy

This scenario assumes regional self-sufficiency in energy. The rapids ('cachuelas') in the area will be used as much as possible for generation of electricity with small hydro plants. In Cachuela Esperanza, part of the river flow (10%) will be diverted over turbines with a capacity of at maximum 10 MW. Isolated communities will not be connected to the net but will generate electricity by using Brazil nut casks, diesel or natural gas<sup>6</sup> as fuel in thermo-plants or (preferably) by applying alternative techniques (solar panels).

##### 3) Energy production for the national market

Under this scenario the region will produce more energy than the regional demand. The surplus will be added to the national net. At Cachuela Esperanza a reservoir and power plant will be constructed with a capacity of 800 MW. The 115 KVolt transmission line, that is presently under construction to connect Trinidad with the national net will be extended to Cachuela Esperanza. Many of the communities of the Northern Amazon Region will be connected to the net.

##### 4) Energy production for the international market

In this scenario the hydropower potential of the area will be exploited to the maximum. Besides Cachuela Esperanza the Binacional power plant on the

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<sup>6</sup> brought to the area in tanks



Río Madeira will be brought to production, as will be the El Bala Plant in the upper Río Beni (1200 MW). The surplus of energy will be exported to Brasil (and Peru?). Most communities in the Northern Amazon Region will be connected to the net. Construction of the Cachuela Esperanza and Binacional reservoirs also implies that the navigability of the Río Madera and Río Beni will improve. Actually the Río Madera Hidrovia will be effectuated. Besides the river transportation network, also the road network is thought to extend.

### 3.2 Consistency analysis

The purpose of this step in the SEA procedure is to check the consistency of the plan/SEA to be developed with existing policies, plans and programmes, through interagency co-operation.

This requires an inventory (both public and private) at international, bi-national, national, regional and local level of a number of development sectors to ensure that plans are compatible with each other. Examples for the VBRFMA are (i) the Ramsar-convention, IIRSA initiatives and Pacto Amazónico at international level, (ii) agreements between Bolivia and Brazil<sup>7</sup> for the Madera basin and the 'Programa Amazónico Trinacional' at tri- and bi-national level and (iii) the Strategic Plan on Forests, the National Watershed Programme, the Plan for Protected Areas, the National Programme for Bio-trade and the National Wildlife Programme at national level, and (iv) the development and management plans at regional (e.g. 'Plan de Desarrollo Departamental Pando Sostenible' of Pando department) and local level.

As part of the SEA, an overview should be made of all plans and programmes of different sectors (e.g. energy, transport, water, land use/spatial development plans, social improvement/poverty alleviation plans) that have a link with or set conditions for the 4 desired development scenarios and 5 energy scenarios as identified in paragraph 3.1. An analysis should be made of:

- Which policies/plans/programs generate opportunities for the different scenarios
- Which ones set environmental and socio-economic conditions (criteria) for the different scenarios; and
- Which ones have the potential to conflict with the scenarios and how these conflicts can be solved.

### 3.3 Terms of Reference for the SEA technical study to be carried out

These ToR summarize the key findings as to the required content of the SEA and the scope and topics to be investigated.

In paragraph 2.1, the NCEA recommended to undertake the SEA as part of the development of a plan for the integrated development for the Northern Amazon Region focusing on assessing options for hydropower generation. The assumption is that development of hydropower and the associated develop-

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<sup>7</sup> Such as: 'Ajuste complementario al Acuerdo Básico de Cooperación Técnica y Científica entre el Gobierno de la Republica Federativa del Brasil y la República de Bolivia, relativa a la Central Hidroeléctrica Cachuela Esperanza (1984), "Memorando de Entendimiento" entre ambos países sobre el Desarrollo de Intercambios Eléctricos y Futura Integración Eléctrica (1998). Comunicados conjuntos de los dos gobiernos sobre el aprovechamiento hidroeléctrico y de navegación del Río Madera (2001 en 2003).

ment of infrastructure are the key drivers of the socio-economic development potential of the Northern Amazon region. Most of these are indirect; they are related to changes in the biological environment, which are on their turn are influenced by changes in the physical environment: the characteristics of the rivers, waters and soils in the area.

The purpose of an SEA for the long term future development of the region would be to compare the 3 different regional development scenarios, and associated scenarios for energy development.

The SEA could be structured using a matrix as presented below:

Scenarios for hydropower development▶	1) Autonomous development	2) Regional self sufficiency in energy	3) Energy production for the national market	4) Energy production for the international market
Scenarios for future socio economic development▼				
1) Scenario extensive forest-dependent development				
2) Scenario based on diversified agro-forestry				
3) Scenario intensive agro-industrial development				

As has been suggested in paragraph 3.1.1., for each of the 3 socio-economic development scenarios, a set of environmental and socio-economic criteria (or conditions) have to be formulated. With these criteria or conditions, the 4 hydropower development scenarios can be assessed. The matrix will show in which boxes of the matrix there will be a match (putting a + in the box) between socio-economic development scenarios and hydropower-generation scenarios and where there will arise incompatible situations (putting a -). For instance, intensive agro-industrial development will probably not be possible with an autonomous development scenario of hydropower generation.

The boxes where there is a match will lead to a limited number of realistic scenarios and can be further elaborated in the SEA in terms of a description of conditions and requirements, and opportunities and impacts.

In paragraphs 3.3.1 to 3.3.3 an overview is given which can be used to identify:

- Environmental and socio-economic criteria to define the conditions which apply to each of the 3 socio-economic development scenarios; and
- Opportunities that each of the matching combination of scenarios offers and impacts that will be caused as a result of this match.

A description of the current situation in which the electrification of the region is limited (only in Cobija, Riberalta and Guayaremerin, electricity is produced by means of diesel generators) can be used as a baseline.

Finally, the scenarios will have to undergo a sensitivity analysis. This means that a check has to be done whether the desired socio-economic development is still possible when the construction of 2 hydropower plants along the Rio Madera near San Antonio and Jirau in Brazil will take place. A distinction could be made between San Antonio only, and development of both San Antonio and Jirau. This will generate information on possible restrictions that Brazilian dams put to desired socio-economic development in Bolivia.

### **3.3.1 Socio-economic conditions/opportunities/impacts are for example:**

- **Forest and forest related economic activities**

Both small scale (recollection and/or cultivation of biodiversity products) and large scale (Brazil nut production). Present soil and humidity conditions are excellent for both quality and size of Brazil nuts. Controlled timber production is probably a development opportunity for the region.

Flooding and/or permanent high water levels in the rivers will affect soil and groundwater conditions, altering production conditions of Brazil nut trees and other species. These may alter quality and quantity of the forest production and even kill trees.

- **Agriculture**

People might be encouraged to engage in intensive agriculture or cattle breeding, which are considered activities not suited for the Northern Amazon Region's soil and will lead to rapid deforestation. Higher water levels, even without flooding, also impact present subsistence agriculture on river banks in the dry season.

- **Bio fuel production**

Opening up the area may improve possibilities for the large scale production of bio fuels, e.g. African Palm, sugar cane or soy.

- **Water use**

Surface water is used as drinking water throughout the area. Contamination of surface water may jeopardize this use of the resource.

- **Fisheries**

Most scenarios will affect levels of fish population that are already decreasing. Fish is an important part of the local population's diet. Fishing is also an important economic activity for peasants and indigenous people, and the subsistence basis of the Esse Ejje people, living alongside the Beni and part of the Madre de Dios rivers. Fishery may be considered an important economic potential that can be impacted both positively and negatively with consequences for rural peoples' income levels. It is therefore important to assess volumes, present and future importance of fishery in both food and local economy.

- **Energy production**  
The energy produced has an economic value. Export of electricity may make available funds to finance the works. An increase in regional income (at the level of the Prefectura) may result in improved basic services (health care, education, communication, others).
- **Industrial progress**  
This refers to the possibility to industrialize Brazil nut processing, as well as possibilities for production and processing of timber, meat, fish and new biodiversity products (exotic fruit juices, medicines,...). Industrial progress may however pose increased pressure on e.g. forest resources.
- **Tourism**  
A higher water level in the Amazon rivers, means losing the natural attraction of the rapids, especially the Cachuela Esperanza Rapid, which forms part of the Triangulo Amazonico<sup>8</sup> tourist project, promoted by local and regional governments. This site combines historical and archaeological values with beautiful natural scenery, but also other rapids in combination with forest scenery are considered to be possible tourist attractions.
- **River transport**  
Construction of the reservoirs and drowning of the rapids, in combination with the construction of shiplocks, will improve the navigability of the rivers and increase the options for export of bulk products. On the other hand discharge regulation and changes in river morphology (sedimentation) may reduce depths and so hinder navigation.
- **Job opportunities**  
Development of the area, either by increase of tourism, increased industrial activities or more intensive use of the forest will increase the job opportunities. However, it can also have negative impacts: when for instance the Brazil nuts will be crashed mechanically in future, this will imply a loss of job opportunities for especially women, who are now crashing Brazil nut manually.
- **Displacement of people**  
Depending on the localization of the dams, peasant communities and indigenous settlements might be affected, as well as some private settlers, dedicated to cattle farming. This would imply a process of compensation and resettlements, which means confronting demands and conflicts with and among settlers and possibly an acceleration of the urbanization process of the cities of Riberalta, Guayaramerin and Cobija. These cities lack sufficient services for their present populations and would have difficulty to attend more people.
- **Immigration to the area**  
Big infrastructural works will also attract people and cause immigration influx from other parts of Bolivia, during and after the works, both in the

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<sup>8</sup> Ruta Guayaramerin – Cachuela Esperanza - Riberalta

rural areas and in the cities. Although the legal land property situation has improved significantly in the last few years, new immigrants could try to proceed to illegal land occupations and illegal extractive activities. It could also trigger a process of informal relations between landowners and occupants breaking existent legal dispositions and social agreements about land property in the region.

- **Public health**

Through reservoir construction, local population may be affected as a result of an increase in the incidence of water borne diseases like malaria, leishmaniasis and dengue. If the water is used as drinking water, poor water quality (mercury) may also affect public health.

### 3.3.2 **Environmental conditions/opportunities/impacts**

As stated above, most of the changes in the socio-economic conditions are indirect, they are the result of changes in the biological/ecological environment. At the same time environmental conditions are affected by human interventions.

Bolivia is a signatory of the Convention on Biological Diversity, as such extinction of biodiversity (genetic variety, species and ecosystems) should be avoided at all cost and impacts on ecosystems and ecosystem functions and services should be mitigated and/or compensated.

Extinction of species or negative impact on populations is usually directly caused by changes in the physical environment, e.g. by flooding and/or changes in ground water level (terrestrial species, site specific ichthyofauna in rapids), or by obstruction of migratory paths by the dams or flooded areas (migratory ichthyofauna, eventual fragmentation of terrestrial bio-corridors). Impact may also be indirectly, e.g. resulting from changes in human occupation and land use systems, or induced micro-regional climatic changes.

Changes in the biological/ecological environment that may affect the socio-economic environment and that should be taken into account in the SEA are for example:

- **Extinction of singular ecosystems**

At the ecosystem level, the impact on different ecosystems (land units ZoniSIG) and vegetation types should be assessed. Based on the existing GAP-analysis (GEF), the flooding or loss of critical ecosystems or priority areas for biodiversity conservation should be considered, within existing or planned protected areas, in view of mitigation and/or compensation measures. Special attention should be given to the impact or total loss (extinction) of unique or “singular ecosystems”.<sup>9</sup>

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<sup>9</sup> Singularity of an ecosystem is homologue to the endemism on the species level; If a certain unique ecosystem is destroyed, an example of biodiversity on ecosystem level has gone extinct. An example could be the low forest ecosystem on the Precambrian shield present in the Reserve Bruno Racua, which is unique in Bolivia’s ecosystem diversity, but might still occur extensively in Brazil.

- **Extinction of endemic species**

At species level, floristic and faunistic (endemic) species (terrestrial and aquatic) may become extinct. Especially the presence of site specific fish-fauna in rapids like Cachuela Esperanza should be assessed. Based on existing information, the level of endemism and singularity should be specified (local endemism, national level endemism, endemic for the Madera basin) to establish the relevance of the loss (complete extinction of locally endemic species; extinction of species from the Madera basin but still present in other basins; extinction of species for Bolivia, although present in Brazil). Also emblematic species (like the pink dolphin) deserve attention.

- **Degradation of ecosystems and reduction of populations**

Different energy inputs may enable different levels of intensity of land use, affecting present day forest cover. The positive and negative impacts of these tendencies should be considered, in their socio-economical (improvement of living standard, distribution of income, equity in access to resources, etc) and environmental aspects (rate of deforestation, level of fragmentation, degradation (erosion) of ecosystems through different land use types). Impact on the present land use systems of agro-forestry, based mainly on extraction of non-timber forest products and the socioeconomic impact on the social actors involved in these activities, should be established and predicted within the different scenarios.

Changes in hydrology might have serious impacts on the wetland system of the Madera river basin. Moreover, flooding or indirect changes in hydrology might lead to habitat destruction of endangered species (red lists of IUCN). Change in land use may cause deforestation and fragmentation of forest cover, which is another factor that could be modeled.

As for fish, apart from the more dramatic possibility of total extinction of site specific species, the (trans-boundary) impact of the dams on populations of migratory fish should be established, with special attention for economic relevant species. The cost of the impact to the local communities dependent on fisheries for subsistence and/or for commerce should be estimated.

As a consequence of the loss of fisheries, the pressure on fauna as a means of protein resource might increase (hunting). This indirect impact should be considered in addition to the loss of fisheries.

- **Reduction of the potential use of biodiversity and bio-trade opportunities**

Flooding, but also indirect impacts as induced changes in land use might lead to the loss of opportunities of sustainable use of biodiversity. Impacts on ecosystem productivity should be assessed, especially related to cash crops as the Brazil nut; flooding of portions of their habitat or indirectly rising ground water levels might reduce productivity. Also the loss of other non-timber forest products with economic potential (asai, copuazu, etc.) and timber production should be estimated.

- **Reduction of ecosystem services**

In case of flooding of forests, their function of carbon absorption and carbon sink will be affected. For compensation measures, the cost of this loss

can be estimated extrapolating from studies carried out in National Park Noel Kempff Mercado.

On the other hand, the impact of extensive deforestation on the carbon emission rate affecting global climate change might be taken into account.

### 3.3.3 **Physical conditions/opportunities/impacts**

Above listed changes in the biological/ecological environment are the consequence of changes in the physical environment. The most common direct impacts of hydropower related dam construction on the physical environment that should be taken into account in the SEA are:

- **Loss of inhabited/productive area**  
Construction of storage reservoirs implies inundation of areas that may presently be in use for production of agricultural produce, timber of non-timber forest products. Also settlements and infrastructure (roads, foot-paths) may flood. Flora and fauna in the impoundment area will disappear.
- **Changes in seasonal flooding**  
Storage reservoirs change downstream discharge patterns and may affect flood frequency and flood levels in the floodplains. This may affect the wetland ecology. This impact is especially important regarding the construction of the El Bala reservoir, which will have a flood regulation function.
- **Change in flow velocities**  
Reservoir construction changes the flow velocities both upstream and downstream of the dam site. Drowning of the rapids will greatly reduce local flow velocities. This may have an impact on the river morphology, on the water quality and on the aquatic flora and fauna.
- **Changes in river morphology**  
Reservoir construction and the related changes in flow velocities result in a change in erosion and sedimentation processes. In the reservoir part of the sediment load of the river will settle, resulting in a loss a reservoir capacity and so reservoir lifetime. Sedimentation may block river flows and lead to elevated water levels. Downstream of the reservoir, the reduced sediment load of the river may increase the erosive power of the river, what may result in erosion of the riverbed.
- **Water quality**  
The quality of water stored in reservoirs may become very poor as a result of increased residence times and the decay of the flooded vegetation. The reservoir water may become anoxic and due to increased nutrient levels algae blooms may occur. Releases of poor quality water from the reservoir may negatively affect the water, and thus aquatic fauna, in the downstream river. Drowning of the rapids will locally reduce oxygen levels of the water. Special attention should be given to the behavior of mercury accumulation in the reservoirs.

- **Groundwater levels**

In the vicinity of the reservoirs groundwater levels may increase, which may have an impact on the vegetation. Special attention should be given to areas where Brazil nut is collected. Downstream of the dam sites groundwater levels may fall, possibly affecting wetland areas in the flood-plains.

- **Impacts on the local/global climate**

Flooding of vegetated areas results in a reduction of stored CO<sub>2</sub>, thus adding to climate change. Releases of methane gas, a very potent greenhouse gas, from the reservoirs adds to his impact. On the other hand, replacement of diesel powered plants by hydropower reduces CO<sub>2</sub> emissions.

Besides, a number of impacts related to land-use changes in the area should be considered:

- **Soil erosion**

Changes in land use (mainly a reduction in forest area) in the area may increase soil erosion rates and as such the amount of sediment being delivered to the river system and ultimately the reservoirs. This has an impact on the river morphology, probably resulting in increased flooding, and reduced navigability and on reservoir lifetimes.

- **Soil characteristics/productivity**

Soil characteristics in deforested areas will change, not only physical characteristics may change (compaction, reduced infiltration rates), but also chemical characteristics (loss of organic matter, nutrient status), this may lead to reduced soil productivity.

- **Discharge pattern**

Changes in land use and associated changes in soil characteristics result in changes in percentages direct runoff and water storage capacity of the soils. As a result peak flows will increase (resulting in flooding), whereas low flows will decrease (possibly resulting in increased sedimentation and reduced water depths, as well as water shortages).

#### **4. INSTITUTIONAL ARRANGEMENTS AND IMPLEMENTATION MODALITIES**

This chapter deals primarily with the assessment phase of the SEA process:

In EIA, it is generally a consultant who is responsible for the realization of the EIA and the competent authority reviews and (dis)approves the EIA study. In SEA, generally government agencies are responsible for the elaboration of the SEA, trough e.g. en SEA team, assessing strategies in a participative and transparent way.

The NCEA has proposed, and this was agreed by VBRFMA, that the SEA could best be executed by a team of Bolivian experts, thus generating SEA capacity and experience within the country. These experts should be recruited preferably from within the VBRFMA and other relevant government authorities or alternatively contracted from outside especially for this SEA but then operating in the offices of VBRFMA. Criteria for the selection of experts



are knowledge of EIA, preferably in combination with a background in (socio) economy, hydrology and nature conservation. The team should be headed by a team leader, with basic knowledge of SEA. The tasks of this individual will be managing the SEA team and secretarial support, arranging contacts with relevant stakeholders, overseeing and editing SEA report production. This person will also be responsible for involvement of all actors and building up mutual understanding and ownership of the results.

The NCEA also recommends to form a Steering Group for this SEA, in which representatives of the most important stakeholders have a seat (eg. at general directors level from VBRFMA, Vice Ministry of Electricity and Alternative Energy and possibly Prefecturas of Pando and Beni). This steering group meets regularly to guide the SEA process and review progress. This steering group is especially meant to guarantee the political back-up and support for undertaking this SEA. The SEA team leader will attend these meetings.

As there is very limited SEA experience in the country itself, the NCEA recommends to make use of international SEA experience. In Bolivia there are international consultants, with experience in SEA (e.g. related to the Corredor Norte SEA) who could guide and coach the team (eg. a few days each month). The NCEA also recommends to open a web-site on this pilot SEA to enhance transparency and participation, but also to enlarge the learning effect (and other possible 'spin-off) of this pilot SEA.

Profile of the SEA team: the team should reflect expertise on ecology, sociology/public participation, forests, agriculture, hydrology/hydraulics, but also regional planning, economy and should definitely include experts who know about electricity production (technically on hydropower) but also on electricity demand. Knowledge on the Northern Amazon Region, as well as on SEA/planning studies, and hydropower projects is required or strongly advised.

Costs: Estimated at US \$ 100.000-150.000 (including in kind by government agencies and support to stakeholders (NGOs) for participation. Study duration: 1 year. A list of reference material (such as Appendix 6 to this ToR) should be added for use by team.

The final SEA should:

- Present a summary of the scenarios that have been considered and give reasons for selecting the preferred scenario or rejecting the other scenarios, and give insight in how the assessment was performed;
- Be accompanied by mitigation and compensation plans, including estimated budgets; and
- Give an overview of difficulties (such as technical deficiencies and lack of know how) in compiling the required information.

The SEA results and decision should be published.

The SEA should also set indicators to monitor the implementation of the adopted plan/SEA and discuss the outcomes with the stakeholders