Blueforests Strategy Document

Standardized Methodologies for Carbon Accounting and Ecosystem Services Valuation of Blue Forests in Ecuador

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1. Introduction

In 1969 Ecuador had 203,624.6 hectares of mangroves and by 2014, this ecosystem decreased by 27.7% to 157,094.28 ha. The situation is more critical for salt marshes. In 1969, Ecuador had 51,461 ha of salt marshes that decreased by more than 90% to a total of 3,705.2 ha nationwide.

For the past four decades, the main causes of mangrove deforestation and salt marsh transformation have been the expansion of shrimp ponds for aquaculture, the expansion of urban areas, especially Guayaquil and Machala[1], and the solid and liquid pollution affecting the water and soil of mangroves.

Since 1980 the Government of Ecuador established a legal framework to enforce the conservation of mangroves and salt marshes. In 1999 through the Executive Decree No. 1102 and in 2000 through the Ministerial Agreement No. 172 from 2000, the government established "Sustainable Use and Custodial Agreements of the Mangroves", referred in this document as "Mangrove Concessions". The Ministry of Environment is given the authority to tender concessions to local user organization (such as fishing cooperatives or crab-users associations) so that they may sustainably harvest and market fish, clams, and crabs, among other biological resources, in coordination with and supervision by the Ministry of Environment.

However, perhaps one of the most important advancements pertains to the modifications of the Forest Law in 1990, when the government decreed that mangroves belong to the State and are not susceptible to appropriation; hence, there are no land titles or private

[1] Guayaquil is the most populated city in Ecuador and Machala is the fifth most populated city.

property rights over areas with mangroves.[2] Also, is important to highlight that according to the Ecuadorian Constitution (article 74) no person is allow to appropriate the ecosystem services, they are owned by the State.

In this framework Ecuador needs more understanding of the ecosystem services that mangroves provide and the situation of local communities that depends on those mangroves for their daily based activities. Enforce the implementation of the mangrove concessions and support the evaluation of the policy framework in Ecuador.

This document shows the strategy for the Blueforests Project in Ecuador, that aim the conservation of mangrove ecosystem through the understanding of the benefits developed by its ecosystem services.

2. Objectives of the project

The focus of the GEF Blue Forests Project small-scale intervention titled 'Ecuador Blue Forest Project' is the application of blue forests methodologies and approaches for valuing carbon and other ecosystem services (ES). The intervention aims to improve the understanding of ES and carbon storage and sequestration for mangrove ecosystems in Ecuador, and to develop improved ecosystem management founded on that understanding.

The intervention is applicable to an area covering a total of 41,000 ha in the Gulf of Guayaquil. This project will help meet national priorities in coastal management, especially pertaining to the protection of mangrove ecosystems, and priorities in national climate change policy. There are two specific objectives to achieve the application of Blueforests approaches:

Objective 1: Improving the understanding of blue forests carbon storage and other ecosystem services.

Objective 2: Improving blue forests capacity and ecosystem management.

This project considers **Blueforests as the promotion of better coastal ecosystem management by harnessing the values associated with carbon and ecosystem services**

[2] Until this point, some mangroves were still considered private property while others were conserved because they were located in protected areas.

(coastal protection, nursery services, support marine biodiversity habitat, scenic beauty and others). With this consideration, the project will develop information of mangroves and their ecosystem services to improve the knowledge of decision makers, community leaders and the conservation community.

The three mail outputs of the project are:

1. Ecosystem service information developed and delivery to main decision makers, including carbon assessments and other key service.
2. Enforce the management of 41,000 ha of mangrove forests at five sites through the mangrove concessions and the implementation of Socio-Manglar incentive.
3. Assess the implementation of the Ecuadorian policy framework for mangrove conservation.

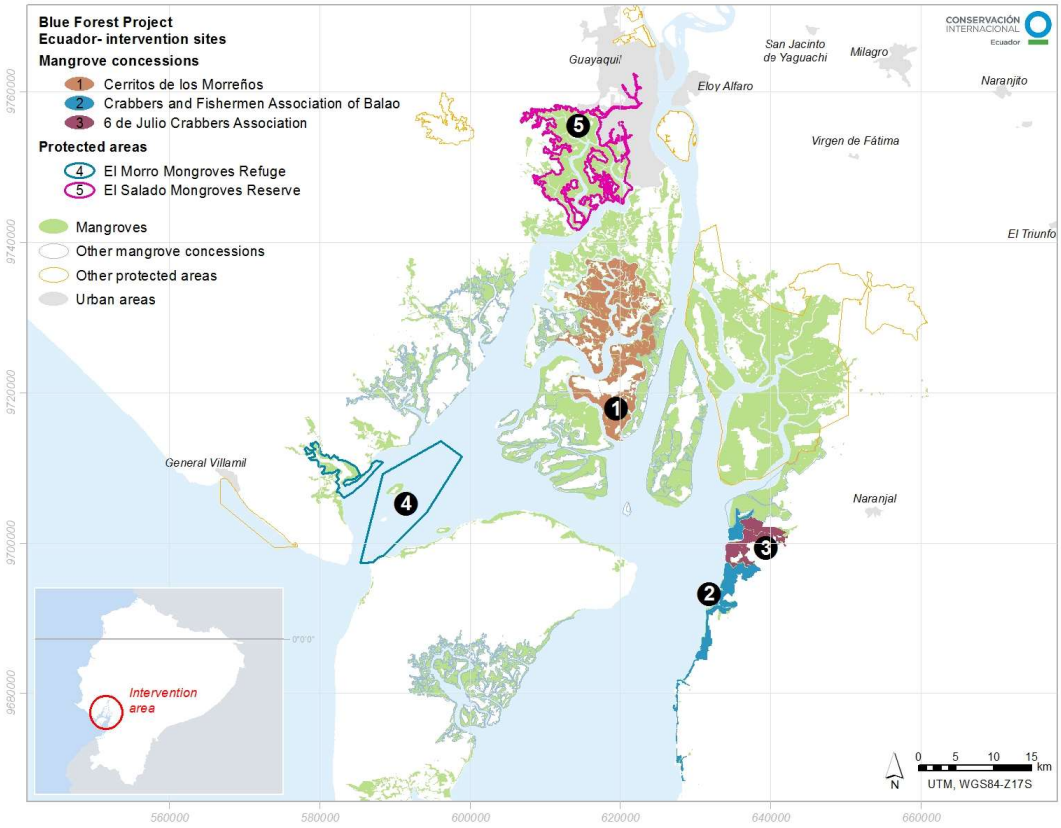
4. Areas of intervention of the project

In figure 1 the areas of intervention of the project are presented. These five areas are a good portfolio of the multiple governance structure and the multiple challenges of mangrove conservation in the Gulf of Guayaquil.

The 41,000 hectares that the project will work are composed by:

1. Cerritos de los Morreños Mangrove Users Association: 10,869.53 ha
2. Balao Crabbers and Fishermen Association: 3,157.51 hectares
3. 6 de Julio Association: 2,036.27 hectares
4. El Morro Wildlife Reserve: 10,130 hectares
5. El Salado Wildlife Reserve: 15,497.42 hectares

Figure 1: Areas of intervention of Blueforests Project:



5. Project components

The Ecuador Blue Forests Project has three main focal areas, described as follows:

1. **Ecosystem service assessment** – Activities focused on the values of ecosystem services include the following:
    a. An assessment of the information gaps related to ES valuation and the production of an ES assessment report.
    b. The production of a national report raising the profile of mangrove ES in a national context in particular services as carbon storage, coastal protection, food security and scenic beauty.

2. **Mangrove concessions** – Activities focused on mangrove concessions include the following:
    a. Evaluating the effectiveness of existing management plans and concession agreements to protect mangrove ecosystems.
    b. The creation of new mangrove concessions that are effective in protecting mangrove ecosystems and include ES valuation.
    c. Enforce the management of existing mangrove concessions.

3. **Carbon and ES Mangrove Policy** – Activities focused on mangrove policy include the following:
    a. Engagement with the national government to support the inclusion of mangrove values (carbon and ES) in political instruments that address climate change. In particular a Bluecarbon NAMA,
    b. Evaluation of the effectiveness of penalties for mangrove deforestation (AM056).
    c. Engagement with the national government to support the inclusion of mangrove values (carbon and ES) in national instruments related to conservation, biodiversity and sustainable development (e.g. legal framework for mangroves, National Biodiversity Strategy).

6. Ecosystem Service Assessment

As one of the most productive ecosystems (Mitsch & Gosselink, 2007), mangrove forests provide a wide range of services, including raw materials and food, coastal protection, erosion control, water purification, maintenance of fisheries, carbon sequestration, and tourism, recreation, education, and research (Barbier et al., 2011).

This component focusses in two aspects of the demand of information of key decision makers in Ecuador: the biophysical information of the ecosystem services of mangrove ecosystem and the economic value of those services. This project will focus in four main ecosystem services: coastal protection, scenic beauty, bluecarbon and food security.

2.1 Analysis of coastal protection, scenic beauty and food security services

Mangroves, together with other coastal habitats such as sea grass and coral reefs, play a great role in protecting coastal areas. For example, mangroves can reduce the surge from storms and cyclones; hence protect backshore areas from storms (Das & Vincent, 2009). Through wave attenuation and sediment buildup, the ecosystem can potentially mitigate the impact of shoreline erosion (Spalding et al., 2014). Moreover, within the climate change adaption context, several studies discussed the effect of mangroves on maintaining the shoreline in the face of sea level rise (McKee et al., 2007).

Coastal protection service integrates factors that determine the effectiveness of protection. For example, extent of forest, soil slope, tree density, tree diameter, biomass ratio area, tree height, soil texture, complexity of the root system, mangroves age, among others (Alongi, 2008; Krauss et al., 2009; McIvor et al., 2012 and 2013, Spencer and Möller, 2013).

Within this context, the objective of this component is to evaluate the coastal protection service, specially related to flood prevention and wave attenuation, which is provided by the mangroves of the Gulf of Guayaquil.

Methodology:
Two approaches will be applied: spatial modeling and evaluation of perceptions.

Spatial modeling

By applying GIS tools and some coastal protection models we will identify areas benefited by mangroves. For this, we will apply models comparing three scenarios of mangrove distribution: 1) current distribution scenario (2014 data), 2) restoration scenario (mangroves recover their historical distribution), and 3) total lost scenario (all mangroves disappear). The comparison of those results will reveals those areas that receive protection from mangroves. Those areas will be characterized by population concentration and presence of key infrastructure in order to quantify coastal protection service.

We will explore and evaluate some coastal protection models in order to evaluate the most suitable for this exercise. Among the models are InVEST (Sharp et al., 2015), Co$ting Nature (Mulligan, 2015), ARIES (Villa, et al., 2014), SEAMat (Panzeri et al., 2012), TESSA (Peh et al., 2014), IFAM (Eldho et al., 2014), SWAN (Suzuki et al., 2011), WAPROMAN (Vo-Luong and Massel, 2008), and other regression models (Cohen et al., 2004; Das and Vincent, 2009; Bao, 2011).

Evaluating perceptions

We will try to capture the perceptions of local communities regarding the coastal protection service that mangroves provide. We will include two groups of people: 1) people who currently live in or near to mangrove areas, and 2) people who live in or near to areas without mangroves but with them in the past. We will compare the results from these groups to formulate conclusions.

We will explore tools available at http://www.aboutvalues.net/method_navigator/ in order to select the most useful for our assessment.

Activities:

- Review literature and tools related to coastal protection analysis and evaluation of perceptions.
- Gather geographical information about current and historical mangrove distribution, population distribution, infrastructure and facilities in the study area.
- Run spatial models according to the defined scenarios defined.
- Develop workshops with communities to capture their perceptions about coastal protection.
- Analyze obtained data and generate key information to decision makers.
- Valuate the economic contribution of the coastal protection service to the Gulf of Guayaquil that represents four municipalities.

Products:

- Technical report of the coastal protection assessment.

Expected results:

Ecosystem service assessments should be 'issue-driven'. They can be done to gain new insights, to make a strong argument, to start a discussion, to help settle a negotiation, to enhance a planning process, or to reach a decision.

In our case, we expect to generate spatially explicit information that allows decision makers:

- To understand the risks faced by coastal territories.
- To understand the contribution of mangroves to reduce impacts.
- To incorporate mangroves (natural solutions) into broader coastal zone management planning, including investments related to protection and restoration of mangroves.

- To incorporate mangroves as an ecosystem based adaptation strategy in the local planning.

Key partners:

- INOCAR
- Municipalities of Guayaquil, Durán, Naranjal, and Balao
- Guayas Provincial Government

2.2 Bluecarbon analysis

Besides mangrove concession another key development in public policy related to mangrove conservation in Ecuador was the launch of the Socio Manglar program in October 2014. It aims to complement and consolidate the outcomes reached by the mangrove concessions policy, particularly by enhancing mangrove conservation through the livelihood improvement of local communities. Socio Manglar provides direct economic incentives to local user organizations conditioned on the compliance of the management plans approved when they received a mangrove concession as well as the participatory investment plans[3]. The mangrove concessions and the conservation agreements with Socio Manglar are 10-year agreements that can be renewed for another 10 years.

Until December 2015, Socio Manglar has signed 23 conservation agreements, contributing to the protection of more than 22,200 hectares of mangroves and benefitting more than 3,200 people through the payment of US$317,800 per year. In the Gulf of Guayaquil there are 6 Socio Manglar agreements signed with 10,370 hectares.

Although the project didn´t include a bluecarbon analysis in Ecuador, we have envisioned the need to support the Ministry of Environment in the provision of information about the bluecarbon services of mangroves. The overall reasoning behind the bluecarbon analysis is that Socio Manglar is still financed by the Government Budget but require another source to reduce risks. It's important to acknowledge the benefits from carbon to enforce Socio Manglar.

Activities:

[3] Participatory investment plans, referred in this document as "Investment Plans", are required to participate in Socio Manglar and will be explained in further detail later in this document.

- Gather information of bluecarbon studies in the Latin-American region
- Analyze existing information of carbon in mangroves in Ecuador and generate the most consistent information on carbon storage service.
- Support CATIE students to develop bluecarbon information in the Gulf of Guayaquil.
- Develop a pre-feasibility assessment of a mangrove NAMA and describe a conceptual approach for the development of an internationally supported blue carbon-focused NAMA in Ecuador that could be used for submissions to the UNFCCC NAMA registry[4].
- Generate key information for decision makers.

Product:

- Prefeasibility Analysis of Bluecarbon in Ecuador.
- Quantification of the bluecarbon service in the mangroves in Ecuador.

Key partner: Ministry of Environment, CATIE

7. Mangrove Concessions

The objective of this component is to enforce mangrove concessions while improving the information of ecosystem services. In the support of the mangrove concessions the project will understand and face the main gender-based constrains and barriers to promote an equal access to the resources and to promote conservation activities in the concessions.

3.1 Cerritos de los Morreños Mangrove Users Association: 10,869.53 ha

Objective: Enforce the local association to improve the management of the mangrove and its ecosystem services and support its application to Socio-Manglar incentive.

Activities:

- Implement FPIC procedures for the decision making of the association towards Socio-Manglar incentive.
- Prioritize one ecosystem service to work in the association that could allow the diversification of income
- Generate primary information and a strategy for its implementation.
- Enforce the participation of women in the decision making process.

[4] The pre-feasibility assessment should determine whether the proposal should be submitted as a NAMA concept seeking support for preparation or as a NAMA proposal seeking support for implementation.

Product:

- Strategy for the implementation of an ecosystem service in the Association.
- Application to Socio-Manglar incentive.

3.2. Balao Crabbers and Fishermen Association (3157,51 hectares) and 6 de Julio Association (2036,27 hectares)

Objective

Develop information about the service of food provision. It's important to develop this information to highlight its importance of the food provision service to the food security of the families and their income. We will use this information to highlight the importance of food provision service with the direct beneficiaries and to give inputs of the mangrove concession policy.

Activities:

- Gather secondary information of the crab extraction.
- Use direct market price methods
- Mapping the service of food provision in areas
- Develop workshops with communities to capture their perceptions about coastal protection.
- Analyze obtained data and generate key information to decision makers.
- Develop the report

Product:

Economic valuation of food provision service in Balao Association and 6 de Julio Association.

3.3. El Morro Wildlife Reserve: 10,130 hectares

Objective: Inclusion of the ecosystem services perspective in the management plan of the area, strengthening the participation of local communities in the area.

Activities

- Participatory identification of the importance of mangrove ecosystem services in the area with the local communities in the buffer zone.

- Support the MAE en in the establishment of an ecosystem services as a conservation object in the management plan.
- Support local associations to access to a mangrove concession inside the area and in the buffer zone.

Product

- Application to mangrove concession.
- Management plan with ecosystem service as an object for conservation.

Partners

- BIOEDUCAR
- MAE

3.4. El Salado Wildlife Reserve: 15,497.42 hectares

Objective: Identify the mangrove ecosystem services in El Salado and develop strategies for its conservation.

Activities

- Participatory identification of the importance of mangrove ecosystem services of El Salado for the city of Guayaquil.
- Technical assistance to the MAE to strengthen the identification of mangrove ecosystem services as an object or direct conservation value for the area.

Product

- Evaluation of the importance of mangrove ecosystem services of El Salado for Guayaquil city.
- Annual Operational Management Plan 2017 and 2018, strengthens the identification of mangrove ecosystem services as an object or direct conservation value for the AP, affecting decision making

Partners

- MAE

Effectiveness of mangrove concessions: an analysis of the welfare of local fishermen

There is a high need to access to socioeconomic information of local communities and associations that works in mangroves and will receive the impact of the public policies that are enforcing mangrove conservation in Ecuador.

Objective: Develop socioeconomic information of the families in mangrove areas and analyze the impact from conservation policies.

Activities:

- Propose a conceptual and methodological framework for the socioeconomic conditions of families.
- Define a sample for primary information on the basis of a simple random sampling.
- Generate primary information gathered directly with families living in the study area, through direct surveys and other field instruments validated.
- Report the findings of the analysis in particular highlighting the relationship between ecosystem services of mangroves and human welfare and conservation policies of mangroves and human welfare.
- Provide key information to decision makers

Product

- Methodological framework
- Data base
- Final report of the socioeconomic conditions of the families in mangrove ecosystem in the Gulf of Guayaquil

Partners:

- ESPOL University
- CONDESAN
- MAE

8. Carbon and ES Mangrove Policy

The relationship of ecosystems with human welfare has been one of the topics that have been explored in recent years. In Ecuador, this subject has been studied mainly in relation to mountain ecosystems and freshwater services. Similar studies related to tropical forests, mangroves or marine ecosystems are significantly smaller and are even scarcer if we look to analysis of the complex relationships between public policy, ecosystem health and welfare of local communities.

Under this second component of the project we will develop analysis that will try to measure the implementation of public policies and their impact on mangroves and on local communities. Also, we are going to develop information about the current legal framework for blueforests initiatives.

Objective: Develop a national scale report about the carbon and ecosystem services policies in Ecuador.

Activities:

- Support IUCN in the development of the Country Policy Report
- Develop the analysis of the impact of public policies in welfare of local communities. This study will should show in quantitative and qualitative terms different ways policies and conservation measures for the mangrove ecosystem have affected the welfare of the user population of mangrove ecosystem services.
- Marisco analysis for mangrove conservation.
- Analysis of the implementation of penalties for mangrove deforestation practices.
- Provide key information to decision makers
- Report the findings of the analysis highlighting the relationship between ecosystem services of mangroves and human welfare and conservation policies of mangroves and human welfare.

Product

- Country Policy Report
- Report on the implementation of R056 for mangrove penalties.

Partners:

- IUCN
- MAE

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