Terms of Reference

REGIONAL SUPPORT TO THE PREPARATION OF ALLOMETRIC EQUATIONS IN THE GUIANA SHIELD

REDD+ for the Guiana Shield

Regional technical collaboration project

Context: REDD+ for the Guiana Shield project

REDD+ for the Guiana Shield[1] is a project that establishes a **regional technical platform for REDD+** development in the Guiana Shield eco-region, involving forestry departments and other relevant institutions from *Suriname*, *Guyana*, *French Guiana* and the *State of Amapá in Brazil*.

The project aims to provide **information** and **tools** at the regional level that countries can use to tackle deforestation and forest degradation in the framework of the REDD+ mechanism, by establishing sound forest monitoring technologies and encouraging science-based policies.

The project is financed with an amount of 2.7 million Euros mainly by the European regional development fund (ERDF)[2], the French fund for global environment (FFGE)[3], the Regional council of Guiana[4] and French forestry commission[5]. It is implemented by ONF and ONF International in 2013-2015.

Through a series of activities such as technical working groups, training sessions and creation of regional tools, the project has the following objectives:

- **Strengthen the capacity, knowledge and expertise** on REDD+ in the forestry services of different partner countries. The targeted topics are the measurement and monitoring of forest cover and carbon stocks, improving understanding of drivers of deforestation, and modelling future deforestation;

- Establish a **regional collaboration platform** and build a **network** to facilitate dialogue in the region on the technical issues cited above, in order to create common understanding of the challenges of reducing deforestation in the ecosystem of the Guiana Shield;

- Develop **tools** to support the implementation of REDD+ and land use planning in the region.

The project is governed by a Steering Committee that meets twice a year and decides on activities to be carried out in the coming period. The 3rd Steering Committee meeting in June 2014 approved a regional Training and Technology Transfer plan for the second half of 2014, which includes a request for regional support related to allometric equations. These terms of reference specify how this regional support will be provided through a first step which is an inventory of knowledge, capacity and tools used by each country partner.

Rationale: Need for allometric equations

Allometric equations are statistical models for calculating tree volume and biomass, using the relationships between different tree characteristics. Which characteristics involved varies between different allometric equations, but some common variables are **diameter**, **tree height** and **wood density**. Those variables are relatively easy to measure in the field, compared to measuring the volume and biomass directly for each tree, which is mostly not realistic. The word allometry refers to the growth of part of an organism in relation to the growth of another part or of the whole organism, in this case a tree. Allometric equations work on the principle that all trees in a population develop in the same way if they are growing under the same conditions, which should be the case within the same forest type, within normal variability related to the life-history of trees. Allometric equations can be used to assess many ecosystem services provided by forests, including the estimation of forest carbon stocks, by processing data collected in the field. National forest inventories involve allometric equations for REDD+ Measurement, Reporting and Verification (MRV).

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[1] Project website: http://reddguianashield.com/
[2] Fonds européen de développement régional (FEDER)
[3] Fonds français pour l'environnement mondial (FFEM)
[4] Conseil Régional de la Guyane
[5] Office National des Forêts (ONF)

The choice between different allometric equations has large implications for carbon accounting. For many existing allometric equations, the mathematical formula has been developed based on data collected far away from the Guiana Shield. If the accuracy of those equations has only been tested for directly-measured biomass data from other parts of the world, there is a large uncertainty when applying them on field data from the Guiana Shield. Several factors vary between different tropical forests in the world, including species composition, wood density of species, max height and height-diameter relationships, crown size, etc. Consequently, the total above-ground biomass and its relationship with measurable variables also differ. Some research shows that the Guiana Shield forests are very different from the rest of the Amazon and may in some cases have more in common with certain African forests, so it may not be accurate to apply wider regional formulas for generating statistics. Because of this, there is a need to establish new allometric equations and/or to verify and validate existing regional or pantropical allometric equations for forest types in the Guiana Shield.

Considering the cost and work required to developing new allometric equations, it is very appropriate to adopt a regional approach for it.

Objectives and framework for this regional support

This Regional Support to the Preparation of Allometric Equations in the Guiana Shield aims at:

- Inventorying and analyzing allometric equations that are used or could be used in the Guiana Shield context
- Assessing the relevancy and feasibility of developing new allometric equations specific to the Guiana Shield forests, and establishing an operational strategy for that
- Building capacities related to biomass estimates and allometry

Answering these objectives will be done through three main phases, as detailed below. As a continuation, it will also be possible to implement a 4th phase, dedicated to a training session.

1. **Phase 1 – Inventorying and analyzing allometric equations that are used or could be used in the Guiana Shield context**

Thanks to literature review and in-country missions, this phase will enable to identify which allometric equations – if any – have been developed, tested and/or are used in Suriname, Guyana, Amapá and French Guiana. Each of the identified equation will be analyzed in order to further understand their development methodology and their results, including local tests of pantropical equations.
This analysis will not be limited to equations that are used in the region but might also include some other equations that – from the experts' perspective - could be relevant for Guiana Shield context. Experts will consider all forest strata and will focus on the main ones for which they will formulate recommendations.

Short in-country missions (3 to 4 days) will enable to meet with possible users and developers of allometric equations, as well as with people involved in Forest Inventories (mainly forestry services, REDD+ authority, research institutes and private sector when relevant). Objectives of those missions are to collect information, to better identify and assess existing human and institutional capacities related to allometry and forest inventories, as well as to identify needs and future projects in terms of allometric equations.

This phase will result in a study report (including recommendations for the regional development of new allometric equations and to build capacities) that will be presented and discussed during a regional meeting (see phase 3).

2. **Phase 2 – Developing new equations specific to the Guiana Shield Ecoregion: relevancy, feasibility and guidelines**

Based on the previous study and collecting additional information through Focal Points and distant exchanges, an additional report will focus on a regional strategy to develop allometric equations. Guidelines will build upon the phase 1 study and will emphasize the necessity to reinforce cooperation between users of allometric equations (such as forestry services or REDD+ authority) with researchers.

Among others, this regional strategy will focus on:

- Regional priorities in terms of allometric equations,
- Guidelines and recommendations on how to reach the implementation phase for this strategy, including:
    - Institutional and organizational arrangements to conduct a whole process of regional preparation of the Guiana Shield allometric equations.
    - methodology for the allometric equation development
    - field operations and office operations (i.e. analysis of data)
    - planning
    - capacities reinforcement
- Budget estimates and identification of potential funding.

A guidelines report will first be drafted and shared with project partners. It will be presented and discussed during a regional meeting (see phase 3) and finalized after including comments.

3. **Phase 3 – Results presentation and discussion**

During a 2 days regional meeting, results from phase 1 and phase 2 will be presented and discussed with project partners. This meeting will take place in French Guiana and will welcome three participants per country (ideally two from the forestry services and MRV responsible team and one from research sector in the country).

Discussions will be facilitated to improve the regional strategy guidelines, that will be finalized afterwards by the expert.

4. **Phase 4 (optional) – Training**

As a possible extension to this project and based on previous phases results and depending on partners' interest and availability, a training session might be developed in order to build regional capacities on allometry and forest inventories. This training could be organized in Paracou CIRAD station (Kourou, French Guiana) and would target three to four participants per country involved in forest inventories, allometric equations and data analysis.

A possible budget has been estimated for such a training session. If relevant, it will be reassessed later and submitted to Steering Committee members.

Implementation

Team of Experts

Three experts will be in charge of this regional support:

Quentin Delvienne (ONFI) will be in charge of the whole process supervision. He will implement phase 2 (from Paris) and will facilitate the regional meeting in Cayenne (phase 3) with the support from the two other experts.

Aurélie Dourdain (CIRAD) will be in charge of meeting the resource persons in the different countries, as well as of collecting data. The collected data and information will be compiled and analyzed by Aurélie Dourdain with the support and scientific backstopping of **Bruno Herault (CIRAD)**. Both of

them who will also be in charge of presenting the study report results to partners during the regional meeting (phase 3).

CVs are available on demand.

Deliverables

Three different deliverables are expected from this Regional Support:
1. A study report stating the art of allometric equations in the Guiana Shield, including some recommendations;
2. A guidelines report on how to regionally develop new Guiana Shield oriented allometric equations;
3. Presentation materials following the regional meeting.

Documents 1 and 2 will be shared for comments with the partners involved in this study before the Regional Meeting. They will be discussed during the Regional Meeting and will be finalized after this meeting, once comments will be integrated.

Calendar

Implementation will start as soon as the ToRs will be validated (i.e. 2 weeks after sending if no comments or objections) and will end in September 2015, after the regional meeting. See detailed calendar on page 6 of those ToRs.

Budget

The budget needed for implementing this regional support is 55,715 €, which includes expertize, logistics for data collection and results restitution meeting.

An additional 22,355€ (estimates) will be needed for the capacity building session in Paracou. This second budget will be submitted to non-objection once the regional support results will provide clearer view on the relevancy and feasibility of such a capacity building session.

Activities	TOTAL
Phase 1 - State of the Art of Allometric Equations in the Guiana Shield	
Expertise	13 300 €
Logistics	3 215 €
Phase 2 - Guidelines on how to develop new Allometric Equations for the Guiana Shield forests	
Expertise	7 245 €
Logistics	*- €*
Phase 3 - Regional Meeting	
Expertise	8 825 €
Logistics	22 250 €
Phase 4 - Capacity Building (optional)	
Expertise	7 355 €
Logistics	15 000 €
Coordination	
Coordination by ONFI expert	2 400 €
TOTAL Phase 1+2+3	**55 715 €**
TOTAL 1+2+3+4	**79 590 €**

Activities	Who	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36	W37	W38	W39	W40
		March 2015				April 2015					May 2015				June 2015				July 2015					August 2015				September 2015				
Phase 1 - State of the Art of Allometric Equations in the Guiana Shield																																
Litterture review	*CIRAD*	█	█																													
In-country missions (3 to 4 days per country)	*CIRAD*		█	█	█	█																										
Data analysis and reporting	*CIRAD*					█	█	█	█	█	█																					
Draft report	*CIRAD*											X																				
Phase 2 - Guidelines on how to develop new Allometric Equations for the Guiana Shield forests																																
Preparation of work	*ONFI*								█	█	█	█	█																			
Development of Guidelines	*ONFI*												█	█	█	█	█	█	█	█	█	█										
Draft report	*ONFI*																						X									
Phase 3 - Regional Meeting																																
Preparation	*ONFI/CIRAD*																							█	█	█						
Expected comments on draft reports	*TBD*												█	█																		
Regional Meeting (2 days/4 participants per country)	*ONFI/CIRAD*																												X			
Provision of final report	*TBD*																														X	
Phase 4 - Capacity Building																																
Capacity building session in Paracou (to be confirmed)	*CIRAD*																												█	█		