Development of Standardized Baseline for Efficient Charcoal Production in West Africa

(Senegal and Ivory Coast)

Final Project Report

Short version

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1. Introduction

In the Western African region, rampant deforestation is fuelled by the immense local demand for fuel wood and charcoal to meet domestic thermal needs. The Foundation "Future of the Carbon Market" has funded the project "Development of Standardized Baseline for Efficient Charcoal Production in West Africa" in close coordination with the Regional Cooperation Centre (RCC) of the United Nations Framework Convention on Climate Change (UNFCCC) in Lomé, Togo.

1.1. Objectives of the project

The objective of the project was to support the development of standardized baselines (SBLs) for efficient charcoal production, along with other measures, in Senegal and potentially other West African countries to help reduce the burden on forests.

The Project Team from South Pole Group & AERA Group conducted an assessment study for the potential development of SBLs in additional West African countries, and recommended to do so in Burkina Faso, Ivory Coast, Ghana and Mali. The Foundation agreed to extend the scope to Ivory Coast and Ghana in addition to Senegal.

This report[1] synthetizes the results of the project, how the SBLs could be used in **Senegal and Ivory Coast** and the lessons learned.

1.2. Development of standardized baselines

A standardized baseline (SBL) in the context of Clean Development Mechanism (CDM) projects describes the base carbon intensity level on which emission reductions are measured.

It aims to facilitate:

1. Calculation of emissions reduction or absorption.
2. Establishment of additionality, while helping to ensure environmental integrity
3. Development and funding of other mechanisms at sectoral level (e.g. Nationally Appropriate Mitigation Actions - NAMAs)

The SBLs resulting from this project are valid country-wide, thus avoiding establishing a baseline at project level.

[1] This report is a shortened version of the original final report and focuses on the outcomes in Senegal and Ivory Coast, only.

The use of the SBL in the charcoal sector aims to facilitate the production of charcoal in a more efficient way by pursuing three objectives:

1 Replace the traditional kilns with more efficient technologies to produce charcoal (i.e. technology switch).
2 Use renewable instead of non-renewable biomass (i.e. fuel switch).
3 Capture and destroy methane (if applicable).

The SBLs resulting from this project have been developed using a combination of (1) the approach contained in the "Guidelines for the establishment of sector specific standardized baselines" (UNFCCC, 2011), and (2) the methodological approach contained in the small-scale methodology "AMS-III.BG: Emission reduction through sustainable charcoal production and consumption" (UNFCCC, 2014).

The proposed standardized baselines documents (i.e. CDM-PSB-FORMs) have been prepared based on official documents (i.e. studies, reports, government data, etc.) gathered mainly at meetings with key stakeholders, which took place during data collection missions in the three countries (See ANNEX 1, 4 and 6 for the list of activities carried out in Senegal and Ivory Coast).

The CDM-PSB-FORMs completed with additional documents were sent to the Designated National Authorities (DNAs) of Senegal and Ivory Coast, in order for them to review and submit their proposed SBL to the UNFCCC for approval.

The DNAs of Senegal and Ivory Coast submitted their CDM-PSB-FORMs and additional documents in a timely fashion, and, on 19 October 2016, the UNFCCC approved the SBLs without any request for clarification.

2. Approved SBLs for Senegal and Ivory Coast

The approved SBLs for Senegal (UNFCCC, 2016a), and Ivory Coast (UNFCCC, 2016b) are based on the CDM-PSB-FORMs and additional documents submitted by the DNAs (Republic of Senegal, 2015 & Republic of Ivory Coast, 2016).

The scope of the approved SBLs covers:

1. Standardized values of parameters used for baseline emissions calculation,

2. Positive lists for fuel switch, technology switch and methane destruction in the charcoal sector.

2.1. Standardized values used for baseline emissions calculation

The equations to calculate the emission reductions in the charcoal sector are found in the small-scale methodology AMS-III.BG (UNFCCC, 2014).
For project activities NOT equipped with capture and destruction of the pyrolysis gases, emission reductions are calculated as shown in Equation 1 below:

Equation 1

$$ER_y = \sum_i Q_{CCP,i_y} \times \left[\left(CF \times NCV_{wood} \times \frac{NCV_{charcoal,i}}{NCV_{charcoal,default}} \times f_{NRB,BL,wood} \times EF_{projected_{fossilfuel}}\right)\right] - PE_{FF,y} - PE_{El,y} - PE_{BC,y}$$

For project activities equipped with capture and destruction of the pyrolysis gases, emission reductions are calculated as shown in Equation 2 below:

Équation 2

$$ER_y = \sum_i Q_{CCP,i_y} \times \left[\left(CF \times NCV_{wood} \times \frac{NCV_{charcoal,i}}{NCV_{charcoal,default}} \times f_{NRB,BL,wood} \times EF_{projected\_fossilfuel}\right) + (SMG_{y,b} - M_d) \times (1 - f_{NRB,BL,wood}) \times GWP_{CH4,y}\right] - PE_{y,fugitive} - PE_{y,flaring} - PE_{FF,y} - PE_{El,y} - PE_{BC,y}$$

Where:

$$PE_{y,fugitive} = \sum_i Q_{CCPi,y} \times GWP_{CH4,y} \times SMG_{y,b} \times f$$

The work performed by the Project Team, in collaboration with the DNAs of Senegal and Ivory Coast, was used by the UNFCCC as a basis to establish the standardized values to be used in Equations 1 & 2 above.

The standardized values found in the approved SBLs, are listed below:

Parameter	Description	Standardized value Senegal	Standardized value Ivory Coast	Unit
fNRB,BL,wood	Fraction of biomass used in the absence of the project activity that can be established as non-renewable biomass	0.85	0.93	Fraction
Md	Factor to account for any legal requirement for capture and destruction of methane in the charcoal production facility	0 (as per Official letter by DNA of Senegal)	0 (as per Official letter by DNA of Ivory Coast)	tonne of CH4/tonne of raw material
SMGy,b	Specific methane generation for the baseline charcoal generation process in the year y	0.030	0.030	tonnes CH4/t charcoal
CF	Default wood to charcoal conversion factor	6	6	
NCVwood	Default net calorific value of wood	0.015	0.015	TJ/t
EFprojected_fossilfuel	Emission factor for the substitution of non-renewable woody biomass by similar consumers	81.6	81.6	tCO2/TJ
NCVcharcoal,default	Default net calorific value of charcoal from coconut husks, bamboo and other purely woody source of biomass Default net calorific value of charcoal from other sources such as mixed agricultural wastes	0.0295 0.01947	0.0295 0.01947	TJ/t TJ/t

2.2. Development of positive lists

The work performed by the Project Team, in collaboration with the DNAs of Senegal and Ivory Coast, was used by the UNFCCC as a basis to establish positive lists for fuel switch, technology switch and methane destruction in the charcoal sector.

If a project activity belongs to one of the positive lists specified below, additionality is approved by default.

2.2.1. Feedstock

In accordance with the Guidelines for the establishment of sector specific standardized Baselines (UNFCCC, 2011), the cumulative percentage of the output “Charcoal production for residential cooking”, based on the available fuels / feedstocks, is arranged in descending

order of carbon intensity of the fuels / feedstocks.

Fuels / feedstocks which have a lower carbon intensity than all the fuels / feedstocks used to produce aggregately more than the approved additionality threshold Xa of 80% for the energy for households, but facing barriers or that are less commercially attractive should be included in the positive list of fuels / feedstocks.

A switch to any of the fuels / feedstocks in the positive list is deemed to be additional.

The value Xa is a threshold for additionality approved by the UNFCCC at 80% for priority sectors (i.e. energy for household, energy generation in isolated systems and agriculture), and 90% for the remaining sectors.

Senegal

Figure 1 below shows the percentage of the total output produced by each of the fuels / feedstocks found in Senegal, and the additionality threshold Xa (80%).

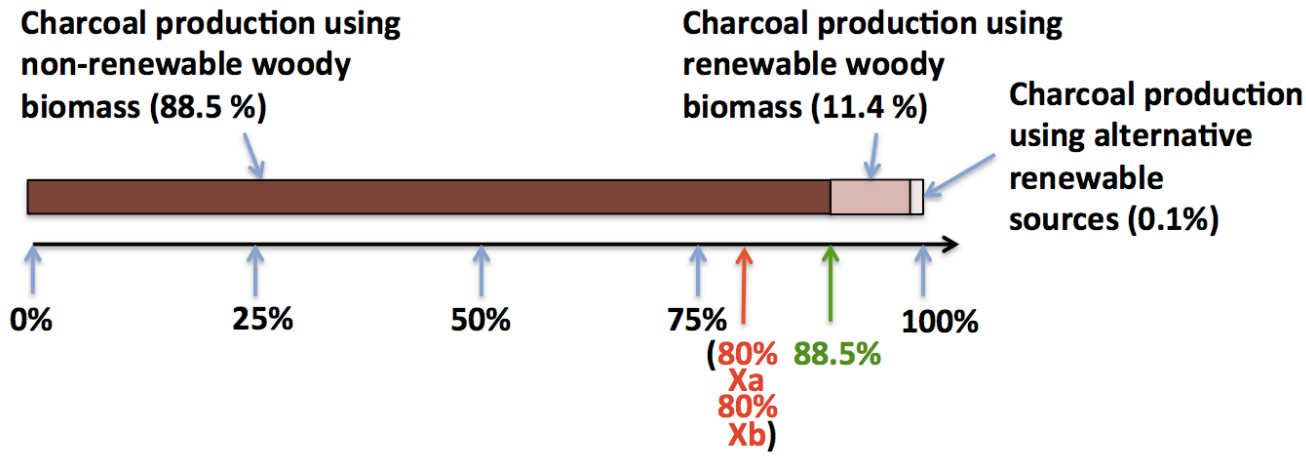

Figure 1 – Proportion of charcoal produced in Senegal by type of feedstock

In Senegal, non-renewable biomass is used to produce more than the threshold of 80% of charcoal production (i.e. 88.5%).

Consequently, the approved SBL for Senegal states that “Renewable biomass” is included in the positive list of fuels / feedstocks.

In practical terms, a fuel switch to renewable biomass (i.e. renewable woody biomass or alternative renewable sources) is therefore deemed to be additional.

Ivory Coast

Figure 2 below shows the percentage of the total output produced by each of the fuels / feedstocks found in Ivory Coast, and the additionality threshold Xa (80%).

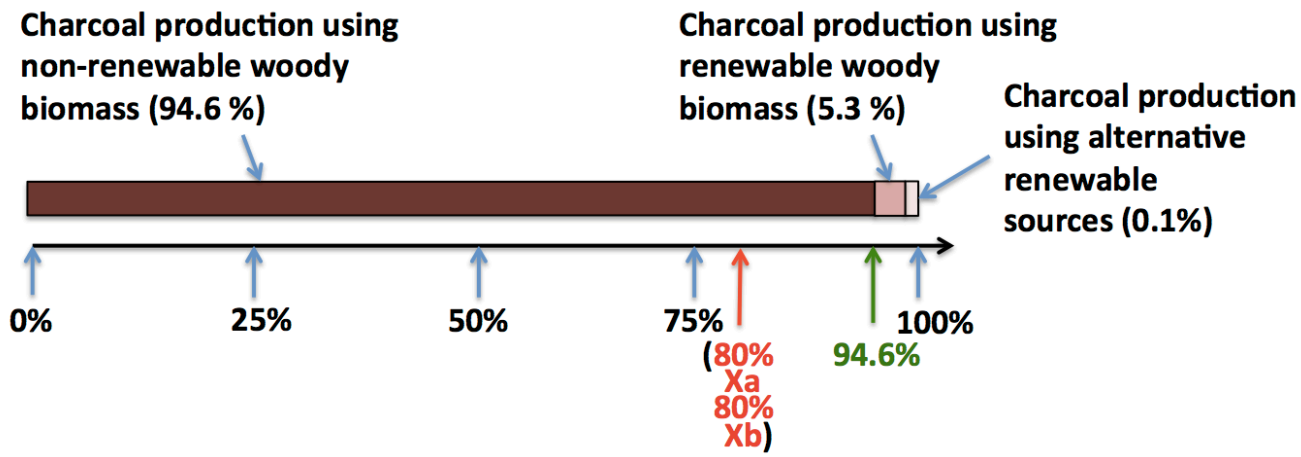

Figure 2 – Proportion of charcoal produced in Ivory Coast by type of feedstock

In Ivory Coast, non-renewable biomass is used to produce more than the threshold of 80% of charcoal production (i.e. 94.6%).

Consequently, the approved SBL for Ivory Coast states that "Renewable biomass" is included in the positive list of fuels / feedstocks.

In practical terms, a fuel switch to renewable biomass (i.e. renewable woody biomass or alternative renewable sources) is therefore deemed to be additional.

2.2.2. Methane destruction

The DNAs of Senegal and Ivory Coast confirmed in an Official Letter that there were no legal requirements for capture and destruction of methane in charcoal production facilities.

Consequently, the approved SBLs for Senegal & Ivory Coast state that "Any level of capture and destruction of methane emitted during the pyrolysis process" is included in the positive list of methane destruction.

In practical terms, a project activity equipped with technology able to capture and destruction of the pyrolysis gases, is therefore deemed to be additional.

2.2.3. Technology

In accordance with the Guidelines for the establishment of sector specific standardized Baselines (UNFCCC, 2011), the cumulative percentage of the output "Charcoal for residential cooking", based on the available technologies, is arranged in descending order of carbon intensity of the technologies.

The technologies which have a lower carbon intensity than all the technologies used to produce aggregately more than the approved additionality threshold Ya of 80% for the energy for households, and are less commercially viable as these, should be included in the positive list of technologies.

A switch to any of the technologies in the positive list is deemed to be additional.

Senegal

Figure 3 below shows the percentage of output produced by each of the technologies found in Senegal, and the additionality threshold Ya (80%).

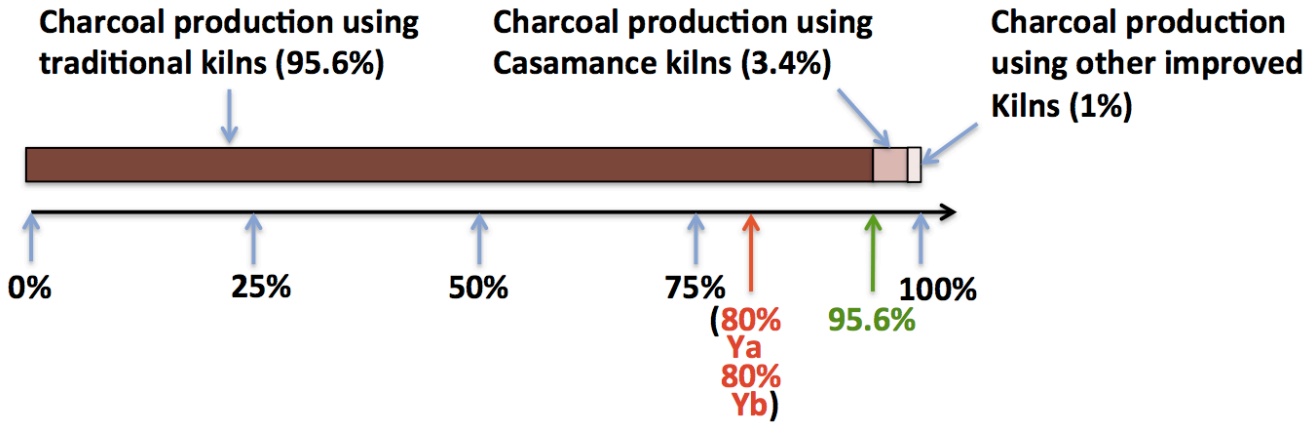

Figure 3 - Proportion of charcoal produced in Senegal by technology

In Senegal, the traditional earth mound kiln is the single technology, which produces more than the additionality threshold Ya (80%) of the total output, producing 95.6% of the country's charcoal.

Consequently, the approved SBL for Senegal states that "Metal kilns and other improved kilns, including but not limited to Casamance kilns, Adam retort sedimentary kilns, Carbo twin retort kilns, and Pyro 7 retort sedimentary kilns with or without briquetting process", are included in the positive list of technologies.

In practical terms, a technology switch to any improved kilns, less carbon intensive than the traditional kilns, is deemed to be additional.

Ivory Coast

Figure 4 below shows the percentage of output produced by each of the technologies found in Ivory Coast, and the additionality threshold Ya (80%).

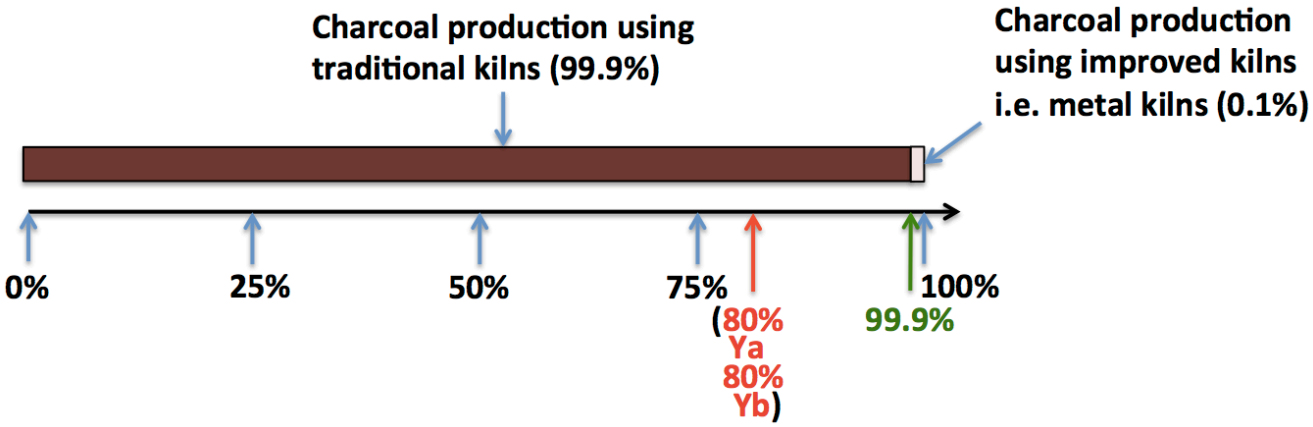

Figure 4 - Proportion of charcoal produced in Ivory Coast by technology

In Ivory Coast, the traditional earth mound kiln is the single technology which produces more than the additionality threshold Ya (80%) of the total output, producing 99.9% of the country's charcoal.

Consequently, the approved SBL for Ivory Coast states that "Metal kilns and other improved kilns, including but not limited to Casamance kilns, Adam retort sedimentary kilns, Carbo twin retort kilns, and Pyro 7 retort sedimentary kilns with or without briquetting process, are included in the positive list of technologies.

In practical terms, a technology switch to any improved kilns, less carbon intensive than the traditional kilns, is deemed to be additional.

2.3. Further use and application of the SBLs

2.3.1. CDM projects

The new SBLs for efficient charcoal production can be applied to all CDM project activities to:

1. **Facilitate the calculation of emission reductions by using standardized values.**

See section 2.1.: "Standardized values of parameters used for baseline emissions calculation in Senegal and Ivory Coast"

2. **Facilitate the establishment of additionality under the CDM:**

- A fuel switch to renewable biomass (i.e. renewable woody biomass or alternative renewable sources) is deemed to be additional.

- A project activity equipped with technology able to capture and destruction of the pyrolysis gases, is deemed to be additional.

- A technology switch to any improved kilns, less carbon intensive than the traditional kilns, is deemed to be additional

See section 2.2.: “Positive lists for fuel switch, technology switch and methane destruction in the charcoal sector in Senegal and Ivory Coast”.

2.3.2. NAMA projects

The new SBLs for efficient charcoal production are catalysts for the implementation of NAMAs in the charcoal sector and can be applied to:

- **Facilitate the calculation of emission reductions by using standardized values.**

See section 2.1.: “Standardized values of parameters used for baseline emissions calculation in Senegal and Ivory Coast”.

No demonstration of additionality is needed in NAMA projects.

2.3.3. Additional thoughts by the DNA of Senegal

The DNA of Senegal mentions several recommendations in their official report of the workshop for launching of the SBL:

1. Plan and implement relevant studies to update data to be used in the SBL revision in 2019.

2. Assess the best way to implement the tool in potential CDM and NAMA projects.

3. Create a new committee to focus on the design of relevant NAMA projects related to the charcoal production.

2.3.4. Additional thoughts by the DNA of Ivory Coast

The CDM – DNA coordinator for Ivory Coast, Ms Rachel BOTI-DOUAYOUA provided additional / extended thoughts by email (Translated from French):

1. The SBL will be used as a baseline for all projects in the charcoal sector as there were no baseline data available previously.

2. Emission reductions of low carbon projects in the charcoal sector will be estimated using this SBL within the framework of the Nationally Determined Contributions (NDCs).

2.4. The use of the SBL in relation to mitigation targets

2.4.1. Senegal

The references to charcoal in the NDC of Senegal (Translated from French) are as follows:

Objective - Forestry sector
Emission reductions linked to firewood and charcoal consumption.

Unconditional options

1. Participatory development and management of forests (more than 30 forests within the World Bank project PROGEDE.

2. Effort of domiciliation of the exploitation of wood and the production of charcoal in the managed forests.

3. Technology switch to the Casamance kiln from the traditional kiln.

4. Diversification of domestic fuels.

The references to charcoal in the NDC of Senegal are in line with the objectives of a NAMA since they:

- Support a sectoral policy (i.e. managed forests)
- Target transformational changes (i.e. domiciliation of production of charcoal in the managed forests)
- Promote energy efficiency (i.e. the use of improved kilns).
- Promote fuel switch (i.e. subsidies to help migrate to another fuel).

The SBL for efficient charcoal production in Senegal can be applied to all future NAMA projects in the charcoal sector that will implemented to help achieve the mitigation targets in the NDC.

The SBL will facilitate the calculation of emission reductions by using standardized values. See section 2.1.: “Standardized values of parameters used for baseline emissions calculation in Senegal and Ivory Coast”.

2.4.2. Ivory Coast

The references to charcoal in the NDC of Ivory Coast (Translated from French) are as follows:

Mitigation - Agriculture / Forestry

Orientation

- Development of sustainable domestic energy solutions for the cooking needs of the population.

Measures / Actions

- Promotion of charcoal production using alternative renewable sources through the valorisation of agricultural biomass

Economic co-benefits

- Diversification of revenues in local communities

Social co-benefits

- Creation of green jobs
- Improvement of the living conditions of women in rural areas

Environmental co-benefits

- Reduction of GHG emissions

The references to charcoal in the NDC of Ivory Coast are in line with the objectives of a NAMA since they :

- Promote the use of alternative renewable sources in the charcoal production.

The SBL for efficient charcoal production in Ivory Coast can be applied to, for example, a “NAMA, fuel switch in the charcoal production” that would help achieve the mitigation targets in the NDC by using an alternative renewable source (i.e. agricultural biomass).

There is a great potential for this type of NAMA in Ivory Coast since only 0.1% of the charcoal is produced from alternative renewable sources (See Figure 2: “Proportion of charcoal produced in Ivory Coast by type of feedstock”).

The SBL would also be a good leverage to facilitate the funding of the "NAMA, fuel switch in the charcoal production", and would also facilitate the calculation of emission reductions by using standardized values.

See section 2.1.: "Standardized values of parameters used for baseline emissions calculation in Senegal and Ivory Coast".

3. Conclusions and lessons learned

This project provided a new and powerful tool to facilitate a more efficient charcoal production in Senegal and Ivory Coast: standardized baseline approved by the UNFCCC. These SBLs will contribute to the implementation of much needed CDM and NAMA projects due to substantial associated cost savings (i.e. no need to establish the baseline to calculate emission reductions and to demonstrate additionality under the CDM).

The DNAs of both countries were very pleased with the outcomes of the studies. The workshops for launching of the SBLs in Senegal and Ivory Coast were effective first steps in the dissemination of the SBL for efficient charcoal production.

Due to the rather sensitive nature of the subject (i.e. thermal energy for cooking), the project has created a lot of interest in the countries. In fact, the DNAs confirmed at the beginning of the project that they strongly support the initiative and that they would fully collaborate.

The Project Team hopes that the following lessons learned should be taken into account:

- From the experience of the Project Team in this project and others, the truth of the matter is that there is a severe lack of data (let alone the fact that available data is likely to be outdated and coming from unreliable sources) in most of the Sub-Saharan African countries. The Project Team members thus needed justify statements to the UNFCCC with acceptable data.

  Project Team's suggested approach for the future: Secure a budget to carry out a survey with a representative sampling.

- Official versus informal situations: it sometimes turns out that there is a significant gap between official statistics/laws and actual, informal figures or facts. Relying on official, public evidence only could thus significantly bias or undermine the analysis and results; complementary research methods based on quantitative considerations, anonymous interviews etc. should be employed.

  Project Team's suggested approach for the future: Research mandates should always be framed in a flexible way to encompass alternatives methods and considerations 'outside of the official sphere' (cf. CDM notion of 'degree of law enforcement').

- Cross-border stimulation potential: for innovative topics like carbon finance for renewable charcoal, neighbour foreign traction can sometimes play a prominent role in succeeding in the undertaking & implementation of a research or brainstorming effort, since what has been successfully adopted or at least experimented in a close country of the same region raises awareness and interest more efficiently that a pure theoretical new idea.

  Project Team's suggested approach for the future: The multi-country approach should be conserved for future endeavours, ideally phasing efforts from the most relevant priority country towards similar additional duplications.

- Cultural differences: never underestimate differences in culture, language & mind-set when it comes to international partnerships and contractors.

  Project Team's suggested approach for the future: Allow plenty of buffer time as things will always take longer between foreign individuals who share work for the first time to accommodate to each other's way of dealing with tasks, etc.

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Annex: Activities carried out in Senegal and Ivory Coast

In **Senegal**, the Project Team (i.e. Denis Valliere from South Pole Group, Alexandre Dunod from the AERA Group, and Aliou BA, a Senegalese consultant) in collaboration with the Designated National Authority (DNA) have carried out the following activities:

- 17 April 2015. Kick off workshop held at the Conference Room of the Ministry of Environment (DEEC) of Senegal, Dakar, Senegal.
- April 2015. Data collection mission in Senegal.
- May to October 2015. SBL analysis and development.
- October & November 2015. Drafting of the SBL proposal for Senegal to be submitted to the UNFCCC for approval.
- 10 November 2015. SBL proposal sent to the DNA of Senegal, by the Project team.
- 25 November 2015. Submission of the SBL proposal (Republic of Senegal, 2015) by the DNA.
- 19 October 2016. Approval of the SBL for Senegal by the UNFCCC.
- 13 April 2017. Workshop for launching of the SBL held at the Conference Room of the Ministry of Environment (DEEC) of Senegal, Dakar, Senegal.

In **Ivory Coast**, the Project Team (i.e. Denis Valliere from South Pole Group and Alexandre Dunod from the AERA Group) in collaboration with the Designated National Authority (DNA) have carried out the following activities:

- 30 June 2015. Kick off workshop held at the Manhattan Suites Hotel, Abidjan, Ivory Coast.
- July 2015. Data collection mission in Ivory Coast.
- July to October 2015. SBL analysis and development.
- October & November 2015. Drafting of the SBL proposal for Ivory Coast to be submitted to the UNFCCC for approval.
- 11 November 2015. SBL proposal sent to the DNA of Ivory Coast, by the Project team.
- 1 February 2016. Submission of the SBL proposal (Republic of Ivory Coast, 2016) by the DNA.
- 19 October 2016. Approval of the SBL for Ivory Coast by the UNFCCC.
- 13 April 2017. Workshop for launching of the SBL held at the Hotel “Résidence Ohinéné”, Abidjan, Ivory Coast.