June 2012

Work Plan

A pre-project under the ITTO Thematic Programme on Trade and Market Transparency

Ref.: TMT-PA 007/11 Rev.1 (I)

Work plan for accounting methodology development for wood products in climate change mitigation projects involving tropical timber

Timothy Pearson and Sandra Brown

WINROCK INTERNATIONAL

ACKNOWLEDGEMENTS
We thank Ken Skog for helpful discussions.

TABLE OF CONTENTS

1 INTRODUCTION AND BACKGROUND

1.1 Scope of Deliverable

The scope of this deliverable is to lay out a plan for developing a new accounting approach for wood products in mitigation projects involving tropical timber. The work plan will detail the necessary analyses together with the timing and estimated costs.

1.2 Introduction

Harvested wood products are an important global carbon sink that is growing. The rate at which carbon is emitted from harvested wood products is a function of the rate of retirement of products from end uses and the various processes used to dispose of products. Altering forest harvesting practices impacts wood product production that in turn impacts greenhouse emissions to the atmosphere. These impacts have the potential to be used for climate change mitigation and compensation for emission reductions through voluntary and compliance carbon markets.

Improving the accuracy of methods for accounting will reduce uncertainty in estimations of emission reductions, enhancing compensation for activities that reduce emissions from forest harvests and wood product use and promoting sustainable forest management and activities that increase storage in harvested wood products.

Because no regulatory market that involves forest-based projects exists, the methodologies for accounting for this pool have been developed for the voluntary market. Under the voluntary market one method for accounting for wood products has dominated. It can be found in six out of eight methodologies under the Verified Carbon Standard and two out of two methodologies under the American Carbon Registry. These methodologies cover improved forest management, afforestation and reforestation, and reduced emissions from deforestation and degradation. In examination, the ITTO noticed high turnover or retirement rates[1] for wood products derived from projects in tropical countries.

[1] Wood products do not decay while in use as they are generally treated to prevent this process, instead they are retired or turned over and disposed of either by burning, recycled, or buried in landfills. The term "decay" is often mis-used instead of the term retirement. If one is referring to the biological breakdown of wood products then the correct term is decomposition, a complex process that includes microbial decay, fragmentation by invertebrates (e.g. termites), and weathering.

1.3 Structure of workplan

The work plan will include the following elements:

1. Analysis of production and export of wood products
2. Analysis of in use lifetime of wood products
3. Analysis of emissions from retired wood products
4. Calculation of net atmospheric impact of wood products
5. Plan for accounting methodology development
6. Likely costs and timing

2 PLAN FOR EVALUATION OF PRODUCTION AND EXPORT OF WOOD PRODUCTS

The first step in any accounting of wood products is to assess production and shipping. Specifically:

- What is the efficiency with which products are produced? (And therefore, what emissions occur during production?)

- What products are produced? What product groupings make the most sense for subsequent calculations and ease of categorization by users?

- What is the in-use destination of products? In particular, will they be exported? And if so to what country?

The products produced will vary by country and full consideration will have to be taken of whether waste in initial timber processing is subsequently diverted to the production of other wood products.

As identified in the literature review, the question of timber and wood product export is a critical weakness of current mitigation project accounting approaches for wood products. To improve accounting, the proportion of exports from tropical countries going to temperate of boreal regions should be estimated and appropriate rates of retirement and disposal methods should be applied to calculate emissions from the exported proportion of HWP. Statistical databases exist (e.g. FAO databases) that record export proportions could be used to develop default factors for timber originating in tropical countries and being exported to make products in temperate or boreal regions of countries

Determination of ultimate emissions from landfill, debris piles or burning will be governed by the country in which the product is retired and not by the country that produced the timber. It is incorrect to assume products are not exported from the country where the timber was harvested.

One approach would be to examine ForesSTAT which is part of FAOSTAT maintained by the Food and Agriculture Organization of the United Nations (http://faostat.fao.org/site/626/default.aspx#ancor). For each country it is possible to pull up for a given year a volume and / or biomass of harvested products exported (e.g. Table 1 for Congo in 2009).

The assumption could be made that all exports of wood products would be to temperate or boreal countries. Through comparisons of outputs from ForesSTAT, it would be possible to compute the proportion that is exported for each producing country by exported product.

Significant analysis has already been conducted by scientists at UC Davis (http://steps.ucdavis.edu/research/Thread_6/lcfs/forestry) that would be built on as part of this work.

Table 1 Results from ForesSTAT for wood product exports from Congo for 2009

Export Quantity (m3)

	item		2009	
Cong	Chips and Particles	173906.00	m	*
Cong	Ind Rwd Wir (C)	1162.00	m	
Cong	Ind Rwd Wir (NC) Other	5565.00	m	*
Cong	Ind Rwd Wir (NC) Tropica	546005.00	m	
Cong	MDF	2.00	m	F
Cong	Plywood	113.00	m	
Cong	Sawnwood (C)	0.00	m	*
Cong	Sawnwood (NC)	93015.00	m	
Cong	Veneer Sheets	19153.00	m	
Cong	Wood Residues	14.00	m	*
Cong	Fibreboard + (Total)	2.00	m	A
Cong	Industrial Roundwood + (Total)	552732.00	m	A
Cong	Industrial Roundwood(C) +	1162.00	m	A
Cong	Industrial Roundwood(NC) +	551570.00	m	A
Cong	Roundwood + (Total)	552732.00	m	A
Cong	Sawnwood + (Total)	93015.00	m	A
Cong	Wood-Based Panels + (Total)	19268.00	m	A

Export Quantity (tonnes)

	item	2009		
Congo	Chemical Wood Pulp	0.00	tonnes	
Congo	Newsprint	1.00	tonnes	*
Congo	Other Paper+Paperboard	3.00	tonnes	
Congo	Printing+Writing Paper	0.00	tonnes	F
Congo	Recovered Paper	28.00	tonnes	F
Congo	Unbleached Sulphate Pulp	0.00	tonnes	F
Congo	Wood Charcoal	12.00	tonnes	F
Congo	Wrapg+Packg Paper+Board	3.00	tonnes	
Congo	Wrapping Papers	3.00	tonnes	F
Congo	Paper and Paperboard + (Total)	4.00	tonnes	A
Congo	Paper+-Board Ex Newsprnt + (Total)	3.00	tonnes	A
Congo	Pulp for Paper + (Total)	0.00	tonnes	A
Congo	Total Fibre Furnish + (Total)	28.00	tonnes	A
Congo	Wood Pulp + (Total)	0.00	tonnes	A
Congo	Wood Pulp Exc Mechanical + (Total)	0.00	tonnes	A

Planned steps for EVALUATION OF PRODUCTION AND EXPORT OF WOOD PRODUCTS:

STEP 1: Assess conversion efficiencies and establish default values

Through consulting the literature, experts and practitioners establish defaults that can be applied in an accounting methodology for the efficiency of conversion of timber to wood products. Such defaults will likely vary by product class (STEP 2) and by production region.

STEP 2: Develop categorization of products for accounting

Categorization must be easily applied by users and must be applicable for projection of in-use lifetime (Section 3) and emissions subsequent to retirement (Section 4).

STEP 3: Determine in-use destination

By country and product category (STEP 2) calculate export proportion and for the expert proportion determine proportional destination countries. This analysis shall most likely be based on ForesSTAT as detailed above.

3 PLAN FOR ESTIMATION OF IN USE LIFETIME OF WOOD PRODUCTS

Once produced and distributed it is next necessary to determine how long products shall remain in use before retirement and possible emission. This analysis shall adopt the commonly used approach given in the IPCC of an exponential decay curve centered on a published half-life value for a given product.

Planned steps for ESTIMATION OF IN USE LIFETIME OF WOOD PRODUCTS:

STEP 1: Investigate available half-life data for products

From the literature and discussions with experts determine half-lives for product categories. Consider whether there are grounds for half-lives to vary by region or latitudinal zone.

STEP 2: Consideration of recycling

Examine literature-derived half-lives and associated assumptions. Where recycled proportion is not incorporated consider available data on recycled proportions and the potential to change half-lives to incorporate recycling.

4 PLAN FOR ESTIMATION OF EMISSIONS FROM RETIRED WOOD PRODUCTS

Once retired, wood products will either decompose in debris piles, be stored and a proportion decomposed in landfills, or will be burned. The three different pathways will have significant implications for the ultimate estimate of emissions.

Planned steps for ESTIMATION OF EMISSIONS FROM RETIRED WOOD PRODUCTS:

STEP 1: Determine disposal pathway proportions

The various pathways with and without energy capture will be investigated for different countries, regions and latitudinal zones. Determine default proportions that can be applied. For developed countries examine the broad applicability of the defaults given for the US in Smith et al. (2006).

STEP 2: Emissions from debris piles

Investigate decomposition of and emissions from wood products in debris piles and determine default emission rates. Investigate whether rates should or should not vary by region.

STEP 3: Emissions from burning

Develop default greenhouse gas emissions for burning of wood products. For developed countries determine proportion of burned products associated with power generation and determine potential for a proportional emission reduction to be associated with offset power generation from fossil fuels.

STEP 4: Emissions from landfill

IPCC methods will be used to estimate emissions through time. The IPCC has a spreadsheet tool that allows calculation of emissions for landfilled wood and paper each year after deposition. Investigate impact of methane capture from landfills.

5 CALCULATION OF ATMOSPHERIC IMPACT OF WOOD PRODUCT STORES

The most complex part of the new analysis will be with respect to permanence. The existing voluntary market wood product accounting methodology considers between 0.5% and 9.7% of timber biomass extracted to be permanently stored for tropical timber and 1.7% to 25.9% for temperate timber. The remainder is considered immediately emitted, and thus no positive impact on the atmosphere.

This approach is neither conservative for projects that decrease timber harvest, and thus wood product storage, nor does it give realistic credit for projects that increase timber harvest and wood product storage. Even products that have a lifetime of just one year still keep a quantity of greenhouse gases out of the atmosphere for a year and has a positive impact on the ultimate global warming that occurs.

Two approaches are proposed. Both will be prepared and relative strengths and weaknesses considered including situations in which one or other is significantly favored.

Radiative forcing

The first approach lies in examination of an atmospheric or radiative forcing approach. The IPCC defines radiative forcing as:

> *Radiative forcing is a measure of the influence a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism.*
>
> *IPCC 4th Assessment Report*

The proposed approach would calculate the amount of stored carbon in HWP for each year of the product's life and therefore calculate the actual atmospheric impact of the specific units of carbon dioxide equivalent kept out of the atmosphere. This would be akin to the calculation of the global warming potential of the post-harvest emissions from timber.

This means that over a 100 year period, the atmospheric impact of a unit of carbon stored in product x can be directly compared to a unit emitted to the atmosphere in year zero.

A methodology would either have a set of defaults for products by category, origination country and destination country (with calculation of landfilled proportion and burned proportion on retirement), or would provide a tool that users would be able to use by entering in values and details to gain a final atmospheric impact.

Similar analyses have already been conducted in estimating biogenic CO_2 fluxes in life cycle assessments (e.g. Cherubini et al 2012) that can be viewed as a partial proof of concept.

To provide a hypothetical example: Subsequent to harvest, timber is extracted from the forest for processing to timber products. The following proportional emissions occur in the year of processing and in subsequent years:

Year 0	50%	Year 11	2%
Year 1	2%	Year 12	2%
Year 2	3%	Year 13	2%
Year 3	5%	Year 14	2%
Year 4	8%	Year 15	1%
Year 5	5%	Year 16	1%
Year 6	4%	Year 17	1%
Year 7	3%	Year 18	1%
Year 8	3%	Year 19	1%
Year 9	2%	Year 20	1%
Year 10	2%	Year 21	1%

In comparison to no wood product storage 2% of potential emissions are avoided for one year, 3% for two years, 5% for three years through to 1% for 22 years. The analysis asks what is the impact on the atmosphere over a 100-year time period in terms of radiative forcing (affecting the balance of incoming and outgoing energy) of these periods of storage relative to a full immediate emission in the year of harvest.

Without considering radiative forcing the calculations would represent just a delay in emissions but ultimately no long term impact on the atmosphere. The reality is different. An emission avoided today avoids an ongoing atmospheric impact and delaying by 5 or 20 or 40 years has a permanent effect that the radiative forcing calculations capture

This radiative forcing approach is more complex but can be applied in every situation. In contrast, the long term average approach is limited to stable harvesting cycles (perhaps uncommon in tropical situations). The relative benefits of each option in terms of carbon credit accounting is still to be determined.

The calculations of radiative forcing require specific expertise and knowledge. Therefore to prepare a truly user-friendly method and outputs the plan incorporates a consultancy with an expert in radiative forcing calculations.

Long term average

The second approach is a long term average based solution. This approach only works for projects that have a harvest cycle. The solution is derived from the VCS approach for the carbon pool in trees in afforestation and forest management projects. For these pools the available offsets cannot exceed the calculated long term average stock that is stored over the harvest cycle.

Presuming a system where harvest happens on a sustainable cycle with regrowth restoring harvested biomass then it would be possible to model out the retirement and emissions from wood products over many cycles ultimately calculating the stable resulting quantity that is effectively stored in the wood products pool.

The long term average approach works only in the situation where there is a sustainable repeated harvest cycle with recovery of aboveground biomass and constant harvest volumes at the end of each cycle. In this case it is possible to model the sequestration and emissions from the harvested wood products pool over several cycles to the point where the emissions resulting from existing stocks is balanced by the sequestration after each harvest cycle. An example is given in Figure 1 of a single compartment/management unit on a 36 year cycle with products produced with a 20 year half-life. In this case, after three cycles a constant is reached for which an average wood product stock can be calculated (red line). The example includes use of the exponential decay model for in-use products. A more complex analysis could plot emissions considering disposal methods as well.

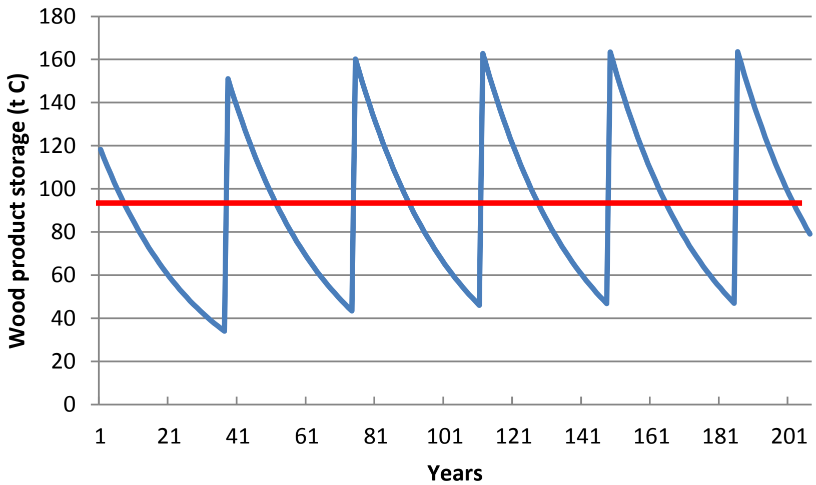


Figure 1. Example of long term average storage in harvested wood products

Planned steps for 5 CALCULATION OF ATMOSPHERIC IMPACT OF WOOD PRODUCT STORES:

STEP 1: Determine applicability conditions for two methods

As described above the long term average approach can only be used under specific circumstances. Through the process of methodology development the application potential and limitations will be identified and written up.

STEP 2: Develop the long-term average approach

The method will likely consist of a set of accounting instructions for users as exists under the VCS for long-term average calculations for the stock of other pools in commercial plantations for afforestation and improved forest management. Users will have to plot the stock in wood products (and all pools) over sufficient harvesting cycles to reach the stable point where emissions from retired products are balanced by the new additions to the pool from harvesting.

STEP 3: Develop radiative forcing approach

Step 3.1: Identify consultant for modelling radiative forcing. The consultant shall be experienced in radiative forcing calculations, greenhouse gas atmospheric residence and the latest associated science.

Step 3.2: Work with the consultant supplying all associated usage and emissions results (sections 2, 3 and 4) and providing structure and expectations.

Step 3.3: The expected output will be a simple accounting method that can be applied by users without specific knowledge and expertise. Options would include an excel-based calculator or a set of default multiplication factors.

6 PLAN FOR METHODOLOGY WRITING

With analyses complete the final part of the work will be writing up methodological requirements for wood product accountings. Such text will ideally fit with minimal or no changes into existing methodologies to facilitate the process of adoption by the relevant standards.

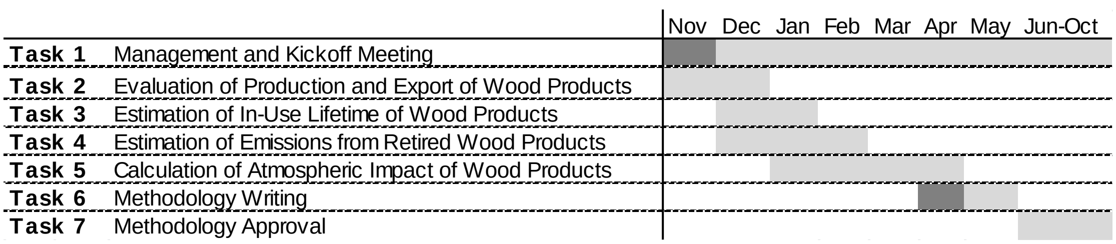
STEP 1: Write up methodological steps required of users accounting wood product sequestration and emissions

STEP 2: Discuss with the Verified Carbon Standard and the American Carbon Registry the update of existing methodologies with the enhanced calculation approach

STEP 3: Tailor methodological write-up (where necessary) to each existing approved methodology

7 LIKELY TIMING AND COST

Tasks 1 through 6 would be completed within 7 months. The timing of Task 7 (methodology approval) would depend on the requirements from the relevant standards but is estimated to span an additional 4-6 months.



**travel indicated in dark grey highlighted months*

Cost:

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	
	Management and Kickoff Meeting	Evaluation of production and export of wood products	Estimation of in use lifetime of wood products	Estimation of emissions from retired wood products	Calculation of atmospheric impact of wood product	Methodology writing	Methodology approval	
LINE ITEMS	cost	cost	cost	cost	cost	cost	cost	Total US$
A. DIRECT COSTS								
I. TOTAL SALARIES, BENEFITS, AND OVERHEAD	16,721	10,380	5,190	13,956	16,642	8,776	8,651	80,317
II. TOTAL TRAVEL AND PER DIEM	12,412							12,412
III. OTHER DIRECT COSTS	60	60	60	60	60	60		360
B. TOTAL CONSULTANT COSTS					15,831			15,831
C. TOTAL INDIRECT COSTS AND FEES	3,710	1,155	582	1,549	3,593	978	692	12,258
TOTAL ESTIMATED COSTS	32,903	11,595	5,832	15,565	36,126	9,814	9,344	121,178

The budget includes an initial meeting at ITTO that would be attended by Dr Sandra Brown and Dr Tim Pearson.

This budget does not include the cost of Professor Hashimoto's time. It is assumed he would be contracted directly by ITTO. The professor's time seems to be limited but it would be invaluable to have him involved in the meetings that occur in Japan and advising and reviewing throughout the project. If Professor Hashimoto has more available time a more substantive role for him in the project would be devised.

The budget also does not include the costs that would be associated with the required approval process at the ACR and the VCS. In particular if the VCS requires a double approval process by verifier organizations it can be expected that the associated cost could be as much or more than $50,000.

Dr. Timothy Pearson
Program Officer II,
Ecosystem Services
office 703.302.6559
fax 703.302.6512
e-mail tpearson@winrock.org
2121 Crystal Drive, Suite 500
Arlington, VA 22202, USA
www.winrock.org/ecosystems

WINROCK INTERNATIONAL