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Accounting of CO₂ emissions from biomass under the UNFCCC

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CO₂ emissions from biomass combustion
Accounting of CO₂ emissions from biomass under the UNFCCC

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ABSTRACT

Many Parties to the United Nations Framework Convention on Climate Change (UNFCCC) are envisaging the use of significant amounts of biomass as a primary source in their energy supply. The present greenhouse gas (GHG) emission inventory guidelines, based on methods and approaches originally proposed by the IPCC in the 1990s do not add the CO₂ emissions from the combustion or incineration of these biogenic fuels to national total emissions, as it is assumed these emissions reverse recent CO₂ removals from the atmosphere during photosynthetic growth of the biomass, largely within the Party’s own boundaries. In a national annual inventory under the UNFCCC, the biomass carbon harvested in a specific year is balanced against the biomass carbon oxidation processes addressed in the energy and waste sectors of GHG inventories. The CO₂ emissions from biomass oxidation in the present Intergovernmental Panel on Climate Change (IPPC) inventory approach are accounted for by the country harvesting the biomass via the subtraction of the harvested biomass from C pools on their lands. This harvested biomass carbon is implicitly assumed to be oxidized both in the year and the country of harvest, regardless of whether this is factual. In the case of biomass exports, the CO₂ emissions from the combustion/oxidation of this harvested biomass are not included in the national totals of the country where the biomass is used, as under the present approach this would lead to double counting on the global scale. With the increasing use of biomass on industrial scales, the assumptions underlying this approach start to introduce material inaccuracies on a national scale (versus global). Biomass combustion may no longer be negligible compared with fossil fuel combustion as biogenic fuels are increasingly traded internationally. In this paper, we review the present IPCC carbon mass flow approach and propose a change in the reporting and accounting methods that has the potential to address this national GHG emissions reporting issue.

KEYWORDS

Biomass; CO₂ accounting; energy sector

Introduction

While the world is working to implement the Paris Agreement [1], many Parties to the treaty are planning to reduce their carbon dioxide (CO₂) emissions through increased use of biomass for energy. Some of these Parties argue that when combining the use of biomass with carbon capture and storage technology (CCS), they will decrease CO₂ concentrations in the atmosphere (i.e. “negative emissions”), referred more formally as BECCS (biomass for energy combined with CCS). Many countries see this approach as necessary to reach net zero emissions by compensating unavoidable non-CO₂ emissions from other sectors [2–6].

In general, the use of biomass to meet these commitments is grounded on the assumption that biomass is a “CO₂ neutral” energy resource. This assumption is itself based on the interpretation that biomass carbon is part of the so-called short carbon cycle. Photosynthesis in plants, trees, and algae converts atmospheric CO₂ into carbon and embeds that carbon in the biological mass of photosynthetic organisms. Harvesting this biomass and combusting it for energy returns this carbon to the atmosphere as CO₂. Biomass combustion for energy is thus interpreted as reversing the relatively recent uptake of CO₂ from the atmosphere while this biomass was growing. Generally, there is no more than a year (e.g. biomass from agricultural crops) to a few decennia (e.g. wood) between the period in which CO₂ is removed by photosynthesis from the atmosphere and when CO₂ is re-emitted through combustion of biomass. This time span is very short compared to the geological time...
scale required to transform biomass into fossil fuels. The processes in the earth’s crust take millennia to convert dead biomass into natural gas, petroleum, and coal used in energy systems.

In the 1990s, national greenhouse gas (GHG) emissions estimation and accounting methods were developed at a time when biomass for energy was primarily used in an informal manner in residential wood stoves and fire places or as a waste stream from timber processing. The carbon mass flow associated with these methods is presented in Figure 1. In general, forestry and other land use carbon pools:

- increase over one year as a result of the balance between photosynthetic growth and loss by foraging animals, mortality and decay, forest fires, pests, storms, etcetera (net photosynthetic growth);
- decrease in the same year as a result of harvesting for fuel (mainly fire wood), wood to produce harvested wood products (HWPs), and agricultural crops.

On a global scale, if the increase due to net photosynthesis equals the loss due to harvesting of biomass (e.g. for fuel, timber, crops) the land in question can be seen as managed in a carbon neutral manner. The default assumption in the current national GHG inventory approach assumes that both the combustion of biomass fuels and incineration of biomass waste products occurs in the same country where net photosynthesis adds carbon to terrestrial biogenic carbon pools. If no significant imports of biomass fuels occur, then the combination of biomass harvesting and biomass combustion could be viewed as a carbon neutral contribution to a country’s energy system. The annual accounting of emissions and removals for the IPCC Land-Use and Land-Use Change and Forestry (LULUCF) sector, thus, boils down to estimating the mass changes in terrestrial carbon pools over a calendar year (i.e. carbon stocks on 31 December minus stocks on the preceding 01 January). This is true for both carbon pools on forest and agricultural lands and includes land use changes.

A Party’s estimates for its LULUCF sector is an aggregate of the changes in carbon stocks on all relevant plots of land within the boundaries of the country. We recognize the significant detail and complexity within the IPCC quantification underneath this general approach. However, this complexity does not change the simple fact that the carbon in harvested biomass in a given country has been removed from a terrestrial carbon pool. And, with the default method the harvesting country implicitly reports the CO₂ emissions from the oxidized carbon (from energy or waste sectors) even when the actual oxidation/combustion occurs in another country that imports biomass fuels.

In the 1990s, energy statistics on biomass use were often incomplete and of low quality. The harvesting of fire wood and processing of timber also tended to occur locally with limited international trade. Furthermore, in the 1990s in most industrialized countries, the use of biomass fuels was negligible as compared to the use of fossil fuels. This condition allowed the authors of the 1996 IPCC Guidelines [7] to codify pragmatic guidance for reporting the CO₂ emissions from the use of biomass for both energy and HWPs. The estimation of net annual emissions and removals of CO₂ in the LULUCF sector boils down to the net change of the total mass of carbon in all pools within a year. And, the carbon in biomass harvested for energy and for HWP manufacturing is assumed to no longer be in these terrestrial carbon pools. As a result, the IPCC recommended in 1996 to not include the CO₂ emissions caused by combustion or incineration of biomass in reported national emission totals, as doing so could constitute double counting of CO₂ emissions that have already been implicitly accounted for through carbon pool subtractions under the LULUCF sector.

These assumptions that were codified in the IPCC guidelines, become increasingly inappropriate as countries use greater amounts of biomass for energy in industrial combustion units, frequently running on imported biomass, as a CO₂ emissions mitigation strategy, as well as embark on industrially removing CO₂ from the atmosphere [2–6]. More than twenty years later, neither the 2006 IPCC Guidelines [8] nor the IPCC’s latest 2019 Refinement [9] provide much added clarity on the issue.
The authors each have over two decades of experience as recurring authors of the IPCC’s methodological guidelines for the preparation of national GHG inventories [7–9] and as national inventory report reviewers for the UNFCCC [10]. With that context, we are concerned with how national inventories now being submitted under the UNFCCC currently treat CO₂ emissions from biomass combusted for energy. These worries are triggered and intensified by the expectation that Parties may increase their use of biomass for energy under the lay belief that it is, by default, a carbon neutral energy resource [6, 11].

Under past and present UNFCCC agreements, emission reduction targets are set at the national level, not the sectoral level. Our worries relate to implications of these national inventory methods and assumptions have on the tracking of progress on and compliance with national emission reduction commitments. The CO₂ emissions from biomass oxidation are presently accounted for methodologically by the biomass harvesting country. Again, this harvested biomass is implicitly assumed to be oxidized both in the year and the country of harvest, regardless of whether this is factual. For countries that use imported biomass fuels and HWPs, the CO₂ emissions of the combustion/oxidation of this biomass is not currently reported in their national totals. One can interpret the current approach as “blaming the wrong country” for the emissions of biomass use, using the same logic that emissions from fossil fuel combustion are not assigned to the country that produced the fuel, but instead to the country that combusted the fuel.

In the following sections, we explain our worries on this issue and propose a change in accounting to improve transparency in national GHG inventory reporting, avoid problematic misinterpretation of carbon neutrality claims, and improve the overall trust Parties have in these reports.

We are not writing this as representatives of any Party, but as technical/scientific experts who are worried about the present practice of reporting biomass combustion emissions.

Using biomass to mitigate CO₂ emissions

Using biomass as an approach to meet national GHG emission reduction targets will affect the reporting of emissions from the energy sector. At present, the amount of CO₂ emissions from the energy sector in most developed countries is up to 60 to 80 percent of the national total GHG emissions. In a country that has reduced their GHG emissions to net zero, the emissions from the energy sector will be reduced and even become negative to compensate for emissions of non-energy sources. More and more countries are beginning to use biomass in industrial sized combustion units and as a fuel along with gasoline and diesel oils. With these changes, biomass is both increasingly a significant contributor to some national energy balances and a fuel product that is traded internationally [6, 11].

Figure 2 schematically presents the carbon flows associated with national CO₂ emissions accounting, assuming that international trade of biomass for fuels is no longer negligible. Using the current IPCC guidelines approach, CO₂ emissions from biomass imported for use as fuel will not be included in national totals of the country combusting these biofuels. Instead the IPCC approach implicitly assumes the LULUCF sector carbon pool stock changes in the harvesting country will account for the eventual CO₂ emissions. [7–9, 12].

A similar situation occurs for products like timber and HWPs. Imports and exports of these products cause emissions and removals of biogenic carbon to be added to national inventory totals in countries where they sometimes do not occur in reality. The 2019 Refinement to the IPCC Guidelines recognize this issue for HWPs (Table 1). In cases where the land is managed in a carbon neutral manner, the present reporting of biomass for energy follows an approach comparable to the “Assumption of a steady-state HWP pool” approach. Where the forest lands are not managed in a carbon neutral manner, the present reporting follows a “Production’ approach”. In both cases all emissions (i.e. not reported removals) are attributed to the harvesting country, not to the biomass energy or HWP consuming country.
Only when the harvesting and the consuming country are the same, there is no problem with the attribution of the emissions to a country’s national total. However, when international trade of biomass for energy is no longer negligible, this current approach will no longer reflect the total emissions occurring within the national territory.

### Various types of biomass

Biomass, when used for energy, occurs in various types and forms, including solid, liquid, and gaseous fuels (Table 2). Harvested biomass used to produce useful energy can either be combusted as a primary fuel, such as firewood, or processed into a secondary fuel (called transformation in energy statistics, Subsector 1.8 in the IPCC system of categories, see Table 3), such as charcoal or biodiesel. In addition to the harvested biogenic carbon in the LULUCF sector, agricultural crops are also used as fuels to produce useful energy and to manufacture longer-lasting products, such as roof thatching and thermal insulation. And all of these harvested materials can be exported or imported. The situation is complicated because some of this biomass is included with harvested crops in agriculture (sugar cane, palm oil). In the reporting procedures of biofuels blended with fossil fuels, the CO₂ emission factors are “corrected” to remove the fraction of CO₂ from biogenic origin from the calculated CO₂ emissions of combusting these blends.

### Biomass accounting in a carbon neutral energy supply

Figure 2 illustrates how import and export of both biomass and HWPs complicates the accounting of CO₂ emissions from biomass combustion/oxidation. Comparing the current approach to biomass energy with the approaches as defined for HWPs in the IPCC 2019 Refinement [13] (Figure 3), the use of biomass for energy follows one of the approaches where all emissions are accounted for by the Party where the biomass is harvested. Neither the IPCC guidelines [7–9] nor the UNFCCC reporting requirements [15] include information how to check the assumption that the short (or long) carbon cycle within a country are in balance (i.e. sustainable).

This paper concentrates on the use of biomass for energy. Due to the present national GHG inventory accounting practice, most policy makers and laypeople will interpret a national energy system that largely uses biomass fuels rather than fossil fuels as reaching carbon neutrality. However, in reality there may be significant net CO₂ emissions associated with such practices that rely significantly on imported biomass fuel.

### Incongruity between current accounting approaches

Currently, biomass used as a fuel is treated differently from all other fuels in the 2006 IPCC guidelines. The IPCC [16] defines three subsectors within the Energy sector (Table 3). The approach, both for estimating the GHG emissions and accounting for them in national totals, is the same for all fuels with the exception of CO₂ from biomass, as shown in Table 3.

Figure 3 provides a carbon mass flow diagram of a country’s energy system. Fossil carbon is flowing into the system — embedded in solid, liquid and gaseous fossil fuels — and biogenic carbon is flowing into the system in biogenic fuels. Part of

<table>
<thead>
<tr>
<th>Element of wood biomass</th>
<th>Assumption of “a steady-state HWP pool”</th>
<th>“Stock-change” approach</th>
<th>“Production” approach</th>
<th>“Atmospheric flow” approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unutilized wood harvest residues</td>
<td>Producing country</td>
<td>Producing country</td>
<td>Consuming country</td>
<td>Producing country</td>
</tr>
<tr>
<td>Harvested wood biomass used directly as energy feedstocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial residues from manufacturing semi-finished wood products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial residues from manufacturing finished wood products in use* **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood biomass collected and burnt as post-consumer waste</td>
<td>Consuming country</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Discussion of the “production” approach in this section also applies for the “simple-decay” approach (see Section 12.3 and Annex 12.1).

**In the case of the “stock-change” approach, strictly, CO₂ emissions from wood biomass collected and burnt as post-consumer waste are only reported by a consuming country if the finished wood products are consumed and used in the country where they are manufactured and are not exported to another country.
the total fuel supplied to the country will be directly combusted for energy. This includes mainly gaseous and solid fossil fuels and wood. The rest of the fuels supplied will be transformed into other forms of energy in refineries, coke ovens, charcoal production and many other industries before it is combusted in power plants and all other use of fuels within the country.

All emissions of CO₂ from the combustion of fossil fuels are presently reported in IPCC subsector 1A Fuel Combustion Activities. However, emissions of CO₂ from combustion of biogenic fuels are reported in memo-items and are not added to national emission totals. Non-combustion emissions of CO₂ from the Energy sector are reported in IPCC subsector 1B Fugitive emissions from fuels, including those caused by the exploitation of the coal mines, oil and gas wells, and all non-combustion emissions from transport of these fuels.

Note that the biogenic fuels flowing into the country’s energy system as represented in Figure 3 are only those that are used within the country itself, including those that are harvested within the boundaries of the country; flows related to exported and imported biogenic fuels are not included in Figure 3. This is not different from the fossil fuel input in the system: the amount of fossil fuels considered in the emission inventory reflects the balance of domestic fuel production, exports and imports, as well as annual changes in the stocks of each fuel [17]. If biomass to energy and BECCS were to become a more widely deployed mitigation option in industrial-sized plants, then one would expect much of this biomass would be traded within a country’s economy and internationally. As a consequence, data on production, imports, and exports of fuels from biomass should be available in national energy statistics.

**Table 2. Definitions of fuel types used in the 2006 IPCC Guidelines (from table 1.1 in the Energy Volume of the 2006 IPCC Guidelines [14]).**

<table>
<thead>
<tr>
<th>Type</th>
<th>English description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid biofuels</td>
<td>Wood/Wood Waste Wood and wood waste combusted directly for energy. This category also includes wood for charcoal production but not the actual production of charcoal (this would be double counting since charcoal is a secondary product).</td>
<td></td>
</tr>
<tr>
<td>Sulphite Lyes (Black Liquor)</td>
<td>Sulphite lyes is an alkaline spent liquor from the digesters in the production of sulphate or soda pulp during the manufacture of paper where the energy content derives from the lignin removed from the wood pulp. This fuel in its concentrated form is usually 65-70 percent solid.</td>
<td></td>
</tr>
<tr>
<td>Other Primary Solid Biomass</td>
<td>Charcoal combusted as energy covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material.</td>
<td></td>
</tr>
<tr>
<td>Liquid biofuels</td>
<td>Biogasoline Biogasoline should only contain that part of the fuel that relates to the quantities of biofuel and not to the total volume of liquids into which the biofuels are blended. This category includes bioethanol (ethanol produced from biomass and/or the biodegradable fraction of waste), biomethanol (methanol produced from biomass and/or the biodegradable fraction of waste), bioETBE (ethyl-tertio-butyl-ether produced on the basis of bioethanol: the percentage by volume of bioETBE that is calculated as biofuel is 47 percent) and bioMTBE (methyl-tertio-butyl-ether produced on the basis of biomethanol: the percentage by volume of bioMTBE that is calculated as biofuel is 36 percent).</td>
<td></td>
</tr>
<tr>
<td>Biodiesels</td>
<td>Biodiesels should only contain that part of the fuel that relates to the quantities of biofuel and not to the total volume of liquids into which the biofuels are blended. This category includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), biodimethylether (dimethylether produced from biomass), fischer tropsh (fischer tropsh produced from biomass), cold pressed bio oil (oil produced from oil seed through mechanical processing only) and all other liquid biofuels which are added to, blended with or used straight as transport diesel.</td>
<td></td>
</tr>
<tr>
<td>Other Liquid Biofuels</td>
<td>Other liquid biofuels not included in biogasoline or biodiesels</td>
<td></td>
</tr>
<tr>
<td>Gas biomass</td>
<td>Landfill Gas Landfill gas is derived from the anaerobic fermentation of biomass and solid wastes in landfills and combusted to produce heat and/or power</td>
<td></td>
</tr>
<tr>
<td>Sludge Gas</td>
<td>Sludge gas is derived from the anaerobic fermentation of biomass and solid wastes from sewage and animal slurries and combusted to produce heat and/or power</td>
<td></td>
</tr>
<tr>
<td>Other non-fossil fuels</td>
<td>Other Biogas Other biogas not included in landfill gas or sludge gas. Biomass fraction of municipal waste includes waste produced by households, industry, hospitals and the tertiary sector which are incinerated at specific installations and used for energy purposes. Only the fraction of the fuel that is biodegradable should be included here.</td>
<td></td>
</tr>
<tr>
<td>Municipal Wastes (biomass fraction)</td>
<td>Other biogas not included in landfill gas or sludge gas. Biomass fraction of municipal waste includes waste produced by households, industry, hospitals and the tertiary sector which are incinerated at specific installations and used for energy purposes. Only the fraction of the fuel that is biodegradable should be included here.</td>
<td></td>
</tr>
</tbody>
</table>
Actually, in many countries these data are already partly available (see the example for Spain, 1999 data, in [17] and a full database at [18]). Furthermore, the same data are needed to estimate and report the emissions of CO2 to be reported as “memo items” using methods (i.e. activity data and emission factors) provided in the Energy volume of the IPCC Guidelines [8]. This current practice does not require the regular collection of energy statistics on biomass fuels. However, countries using large amounts of biomass for energy should be able to collect these statistics.

Biomass for energy use is no longer primarily occurring in small individual stoves and fireplaces, as was the case when the 1996 IPCC Guidelines [7] were developed. More and more countries now plan to use biomass for energy in industrial size plants as one of the possible technologies to approach a carbon neutral energy system. When such plants are equipped with carbon capture and storage technologies, they will be reported as having negative emissions under the present reporting requirements. Unfortunately, as was shown above, there are problems with the current IPCC accounting and UNFCCC reporting approach for CO2 from biomass energy, specifically:

1. **Incorrect attribution** of CO2 emissions within the UNFCCC reporting system, where biomass is harvested in one country and burned in another; and
2. **Incongruity between methods** used for biomass compared to all other combusted fuels in the Energy sector.

### Table 3. Subsectors within IPCC sector 1 Energy; from table 8.2 in volume 1 of the IPCC 2006 Guidelines [8].

<table>
<thead>
<tr>
<th>Category Code and Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Energy</td>
<td>This category includes all GHG emissions arising from combustion and fugitive releases of fuels. Emissions from the non-energy uses of fuels are generally not included here, but reported under Industrial Processes and Product Use Sector.</td>
</tr>
<tr>
<td>1A Fuel Combustion Activities</td>
<td>Emissions from the intentional oxidation of materials within an apparatus that is designed to raise heat and provide it either as heat or as mechanical work to a process or for use away from the apparatus.</td>
</tr>
<tr>
<td>1B Fugitive emissions from fuels</td>
<td>Includes all intentional and unintentional emissions from the extraction, processing, storage and transport of fuel to the point of final use.</td>
</tr>
<tr>
<td>1C Carbon Dioxide Transport and Storage</td>
<td>Carbon dioxide (CO2) capture and storage (CCS) involves the capture of CO2 from anthropogenic sources, its transport to a storage location and its long-term isolation from the atmosphere. Emissions associated with CO2 transport, injection and storage are covered under category 1C. Emissions (and reductions) associated with CO2 capture should be reported under the IPCC Sector in which capture takes place (e.g. Fuel Combustion or Industrial Activities).</td>
</tr>
</tbody>
</table>

### Figure 3. Carbon flow through a country’s energy system.

In sum, CO2 emissions from biomass used for energy are not currently accounted for in the energy sector in contrast to the case for all other fuels. Yet, these CO2 emissions are currently reported as “memo items” using methods (i.e. activity data and emission factors) provided in the Energy volume of the IPCC Guidelines [8]. This current practice does not require the regular collection of energy statistics on biomass fuels. However, countries using large amounts of biomass for energy should be able to collect these statistics.
One other problem is that those not familiar with the IPCC methodologies may interpret the present accounting approach as justifying policies that presuppose biomass combusted does not have any emissions, since the biomass was grown while removing the same amount of CO₂ from the atmosphere.

We stress that the problem we identify is not in estimating emissions, as the existing IPCC guidelines already provide CO₂ and non-CO₂ emissions estimation methods for biomass combustion. The problem is instead in the IPCC’s and UNFCCC’s approach to accounting and reporting. We admit that the simplifying assumption that the LULUCF sector captures any net CO₂ emissions from biomass combustion for energy is methodologically theoretically correct on a global scale integrated over long time periods. However, the problem lies in the attribution of emissions at the national scale, which is the primary purpose of GHG inventory reporting to the UNFCCC. The current approach further produces flawed suppositions by policy makers not involved in GHG inventory preparation processes that biomass for energy is, by default, a carbon neutral mitigation option.

A straightforward route to solve these problems would be to treat biomass when used as a fuel similar to all other fuels in GHG inventories, specifically:

1. Account for and report domestic GHG emissions (CO₂ and non-CO₂) from the combustion of biomass for energy in the relevant subcategories of IPCC Energy sector 1, A Fuel combustion activities;
2. Estimate the domestic removals (i.e., negative emissions) from harvesting of primary biomass fuels in a new category 1B3 Biomass fuels of IPCC sector 1B Fugitive emissions; and
3. Estimate the domestic emissions from the production/ transformation of biomass into secondary fuels in a the same new category 1B3 Biomass fuels of IPCC sector 1B Fugitive emissions.

Most biomass is produced for other purposes than combustion for energy. We believe, however, that in cases where biomass produced for energy becomes significant within a national energy balance (i.e., volumes are no longer negligible because it is employed as a tool to meet the emission reduction targets), it is reasonable for national energy statistics be collected on this growing activity. The reporting of biomass energy production can easily be harmonized with the reporting of other fuels. Most national statistical agencies already attempt to quantify biomass energy consumption, and such data becomes increasingly available as more biomass energy materials are traded internationally. Further, countries are required to collect this data already for the estimation of non-CO₂ GHG emissions from biomass combustion in their GHG inventories.²

This improvement to nation inventory accounting and reporting would create three categories within subsector 1B: one of (fossil) coal, one for (fossil) oil and gas, and one for all types of biomass. Since charcoal is basically a transformed biomass fuel (see Table 1), it would be logical to move emissions from charcoal production (now in 1A 1c Manufacture of Solid Fuels and Other Energy Industries) to this new subcategory. Figure 4 presents a possible new GHG inventory categorization substructure. This modified structure would also allow for the reporting of GHG emissions from biomass conversions, such as the production of biodiesel and other biofuels, in a more logical category.

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Figure 4. Proposed source categories for biomass harvesting and transformations.
This proposed approach would solve the problems discussed above, specifically:

1. Emissions from biomass combustion for energy would continue to be estimated with a low uncertainty using activity data from energy consumption statistics and emission factors, but now accounted for and added to the national emission totals from the fuel combustion subsector 1A Fuel Combustion Activities. IPCC provides default emission factors for biomass fuels [14]. Again, the estimates are already prepared by Parties, but presently reported as “memo items”.

2. Estimation, reporting, and accounting of carbon pools in the LULUCF sector would not change, as the carbon stored in harvested biomass for energy is not currently not included within forestry and other land use terrestrial carbon pools or HWPs anyway;

3. Carbon temporarily stored in domestically produced biomass fuels would need to be reported and accounted for in a new category 1B3 Biomass Harvesting and Treatment consistently with energy supply statistics for other fuels produced within the country. In other words, these estimates would be based on the amount of biomass produced for use as a fuel within the country, regardless of whether it is combusted within the country or traded internationally;

4. Since both the emissions from combustion in subsector 1A and the removals from biomass growth in subsector 1B would be estimated from national energy statistics, the current problem of different time scales in the LULUCF and Energy sectors related to these two categories would be solved.

In many countries, the national statistics currently available on supply and demand of biomass for energy might not yet be as well developed as for fossil fuels. However, most countries collect some national statistical data on biomass energy and such data is included in the databases of UN Statistics and Eurostat [18].

Accounting and reporting for CO₂ emissions from biomass for energy as recommended above has one additional benefit. Whenever biomass used as fuel is traded internationally, the carbon removals associated with the growth of that biomass will be properly accounted for by the producing country, while all GHG emissions from combusting biomass for energy will be properly accounted for and reported by the biomass consuming country. The current approach implicitly and improperly shifts the accounting of CO₂ emissions from the biomass consuming country to the producing country. Lastly, by explicitly accounting for biomass combustion and biomass production, it is easier to determine whether or not the use of biomass for energy is carbon neutral on a national scale by simply adding the positive emissions from biomass combustion in the energy sector 1A and the negative emissions of biomass harvesting and treatment now reported in the new source category 1B3.

If the original IPCC Guidelines for national GHG inventories had been drafted today, they would probably follow our proposals above. IPCC authors would likely conclude that when Parties are claiming emission reductions through large scale use of biomass, these emissions should not be implicitly included in the LULUCF sector, but explicitly be reported in the Energy sector. As a consequence, the UNFCCC reporting guidelines for national GHG inventories would surely give due consideration to the IPCC’s approach. We should all acknowledge that today’s situation differs considerable from when the precedent of the current approach to biomass for energy was codified in the original IPCC guidelines almost 30 years ago.

Notes

1. The acronym LULUCF was used in the 1996 IPCC Guidelines [7]. This sector is integrated into the AFOLU sector in the 2006 Guidelines [8]. In this paper, we use the acronym LULUCF to refer to the non-agriculture subsectors within the IPCC 2006 AFOLU sector.

2. One could argue that the primary use of fossil fuels is for energy production while this is not true for biomass production. However, a major use of petroleum is also to produce non-energy products (e.g., feedstocks for the production of polymers). This fact is not a sound rationale for neglecting to collect statistical data and report on the use of and CO₂ emissions from petroleum for energy purposes. Why would then this argument then be logical for biomass fuels?

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