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An Analysis of Wood Market Balance Modeling in Germany

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ABSTRACT

A Wood Market Balance model provides a method for generating a highly aggregated summary of wood availability and use. It is an important source of information for the forestry and wood industry sectors. This paper compares the Wood Balance and Wood Resource Balance modeling tools widely used in Germany today, lists the differences between the two and shows why the Wood Resource Balance in its current form is susceptible to misinterpretation. To avoid possible misinterpretation, a proposal is presented for an enhanced Wood Resource Balance. The term Wood Market Balance is proposed for the enhanced model to differentiate it from the already existing models. The Wood Market Balance presents an analysis of wood use at the place of consumption (material and energy uses) in contrast to the Wood Resource Balance which looks at wood input into the industry. Based on the current Wood Resource Balance, the proportion of wood used for energy has been substantially underestimated. The figure derived for Germany for 2010 and commonly referred to in public debate was approximately 50%. The proposed Wood Market Balance, however, indicates that the proportion of wood used for energy purposes is actually higher at roughly 61%.

1. Introduction

The publication of Wood Balances has a long tradition in Germany (see Junghans, 1942, 1943; Köstler, 1936, 1942; Speer, 1951, 1952, 1953, 1955; Wiebecke, 1961). According to Ollmann (2001), the objective of a Wood Balance is to condense the very large amount of available data into a small set of highly aggregated data which provides a basis for assessing foreign trade with wood, wood consumption, dependence on imports and the self-sufficiency of the wood supply. Since around the year 2000, the Wood Balance has been supplemented by the Wood Resource Balance which was developed by Mantau (2004, 2009, 2012a). As a result, Germany now has two complementary balance models which, compared with other industries and sectors, provide a high level of transparency relating to the raw material supply and its usage. Raw material balances are generated in other industries as well (Wagenführ, 1952; Eurostat, 1984) but not with the same continuity as in the forestry and wood industry. The aggregated data contained in the Wood Balance and Wood Resource Balance provides a transparent summary of the forestry and wood industry. It provides baseline data which companies in the forestry and wood industry can use to discuss forestry and economic policy and make policy decisions (e.g. Sauerwein, 2013; Ohnesorge, 2013; Hieke, 2013; AGR, 2012a). The Wood Resource Balance was used in the international study "EUwood — Real potential for changes in growth and use of EU forests" (Mantau et al., 2010a,b), enhancing its status in international discourse (e.g. Steierer, 2010). Wood Resource Balances are not only used to provide a historical perspective on a particular year in the past or for short-horizon forecasts covering only a few years (Mantau, 2012a). They also provide a basis for generating long-term forecasts (for the period up to 2020 or 2030).

Given the significant and increasing importance of the Wood Resource Balance, this paper analyzes that particular model. It questions whether the current balance model accurately reflects reality and if the model has the potential to lead to misunderstandings and misinterpretations. It also explores whether the actual percentage of wood used for energy is not being systematically underestimated by a substantial margin. To avoid possible misinterpretations, enhancements to the Wood (Resource) Balance are proposed and discussed.

2. Wood Balances and Wood Resource Balances — current status

2.1. The Wood Balance (Ollmann and others)

The Wood Balances published by the Federal Research Centre for Forestry and Forest Products (BFH) and its successor institutes (Dieter, 2002, 2003, 2007; Ollmann, 1990, 1993, 1995, 1998, 2000, 2001; Seintsch, 2010, 2011; Seintsch and Weimar, 2013) differentiate between a Woody Biomass Balance and a Total Woody Biomass Wood Balance. The Woody Biomass Balance compares the woody biomass sources (felling, imports, reduction in stocks) with usage (domestic consumption, exports and addition to stocks; Seintsch and Weimar, 2013). The Total Woody Biomass Balance (Seintsch and Weimar, 2013) is more encompassing. It also includes such factors as waste wood and waste paper. The figures are quoted in million m^3 or

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million m^3 (r) roundwood equivalents. Conversions are based on the conversion factors (e.g. UNECE, 2010).

Leaving aside any increase or decrease in stocks, domestic consumption in the Woody Biomass Balance is calculated as a line item balance of felling and foreign trade. The balances are based on official statistics (e.g. the Federal Statistical Office). In addition, statistical data from the paper industry (e.g. VDP, 2012) and empirical data on the post-consumer wood market (e.g. Mantau et al., 2012) are included in the Total Woody Biomass Balance. The data in the Total Woody Biomass Balance is supplemented with foreign trade data on semi-finished and finished products and presented graphically in wood flow diagrams. No detailed information on wood utilization beyond semi-finished goods or on energy use is contained in the Wood Balances.

The fact that only felling data which is derived from official felling statistics is taken into consideration limits the usefulness of the Wood Balances. Felling which does not appear in the official statistics is excluded. The difference between official and unofficial fellings can be considerable. According to Weimar (2011), actual felling in Germany in 2009 was 36% higher than the official felling statistics would indicate (see also AGR, 2012b). The reliance on official statistics does, however, have the advantage that there is no need to carry out extensive empirical studies to generate the balance. This makes it easier to generate annual balance at an affordable cost. Also, it maximizes transparency and facilitates access to the underlying data.

2.2. The Mantau Wood Resource Balance (WRB)

In contrast to the Wood Balance discussed in the previous section where wood consumption is calculated as a line item balance, the Wood Resource Balance (WRB) which was created by Mantau starts with wood uses and works back to the woody biomass sources (Mantau, 2004, 2009 2012a; Mantau and Sörgel, 2006; Mantau et al., 2007, 2010a,b). The Wood Resource Balance generated by Mantau (2012a) for 2010 is shown in Table 2. On the sources side, it differentiates between forest woody biomass (stemwood, other industrial roundwood, forest residues and bark), other primary woody biomass (landscape care wood and short rotation plantation) and other woody biomass (sawmill by-products, other industrial residues, black liquor and post-consumer wood). On the uses side, the balance sheet differentiates between material uses (sawmill industry, pulp industry, panel industry and other material uses) and energy uses (energy use > 1 MW, energy use < 1 MW, households, other). Solid wood fuels appear on both sides of the balance sheet. The line items on the sources side of the balance sheet refer to input into industrial production or energy use. The line item "sawmill industry" means that in 2010 37.3 million m^3 of roundwood were processed in the sawmill industry. This figure was calculated from empirically based surveys in the sawmill industry (Döring and Mantau, 2012).

The balance sheet is based on empirical studies carried out for this specific purpose on energy usage (e.g. Mantau, 2012b; Hick and Mantau, 2008; Weimar et al., 2012), material usage (e.g. Döring and Mantau, 2012) and the post-consumer wood market (e.g. Mantau and Bilitewski, 2010; Mantau and Jochem, 2012) among others. Some of the data was taken from unpublished research reports. As is the case for the Wood Balance, the figures in the Wood Resource Balance are quoted in million m^3 or million m^3 (r) roundwood equivalents. Conversions are based on the applicable literature and empirically derived conversion factors.

Table 2 shows that 51% of the wood was consumed for material uses and 49% for energy uses (2010).[1]

[1] Based on the balance sheet in Table 2, Mantau (2012a) reports use predominately for energy (50.5%); however in conformance with Mantau et al. (2010a), solid wood fuels were excluded in calculating the percentage for solid wood fuel, so the figure for solid wood fuel is 49%.

2.3. Comparison between Wood Balance and Wood Resource Balance

Tables 1 and 2 refer to the same time period and information content, but they show significant differences. The balance sheet total in Table 2 is 135.4 million m^3 which is 2.2 times higher than the total of 62.5 million m^3 shown in Table 1. Approximately one-third of the difference can be explained by the fact that the Wood Balance in Table 1 is based exclusively on official felling statistics and foreign trade and any felling beyond that (e.g. private small-scale harvesting primarily for fuelwood) is not included. About two-thirds of the difference is due to the disclosure on the uses side in the Wood Resource Balance (Table 2) of post-consumer wood and by-products and residues from the production process which are used later on as materials or to produce energy. Besides black liquor from the pulping process, sawmill by-products and other industrial residues are shown on the balance sheet. The line item sawmill by-products includes all by-products and residues from sawnwood production (slabs and trimmings, chips, shavings) which accumulate in addition to the main sawnwood product. Other industrial residues include all woodworking by-products and residues from all primary and secondary wood processing (except sawnwood production), for example carpentry (Mantau, 2012a).

The disclosure of sawmill by-products and residues (other industrial residues and black liquor) results in *balance sheet expansion*. In the world of accounting when a business takes out a loan, the incoming funds are entered on the assets side of the balance sheet and the loan is entered on the liabilities side. In this type of transaction, the assets and liabilities increase by the same amount, resulting in a balance sheet expansion. The balance sheet total increases by the amount of the loan. The opposite effect takes place when, for example, a loan is repaid. The assets and liabilities decrease by the same amount (see Eisele, 2002; Schöttler and Spulak, 2009), resulting in a balance sheet contraction.

Mantau refers to the consecutive use of woody biomass materials as cascade use. The "cascade factor" is a metric which describes the balance sheet expansion. The "Cascade factor of Wood Resource Balance … on primary biomass" is quantified as 1.53 for Europe (Mantau et al., 2010b). The cascade factor in the sawmill industry for Germany is 1.54 (Mantau, 2008).

In contrast with the Wood Balance, the Wood Resource Balance is based primarily on empirical studies carried out specifically to collect data for the balance (especially company surveys). This makes the data acquisition more labor intensive. The significant amount of effort required is presumably the reason why the Wood Resource Balance has so far only been published every two or three years rather than every year.

3. The Wood Resource Balances might lead to misinterpretation

The fact that the balance sheet total is substantially higher in the Wood Resource Balance compared with the Wood Balance is consistent and inherent to the methodology used, but for several reasons there is a risk of misinterpretation:

1 The disclosure of by-products and residues on the woody biomass sources side expands the balance sheet and increases the balance sheet total. Interpretation of the balance sheet totals as an indication

Table 1
Balance template for the 2010 Woody Biomass Balance (Seintsch and Weimar, 2013).

Woody Biomass Balance 2010			
Sources	[M m^3]	[M m^3]	Uses
Felling	54.4	58.5	Domestic demand
Imports	8.1	3.9	Exports
Stocks, decrease	0	0.1	Stocks, increase
Total	62.5	62.5	Total

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