

Interactive comment on “The European forest sector: past and future carbon budget and fluxes under different management scenarios” by Roberto Pilli et al.

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This is an interesting study that reports the carbon balance (stocks and fluxes) of European forests (26 countries), including harvested wood products, and calculates how the balance changes as a result of different management scenarios. The discussion is well organized and well written, and the topic is timely and of wide interest. I have a number of minor comments, listed below, and one major suggestion. The suggestion is that an additional Figure would help summarize the results and provide a clearer reconciliation of fluxes and stocks (simpler than Fig. 3). The greatest emissions of carbon result from heterotrophic respiration (largely decomposition), and these emissions are expected to increase in the future as the forests age. However, despite the increased

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emissions from decay (greater emissions), the stocks of carbon in dead organic matter will also increase (greater sink). And it's not immediately obvious how these two opposing fluxes contribute to the overall budget. A box-and-arrow Figure would provide a helpful framework for relating fluxes and stocks. The boxes are the five pools of carbon (including HWP) and the atmosphere, and the arrows are the annual fluxes between the pools. Each box also reports the annual change in stock. Thus, the reader can total up the fluxes and get a net flux that is equivalent to the sum of the stock changes. The approach helps reconcile arguments, for example, about whether HWPs are sources or sinks of carbon (they accumulate carbon as sinks, but they also emit carbon as they decay). Apps and Kurz had such a Figure in one of their earlier papers, and others have followed the example.

Specific comments:

Lines 25-28: The difference between the net carbon stock change (110 TgC) and the Net Sector Exchange (NSE) (122 TgC) is presumably explained by including HWP in NSE, but this isn't explicitly stated in the abstract.

Line 26: “Felling also transferred 28 Tg C yr⁻¹ of harvest residues from biomass [to?] dead organic matter pools.” Missing “to”?

Line 28: I suggest inserting “a sink of” between “equals” and “122 Tg C”.

Line 239: The soil pool is defined by what depth? 1 m? 30cm?

Lines 339-340: Why is this value considerably higher than Karjalainen's? Is it because of the higher heterotrophic respiration (line 265)?

Line 437: The loss of C from soil respiration is the third largest emission. But soils are presumably accumulating (a net sink) carbon as forests age. This is what leads me to suggest the box-and-arrow Figure.