



# Eberswalde University for Sustainable Development

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Accurate use of forest inventories shows that unmanaged forests have a higher climate protection effect than managed forests: A response to the letter by Bolte et al.

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## RESPONSE TO THE EDITOR

# Accurate use of forest inventories shows that unmanaged forests have a higher climate protection effect than managed forests: A response to the letter by Bolte et al.

The reply by Bolte et al. (2020) that claims to evaluate objectively the debate between Schulze et al. (2020a) and Welle et al. (2020) goes astray. They conclude that we failed “in revealing both formal citation and methodological failures of Schulze et al. (2020a)” and argue that “the low representativity of the Hainich National Park for set-aside forests in Germany limits its general significance in comparisons of managed and unmanaged forests.” Actually, we have never stated a citation error by Schulze et al. (2020a), but uncovered their methodological mistake, which led to seriously flawed results and conclusions. The problem is a simple one. Whenever the development of different forest types is to be compared, the selection of comparable sites and ecosystems is methodologically challenging. Indeed, Schulze et al. (2020a, 2020b) failed in justifying the suitability and comparability of sample sites with regard to key properties such as stand age.

The data collected in the Hainich National Park (HNP), Germany, originate from a continuous inventory sampling (Nationalpark-Verwaltung Hainich, 2012), which is a proven method for assessing forest development. The accuracy of increment values derived from such an approach requires that in initial and repeat surveys the same trees are sampled (Kurth, 1994). Therefore, in 2000 and 2010, only the trees within the same 1,200 plots can be compared (see Figure 1). Schulze et al. (2020b) insist in their methodological approach of including additional 221 plots that comprise young pioneer vegetation into the 2010 dataset, which were not part of the baseline inventory in 2000. This is unacceptable science, since statistical comparability is no longer given due to changing forest area. Hence, those plots must be excluded from the analysis. This is especially true since the original data source does allow the comparison of identical plots between 2000 and 2010. The erroneous use of their inventory data has also been criticized by the National Park

administration itself (Nationalpark-Verwaltung Hainich, 2020).

In our reply to Schulze et al. (2020a), we questioned why only data from HNP were chosen for the calculation despite providing additional data from other managed and unmanaged forests (ibid, table 1). In their response (Schulze et al., 2020b) to our letter (Welle et al., 2020), the authors preferred not to clarify this point, a fact to which Bolte et al. (2020) do not refer to either. In another response to earlier critiques by Kun et al. (2020) and Booth et al. (2020), Schulze et al. (2020c) introduced further increment data based on the German national forest inventory provided by the Thünen Institute. Although this dataset confirms Hainich's average growth rates of  $9 \text{ m}^3 \text{ ha}^{-1} \text{ year}^{-1}$  (derived from comparison of identical plots) for both unmanaged beech and spruce stands in Germany, Bolte et al. (2020) argue for unrepresentativity.

We maintain our criticism of Schulze et al. (2020a) and reject the conclusions of Bolte et al. (2020). Bolte et al. (2020) did not recognize the methodological error, and that with obscuring arguments it was claimed that forest use for energy purposes is better for climate protection than abandoning it, while important existing research results on the climate balance of old-growth forests and on hidden emissions from forest use were simply ignored.

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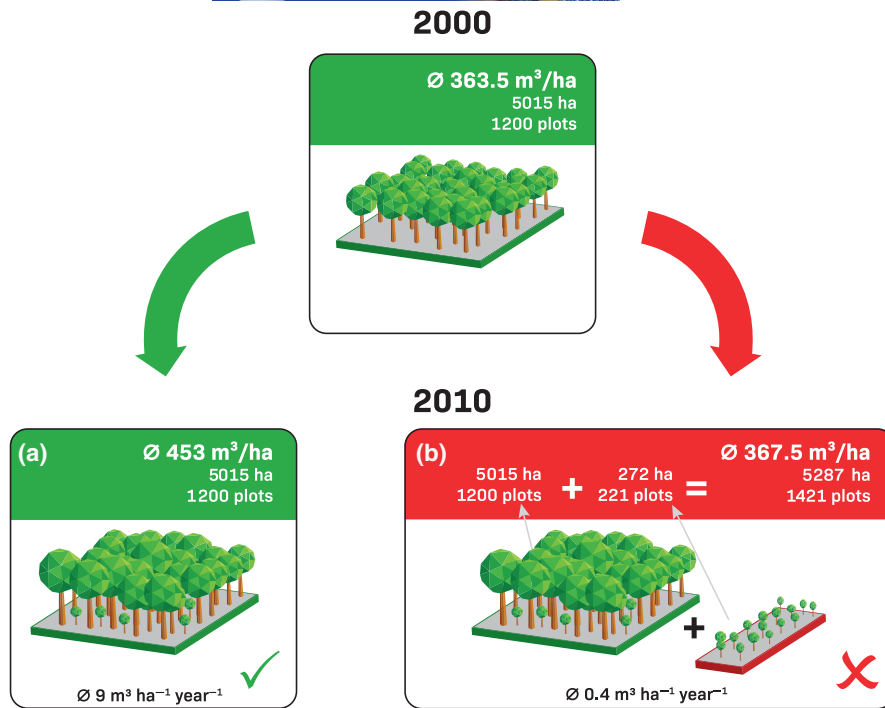
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**FIGURE 1** Schematic representation of the inventory results of the Hainich National Park (Nationalpark-Verwaltung Hainich, 2012), selected by Schulze et al. (2020) to show that unmanaged forests have a poor growth and carbon sequestration capacity. Continuous sampling inventories can only provide reliable results if identical plots are compared over time (a). The main error of Schulze et al. (2020) that has been overlooked by Bolte et al. (2020) is based on the inclusion of data on additional plots of pioneer forest that were not covered by forest in 2000 and thus not included in the initial survey (b). Apart from the inadmissible comparison of incomparable forest areas, the recorded average stock volume of the combined old and pioneer stands (367.5 m<sup>3</sup>) seems to be too low. Considering the total amount of stock volume, the increment of 0.4 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup> is not plausible

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