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National REDD + reference levels deduced from the global deforestation curve

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ABSTRACT

This article proposes an approach to one of the most prominent problems for the establishment of a REDD + regime — namely reference level determination. We have developed a standardised approach for the consideration of national circumstances in REDD + reference levels, which applies the global curve of forest cover development as the benchmark for accounting of avoided deforestation. The approach draws on the identification and empirical quantification of a global deforestation curve which was created by applying the forest transition concept (Köthke et al., 2013). By the underlying regression model the most relevant national circumstances were identified as the average of 140 countries. These national circumstances represent the development stages of the individual countries, from which their future forest cover development in the global average can be determined.
By applying national data for estimating the corresponding average development the article identifies national reference levels for 86 REDD + target countries which are still in their deforestation phase. It is estimated by how much actual deforestation in each country deviates from the mean deforestation curve; the period considered is 2005–2010. This is the first time a uniform global deforestation pattern was used to determine the consideration of national circumstances in REDD + reference levels. The quantitative results provided here may be an important basis for further policy discussions about reference level determination.

1. Introduction

Deforestation (including forest degradation) is a significant source of anthropogenic greenhouse gas emissions as well as a threat to biodiversity globally. About 17% of the global anthropogenic greenhouse gas emissions were induced by tropical deforestation in 1990 (Gullison et al., 2007; IPCC, 2007). According to the Intergovernmental Panel on Climate Change (IPCC, 2007), reducing emissions from deforestation is the most effective and comprehensive mitigation option in the short term and, according to the Stern Review (Stern, 2006), among the cheapest. The REDD + mechanism was therefore initiated in the United Nations Framework Convention on Climate Change (UNFCCC) with the primary aim of fighting climate change. The full name of REDD + mentions the five activities addressed under the mechanism: "Reducing Emissions from Deforestation and forest Degradation and the role of conservation, the sustainable management of forests and enhancement of forest carbon stocks in developing countries" (UNFCCC, 2005, 2008, 2010, 2011a).

The discussion about a feasible REDD + mechanism is ongoing (UNFCCC, 2005, 2008, 2010, 2011a) with several methodological issues still needing to be resolved. One problem is the determination of country specific benchmarks (here called national reference levels)[1] against which the countries' reduction of emissions due to deforestation and the other REDD + activities can be determined (for overviews see, e.g., Angelsen, 2009: Ch.3; Eliasch, 2008: Ch.9.3; Verchot and Petkova, 2010).

Reference level determination is complex because all REDD + target countries[2] have to agree upon one methodological approach despite having very different country specific conditions and interests. The inclusion of all target countries in the agreement is essential to avoid international leakage and guarantee environmental integrity (Olander et al., 2008; UNFCCC, 2011b). In the political discourse it is agreed that a national reference level shall consider historical deforestation and further national circumstances (UNFCCC, 2008, Decision 2/CP.13).

For reference level determination different general options exist, which finally will be a matter of political negotiation. One option is to negotiate reference levels individually for each country. Up to the current REDD + negotiations it seems likely that all countries individually argue on their national reference level design and submit proposals

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[1] In the UNFCCC terminology reference emission levels and reference levels are differentiated and address different REDD + activities. In this article we only refer to the activity of deforestation and use the term 'reference level' for any benchmark.

[2] Potential target countries for the REDD + mechanism are the so called Non-Annex I countries to the UNFCCC (UN, 1992; UNFCCC, 1992/2012).

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on which and how national circumstances shall be considered (see UNFCCC (2012), Decision 12/CP.17 II). However, without a standardised methodology any individually selectable reference level might lead to opportunistic behaviour of the single countries and consequently to low climate effectiveness. Furthermore, issues of comparability and fairness across countries will likely suffer.

To avoid this, experts demand equity, effectiveness and efficiency of the mechanism and seek a uniform methodology for all parties (Angelsen, 2008: Ch.6; Angelsen et al., 2011).

The determination of reference levels deduced from historic national behaviour was discussed early in the REDD + process. This is an option based on a uniform methodology, for which simple linear extrapolations of historical deforestation rates from a reference period to a commitment period were proposed (related approaches are called 'simple historical reference level' and 'compensated reduction approach') (Santilli et al., 2005). Under such an approach, the definition of the required benchmark for emission reduction would be the national business as usual (i.e., historical) deforestation rate.

Approaches based on historical deforestation rates have been criticised by experts, who fear that countries with high forest cover and low historical deforestation rates could be disadvantaged, because neither early action would be honoured nor future development opportunities would be guaranteed. Vice versa, countries with high deforestation rates in the past could be advantaged by less demanding reference levels, which consequently allow high deforestation rates even in the future. This could produce 'hot air' (i.e., the generation of credits without any efforts taken for emission reduction) and would not be climate and cost effective (Angelsen, 2008: Ch.6). A systematic bias of the forest cover development by simple linear extrapolations is likely and must be avoided (Angelsen, 2009; Skutsch et al., 2007; UNFCCC, 2011b). This problem becomes evident when simple historical reference levels are related to the forest transition hypothesis (see Fig. 1). The forest transition hypothesis (originating from Mather, 1992) describes that changes in a region's forest cover seem to follow a determinable pattern of decline and later re-expansion over time. Fig. 1 schematically displays possible consequences of simple historical forest cover extrapolations for countries in different stages at the forest transition curve (adapted from Angelsen, 2008: Ch.6).

Considering the countries' stages on the forest transition curve in their respective reference levels could, however, account for their national circumstances and therefore guarantee equitable development opportunities for the different countries (proposed and requested, e.g., by Angelsen, 2008: Ch.6; Angelsen et al., 2011; Culas, 2012; UNFCCC, 2009). This, however, has not been conducted so far. A few authors have grouped countries according to their stage on the forest transition curve into high or low forest cover and high or low deforestation countries (see Griscom et al., 2009; Murdiyarso et al., 2008) but have not explicitly quantified and modelled the forest transition concept for reference level application. Despite the fact that the causes and drivers of deforestation differ considerably among regions and may be complexly intertwined, the forest transition hypothesis describes that this forest cover pattern is supposed to be similar across time, regions and countries. Köthke et al. (2013) recently parameterised a regression model of global deforestation based on the forest transition concept and thereby found evidence for the existence of a global pattern of forest cover decline. This empirically quantified model seems suited for reference level application.

In this paper we propose a new approach for setting national REDD + reference levels, which builds upon the global deforestation curve identified by Köthke et al. (2013). Our approach defines the benchmark for emission reduction to be the average global forest cover development at different development stages. These development stages are determined by a set of circumstances, like physio-geographic conditions, demographic and (socio-)economic status. The single countries can be placed on the average global deforestation curve according to their individual development status, expressed by their respective national circumstances.

The proposed standardised approach for reference level setting is based on the results of the multi-national regression model mentioned above (see Köthke et al., 2013), by which a global deforestation curve has been parameterised as the average forest cover development of 140 countries. From the available data the regression model determined the most important influences on forest cover for those 140 countries. The identified influencing factors are applied in this paper as the relevant national circumstances which we propose to include in REDD + reference levels. The approach applies the mentioned global deforestation model for estimating the average global forest cover change for each country at its respective development status, i.e., under its individual national circumstances. By this approach the countries' performances below or above average can be determined, as deviations of the observed national deforestation from the average global deforestation at the same development stage can be measured. These

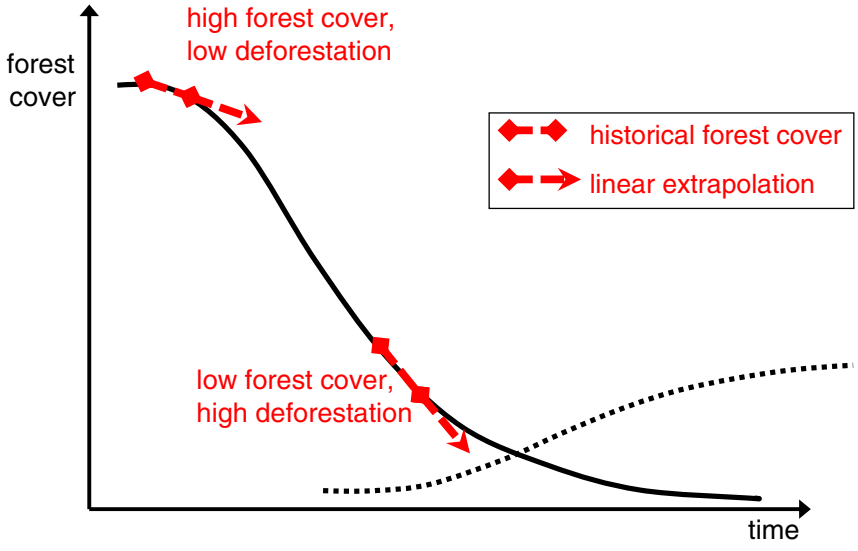

Fig. 1. Forest cover development according to the forest transition concept — divided in the curves of deforestation and forest enhancement (adapted from Mather, 1992 and Grainger 1995). The concept of simple historical reference levels by linear extrapolation of historical forest cover in contrast to the forest transition development is schematically displayed (adapted from Angelsen, 2008).