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Deforestation and timber production in Congo after implementation of sustainable management policy: A reaction to the article by J.S. Brandt, C. Nolte and A. Agrawal (Land Use Policy 52:15–22)

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ABSTRACT

This viewpoint paper presents a reaction to the article by Brandt et al. (2016). It highlights the complexities inherent to the attribution of deforestation impacts to policy interventions when using remote-sensing data. This critique argues that in the context of the Congo a suite of factors (i.e., population density in particular) other than those considered by Brandt et al. (e.g., type of forest, distance from roads and markets) play essential roles in determining the fates of forests. It also contends that care is needed when making decisions regarding which units will be included in the comparison group so that contextual factors and on-the-ground information are properly considered (e.g., when logging operations are inactive or when a concession is used for 'conservation' purposes). Finally, it proposes that a focus on an analysis of deforestation rates for a given level of timber production might be a metric that more accurately represents one aspect of the consequences of forest management, which should also consider the appraisal of trade-offs associated with a larger set of social, financial and ecological objectives.

1. Introduction

Brandt et al. (2016) use remote sensing data from the Republic of Congo to address whether: (1) 2005–2010 deforestation rates were lower in concessions with forest management plans (FMPs) than in those without (FMP vs. No-FMP); (2) deforestation rates declined after FMPs were implemented; and, (3) FMP imple-

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mentation affected wood production. They sourced data from the Satellite Observatory for Forests of Central Africa (OSFAC) databases (Potapov et al., 2012) and Hansen et al. (2013). We contend that the Brandt et al. (2016) article contains data and interpretations that both deserve scrutiny and a more detailed discussion, which we provide below.

The authors used a quasi-experimental matching analysis to compare the rates of forest cover change in FMP and No-FMP concessions as outcome variables, based on randomly selected 1 km^2 parcels.

Covariates used for matching were minimum distance to an active road, distance to the nearest settlement in existence in 2005, travel time to the nearest market, proximity to the Congo and Oubangui Rivers, elevation, average slope, and above-ground woody biomass. They concluded that: (1) deforestation rates were significantly higher in FMP concessions (by an average of 0.2%); (2) after the official starting date of FMP implementation, deforestation in six FMP concessions increased on average by 1.9 km^2/yr and in no case decreased; and, (3) concessions with FMPs had higher and more stable timber production, more extensive forest road networks and, consequently, more deforestation. The first conclusion was based on a comparison of matched 1 km^2 parcels in FMP and No-FMP concessions in the northern part of the country because there were no concessions in the south with registered FMPs. To arrive at the second conclusion, the authors matched parcels in randomly selected No-FMP concessions in both the north and south of the country with FMP concessions that were all in the north.

We agree with Brandt et al. about the importance of understanding the impacts of policy instruments that seek to achieve sustainable forest management goals, and overall welcome the use of remote-sensing methods as an approach that can provide estimates of the effects of a range of interventions. In this commentary, we argue that the conclusions posited by Brandt et al. are compromised by two related sorts of issues. First, there are methodological problems related to the selection of units to be included in their comparative analysis. Second, we question their interpretation of the implications of what an FMP is and achieves, as described below. We propose that a more informative outcome variable related to how FMPs might affect sustainable forest management (SFM) is the amount of deforestation per unit of timber harvested.

The focus of our collective work over many decades in a range of tropical forests has been to bring the concept of SFM into implementation and make it more of an on-the-ground reality. That is why in discussing some of Brandt et al. conclusions we include insights that we believe should be considered when framing analyses of the impacts of SFM on a range of issues: from the most ecological ones to political sustainability.

1.1. Problematic parcel selection criteria

We detect bias in the data selection process employed by Brandt et al. Specifically, (1) deforestation data from the south of the country are of low quality due to more persistent cloud cover (Duveiller et al., 2008); (2) road data are more readily available for FMP concessions precisely because they are required to provide detailed maps with such roads. This situation, as pointed out by the producers of one of the main road datasets used in the analysis (WRI and MEFDD, 2012), renders their comparison with No-FMP concessions liable to reporting biases; and (3), at least three of the forest management units (FMUs) (note that a concession can be comprised of several FMUs) used by the authors as non-FMP parcels (i.e., Pikounda Nord, Tala-Tala, and Jua-Ikié) were not in operation for their entire study period.

In the online-available "Supplementary materials" to their article, Brandt et al. explain that deforestation is very high along the Oubangui River, an important transportation waterway with a high population density. The authors consequently excluded from their matching analysis points <15 km from the river as shown on their map SI-4 (Fig. 1). Due to this selection criterion, their analysis did not include parts of the FMUs Bétou and Mimbeli-Ibenga that did not have FMPs during the studied period and that suffered high rates of deforestation (nearly 1% per annum) for 2000–2010 (BRLi & C4 Ecosolutions, 2014). This exclusion means that deforestation rates are underestimated in No-FMP FMUs given that numerous parcels with high rates of deforestation were not selected. In contrast and without clear justification, the Pikounda-Nord FMU was included among those in the No-FMP group even though it was not harvested during the study period; that FMU is managed as a 'conservation concession' and it thus experienced by its nature neither industrial logging nor deforestation.

Some of the analytical methods employed by Brandt et al. need clarification. For example, it is unclear why human density is treated as a deforestation factor that is *endogenous* to FMPs but *exogenous* to No-FMPs. Given the importance of local population density, it is unclear why they included FMUs within 15 km of the city of Ouesso, the administrative capital of the Sangha Department that borders the Ngombe and Pokola FMUs, both of which have FMPs (Fig. 1). For reasons that are unspecified, their analysis does not consider National Road 2, which crosses 80 km of the FMP Ngombe FMU and was reopened and rehabilitated in 2004 in the Sangha Department. That road is an exogenous deforestation factor, potentially as powerful as the Oubangui River. Whether a high population density (responsible for high deforestation rates) is attributed to the presence of an industrial center, to a main road built by the State close to a provincial capital, or to the combined effect of both factors needs to be considered to assess its likely influence on the outcome. Brandt et al. chose to attribute the high population density to the presence of an industrial center, a decision that at least warrants discussion and an in-depth analysis of local demographic histories.

It seems worth noting that during the period covered by the analysis of Brandt et al., the only concessions with validated FMPs were in the north, whereas all the concessions in the south and some in the north lacked FMPs. Deforestation rates are much higher in the more populated Southern Congo (i.e., >0.2% per annum during the 2000–2010; BRLi & C4 Ecosolutions, 2014). In Northern Congo, two FMUs that are part of the same concession lacked FMPs but experienced very different deforestation rates: 0.1% per annum for Bétou, close to the Oubangui River (the area excluded by Brandt et al.) and 0.01% for Missa, more distant from the river and less populated. These remarks illustrate that local population density seems more powerful than other factors, especially the presence or absence of an FMP. We also stress the challenge of using matching methodologies to attribute with any certainty an effect to a residual causal factor.

The authors attribute differences between concessions with and without FMPs to: (1) the more extensive road networks associated with higher and more stable timber production driven by international market demands for wood from responsibly and legally managed forests (FMPs); and, (2) greater pressure from human activities in concessions with FMPs. We agree with Brandt et al. that the effective implementation of FMPs indicates a logging company's commitment, which may also be reflected in their generation of more and better employment opportunities than concessions without FMPs. Indeed, contributions to local community development and the implementation of social programs in the form of legally required "*social contracts*" are characteristic of responsibly managed concessions (e.g., those certified by the Forest Stewardship Council). Roads and economic development together stimulate human population growth in responsibly managed concessions ("*Economic development* [...] *has led to a 69% growth in human population* [...]"), which increases pressure on resources