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Mapping certified forests for sustainable management - A global tool for information improvement through participatory and collaborative mapping

Florian Kraxner[a,*], Dmitry Schepaschenko[a,g], Sabine Fuss[b,a], Anders Lunnan[c,a], Georg Kindermann[a,d], Kentaro Aoki[e,a], Martina Dürauer[a], Anatoly Shvidenko[a,f], Linda See[a]

[a] Ecosystems Services and Management Program, International Institute for Applied Systems Analysis (IIASA), Schlossplatz 1, 2361 Laxenburg, Austria
[b] Mercator Research Institute on Global Commons and Climate Change (MCC), Torgauer Str. 12–15, 10829 Berlin, Germany
[c] Norwegian University of Life Sciences (NMBU), School of Economics and Business, Box 5003, 1432 Aas, Norway
[d] Austrian Research and Training Centre for Forests, Natural Hazards and Landscape, Seckendorff-Gudent-Weg 8, 1131 Vienna, Austria
[e] Shinshu University, Cooperative Research Center, 4-17-1 Wakasato, Nagano 380-8553, Japan
[f] Sukachev Institute of Forest, Russian Academy of Sciences, Siberian Branch, Akademgorodok 50/28, Krasnoyarsk 660036, Russian Federation
[g] Mytischi filial of Bauman Moscow State Technical University, Institutskaya, 1, Mytishchi-5 141005, Russian Federation

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ABSTRACT

There are currently no spatially explicit, openly accessible data available on forest certification below national level, so understanding the drivers of certification in the past, examining the scope for further certification and using this information for development of future sustainable forest management strategies is challenging. Hence, this paper presents a methodology for the development of a global map of certified forest areas at 1 km resolution in order to satisfy this information need. Validation of the map with certified areas in Russia showed reasonable results, but the lack of openly accessible data requires broadening the strategy for improving the global certification map in the future. Thus, the second aim of the paper is to present an online tool for visualization and interactive improvement of the global forest certification product through collaborative mapping, aiming at a range of stakeholders including third-party certifiers, green NGOs, forestry organizations, decision-makers, scientists and local experts. Such an approach can help to make more accurate information on forest certification available, promote the sharing of data and encourage more transparent and sustainable forest management, i.e. both producers and users can benefit from this online tool.

1. Introduction

Forests are the host to very different uses such as timber production, recreation, habitats for biodiversity, water management and animal husbandry, and in some places, are subject to the rights of indigenous people and local communities. Clearly, there will be interactions between these different uses, potentially causing tradeoffs if occurring in the same place. To capture and balance all of the different services and uses of a forest, the concept of sustainable forest management was developed. Sustainable forest management has multiple objectives and is of vital importance for various Sustainable Development Goals (SDGs, e.g. SDG 15 on "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss"), and for the greenhouse gas balance among many other benefits. The failure of the United Nations Rio Summit to agree upon a sustainable forest convention inspired the first private certification schemes, which began in 1993 (Rametsteiner and Simula, 2003). Subsequently, forest certification was supported by environmental groups to address concerns about deforestation and forest degradation and to promote the maintenance of biodiversity. From there, forest certification has developed into one type of tool for the implementation of sustainable forest management. Many certification schemes have since emerged, where the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC) are the two most prominent private schemes.

In May 2014, these certification schemes reported a total gross area of 440.3 million ha (Fig. 1) under their individual (endorsed) certification standards. The PEFC has endorsed 258 million ha of certified forest land in 28 countries, whereas the FSC has certified a total of 182 million ha in 81 countries (Fernholz et al., 2014). This certified forest area has become an important indicator for many assessments. The revised set of indicators under Forest Europe (Pan-European

* Corresponding author at: IIASA, Schlossplatz 1, 2361 Laxenburg, Austria.
E-mail addresses: kraxner@iiasa.ac.at (F. Kraxner), schepd@iiasa.ac.at (D. Schepaschenko), Fuss@mcc-berlin.net (S. Fuss), anders.lunnan@nmbu.no (A. Lunnan), kinder@iiasa.ac.at (G. Kindermann), kentarou.aoki@gmail.com (K. Aoki), duerauer@iiasa.ac.at (M. Dürauer), shvidenk@iiasa.ac.at (A. Shvidenko), see@iiasa.ac.at (L. See).

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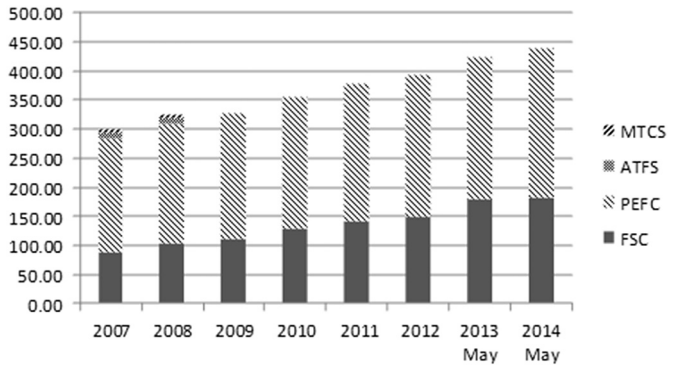

Fig. 1. Forest area certified by major certification schemes 2007–2014, in million hectares by year and scheme. Note that MTCS and ATFS have been endorsed by PEFC in 2008 and hence are accounted under PEFC since 2009.
Source: modified after Fernholz et al. (2014).

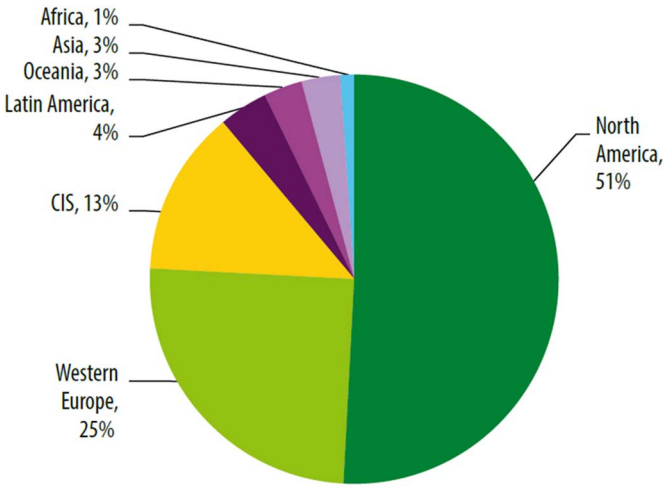

Fig. 2. Total certified forest area by regional share (2014).
Source: modified after Fernholz et al. (2014).

Region), for example, includes one on certified forest area (Linser and Wolfslehner, 2015). Other bodies considering certified forest areas include the Biodiversity Indicators Partnership (BIP), which serves the global user community by responding to the indicator requests of the Convention on Biodiversity (CBD) and other biodiversity-related monitoring and reporting efforts such as IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) (BIP, 2017).

Although the amount of certified forest area has increased almost exponentially during the last decade, about 90% of the globally certified area is located in the northern hemisphere (Fig. 2). This indicates the success of forest management certification in Europe and North America but also shows that certification schemes have still not become widely established in the southern hemisphere (Karmann et al., 2009),[1] although good examples of sustainable forest management in the pursuit of FSC certification exist, e.g. the Congolaise Industrielle des Bois (CIB) in the Republic of Congo.

Karmann and Smith (2009) and Romero et al. (2013) provide comprehensive literature studies on the question of certification effects, where the latter also cover stakeholder views. The authors of both studies found that most literature they reviewed was based on geographically limited case studies, anecdotal evidence, or studies that were not conducted by independent observers. More importantly, they concluded that there is insufficient empirical evidence regarding the impact of certification at a *global* scale and hence more studies of the impact of certification are needed. More recently, Heilmayr and Lambin (2016) showed that FSC certification schemes were more effective in slowing the conversion of forests to other types of land use compared to other market-driven governance approaches in Chile, although the results are only for one country.

In general, there is only very limited statistical data publicly available and readily accessible for carrying out empirical studies to assess the past, present and future development of certification, even though the information in principle exists, at least in the case of FSC. The United Nations Economic Commission for Europe, together with the Food and Agriculture Organization of the United Nations (UNECE/FAO), provides the only official and independent data repository for forest management certification, bringing this information – inter alia from FSC – together; see e.g. the Forest Products Annual Market Review (e.g. Fernholz et al., 2014).

Publically available data from the FSC (2014) and PEFC (2014) can be accessed at an aggregated, national level only, which are plotted in the upper and lower panels of Fig. 3, respectively. Yet there are a multitude of uses for spatially disaggregated data on certified areas for different groups: researchers can combine the data with other spatially explicit information, e.g. on concessions, protected areas, landscape restoration options and economic variables in their global models to investigate questions of interactions, economic incentives and opportunities, and policy scenarios (e.g. Kraxner et al., 2009). Others have pointed to the need for such maps for transparency and credibility reasons (cf. "Transparent Forests" project by FSC, CIFOR and WRI and the Global Forest Watch initiative of WRI and more than 50 organizations). Finally, NGOs can overlay this information with their data on environmental and social indicators, facilitating the monitoring and identification of action needs such as counseling.

In the UNECE/FAO publication series, Kraxner et al. (2008) published the first spatially explicit global forest management certification map (Fig. 4), integrating indicators from FSC and PEFC based on findings by Rametsteiner and Simula (2003). While this map represents a major step in the right direction with respect to the spatial analysis of certification, there is clearly scope for further development, which is the main objective of this study. It is important to note that an evaluation of why and where forests are certified or not can be done with the current publicly accessible information on certification. However, how this can be done is not yet clear and the contribution of this paper is to offer a new methodology to fill this gap. Using a globally consistent approach, we applied a downscaling algorithm to distribute forest management certification areas spatially, which will provide a better representation of where certified forests are located globally. The second objective is to share this information using the interactive online crowdsourcing platform called "Geo-Wiki"[2] (Foody et al., 2014; Fritz et al., 2012; Fritz et al., 2009; Schepaschenko et al., 2015; See et al., 2015). Crowdsourcing is the outsourcing of microtasks to citizens, which includes data collection, analysis, hypothesis generation and opinion gathering, among others (Howe, 2006). The Geo-Wiki platform is used here in two ways: a) as a visualization tool so that the forest certification map and the input data can be viewed and b) as a participatory and collaborative mapping tool so that different users (e.g. scientists, public and private investors, certification schemes) can validate and improve the map using the interactive feedback and collaborative mapping tools within Geo-Wiki[3].

[1] Even though the total FSC-certified area in the tropics exceeds 10% of the global FSC-certified area, the number of certificates (1 out of 4) in the tropics gives a more accurate impression of this discrepancy (FSC, 2017).

[2] Geo-Wiki is a platform that provides citizens with the means to engage in environmental monitoring of the Earth by providing feedback on existing spatial information overlaid on satellite imagery or by contributing entirely new data. Data can be input via the traditional desktop platform or mobile devices. Resulting data are available without restriction (www.geo-wiki.org).

[3] For instructions on how to use the Geo-Wiki tool and how to provide feedback in order to improve the global certification map, please see: https://geo-wiki.org/archive/manual/feedback_forest_certification.pdf.