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Incorporating a Global Perspective Into Future-Oriented Forest Management Scenarios:
The Role of Forest Footprint Analysis

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ABSTRACT

This research serves to integrate the concept of an "ecological footprint" into future-oriented forest management scenarios. Scenarios are commonly used to explore stakeholder perceptions of possible forest futures, and are typically focused on the local impacts of different management choices. This article illustrates how global footprint analysis can be incorporated into scenarios to enable local forest stakeholders in the EU to consider the impacts of their local decisions at national and global levels. This illustration could be helpful to the construction of a forest decision support system that includes wood trade information and social processes (simulation of management decisions under changing political/economic conditions). It finds that different future forest management scenarios involving a potential increase or decrease of the harvested timber, or potential increase or decrease of subsidies for forest protection, combined with various possible changes in local consumption patterns, might have impact on both "internal" (local) and "external" (non-local) forest footprints.

KEYWORDS

Decision Support, Forest Footprint, Forest Management Scenarios, INTEGRAL Project, Sustainability

INTRODUCTION

It has been estimated that by the year 2007 humanity was consuming 1.5 times the resources that the earth had produced in a single year (Ewing et al., 2010). Moderate UN scenarios, involving low population growth and small improvements in diet, suggest that by 2050 we will require two Earths to support us over the long term (Ibid). International trade is playing an increasing role in the rise of global consumption. In general, as countries gain in wealth they decrease their relative reliance on domestic resource extraction, while increasing their overall consumption and reliance on foreign imports.

The concept of a global "footprint" has helped to measure and quantify this shift towards export dependence, by translating all consumption into standardized global units. For example, Wiedmann et al. (2013) define "material footprints" (MF)[1] in terms of the global allocation of raw materials

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extracted to produce end products. They find that with every 10% increase in gross domestic product, the average national MF increases by 6% (Wiedmann et al., 2013).

Given the global nature of production and consumption, "sustainable" land use planning requires consideration of global footprints, since decisions to produce or consume locally serve to reduce, replace or displace impacts elsewhere. Area-based measures of global footprint provide perhaps the most intuitive method to link the footprint concept with local land use. These include concepts such as "ecological footprints" and "forest footprints" that translate consumption into standardized units known as "global hectares". The "ecological footprint" measures human appropriation of ecosystem products and services in terms of the amount of bioproductive land and sea area needed to supply these services (Wackernagel & Rees 1996). Six land use types are considered in this calculation: cropland, grazing land, fishing ground, forest land, built-up land, and carbon uptake land[2] (Ewing et al. 2010). Table 1 outlines the Wackernagel and Rees formula for calculating footprints (Wackernagel & Rees 1996, Wackernagel et al., 2004, Nie et al., 2010). The degree to which footprints are sustainable depends, in part, on the overall capacity of the land to support them. Wackernagel & Rees (1996) have coined the term "biocapacity" to refer to the biosphere's ability to meet the human demand for material consumption and waste disposal.

The above details on global ecological footprints highlight the current excess and inequality of global consumption, as well as the increasing reliance on international trade. The relationship between these overall patterns and forests, however, is quite complex. Currently, the leading global driver of forest loss is the expansion of commercial agriculture in tropical countries, and EU consumption plays a significant role in supporting this expansion (Cuypers et al., 2013). In this regard, it is the EU's production and consumption of agricultural products, and to a lesser extent, biofuels, that exerts the greatest impact on global forests. We suggest that participatory forest land use planning can serve as one venue for generating discussion among forest stakeholders about these cross-sectoral linkages and how EU countries and communities might best address it.

Of more direct relevance to the forest sector, trade in wood products plays a significant role in global forest degradation (Cuypers et al., 2013). Forest trade can also be compared relatively easily with

Table 1. The footprint equation

$$EF = \frac{\Sigma R_i \left(P_i + I_i - E_i \right)}{Y_i}$$

where:

- **EF (Ecological Footprint):** A measure of how much area in global hectares (gha) of biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates, using prevailing technology and resource management practices (measured in global hectares) (global hectare: a productivity weighted area used to report both the biocapacity of the earth, and the demand on biocapacity (the Ecological Footprint).
- **Y_i (Yield Factor in tonnes/ha):** A factor that accounts for differences between countries in productivity of a given land type.
- **$P_i + I_i - E_i$ (Consumption in tonnes of the wood products (i) category):** For this study it used the apparent consumption which calculated as "production plus imports (It includes imports for re-export) minus exports (It includes re-exports) as FAO defines (FAO, 2010).
- **ΣR_j (Equivalence Factor in gha/ha):** A productivity- based scaling factor that converts a specific land type (such as cropland or forest) into a universal unit of biologically productive area. j is one of the six specified categories of ecological productive land. e.g. For forest land and for the year 2005 is 1.33 (WWF, 2008).

Source: (Global Footprint Network 2012)