Forest Policy and Economics 92 (2018) 193–201

Contents lists available at ScienceDirect

Forest Policy and Economics

journal homepage: www.elsevier.com/locate/forpol

Economic impacts of setting reference levels for the forest carbon sinks in the EU on the European forest sector

A. Maarit I. Kallio[a,*], Birger Solberg[b], Liisa Käär[c], Risto Päivinen[c]

[a] Department Bioeconomy and Environment, Natural Resources Institute Finland, Helsinki, Finland
[b] Norwegian University of Life Sciences, Ås, Norway
[c] Tapio Ltd, Helsinki, Finland

ARTICLE INFO

Keywords:
Forest sector
Harvest leakage
Carbon sink
Climate policy
Modelling

ABSTRACT

In order to meet the requirements of the Paris climate agreement, the EU plans to set new goals for forest carbon sinks. This may affect the future development potential in the wood using sectors in Europe and their contribution in the new circular bio-economy. We explore the potential consequences mainly on the forest sector in the region consisting of EU and Norway (EU + N), but also globally, that would arise if the countries in the EU + N constrained economic utilization of their forest resources. For the analysis, we use the global forest sector model EFI-GTM, which also incorporates the trade in wood and wood products.

Due to the globally growing demand for forest products and available forest resources in the rest of the world (RoW) outside of the EU + N, the leakages of harvests, forest industry production and employment opportunities from EU + N to RoW would be considerable. Decreased wood harvests and forest industry production in the EU + N would raise the wood and forest industry product prices globally, and increase production and employment in the forest sector in RoW. Due to the harvest leakage, climate mitigation benefits of the policy in the form of forest carbon sinks in the EU + N would be considerably reduced. Also, there would be inter-sectoral carbon leakage, as part of the wood consumption would shift to more energy-demanding competing materials.

1. Introduction

During 1990–2015, the average net removal of greenhouse gas from the atmosphere by forest land in the EU28 has been 419 Mt-$CO_{2\text{-eq}}$/yr. Thus the EU forests have been an important carbon sink, without which the annual greenhouse gas emissions in the EU would have been on average 9% higher (Eurostat, 2017a). The Paris agreement (UNFCC, 2015) for climate change mitigation requires that the parties should take action to enhance the carbon sinks, but it does not define which baseline to use for verification (Valade et al., 2017). For its 2030 climate and energy framework, the EU Commission proposed setting "forest reference levels" (FRLs) for carbon sequestration in forests for 2021–2030. They would define the country baselines to which the future carbon sinks or emissions would be compared for accounting purposes. The draft text for a legal proposal (COM(2016) 479 final, article 8.3) stated that the national forestry accounting should include FRLs based on the continuation of current forest management practice and intensity, as documented between 1990 and 2009 per forest type and age class in national forests, expressed in tonnes of CO_2 equivalent per year (European Commission, 2016). After the commission's proposal, the rapporteur Lins (European Parliament, 2017) suggested using instead the period 2000–2012 for calculating the FRLs. In both cases, the new FRLs would have been based on the past intensity of the use of forests and tightened the forest carbon sink goals compared to the FMRLs. The impact of EU climate policies to the harvests in the member countries remains still open: The EU Parliament's (2018) decision in April 2018 leaves some flexibility for the countries to decide on their FRLs.

The new FRL approach will replace the Forest Management Reference Levels (FMRL) of the second commitment period of the Kyoto Protocol (KP) for 2013–2020. The FMRLs account for market prospects and the national policies adopted before the end of 2009. At the same time, the credit of exceeding the forest management sink is capped to a maximum of 3.5% of a country's total emissions in 1990. In some cases, this may have reduced the countries' incentive to increase their forest sinks (Laturi et al., 2016).

In this study, we aim to examine the socio-economic impacts that could result if the EU member countries have to meet tighter goals for forest carbon sinks and if they therefore have to limit the utilization of their forest resources. Due to confidentiality, the planned country level

* Corresponding author.
E-mail addresses: a.maarit.i.kallio@luke.fi (A.M.I. Kallio), birger.solberg@nmbu.no (B. Solberg), liisa.kaar@tapio.fi (L. Käär), risto.paivinen@tapio.fi (R. Päivinen).

https://doi.org/10.1016/j.forpol.2018.04.010
Received 21 December 2017; Received in revised form 26 April 2018; Accepted 27 April 2018
1389-9341/

FRLs were not available from the EU commission for research purposes despite their importance and need for evaluating the impacts of the policy proposal. Lacking the figures that have been under consideration at any stage, we apply the average harvest levels in FAOSTAT (2017a) in the period 2000–2012 in the EU and Norway for the constraint on utilization of the forest resources. For a sensitivity analysis, we consider three other cases of harvest constraints and one case where the baseline is also changed. The policy impacts are analysed by comparing scenarios with and without the assumed harvest limitations. The EFI-GTM global forest sector model is used to quantify the forest sector developments in the scenarios. The time period considered is up to year 2030.

We examine how and how much an introduction of the assumed constraints on forest utilization would influence, mainly in the region consisting of the EU and Norway (EU + N), but in some degree also in the rest of the world (RoW):

- roundwood harvests
- production of forest-based products
- turnover and employment in the forest sector.

The impacts caused by the harvest constraints in the EU + N will be summarized using the concept of leakage of harvests and forest industry production from the EU + N to RoW. By leakage we mean the ratio $-A_t/B_t$, where B_t is the difference in annual harvests or production in the EU + N in year t between a baseline scenario and a scenario where the harvests are constrained in the EU + N, and A_t is the respective difference in harvest or production in RoW.

Few studies have examined the market level impacts of recent climate policies on the forest sector in the EU. Laturi et al. (2016) investigated the timber market impacts and the effectiveness of setting FMRLs in the EU27 in the second Kyoto period. They showed that in the countries where non-LULUCF sector emissions are high relative to the sink potential of the forests, the market impacts of the FMRLs in the form of reduced harvests and increased timber prices could be substantial. In the smaller forested countries, the cap could be reached more easily. That would limit the incentive to forego harvests in order to increase forest sinks and thus affect the wood market less.

Ellison et al. (2011) examined the treatment of forest related carbon sinks in the KP and identified, in addition to the caps set on crediting the sinks, several other sources of disincentives for using these sinks in climate change mitigation. Ellison et al. (2014) pointed out that also the lacking possibilities for trading forest carbon hinder the EU from achieving the full potential of climate mitigation by forest based resources. Based on examining the literature on the role of forest sector in climate change mitigation in Europe, Nabuurs et al. (2017) concluded that by revising the earlier policies and by introducing new measures to improve synergies between climate policy and other societal forest-related goals, mitigation impact of the forest sector could be considerably increased in the EU by 2050.

The market impacts and carbon leakage of the EU policies related to reducing emissions in the energy sector have been examined more frequently. Parossous et al. (2015) estimated such leakage to be 28%, while the median of leakage estimates in the studies they reviewed was 20%. The energy sector differs from the forest sector in many aspects. In the energy sector, various alternative options exist for fuel feedstock, energy carriers and production methods which can be taken into use for emission reduction purposes. Furthermore, energy is an input for a heterogeneous set of applications and products, not all of which are easily transferable to the other countries. Also, the level of product differentiation between the markets and products can be considerable. In the forest industry instead, wood used as a raw material is not easily replaced by other materials or inputs. Forest products tend to be rather homogenous and widely traded in the international markets without important barriers of trade. That makes products coming from one country rather easily substitutable with those produced in another country. The policies affecting the forest sector can thus be anticipated to be more vulnerable to carbon, harvests, and production leakage than those tackling the emissions from the energy production.

Former studies confirm the intuition that the leakage effect caused by policies on wood harvests and forest industry production can be considerable. Wear and Murray (2004) found harvest leakage rate of reduced public harvests in the US to be 84%, whereas Gan and McCarl (2007) report rates from 42% to 95%. Nepal et al. (2013) found that the carbon leakage related to the programs incentivizing the U.S. landowners to sequester carbon into forests and forego timber harvests would lead to the carbon leakage of 70–85% as timber removals would shift to other areas. Hu et al. (2014) examined a set of restricting forestry policies in China and found that their implementation would cause an 80–90% carbon leakage to Russia, Southeast Asia and the EU.

Our study differs from those above particularly in two important aspects. First, we analyse the impacts of potential harvest limitations in Europe, but look also at the wider market impacts. Secondly, we apply a global forest sector model which is rather detailed regarding the European forest sector and includes trade between all regions and products involved.

In the next section, we introduce the model and the main assumptions. The results are presented in Section 3. Section 4 provides discussion. Main conclusions are drawn in Section 5.

2. Material and methods

2.1. Model used

The EFI-GTM model is a multi-regional and multi-periodic partial equilibrium model of the global forest sector. It depicts the system consisting of wood supply, forest industries and production of wood-based energy and biofuels, demand for forest industry products and wood biomass for energy, and international trade in wood and forest products. The model version used includes 57 regions covering the entire world, the regional disaggregation being most detailed in Europe. The model includes about 30 forest industry and energy sector products, five roundwood categories, three categories for forest chips, four recycled paper grades, and the main by-products of the forest industries, such as sawmill chips and sawdust. The model is continuously updated and developed and it has been used in various applications (e.g. Solberg et al., 2003; Moiseyev et al., 2013; Kallio et al., 2018). The documentation in Kallio et al. (2004) still provides a valid description of its basic operational principles.

2.2. Scenarios and sensitivity analyses

In the main analysis, we compare a scenario "Baseline" with a scenario "Limited" where the harvests in the EU + N are constrained.

In the Baseline, the global forest product markets are allowed to develop rather freely. Yet, we imposed a sustainability condition requiring that no more than 5% of the regional growing stocks can be harvested annually. We also included some trade inertia conditions for wood as discussed in Section 2.3.2.

In scenario "Limited", the EU + N roundwood harvests after 2020 are not allowed to exceed the average harvest levels of the period 2000–2012 in these countries, a period proposed by the Environment Committee of the European Parliament (European Parliament, 2017). All other assumptions are the same as in the Baseline.

In addition to the scenario "Limited" where the EU + N harvests are constrained to

(i) average harvests during 2000–2012,

we calculate the leakage rates for harvests and forest industry production in three other cases for sensitivity analysis. In these cases, the maximum harvests allowed in the EU + N in 2021–2030 are