Journal of Forest Economics 23 (2016) 45–62

Contents lists available at ScienceDirect

Journal of Forest Economics

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

Forests in the Finnish low carbon scenarios☆

A.M.I. Kallio*, O. Salminen[1], R. Sievänen[2]

Natural Resources Institute Finland, Viikinkaari 4, Helsinki FI-00790, Finland

ARTICLE INFO

Article history:
Received 11 May 2015
Accepted 4 December 2015
Available online 14 January 2016

JEL classification:
Q23
Q28
Q42
Q48
Q54
Q58

Keywords:
Carbon balance
Forest sink
Greenhouse gas
Forest sector
Finland
Low carbon economy

ABSTRACT

Finland is committed to the EU goal of reducing greenhouse gas emissions by 80% from the 1990 levels by 2050. We examine the potential role of the forests in fulfilling this goal in Finland. We base our analysis on the six scenarios that supported the parliamentary process of preparing Energy and Climate Roadmap 2050 for Finland to which we contributed by providing the assessment of forest sector development. While the scenario paths show that a systemic change to achieve the 80% target is possible with the increasing use of wood for energy being an important tool to cut emissions, our projections here show that an increase in forest carbon sink alone could play at least as important a role in improving the carbon balance. As the Finnish forests are growing clearly more than the projected removals of wood biomass are, Finland's carbon balance in full carbon accounting might become negative already before 2040 thanks to the forest sink. The forest growth might come to offset all other emissions sources even without other measures and still allow an increase in the use of wood for materials and energy. Nevertheless also other emission saving measures are needed because there is currently a cap which limits the use of LULUCF sinks as an emission reduction tool, and because of the fact that at some future point of time the forest sink will saturate while being vulnerable to many risks at the meantime.

☆ This article is part of a special issue entitled "Forests and climate: New insights from forest sector modeling".

* Corresponding author. Tel.: +358 29 532 5434.
E-mail addresses: maarit.kallio@luke.fi (A.M.I. Kallio), olli.salminen@luke.fi (O. Salminen), risto.sievanen@luke.fi (R. Sievänen).
[1] Tel.: +358 29 532 5346.
[2] Tel.: +358 29 532 5487.

http://dx.doi.org/10.1016/j.jfe.2015.12.001
1104-6899/

Introduction

The European Commission (EC, 2011) has launched a goal of reducing greenhouse gas emissions by 80% from the 1990 levels by 2050 primarily through internal measures within the EU. The intermediate steps toward this goal include a 40% reduction in the emissions by 2030 and a 60% reduction by 2040. With these targets, the EU aims to contribute in the goal of limiting the global warming to 2 °C degrees during this century. In Finland, the goal of the 80% cut in greenhouse gas emissions by 2050 was stated by the Finnish Government (Government of Finland, 2014) in its proposal for the climate law to the parliament. We examine here the potential role of the forests in fulfilling this goal in Finland.

We base our analysis on six Low Carbon Finland 2050 (later also LCF) scenarios[1] (Koljonen et al., 2014), for which we provided the assessment of forest sector development. The scenarios aimed to identify cost-effective pathways for Finland to move into a low carbon economy by 2050 in order to support the parliamentary process of preparing Energy and Climate Roadmap 2050 for Finland (The Ministry of Employment and the Economy, 2014). Increasing carbon sequestration in forests would not help Finland meet its international climate commitments, because the credits obtained from the sinks in LULUCF sector are limited in the international climate agreements, Kyoto protocol and later agreements. Therefore, the development of forest sinks was ignored as a mean to achieve the 80% emission reduction goal in the LCF scenarios. Instead, increasing use of wood energy plays an important role in the low carbon paths for Finland.

While burning energy wood immediately releases CO_2 to the atmosphere, the sequestration of carbon to the forests may offset the emissions from burning wood and other fuels. However, recent studies (e.g., Lecocq et al., 2011; Kallio et al., 2013) argue that the carbon released to the atmosphere from burning energy wood is not tied back to the forest soon enough to provide emission reductions in the short to medium term. Also, increased use of wood energy is seen to lead to shorter forest rotations with lower carbon stock of forests and increasing need of fertilization (Schulze et al., 2012). Some other studies, e.g., Werner et al. (2010), Lundmark et al. (2014), oppose this and argue that such views are too short-sighted.

Werner et al. (2010) consider the full effects of alternative forest management and wood use regimes in Switzerland and its trading partners. Based on model-aided scenarios they conclude that from a climate change mitigation perspective, it would be optimal to increase the forest growth to its full potential and keep harvesting the growth. The best option would be to use the wood so produced mostly to construction materials with long life time and then to other purposes in a cascaded manner. But even an increase focusing in energy wood is better in the long run than the business as usual case, if there is no market for increasing amounts of construction materials. The scenario, in which forest are used least intensively and are largely left unmanaged, leads to high carbon stock in the short-run, but the stock increase then saturates and the natural mortality is increased. Therefore, Werner et al. find this to be the worst option in the longer run from a climate change mitigation perspective, even in the absence of any risks related to the forest sinks. Lundmark et al. (2014) argue that for the reasons above and due to the risk related to forest sinks, it is more fruitful to use forests actively to replace fossil fuels or non-wood products, the production of which require more fossil fuels. They examine the role of Swedish forests and wood-using sectors in the national carbon balance. They find that for each cubic meter of wood used, 0.47 t of carbon dioxide emissions is avoided when the whole spectrum of direct and indirect impacts, except change in forest soil carbon, in Sweden and abroad are considered. Lundmark et al. conclude also that increasing the use of wood for energy in Sweden would mitigate climate change. Furthermore, they consider a scenario, where the forest growth is increased through silvicultural measures such as fertilization so that a part of additional wood produced is directed to wood products and the rest to energy production. This scenario shows a considerable decrease in greenhouse gas emissions compared to the baseline. Notably, the majority of the emissions savings in their scenarios takes place outside of Sweden where the forest industry products are exported to and where these products substitute for more carbon intensive products.

[1] The scenarios were prepared by a multidisciplinary group of researchers from VTT Technical Research Centre of Finland, the Government Institute for Economic Research, the Geological Survey of Finland and Natural Resources Institute Finland including wide consultation between industries, non-governmental organizations (NGOs), scientists, and policy makers.