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Paper abstract for special session:
"Ecosystem services and natural resources of the north – sustainability, values and trade-offs"

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Sustainability of ecosystem services from a boreal forest – conservation for biodiversity, carbon storage and other ecosystem services of the protected Trillemarka forest in Norway.

Summary abstract (max. 150 words):
Forests provide many types of ecosystem services, including supportive services of ecological functions, carbon storage, timber production, and recreation. Biodiversity is the basis for ecosystem services, to a different extent for various types of services. Actually there is a basket of different ecosystem services, and the crucial policy issue is the selection of possible baskets both now and in the future. There must be made a trade-off between the different types of service, as some can be jointly produced while others represent a conflict of interest. The paper illustrates the use of different ecosystem services from boreal forests with large potential for carbon sequestration and other ecosystem services, with a case study from a protected forest area in Norway. We analyze the conflict and synergy between timber production and carbon storage in a hundred years perspective, and the situation in terms of biodiversity and potential use for recreation is discussed.

Extended abstract (600-1200 words, not counting references):

In the research community and among policy makers it has traditionally been common to assume that wood from boreal forests is a carbon neutral energy source because the regrowth of a felled tree will capture the same amount of carbon that was released through combustion of the harvested biomass. Consequently, wood fuels have been considered an attractive alternative to fossil fuels from a climate perspective and policies have been implemented to increase the use of wood as an energy source. Moreover, the carbon neutrality assumption leads to the conclusion that there is a conflict between a forest management policy that is in the favour of the environment and a forest policy that emphasize the recreational and biodiversity values of a forest.

However, a number of recent contributions show that the carbon neutrality assumption is misleading, not least when dealing with wood from boreal forests (Haberl et al 2012, Schulze et al 2012) When wood in a slow-growing boreal forest is harvested and combusted, it may take almost a century before the released amount of carbon again is stored in the forest. As the analysis of this paper illustrates, taking the capacity of the forest as carbon storage into consideration might support the conclusion that forest conservation is socially optimal. Hence, instead of conflicting interests, there might be a synergy between concern for biodiversity and climate in increased forest conservation. Using different prices on the ecosystem service of carbon storage, referring to different scenarios for the development of prices on carbon quotas, we analyze to what extent and under which assumptions forest conservation becomes socially optimal.

The purpose of this paper is to analyze the societal trade-off between forestry and forest conservation, taking into account the benefits from carbon sequestration, as compared with the cost of forest conservation. The benefit of forest conservation will be enhanced by the additional benefit of biodiversity protection. Given different carbon price scenarios, it will be discussed to what extent additional forest conservation will be socially optimal.

A national analysis will require a national set of priorities of forest conservation. It will have to be specified both in terms of conservation targets and measures and in terms of area productivity and volume of timber stock. It should also be specified in terms of different geographical areas, representing different types of forest qualities. At present the conservation of productive forests in Norway is limited to 2.5 %. A biological evaluation recommends a minimum of 4.6% as a target (Framstad et al. 2002). In a recent report WWF recommends as much as 10%, with a national list of important areas to consider (WWF 2012).

To make some preliminary illustrations of the potential trade-offs between the societal goals of traditional forestry and carbon sequestration, a case study will be analysed, for a recently protected area, the Trillemarka nature reserve which is about 147 km2. Here both the land owners and the local communities were economically compensated.

The starting point for our numerical analysis will be the forest model described in Holtsmark (2012). This model includes the dynamics of the forests' multiple carbon pools and how their dynamics are influenced by harvest. For example, Asante and Armstrong (2012), Asante et al (2012), Hoel et al. (2014), and Holtsmark et al. (2014) demonstrate importance of the dynamics of the pools of dead organic matter (both naturally deadwood and residues). These pools are therefore emphasized in the model.

The model will be recalibrated to the new version, to fit to the characteristics of Trillemarka forest area. The recalibration of the model will be based on data on age structures and other characteristics. A possible extension of the model that will be included is the dynamics of soil carbon and how this is influenced by harvesting (Olsson 1996).

Simulation of the models, considering different conservation and harvest scenarios will shed light on the issues mentioned above. We will draw on the theoretical studies of Hoel et al. (2014) and Holtsmark et al. (2014).

In order to give a more comprehensive overview of the ecosystem services potential of this protected forest area, we will take into account biodiversity values and the value of other ecosystem services, in addition to carbon storage. The biodiversity of the protected forest area is a value in itself and as potential for other ecosystem services. Potential timber values will be calculated. Cultural ecosystem services will be assessed, in particular recreation values, in terms of cabins in the vicinity of the nature reserve.

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