Modelling forest management in Sweden: trade-offs between carbon benefit and biodiversity conservation

[1] Bishnu Chandra Poudel, [2]Johan Bergh, [3]Tomas Lundmark, [4]Annika Nordin, [5]Roger Sathre, [6]Eva-Maria Nordström, [6]Hannes Böttcher

[1]Ecotechnology and Environmental Science, Mid Sweden University, Akademigatan 1, Sweden, Email: bishnu.poudel@miun.se
[2]Swedish Forest Research Centre, Swedish University of Agricultural Sciences (SLU), 230 53 Alnarp, Sweden. Email: johan.bergh@slu.se
[3]Department of Forest Ecology and Management, Swedish University of Agricultural Sciences (SLU), 901 83 Umeå, Sweden. Email: tomas.lundmark@slu.se
[4]Department of Plant Physiology and Forest Genetics, Swedish University of Agricultural Sciences (SLU), 901 83 Umeå, Sweden. Email: annika.nordin@slu.se
[5]Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, Berkeley California 94720, USA
[6]International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria

Swedish forests play a vital role in mitigating climate change by reducing carbon dioxide emissions. Emissions reduction depend on forest management strategies because when the aim is to increase forest growth and product harvest, the carbon sequestration and substitution of carbon-intensive materials increases so as the total carbon benefit. It remains unclear, however, whether intensively managed Swedish forests secures required habitat for biodiversity in future. The urgency of the global need to mitigate climate change by reducing carbon emissions by means of forestry is very important but that might eventually jeopardise biodiversity habitat. There have been many discussions of needing a better scientific understanding about increasing set aside forest area, particularly the productive forest, to help conserving biodiversity and its trade-offs.

We perform a comprehensive model based analysis including forest management, product use and carbon benefit of Swedish forest sector. We define different forest management scenarios i.e. reference, intensive forestry and increase set aside for modelling. A system analysis method uses five models to analyse net primary production (BIOMASS), forest biomass growth and harvest estimation (HUGIN), soil carbon stock calculation (Q Model), substitution of carbon benefit estimation (SUBSTITUTION) and international market assessment (GLOBIOM) for the next 100 years. We combine biodiversity habitat indicators such as forest age structure, tree composition, dead wood availability and preferred habitat types by red listed species in boreal forests and our forest's state during the whole study period for all scenarios. Finally, we evaluate the effect of forest management scenarios in total carbon benefit and indicators of biodiversity conservation. The result showed that a forest management policy where large areas are set aside will potentially increase carbon benefit and supports biodiversity conservation but reduces product supply and trade for short period. However, carbon benefit and product supply both decrease in the long-run but increase the biodiversity conservation potential. Substitution carbon benefit level also plays an important role in calculating carbon balance. It appears that trade-offs between carbon benefit and biodiversity conservation exists. The country policy should address the issue and prioritise forest area for management and set aside to fulfill the country objective.

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