

Editorial

Sustainable Utilization of Forests

Sustainable use of natural resources is a generally accepted target in most current societies. Sustainability can be defined in many ways, the aspects generally including environmental, social and economical sustainability. Sometimes also cultural sustainability is separated. Use of renewable resources is often mentioned as one cornerstone of sustainability. However, renewable resources can also be utilized in an unsustainable manner, by for example exceeding the renewal rate of those resources, by causing biodiversity losses or by violating the rights of local populations. Increasing attention is being paid on the role of biomass in climate change mitigation and as carbon stock.

Forests are one of the most important renewable resources. Their role is multifunctional, providing raw-material for pulp, paper and timber, and fuel. Utilization of forests offers employment and economic benefits, but, on the other hand, forests also provide numerous non-monetary ecosystem services, such as clean air and water, support of nutrient cycles, maintenance of carbon storage and biodiversity, and recreational value. Various functions of forests make its sustainable utilization a complex and controversial issue, and a challenging research topic.

This article collection points out some current topical research on sustainable utilization of forests from various perspectives. The first paper by Prof. Cieszewski *et al.* describes a simulation-based quantitative approach to sustainability analysis of forest biomass production and utilization in the context of new bioenergy mill siting. The described analysis is based on publicly available forest inventory data for the state of Georgia, USA, and growth and yield models available in the literature. Sustainable harvest levels for the purpose of siting bioenergy mills for 10- to 20-year production cycles are determined. The authors suggest that the derived county level information on sustainable levels of biomass production, which vary for different units of analysis, can be used as a reference for effective forest utilization planning and for mill siting.

Mattila *et al.* present in the second paper of the article collection a study on the sustainability of Finnish forest industries using input-output analysis. While the first paper used sustainable harvest levels as an indicator, the focus of Mattila *et al.* is on climate impact, employment, land use and imports. All data for the aggregated economic and environmental tables are presented, making the calculations repeatable. An essential finding of this study was that, in this sector, the most environmental impacts are caused by the production for export markets and local consumer choices have a limited capability to affect the sustainability aspects. To assess more thoroughly multiple dimensions of sustainability in future studies, the authors suggest a support from the techniques from multi-criteria decision making.

Simulation based tools, environmentally extended input-output analysis, as well as multi-criteria decision making are all tools to support decision making on the sustainable use of natural resources. Other methods to serve the same purpose include such as optimization, cost-benefit analysis, and hybrids of these. There is little evidence about these methods' actual performances, and therefore Myllyviita *et al.* conducted an evaluation of 35 peer-reviewed case-studies with the aim to review and compare the characteristics of different methods of supporting the sustainable use of natural resources. The researchers found out that different methods supported decision making in different manners, and the ideal method could be a hybrid of two methods with different approaches: qualitative methods could be used in the problem structuring process, whereas quantitative methods could be used when priorities and thresholds are assessed.

General conclusion of the studies presented here can be drawn that sustainability assessment is a complex issue that can be approached in several ways, depending on the sustainability perspective to be assessed. In many cases, combination of different methods and tools gives the best results.

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