EFSOS 2011: Scenarios and Methods

Additional background information for delegates to the FAO/UNECE Working Party on Forest Economics and Statistics – March 2010

The following paper provides additional information to Working Party delegates on the approach to and methods of the new European Forest Sector Outlook Study (EFSOS) in supplement to the information provided in the background paper on Work Area 3.

1. Scenarios

The choice of scenarios was determined by the importance of the policy questions they address. For reasons of resources, clarity and focus are limited in number, taking into account the advice by the Working Part at its last session

The four policy scenarios focus on four major policy debates related to climate change, energy, biodiversity, and technological progress. They are, as presently defined by the Core Group, presented below. Each policy scenario is related to one of two reference futures, as described by the Intergovernmental Panel on Climate Change (IPCC) and presented below..

Two reference futures: A1 and B2

The A1 storyline and reference future describes a future world of rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building, and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. In general, public awareness concerning environmental issues is low. A1 is a consumer-oriented world with diluted national governance and highly developed global trading system. International best practices are adopted quickly and global standards emerge for many products and services.

The B2 storyline and reference future describes a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population at a rate lower than A1, intermediate levels of economic development, and less rapid and more diverse technological change than in the A1 storyline. While the scenario is also oriented toward environmental protection and social equity, it focuses on local and regional levels. International institutions decline in importance, with a shift towards local and regional decision-making structures and institutions. Human welfare, equality, environmental protection have high quality, and are addressed through community-based social solutions. Compared with A1, there is more emphasis given to social cohesion and maintaining environmental integrity, as well as a greater effectiveness of global institutions. Solutions are found locally within Europe, while North-South differences remain high.

Four policy scenarios

Maximizing carbon storage in European forests

In this scenario, the predominant choice by the forest policymaker towards mitigating climate change is long-term maximization of carbon storage in forest ecosystems, including all carbon pools (above and below ground biomass, deadwood, litter and soil).

Wood energy promotion

In this scenario, the forest policymaker significantly promotes the generation of wood energy, within the EU-27 primarily through renewable energy policy targets, as the predominant choice in mitigating climate change. This scenario will assume that the EU policy targets as set out at present are maintained and translated into policies and that wood energy will contribute a significant percentage in the renewables mix. It also assumes that the 20% increase in energy efficiency target is being met. Other countries in the UNECE region will strive, where appropriate and where forest resources are abundant, to expand their present share of wood for energy in the overall energy mix to levels roughly equivalent with the EU targets.

Priority to biodiversity

In this scenario, the policymaker cares predominantly for the protection and enhancement of biodiversity to meet the international and regional commitments related to forest biodiversity. The policymaker is determined to maintain and enhance biodiversity in forest ecosystems which will translate into quantifiable measures related to both protection and sustainable use. Specific aims are to increase the area managed for biodiversity and to increase biodiversity in "normal" forests, e.g. through the reduction of the level of deadwood removal.

Technology scenario: Improved competitiveness of European forest industry

This scenario assumes rapid development of technologies which foster industrial competitiveness of the forest sector compared with other sectors, as well as the development of new products and processes such as bio-refineries. The policymaker in this scenario significantly invests in research and development in the forest sector with the objective to foster the competitiveness of European forest industry on global markets. The development of multi-purpose plants could also be envisaged as well as the development of new production lines for the use of wood in textiles. In Europe, it could be expected that high value-added products are developing at a faster scale and that lower value-added production is being outsourced to other regions. The energy efficiency of wood products could also be improved through new technology.

2. Methods

EFSOS scenarios will be constructed using a range of known and tested, methods and linking them in a new, innovative approach to the sector outlook. The methodology of each method is appropriate to the part of the sector being analysed. Assumptions for each method are being defined by the Core Team to reflect relevant parameters of the scenario descriptions.

The methods to be used in EFSOS encompass the Wood Resource Balance (Prof. U. Mantau and Mr. F. Steierer), statistical analysis of historic production and trade (Prof. A. Baudin and Dr. R. Jonsson), analysis of historic and future competitiveness (Prof.

M. Dieter and Dr. H. Weimar), a global trade model for forest products (EFI-GTM, Dr. A. Moiseyev) and a forest resource projection model (EFISCEN, Dr. M.J. Schelhaas and H. Verkerk). Each of these methods and their use in EFSOS is briefly presented in the below.

Wood resource balance

The Wood Resource Balance (WRB) is an accounting tool for material flows in the sector, which compares the supply of wood raw material with use (wooden products and energy use) in a national economy. It makes a consistency check of national wood flows that counter-checks the sums of all sources of wood materials against the balance sheet total of the consumption side. It easily integrates information and developments from the forestry and energy sector. It includes not only roundwood and products but also energy uses, unrecorded fellings and wood from outside the forest, recycling of paper and recovered wood products, as well as trade. It incorporates many input to output conversion factors.

While the WRB is mainly constructed in a way to make it possible to detect and roughly estimate missing or weak information by comparing the two sides, it can also serve the purposes of EFSOS and provide the crucial link to the energy side, whilst integrating information from the market projections (future use by the sawmill, panel and pulp industries). The results of the WRB in terms of raw material production and use can be compared with the results of the forest resource projections (EFISCEN) in terms of raw material availability in the forest. This interface is appropriate to address one of the basic question of forest sector outlook studies "Will there be enough wood?" which is inherently linked to the wood energy scenario. While the WRB will be constructed first for the wood energy scenario in the context of EU-wood, it will also be employed for all other scenarios (with no specific energy policy targets), as it provides the essential interface between the different parts of the sector.

Updated conversion factors from 16 countries (see separate paper on forest product conversion factors) will be used in EFSOS in the context of the wood resource balance to convert projected market developments into roundwood equivalents, which can then be compared with the resource availability from the forest (as modelled with EFISCEN) and available raw material sources from outside the forest.

Econometric analysis of production and trade

Supply, demand and trade of processed wood products can be projected using econometric analysis according to the methodology of Kangas and Baudin (2003). This method was applied in the last EFSOS published in 2005. The benefit of this approach is that it covers all aspects of consumption, production, imports and exports (Kangas and Baudin, 2003), on the basis of exogenous assumptions about economic growth and prices of forest products. It uses GDP and price elasticities developed by the analysis of long time series. Subject to the market characteristics of the country in question, two different econometric approaches are used:

(i) A multiple equations approach for demand (two equations) and supply (one equation) are applied for countries which are important in demand and/or supply terms for the product in question (see Kangas and

Baudin (2003) for details). The functional form is log-linear, allowing for direct interpretation of estimated coefficients as elasticities.

(ii) A time series cross-sectional model for consumption for countries and products where either a) only short time series are available and/or the country in question is insignificant in demand and/or supply terms. Again, the functional form is log-linear.

Major markets and producers are analysed individually using the multiple equation approach. The second group consists of countries that are traditional market economies, with minor production of forest products and/or relatively low consumption. The countries that have recently become market economies (countries with economies in transition) constitute group three.

The products analyzed are:

i. Sawnwood – coniferous and non-coniferous.
ii. Wood-based panels – plywood, particle board, and fibreboard.
iii. Paper and paperboard – newsprint, printing and writing paper, and other paper + paperboard.

For wood pulp, other fibre pulp, and recovered paper, consumption is not analyzed but derived for projection purposes from the projected production of final products using conversion factors, indicating the input of raw material needed. However, for countries which are important importers and/or exporters of a specific raw material, imports (or, in some instances, domestic demand) and/or exports are analyzed for projection purposes in the same vein as for final products. Further, demand and supply of veneer sheets are not analyzed. It is assumed that demand and supply elasticities of veneer are the same as those for plywood for the country in question.

Due to the cooperation with the Swedish Future Forest as well as the EU-wood project, the development of market projections for EFSOS is funded in kind as is their review and analysis. The projections are one of the first deliverables for EFSOS-II; initial results have been made available to the members of the Team of Specialists and outlook correspondents for comments.

EFI-GTM

The European Forest Institute Global Trade Model (EFI-GTM) is a partial equilibrium model, focusing on forest products. It makes projections of global consumption, production and trade of forest products, in response to assumed changes in external factors like economic growth, energy prices, trade regulations, transport costs, exchange rates, availability of forest resources, and consumer preferences. The model includes at present 61 regions covering the whole world, with special focus on Europe. The products modelled currently include 6 wood categories, 26 forest industry products and 4 recycled paper grades. The model calculates periodical production, consumption, import and export quantities and product prices for the forest sector products as well as periodical capacity investments of forest industry for each region. The dynamic changes from year to year are modelled by recursive programming. In each period, the producers are assumed to maximize their profits to the production possibility set, while consumers are assumed to maximize their welfare subject to the consumption possibility set. Both producers and consumers are modelled as price takers, i.e. the model assumes competitive markets. It uses, among many other inputs, the elasticities calculated in the market model. It generates price data endogenously, which have been used for the market model, ensuring some

consistency between the projections, even though the methods used vary widely. EFI-GTM adds a dimension which is missing in the market model: direction of trade and Europe's trade relation with the rest of the world. Within EFSOS-II, it has been decided to employ EFI-GTM partially, due to resource constraints, for the baseline and wood energy scenarios.

EFISCEN

The European Forest Information Scenario model (EFISCEN V3.1) is a model that simulates the development of forest resources at scales from provincial to European level (Schelhaas et al. 2007). As a silvicultural model of forest by type and age class, EFSICEN can be used to determine the future forest condition (growing stock, removals etc.) under various silvicultural regimes or external influences (e.g. change in growing conditions caused by climate change). It can also be used to determine what silvicultural methods would be needed to produce a given amount of wood. Data from national forest inventories (NFIs) are used to construct the initial age class distribution and growth function for each combination of province, tree species, site class and owner class that can be distinguished in a country. Each of these combinations is assigned a management regime, defined as the probability that a thinning or final harvest can be carried out as a function of age. For each five-year time step, the national amount of wood to be produced from the forest has to be defined. This total amount is then allocated over the different forest types, according to the felling possibilities as defined by actual age class distributions and the management regime. Principal outputs of EFISCEN are age class distributions, growing stock volumes, harvesting levels and increment. If supplemented with factors to convert growing stock volumes to biomass in different tree compartments (biomass expansion factors) and turnover rates, EFISCEN is able to estimate carbon stocks in, and litter from, living tree biomass. EFISCEN is essential as the core for most of the EFSOS-II scenarios, with modifications to reflect the resource management as per the scenario descriptions.

Competitiveness analysis

Several methods are available to analyze the competitiveness of the forest industry in a country or region (Dieter and Englert, 2006). One of them is the revealed comparative advantage, which indicates whether a country is specialized in a specific sector. Another one is the Constant Market Share analysis. The Constant Market Share analysis disaggregates the overall export growth of a country into four different effects:

1) The world growth effect,
2) the commodity-composition effect,
3) the market-distribution effect and
4) a residual, which usually is interpreted as the competitiveness effect.

For the purposes of EFSOS, an update of historical data (up to 2007) can be made available. In addition, on the basis of trade data, e.g. generated with EFI-GTM, this could be used to analyze future competitiveness.

Additional background information on each of the methods is available in the background papers presented to the extended Team of Specialists meeting held in November 2009: http://timber.unece.org/index.php?id=254