# CHEMICAL BALANCES AND AVAILABLE POTENTIALS OF FOREST BIOMASS FOR BIOREFINERIES

*This Forest Refine – sub-project aims at investigating the chemical balances and concentrations of all biomass components of the major tree species growing in the project region, namely Västerbotten and Central Ostrobothnia. The demands and requirements for forest raw material used in biorefining can be different from the traditional uses of wood. Instead of evaluating the forest reserves in terms of e.g. volume or energy content, the chemical composition of the forest biomass need to be determined in order to provide a comprehensive view of the regional raw material potential for various biorefinery processes. To achieve this, tree-specific information on the chemical compositions will be compiled and this information will further be generalized to cover the whole project region.*

## CHEMICAL COMPOSITION OF THE BIOMASS COMPONENTS OF DIFFERENT TREE SPECIES

In the first stage of the project, a review of relevant literature concerning the chemical compositions of different Nordic tree species is done. The review aims at an extensive picture of the balances of various chemical compounds within separate tree components. The number of different compounds found in tree biomasses is vast. However, not all of these compounds are to be listed but instead only those that are of some value for the biorefining industry or have some use in certain biorefinery processes. The spectrum of the compounds in focus greatly depends on the raw material requirements set by biorefining. For generic purposes, the study is firstly concentrated on the most common compound groups found in woody biomass, i.e. carbohydrates, lignin and extractives (Fig 1.). The tree-level results will also include interspecies differences in chemical composition within all tree biomass fractions.

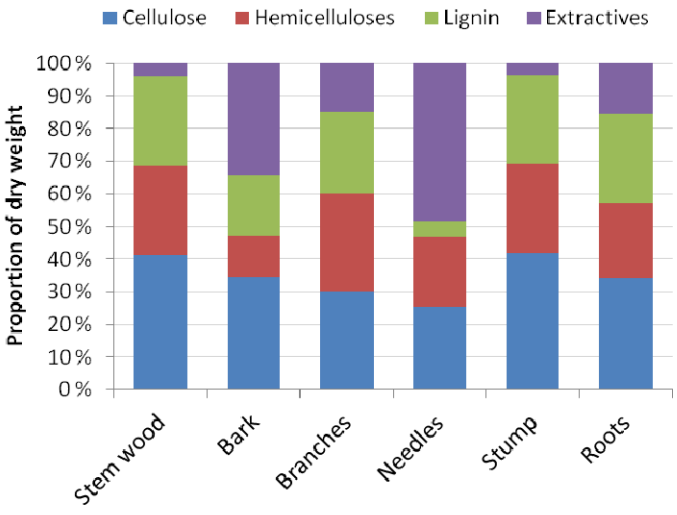


***Figure 1.*** *Chemical composition of the biomass components of Scots pine.*

## UPSCALING CHEMICAL BALANCES INTO REGIONAL POTENTIALS

Tree species specific information on the chemical composition of all tree biomass components will be generalized to regional level. The Botnia Atlantica area is extended to include neighboring counties, since the potential procurement areas for biorefineries are not confined to administrative districts or restricted by county borders. Existing national forest inventory data in both project countries are used in the upscaling to give a description of the regional potentials.

**GIS ANALYSIS OF THE BIOMASS AVAILABILITY AND GEOGRAPHICAL ACCESSIBILITY OF THE RAW MATERIAL**

In addition to the regional raw material potentials, estimations on the accessibility and availability of the biomasses of interest are made for the project area. These estimations will be based on the locations of the current and future biorefineries and their potential procurement areas.

The availability of raw material is influenced by the supply chain structure and this is taken into account in the analysis. Since all of the standing crop in the forests is not constantly available for harvesting, annual felling potentials will be estimated for the project regions. Mostly small-diameter thinning wood, logging residues from clear-cuts and stumps are considered as the primary source of raw material. However, currently used biomass in wood industry (mainly stem wood) can be reallocated for other purposes, such as biorefining. Hence, the total felling yield of wood in the area has to be included in the potential estimations.

Since the biorefining industry is still more or less in its infancy, the development of the forest raw material reserves need to be estimated for the future decades. The availability of the raw material in the future will be estimated by simulations. The results of the biomass availability estimates will be made for both the Swedish and Finnish parts of the project area, in collaboration of project partners from both countries (SLU and Metla).

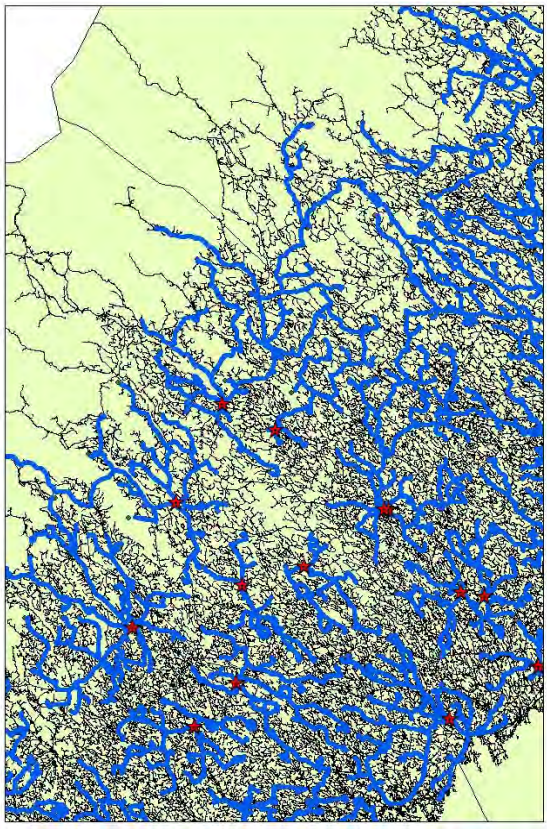

***Figure 2.*** *An example of a raw material availability analysis in Northern Sweden. Network analysis is used to determine the optimal transport routes (blue lines) of raw material from forest plots to terminal locations (red stars) via existing road network (black lines).*


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