Project Database of ICP Forests
PROJECT DESCRIPTION

PROJECT INFORMATION

Project title: **Verification and validation of the Forest4model datacube**
Part of: ForestNavigator (https://www.forestnavigator.eu/)

Project ID: **300**

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PROJECT DESCRIPTION

Forests are essential components of the global carbon cycle, serving as vital carbon sinks and regulators of climate. The rate of carbon removal in European forests is declining, due to an increase in wood demands, natural disturbances, and shares of forests reaching maturity. Therefore, it is essential to promote actions to sustain and enhance forests as carbon sinks. A timely assessment of the EU forest policy pathways needs therefore to consider explicitly the adaptation-mitigation nexus and address the threat posed by climate change and natural disturbances to the permanence of carbon stocks. For this, we develop a near real-time monitoring of EU forests and forest bioeconomy to support GHG Inventory development and policy pathways modelling at EU and national level. This includes a findable, accessible, interoperable, and reusable multi-layered harmonised geodatabase representing the near past (2000-2020) and present status of the EU forests to be used for carbon and biodiversity monitoring and modelling, the 'Forest4model datacube'. The datacube is based on harmonized and triangulated existing data sets, will be updated regularly and further extended, including forest living biomass gains and losses, disentangling natural disturbances, forest area changes, deriving biodiversity and ecosystem indicators, such as deadwood, forest species density and identifying carbon-rich old-growth forests.

We are working with a number of remote sensing (RS) data sets that describe the past and current status of European forests. The ICP Forests biomonitoring network is a highly valuable database providing spatial and temporal data on forest conditions from in situ observations for several decades. Hence, we would like to compare the RS products to the ICP forest monitoring data for product validation as well as for training models to improve RS products in development for forest cover and tree height, forest species density and assessments of vertical forest structure complexity following forest disturbances.

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We would like to obtain ICP data for Europe from both the large-scale forest condition monitoring (Level I) and the intensive forest monitoring (Level II) scheme to benefit from the high temporal resolution assessment that the Level I data provide but also the in-depth description of forest conditions by the Level II data. Most beneficial are precise coordinates for the Level I and Level II data sets. Although our project already comprises a number of different data sets ranging from RS products, national statistics and ground data, we think that the ICP Forest data sets are a valuable addition. Ground data and observations are sparse across Europe and hence an additional data set can fill blank spots for both verification and independent validation of remote sensing products.

For example, we use the Level 1B waveform data product from the Global Ecosystem Dynamics Investigation (GEDI) to characterize vertical forest complexity and derive above ground biomass. The GEDI waveform data provide detailed information on the vertical distribution of vegetation, enabling us to assess the degree of forest structure complexity. We derive a vertical complexity index by extracting features from each waveform, such as waveform height, width, skewness, kurtosis, and the number of peaks. We anticipate a geographical overlap or closeness between GEDI observation points and the ICP forest Level I and/or Level II plots and would like to compare this to the Crown Condition (Level I, C1 and II, CC) and Ground Vegetation Biomass (Level II, GB) data.