



Grant Agreement 823805 MAIL H2020 MSCA RISE 2018

# Existing Models considering local aspects



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Final Event, 13 December 2021, Teleconference



# Introduction and goals

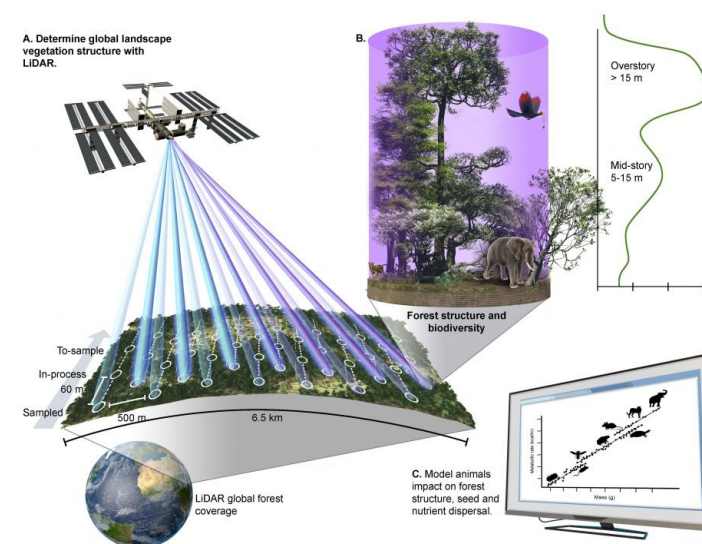
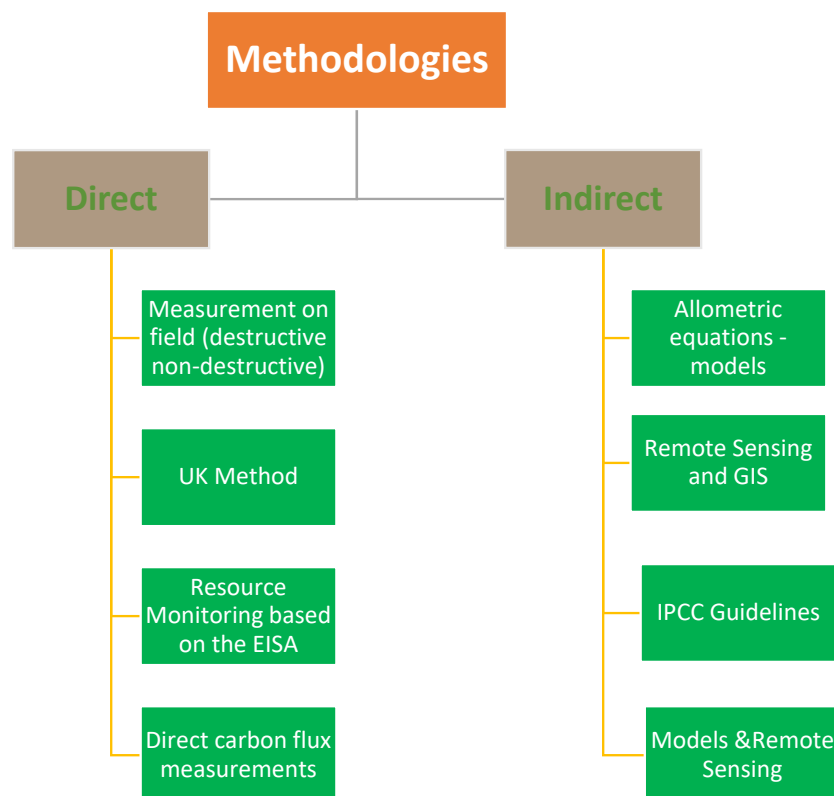
- Vegetation biomass is a large store of carbon that can have a direct influence on climate
- MAIL project focuses on m/sm MLs in order to classify them into carbon sequestration capacity categories
- MLs as potential Carbon Sinks contribute to CO<sub>2</sub> removals and enhance the agroforestry's impact rate in the reduction of GHG.

## **MaiL Main Purpose**

1. Decrease overall CO<sub>2</sub> emissions
2. Increase the CO<sub>2</sub> sequestration at m/sm MLs



# Methodologies for quantifying carbon sequestration



## Measurements on field

### Destructive method

- Trees harvest
- Measure weight before and after oven dried
- Small area/sample size
- Accurate but expensive and time consuming
- Not applicable for degraded forests with threatened species
- Biomass equation for assessing biomass on larger scale



### Non-destructive method

- Estimates biomass without felling
- Specific coefficients per species
- Rare and protected species
- Develop an allometric equation to estimate a tree mass
- High accuracy in a small sample area
- High cost
- Requires many human, equipment and time resources



## UK Method

- *Periodic, direct measurements of carbon in forestry stock*
  - i. Full surveys
  - ii. Plot-based survey
  - iii. Two-stage survey



- Sample-based inventories of carbon accounting
  - i. Statistically based survey of a sample of the total area of forest
  - ii. Assessment of the species composition, age structure, productive potential, growing stock etc
  - iii. Analysis of the results for the sample area(s) for estimations



- Remotely sensed data permit observation and assessment at regional to global scales.



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# Resource Monitoring based on the EISA

## Plot & local-scale research

- Detailed information
- Understanding of carbon-cycling processes
- Improvement of ecosystem models for carbon sequestration and GHG fluxes

## Long-term monitoring

- Trends information not observable by other means

## Spatially extensive surveys

- Assess variability across ecosystems
- Estimates of population parameters
- Evaluation of variables change due to stressors
- GHG fluxes at sites not directly measured

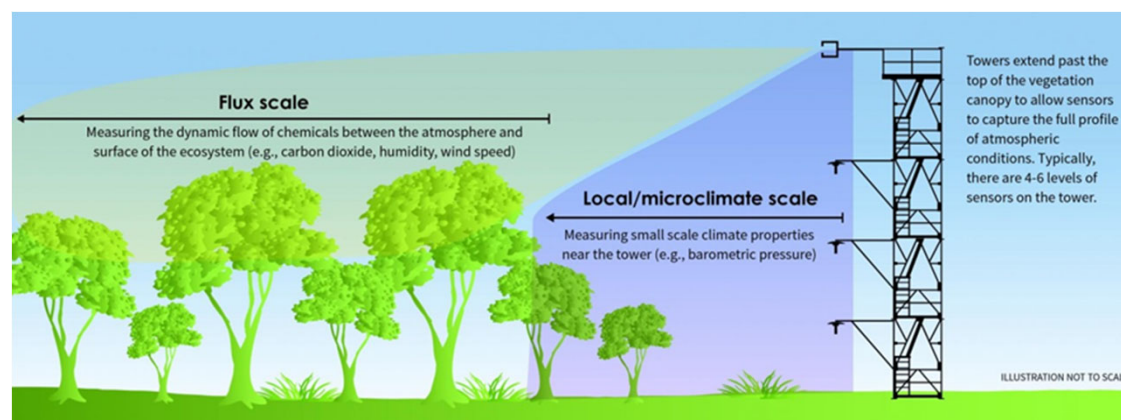
## Remotely sensed data

- Assessment at regional to global scales
- Mapping and tracking changes in in land cover and land use
- Assessing biomass
- Evaluating ecosystem disturbances caused by storms, insects, or fire



# Direct carbon flux measurements

- Measurements of net flow of carbon into or out of the forest
- Tower above the canopy
- Carbon flux is measured, for all carbon pools, including deadwood and litter and other fractions that are not measured using stock-change methods
- High accuracy but represents a small area where the flux towers are installed
- High cost due to installation and maintenance of the flux towers





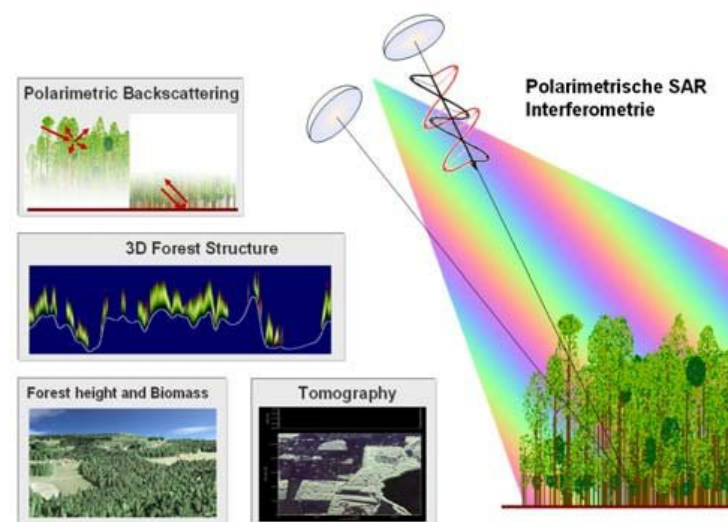
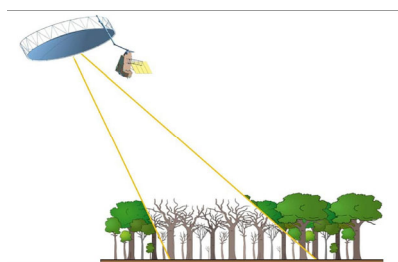
# Allometric equations & Predictive models

- Tree biomass and soil carbon content are assessed using models
- Simulation models are used to evaluate the carbon sequestration potential
- Existing data and knowledge to create projections, or scenarios
- Accuracy depending on the availability of data series that are used as input for a specific sample area
- Homogenic units (tree species composition, age classes, tree growth rates, stand management regimes)
- Cost-effective



# Use of Remote Sensing and GIS

- Areas difficult to access or inaccessible in continental or global scale
- Realistic & Cost-effective
- Vegetation, land cover, land-use change, forest's carbon stocks
- Long-wavelength radar instrument



- Airborne LiDAR systems and polarimetric SAR interferometry
- Landsat ETM, MODIS, MERIS, SPOT



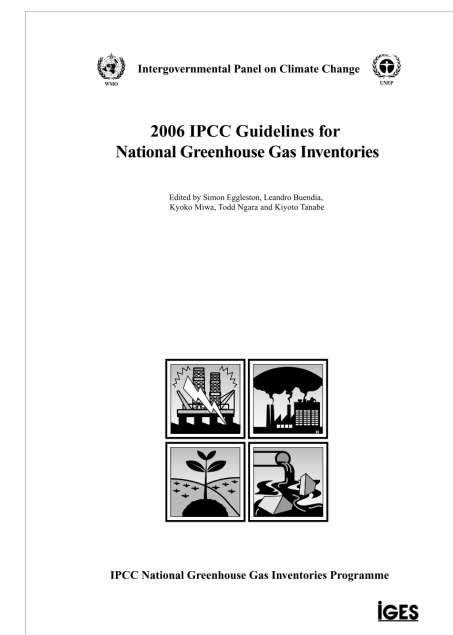
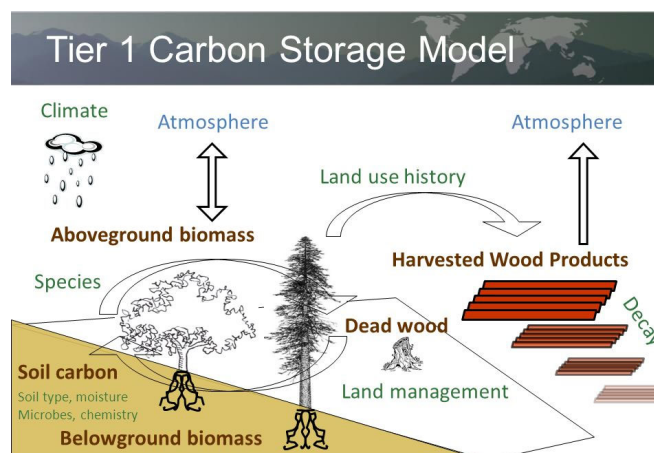
# IPCC Guidelines for carbon stock estimation

Tier	What is the tier about?	Need of input data	Tier assessment profile
<b>Tier 1</b>	A basic method that uses default values by LULUC type and is most suitable for nations with limited inventory and remote-sensing capabilities	<ul style="list-style-type: none"> <li>• Spatially coarse default data based on globally available data</li> <li>• Methods involving several simplifying assumptions</li> <li>• Default values of the parameters from the IPCC guidelines</li> </ul>	<ul style="list-style-type: none"> <li>• Simple first order approach</li> <li>• Large uncertainties</li> </ul>
<b>Tier 2</b>	Based on inventory and bookkeeping it is used where country-specific conditions and estimates of activity data and emission/removal factors are available	<ul style="list-style-type: none"> <li>• Country or region specific values for the general defaults</li> <li>• More disaggregated activity data</li> </ul>	<ul style="list-style-type: none"> <li>• A more accurate approach</li> <li>• Relatively smaller uncertainties</li> </ul>
<b>Tier 3</b>	Based on inventory and process-based models, it includes methods that represent more demanding technical capabilities, accuracy, and data requirements	<ul style="list-style-type: none"> <li>• Detailed modeling and/or inventory measurement systems data at a greater resolution. Heavily depends on remote sensing</li> </ul>	<ul style="list-style-type: none"> <li>• Higher order methods</li> <li>• Lower uncertainties than previous methods</li> </ul>



## Selected method for *Mail*

- IPCC method (Tier 1) selected
- Direct methods were excluded due to time-frame and resources conditions
- Detailed in the IPCC Guideline



- Tier 1 input data are easily accessed from already existing European / global datasets
- Cost-effective approach for biomass and carbon mapping over large geographical regions
- Appropriate for continental studies



*Knowledge gained through T2.5 was used in*  
*T4.2: Quantification of carbon sequestration capacity in MLs*  
*&*  
*T4.3 Estimation of carbon stock in forest products*



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# Thank you for your attention!



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