

North State – Enabling Intelligent Copernicus Services for Carbon and Water Balance Modeling of Northern Forest Ecosystems

Climate Action in Agriculture and Forestry

June 1, 2017

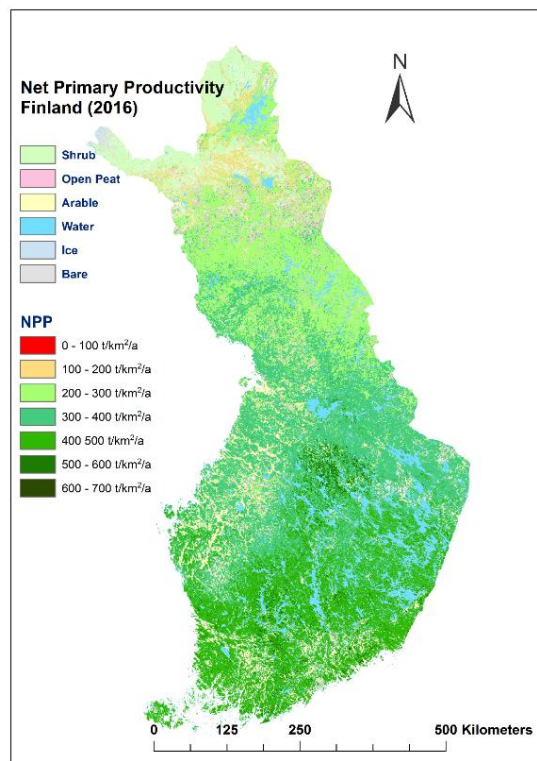
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<http://www.northstatefp7.eu/index.html>

<https://forestry-tep.eo.esa.int/>

www.vtt.fi



Motivation

- Boreal forest, with an area of 11.35 Mkm², is the largest terrestrial biome, and stores
- about 270 Pg C (32% of the world's forest C stock)
- Baltic land area belongs to boreal and partly temperate area
- Forest carbon and carbon balance is of great interest because of its influence to climate
- It is possible to estimate carbon balance in a form of digital maps by combining forest variable prediction from satellite images, climatic data and modeling

- FP7 project North State
<http://www.northstatefp7.eu/>

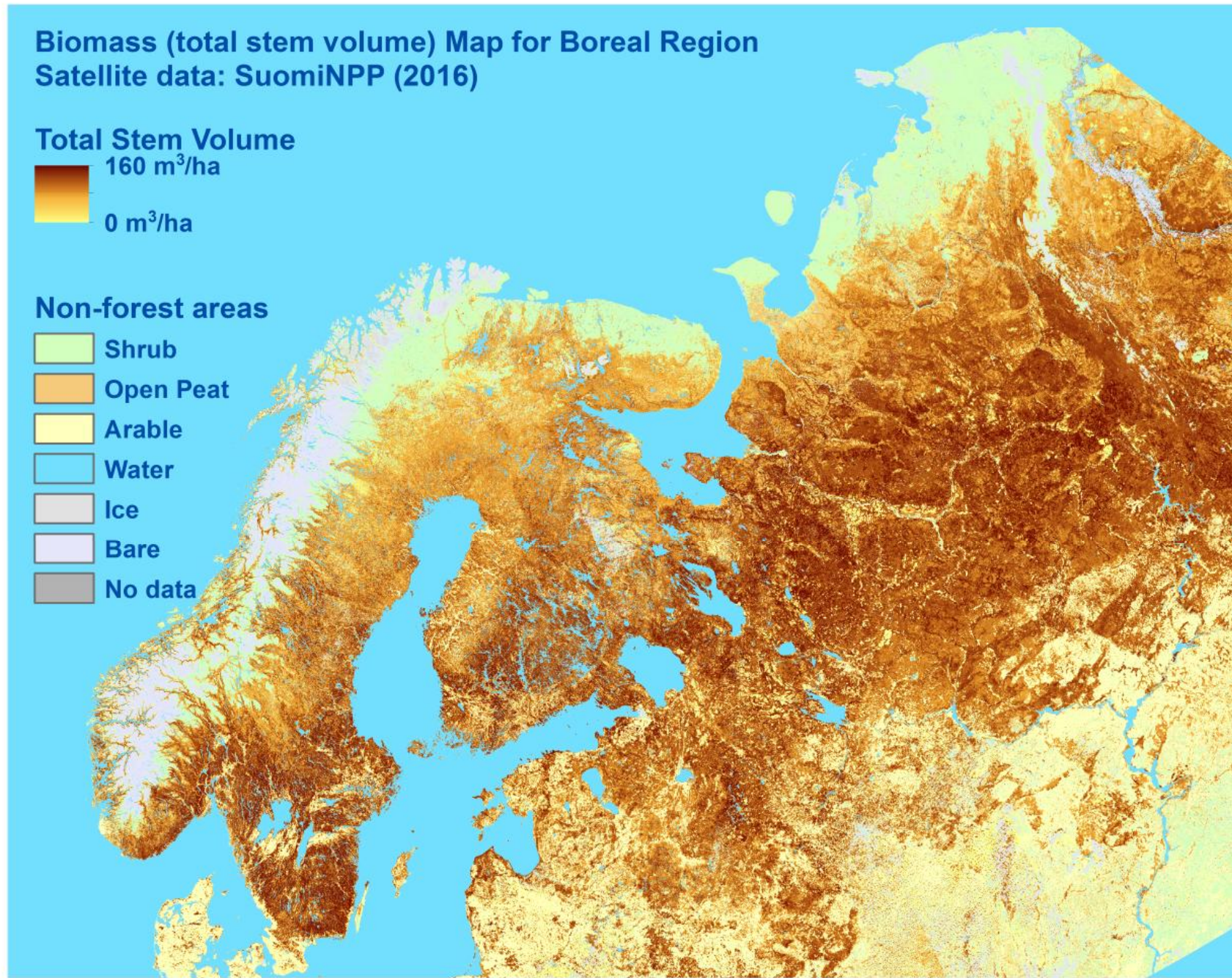


Biomass (total stem volume) Map for Boreal Region Satellite data: SuomiNPP (2016)

Total Stem Volume

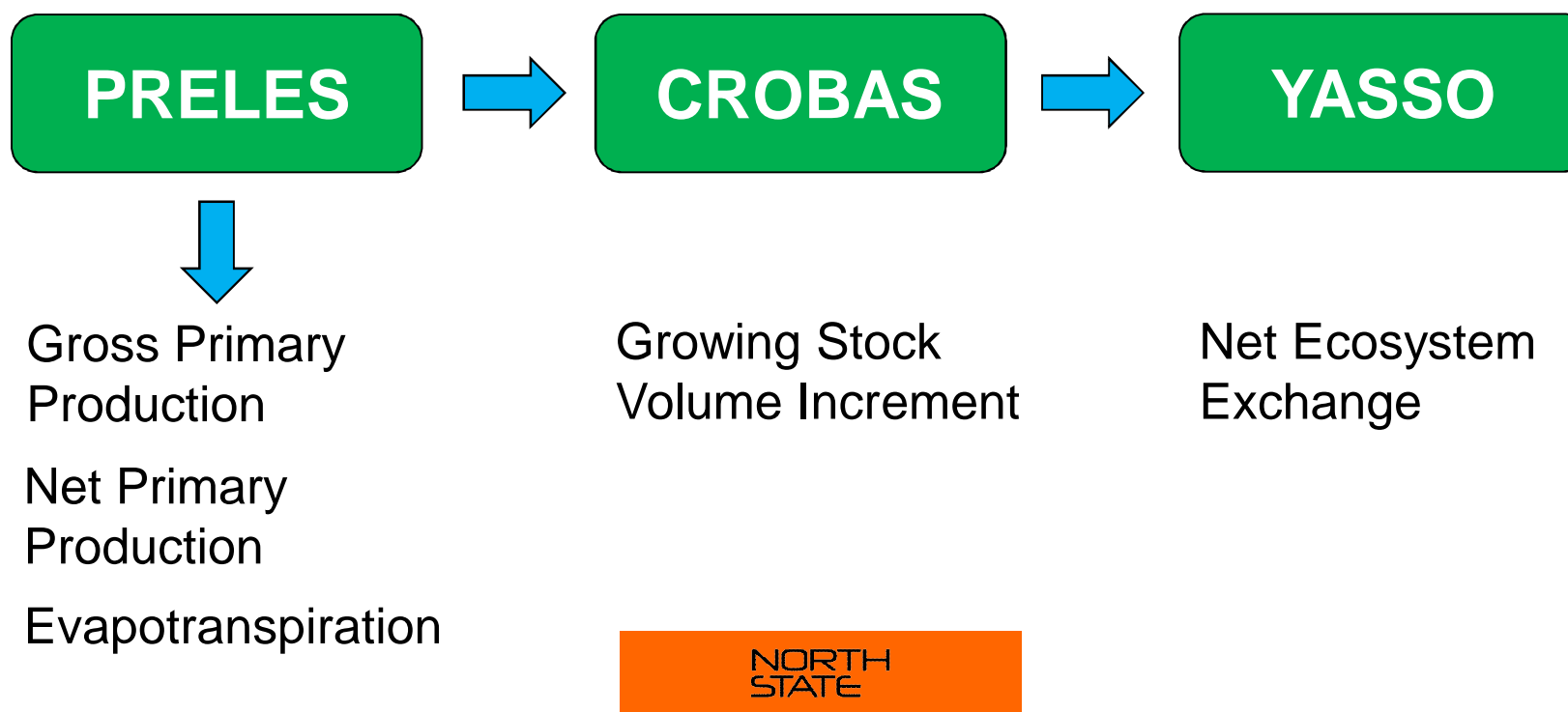


Non-forest areas



Models for carbon balance estimation

PRELES	PREdict Light-use efficiency, Evapotranspiration and Soil water	Univ. Helsinki (Mäkelä et al.)
CROBAS	Tree growth and CROwn BASE from carbon balance	Univ. Helsinki (Mäkelä et al.)
YASSO	Yet Another Simulator of Soil Organic matter	Liski



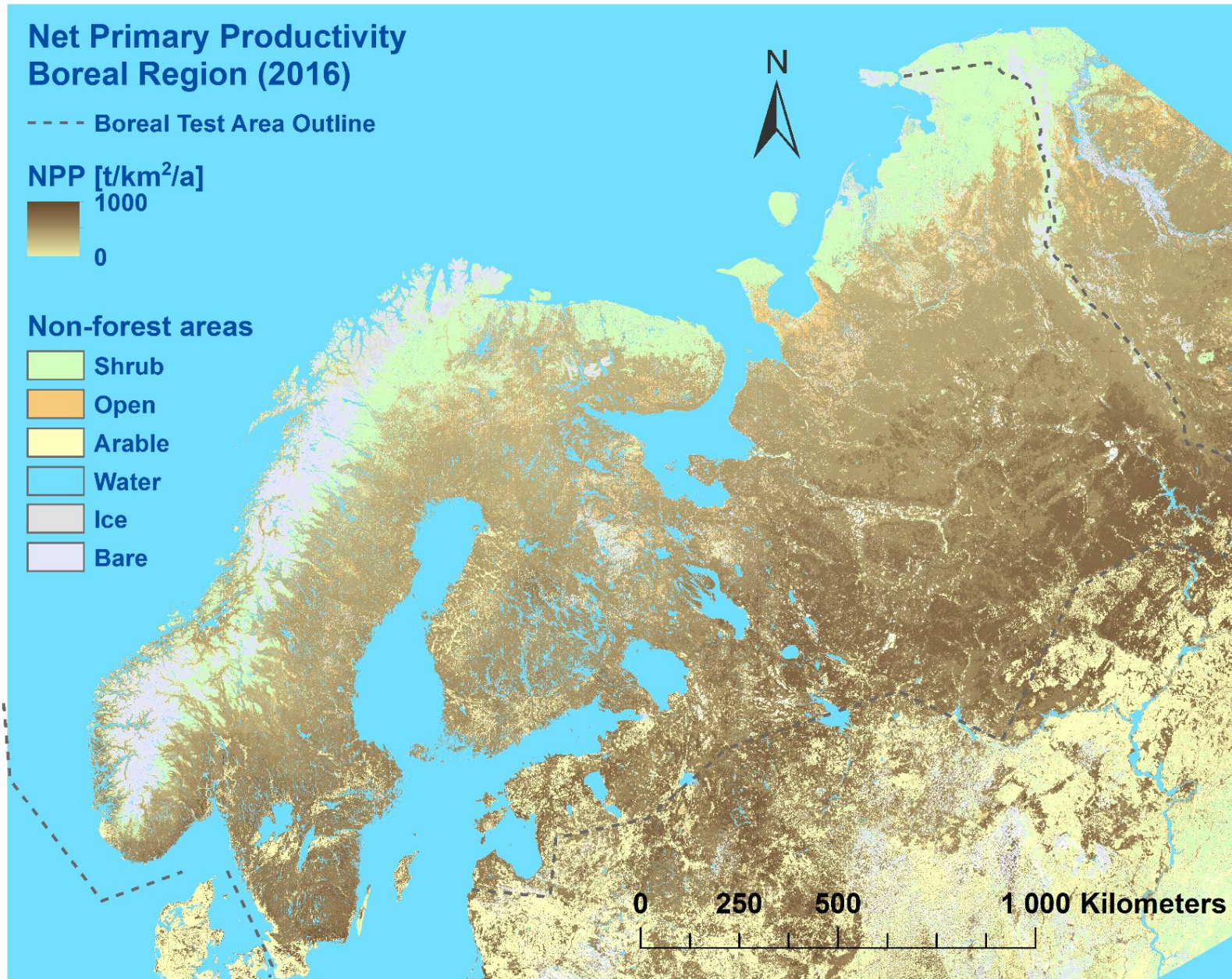
Net Primary Productivity Boreal Region (2016)

--- Boreal Test Area Outline

NPP [t/km²/a]



Non-forest areas

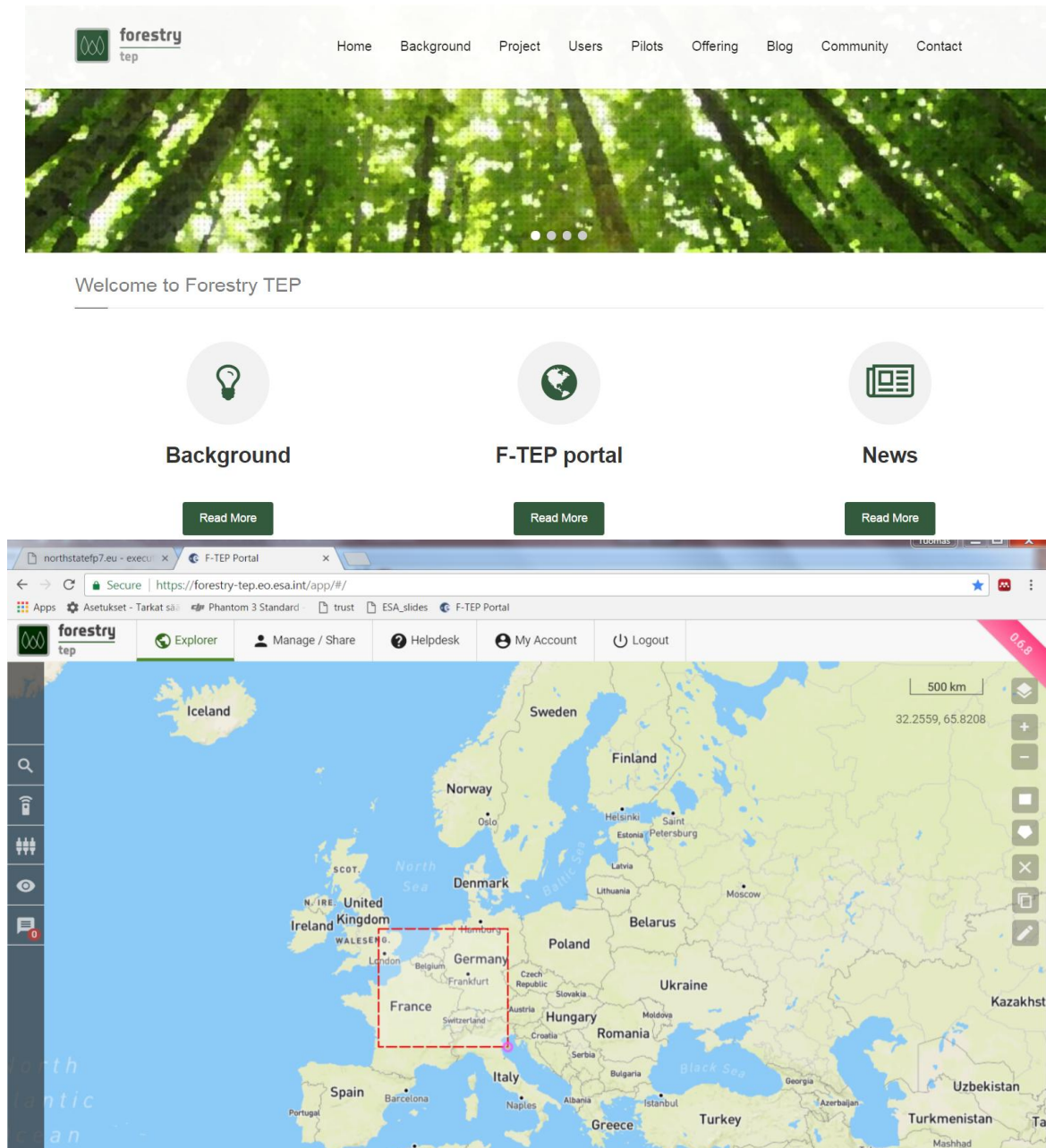


Policies and North State+ relevance to them

- EU Forest policy http://eur-lex.europa.eu/resource.html?uri=cellar:21b27c38-21fb-11e3-8d1c-01aa75ed71a1.0022.01/DOC_1&format=PDF
 - EU Bioeconomy policy https://ec.europa.eu/research/bioeconomy/pdf/201202_commission_staff_working.pdf
 - Paris agreement (article 5) http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf
 - European Space policy [COM\(2016\) 705 - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions](#)
-
- LULUC and Sustainable forest management, including
 - “Development of an adequate information system”
 - Uptake of Copernicus
 - State-of-the-art service development
 - Competitive European space sector

Gaps and barriers, lessons learned

- IT infrastructure and (Copernicus) image delivery have been a bottleneck – DIAS will help
- Analysis of big data masses – platforms to process data in a cloud <https://forestry-tep.eo.esa.int/>
- Scaling up of actual carbon balance, i.e. Net Ecosystem Exchange that includes soil respiration, needs
 - Information on forest growth
 - Ground reference data – availability a major bottleneck
 - Models for soil respiration
- Tree covered and open peatlands
 - Location – challenge from space particularly when with tree cover
 - Carbon assimilation models needed
- Can be progressed stepwise: GPP and NPP first – up-scaling already possible





TECHNOLOGY «» FOR BUSINESS

