Climate-Smart Forestry

Integrated management of forest disturbances

John Kettle
Director of Customer Solutions and International Relations
Natural Resources Institute Finland

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Presentation of Climate-Smart Forestry

- Climate Smart Foresty – what and why?
- Approaches for digitalisation in the Forest
- History of National Forest Inventory in Finland
- Simulations
- Biomass atlas
- Luke's know how is available to you!

What is Climate Smart Foresty?

A development strategy defining alternative scenarios and road maps of forestry for the journey towards a sustainable future.

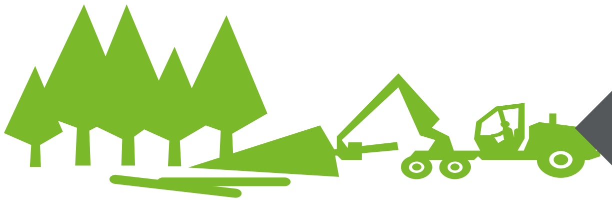
Joint effort of forested countries to actively cooperate, research, study, test and demonstrate different solutions.

Why - Climate Smart Forestry?

- Forests are an extremely important carbon sink worldwide.
- They are also an important bioeconomy resource providing carbon storage as well as raw materials for biodegradable, healthy and recyclable products.
- We must find a way to secure the roles of forests without risking the biodiversity and ensuring human well-being.
- So what to do……?

Digitalization boosts biomass supply and reduces environmental impacts

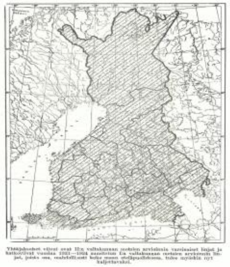
- Cloud services and information networks
- Open data and My data



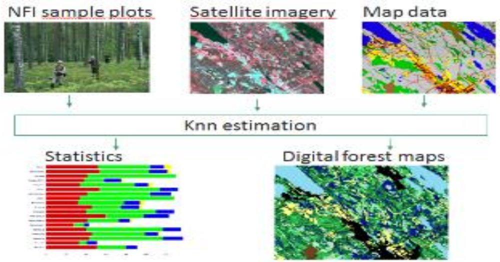
- Mobility and network smart devices and sensors

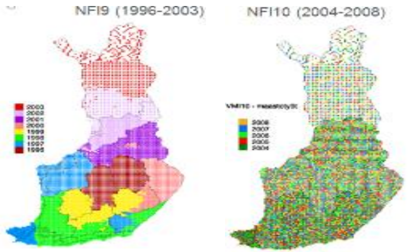
- BIG data and data analysis

History of National Forest Inventory (NFI) of Finland



- First inventory in 1921-1924: line survey supported with plot measurements
- NFI2 (1936-1938), NFI3 (1951-1953, NFI4(1960-1963) similar methods
- Clusterwise sampling in since NFI5 (1964-1970), supported with aerial photography in Lapland
- 8th NFI (1980’s), satellite imagery
  - Forest damages
- 9th NFI (1990’s), permanent sample plots
  - Forest biodiversity
- 10th NFI in 2004 – 2008: a continuous inventory
  - Forest carbon
- 11th NFI in 2009 – 2013
  - Tree measurements outside forests (for carbon reporting
- 12th NFI 2014- 2018
  - Changes in forest management: need for change monitoring





Challenges for the NFI today

- **Demand for ecosystem services are expanding**
  - New information needs while the old needs remain

Photos: E.Oksanen, Luke

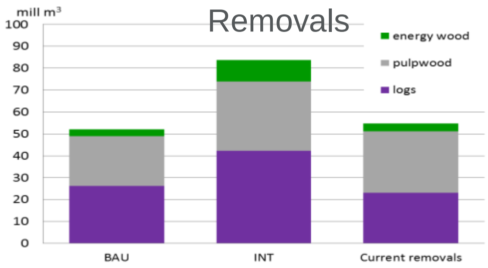
- **Demand for holistic analyses is increaing**
  - Ecosystems, economy, climate, society,..

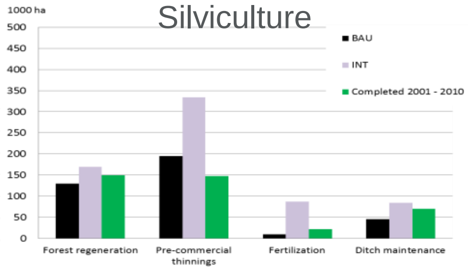
- **Development of social media….**
  - Expertise of institutes and professionals challenged in real-time
  - Communication and reaction on semi-truths in real-time

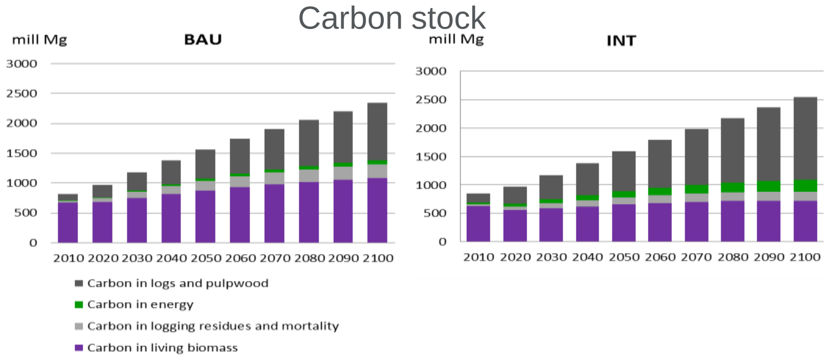
Decision support for policy processes, investment and management decisions

Scenarios:

- “Business as usual” (**BAU**)
- “Intensive management for high quality raw material” (**INT**)







- Free and open on-line services for the results based on NFI http://www.luke.fi/en/services/ > Regional cutting possibilities
- Ad-hoc scenarios, e.g. increase in roundwood removals due to new investments
- Scenarios for national and regional forest programmes, environmental, energy and climate policy
- Software tools for forest planning and decision making
  - MOTTI http://www.metla.fi/metinfo/motti/index-en.htm
  - MELA http://mela2.metla.fi/mela/index-en.html

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Biomass Atlas – open access to Finnish biomass maps

- ***Biomass Atlas*** is a new open access service which collects the location data of biomasses under one, single-user interphase.
- The service enables calculations of the amount of biomass in a given geographical area, as well as examining the opportunities and restrictions to utilize the biomass.
- The biomass data is planned to support investment decisions and sustainable use of natural resources, and to help decision-makers to undertake sustainable energy politics.

Kuva Harri Lehtinen

Developed by Natural Resources Institute Finland Luke together with Syke, Tapio, UEF and UVA and with the funding of the Finnish Ministry of Agriculture and Forestry

Investment on scientific resource management is **profitable**

- Plantation simulator can optimize use of resources
  - Site optimum, plantation optimum
  - Nutrient cycling, carbon, economy, hydrology
- Best management for each site:
  - Water management, fertilization, weeding, harvesting time
- Peatlands and mineral soil
- Allows monitoring and reporting of greenhouse-gas emissions and net fluxes

Luke's offering tackles all aspects of sustainable use of forest resources

Capacity building

- process facilitation and participatory methods in developing forest management, methodologies for forest management planning

Forest resources assessment

- methodologies, data collection methods

Sustainability assessment

- economic valuation, calculation and comparison of emissions
- sustainability assessments, GHG, water

Soil

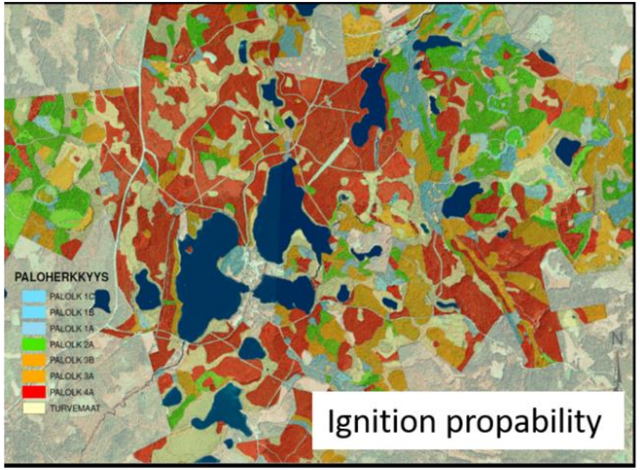
- tropical peatland and acid sulphate soil management,
- intelligent plantation resource management

Forest Fires in Finland
(number of fire-fighting occurences)

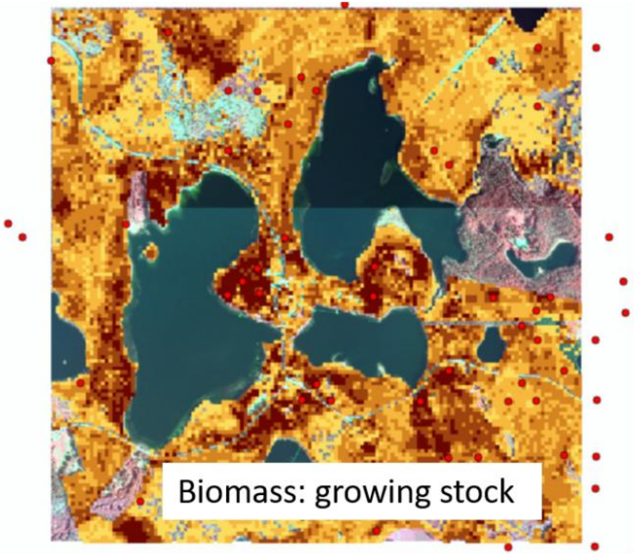
2012	437
2013	1 504
2014	1 708
2015	768
2016	978
2018	statistics not ready yet but all time high, over 2 000

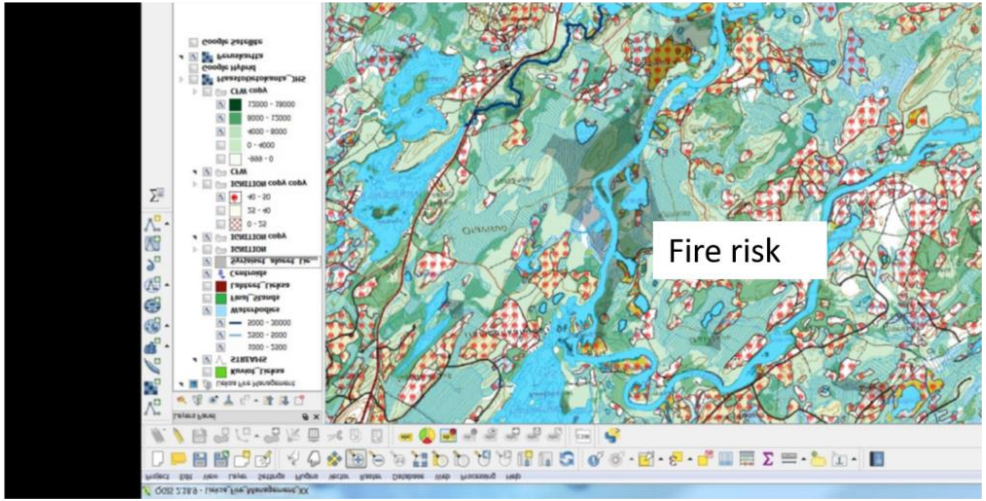
Photo: Erkki Oksanen/Luke

Rapidly developing forest inventory methods, combining to already existing (data, e.g vegetation based site type mapping, make possible to enhance more precise, fuel and fire risk maps helping in fire suppression activities

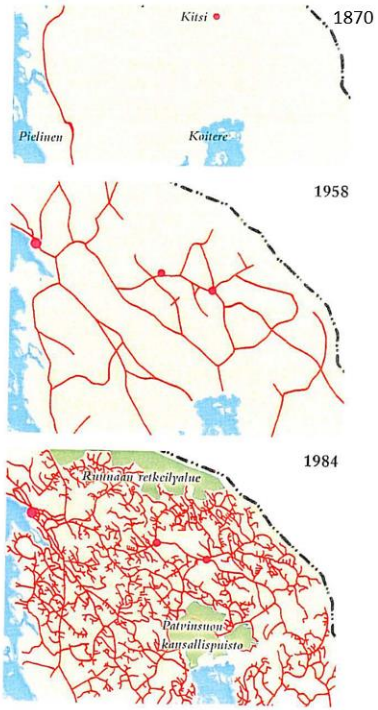


Ignition propability


Biomass: growing stock


Fire risk

Dense forest road network decreases fire risk and helps the fire suppression in many ways



Tieverkoston kehitys Piellisen itäpuolella sijaitsevalla metsäalueella Pohjois-Karjalassa

New Model generation: Forest management in the face of forest fires

Olli-Pekka Kuusela, Oregon State University, Department of Forest Engineering, Resource & Management
Jussi Lintunen, Natural Resources Institute Finland (Luke)

Model basics:

Age-structured forest

Random share of forest area is destroyed by wildfire in each age class

Salvage harvests can be applied to damaged forest stands

Model is calibrated to Douglas Fir stands in Pacific North West/Oregon

We solve **competitive equilibrium** which means:

1) Forest management (timing of final felling) is optimized given the forest owners' objective function and the regional timber demand.

2) Forest owners do not have market power and the timber price level is determined by the equilibrium between supply and demand of timber.

Model output allows analysis of the effects of wildfires on:

1) Annual harvest/timber supply

2) Timber price

3) Age structure of forests

4) Carbon sequestration/storage

In addition, we can compare:

1) Optimal forest management with and without wildfire risks

2) Implication of wildfire risk on management decisions

3) Implication of wildfires on age-structure of forests (joint effect of random wildfires and altered management decisions)

Recently started project that builds research capacity on the economics of wildfires.

Several topical research questions in mind.

Skills that are available regarding fire mitigation at Luke

- Forest mapping
  - Fuel (burning material) mapping methodology and applications
- Benchmark of forest management
- Support for forest fire mitigation roadmap
- Expertise in harvesting practices in fire risk reduction
  - Fuel reducing harvesting technology
- Developing and testing of fire retardents
- Joint scientific projects are welcomed

Thank you!

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