

Finnish forest resource maps and open data sources in the strategic planning at regional and national level.

Forest Data Supporting Business Development Seminar, Ho Chi Minh City, Vietnam
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Luke in a nutshell

- Natural Resources Institute Finland (Luke) is a research and expert organisation with multidisciplinary expertise in renewable natural resources and sustainable food production.
- 715 on-going research projects, including 50 EU funded projects
- Statutory services (defined in legislation), including National Forest Inventory
- Staff 1437, researchers 669



Boreal Green Bioeconomy

5. Bioeconomy products, services and value chains

- Wood products industries
- Green building concepts and urbanization
- Wild forest products
- Services from nature-based well-being and health

1. Biomass production

- Intensification of bioproduction
- Abiotic and biotic risk management
- Improvement of biodiversity
- Precision breeding

3. Harvesting and logistics

- Digitalization and big data
- Supply chain and logistics
- Machine concepts
- Human-machine interactions

4. Biorefineries and industrial symbioses

- Biorefinery potential of biomass
- Biomass conversion technologies
- Industrial symbioses and biocircular economy

2. Resource-smart planning and decision making

- Data on demand
- Regional scenarios
- Land use optimization and closure of yield gaps
- Sustainability, acceptability and biodiversity

NFI and forest management planning

Two inventory systems in Finland:

1) NFI for country & regional level monitoring

- statistics at country and province level
- field plot measurements, supported by satellite images
- covers all land, all owner groups, all land use classes

2) Forest Management Inventory for operative planning

- stand/compartment level data for operational planning
- by Forestry Center for private forests, by Metsähallitus and forest companies for their own forests

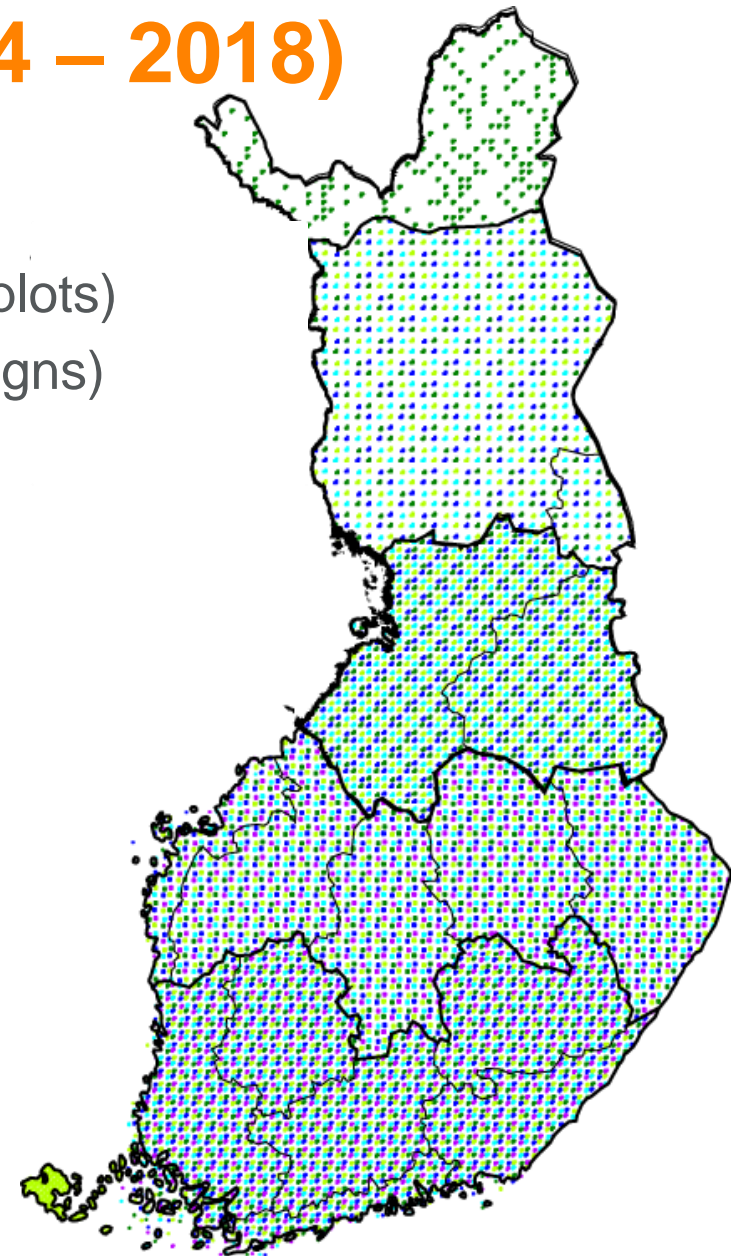
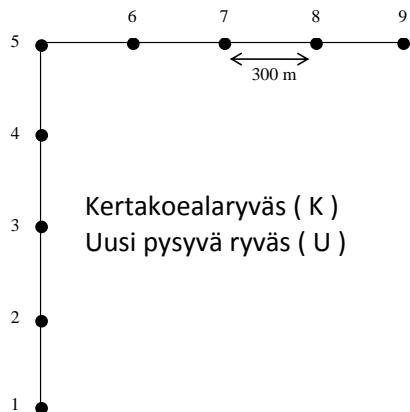


Why NFI?

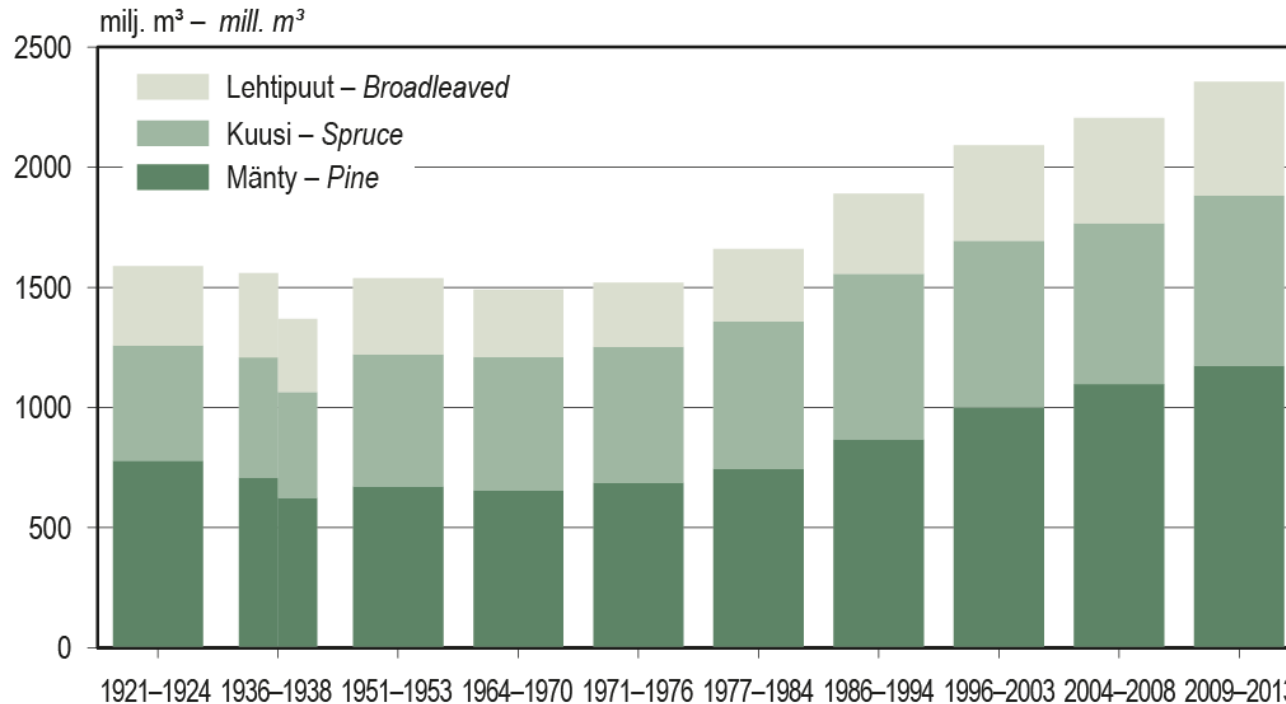
1. Government needs
 - Forest policy, forestry programs
 - Assessing sustainability of forestry
 - Estimating forest carbon budget, other international reports & statistics
2. Regional needs
 - Regional planning
 - setting goals for thinnings, tending of seedling stands etc.
 - Forest certification
3. Forest Industry needs
 - Planning of forest industry investments
 - Timber procurement
4. Research

Design of 12th NFI (2014 – 2018)

- Systematic cluster sampling (ca. 60 000 plots)
- 6 sampling strata (different sampling designs)
- 1/5 of the field plots measured each year
- 3/5 clusters are measured as permanent
- 20 – 22 field crews (2 persons)
- Field work 4 – 5 months
- Trees are measured on circular, fixed area sample plots



Some examples of the NFI results: Total volume of the growing stock



Vuosien 1936–1938 inventoinnin pylvään vasen puoli kuvaa puuston määrää alueluovutusta edeltäneiden Suomen rajojen mukaan, ja oikea puoli alueluovutuksen jälkeisten rajojen mukaan.

The left side of the split column presents the growing stock volume according to Finland's borders before cession of territory after the Second World War. The right side of the column presents the growing stock volume to the present area of Finland.

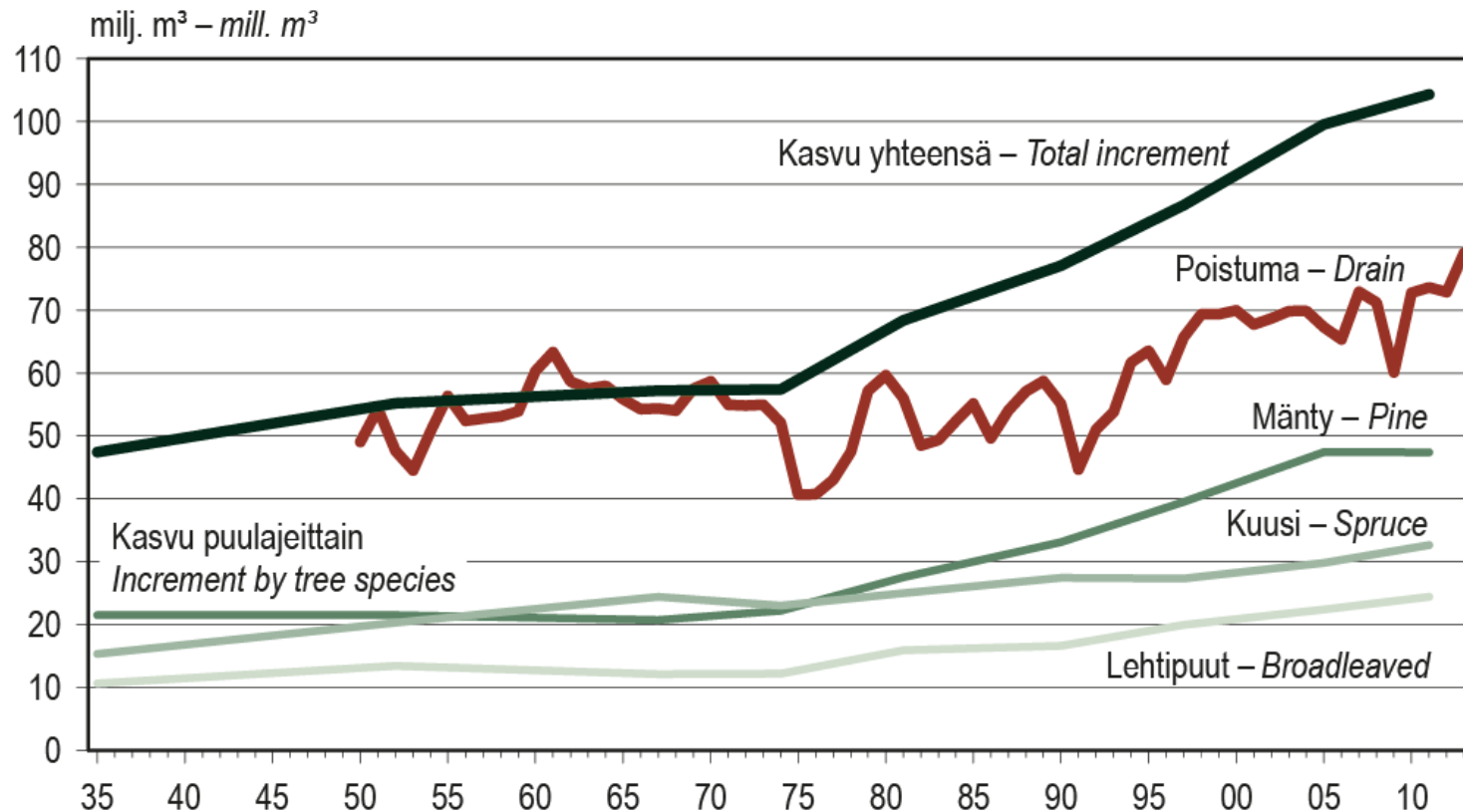
Lähde: Metsäntutkimuslaitos, valtakunnan metsien inventointi – *Source: Finnish Forest Research Institute*

Puuston tilavuus metsä- ja kitumaalla 1920-luvulta lähtien

Growing stock volume on forest land and on poorly productive forest land since the 1920s

Metsätilastollinen vuosikirja 2014

Some examples of the NFI results: Increment vs. drain (fellings and natural removal)



Lähde: Metsäntutkimuslaitos – Source: Finnish Forest Research Institute

Puuston kasvu ja poistuma
Annual increment of growing stock and drain

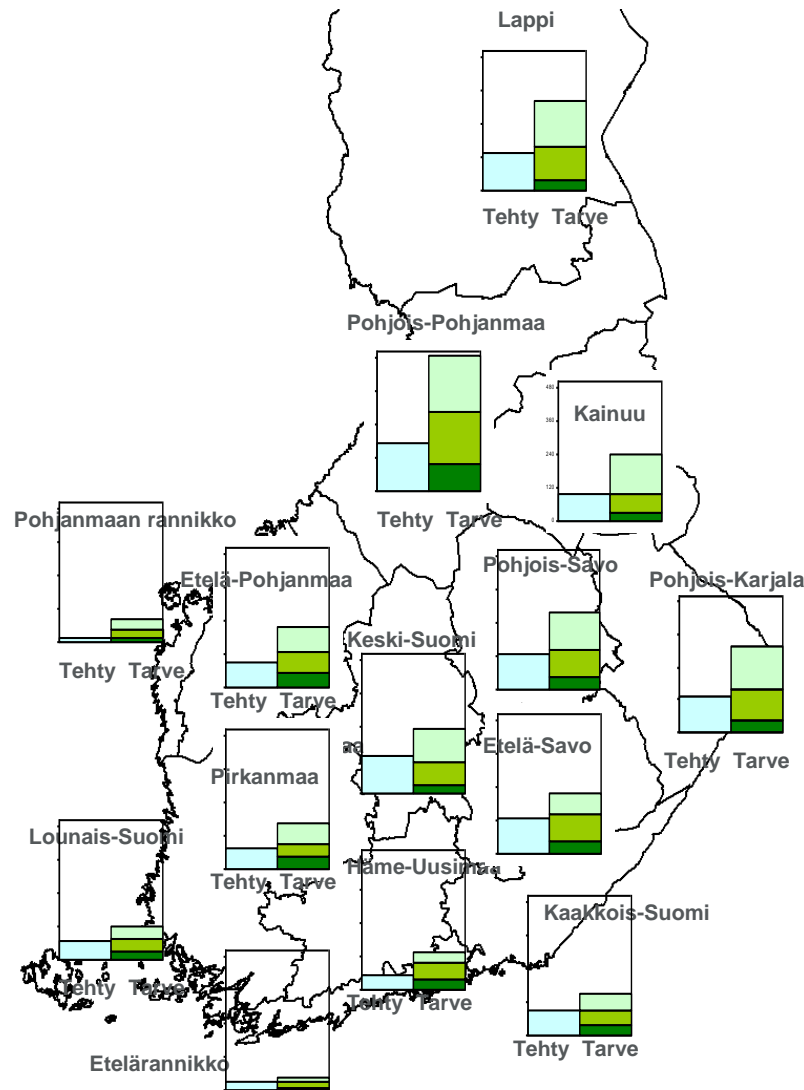
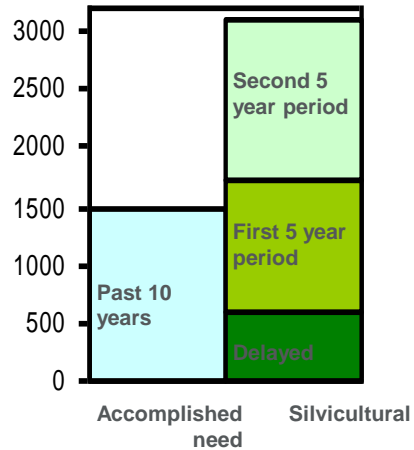
Metsätilastollinen vuosikirja 2014

Examples of NFI Results:

Accomplished first thinnings vs. silvicultural need for thinnings

in the coming 10 year period ,

Whole Finland: Need = 2,1 x Accomplished



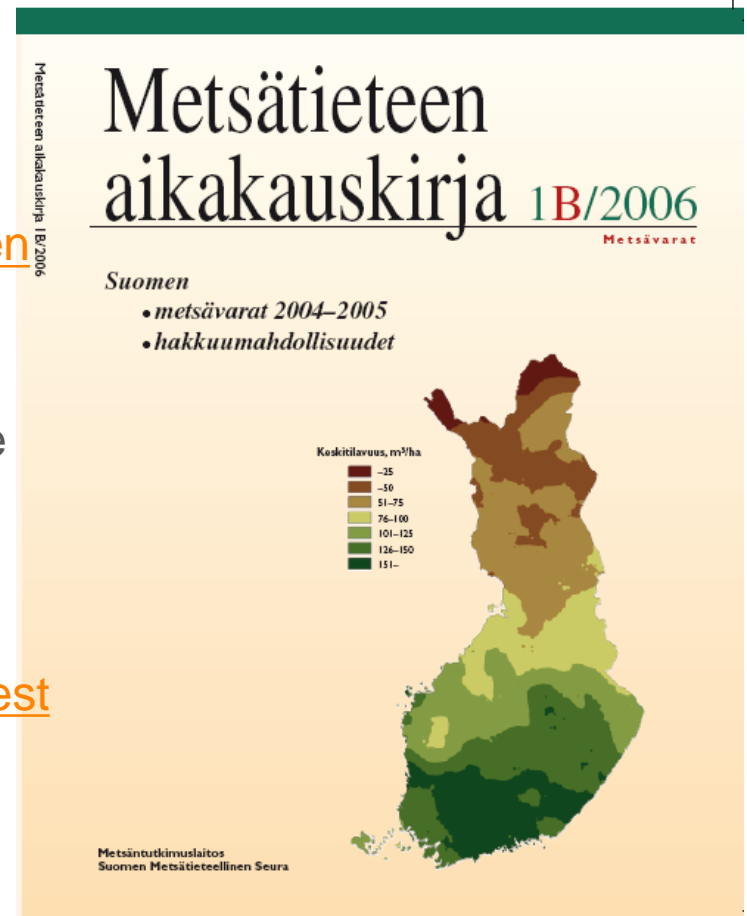
NFI results

The results about the forest resources are produced by regional Forest Centres and published in different volumes of [Metsätieteen aikakauskirja](#) (in Finnish).

The latest main results for the whole country are published annually in the [Finnish Statistical Yearbook of Forestry](#),

and they are also available through [Metinfo Forest information services](#).

<http://www.metla.fi/metinfo/vmi/>



Multi-Source NFI

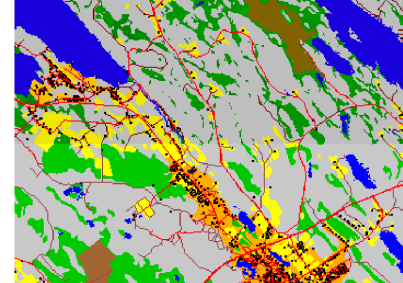
NFI sample plots



Satellite imagery



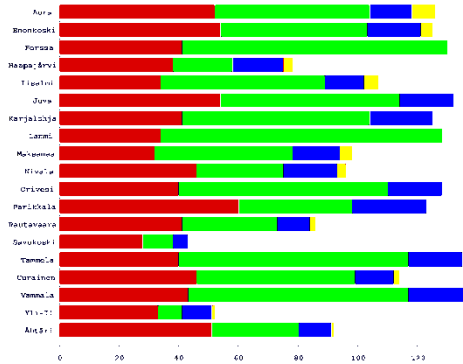
Map data



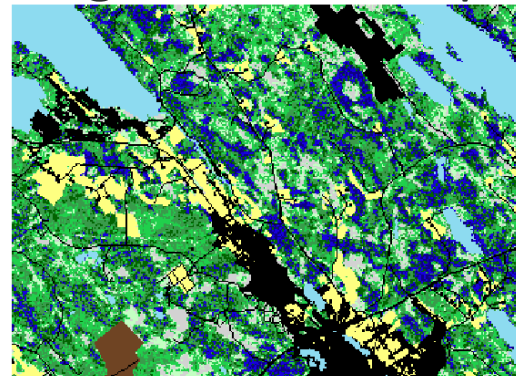
Knn estimation



Statistics



Digital forest maps



Availability of data, legislation

1) Law on the publicity of documents

- As a general rule, documents of authorities are public and can be accessed by anyone.
- In some cases information/data can remain secret, e.g.
 - if the release of scientific research data would may damage the continuation of the research

-> Ground for hiding the coordinates of NFI plots

2) Law on personal data

- to protect privacy of individuals
- personal data = any data related to individual, his/her character or living conditions that can be indentified to a person
- strict limitations to collect, store and process personal data
 - as general rule: not allowed without permission from the individual
 - exceptions: for statutory tasks, scientific research, client service

Availability of data, legislation (cont.)

3) EU Inspire Directive

- aims at improving efficient use of geofenced data and cooperation of authorities
- defines georeferenced data infrastructure for EU
- implemented through national legislation: lists of data that must be available for public
 - includes Multi-Source NFI data (not the plot data)

Access to Multi-Source NFI data

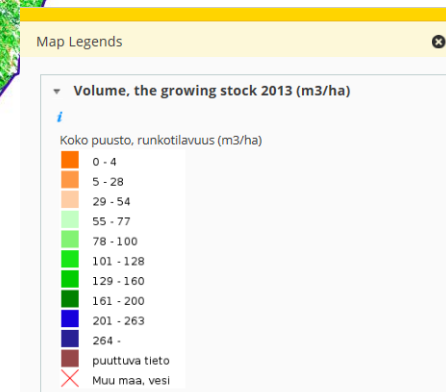
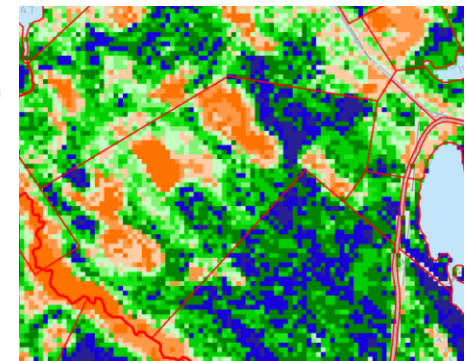
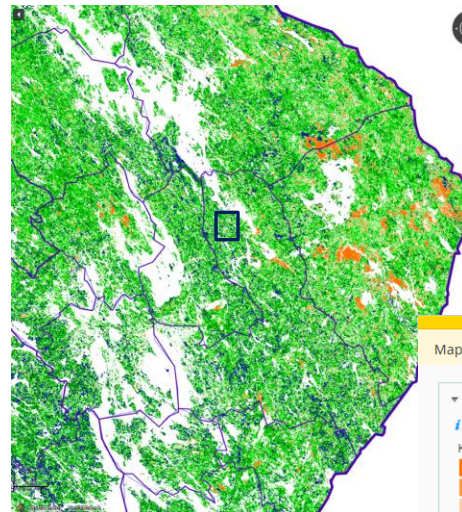
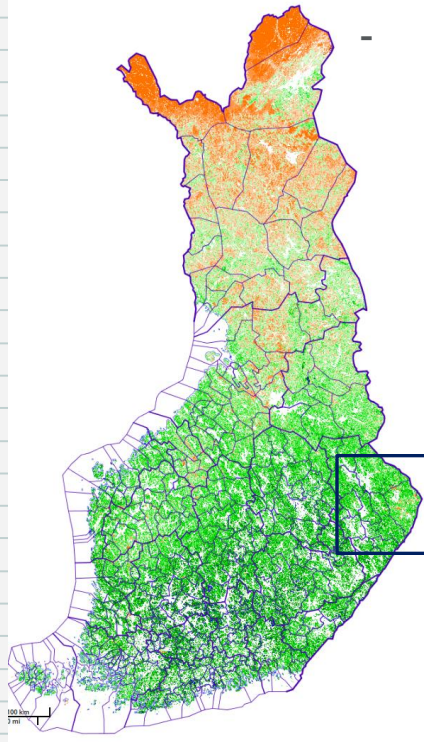
Viewing through the service of National Land Survey

<http://www.paikkatietoikkuna.fi/web/en/map-window>

Map Layers

Background maps (3)
Bio-geographical regions (2)
Buildings (5)
Cadastral parcels (6)
Coordinate reference systems (1)
Elevation (9)
Energy resources (2)
Environmental monitoring facilities (29)
Geographical grid systems (1)
Geographical names (16)
Geology (36)
Guide maps (25)
Human health and safety (11)
Hydrography (21)
Land cover (144)
Land use (21)
Meteorological geographical features (1)
Natural risk zones (22)
Orthoimagery (15)
Others (16)
Population distribution - demography (104)
Production and industrial facilities (4)
Protected sites (36)
Sea regions (7)
Soil (1)
Statistical units (242)
Topographic maps (1)
Transport networks (78)
Utility and governmental services (51)

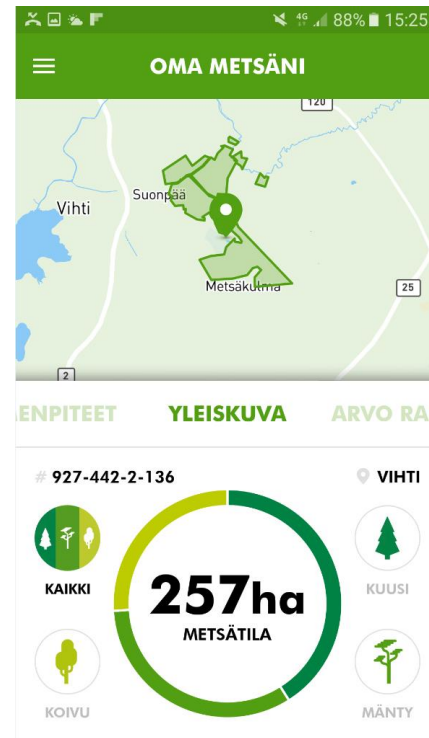
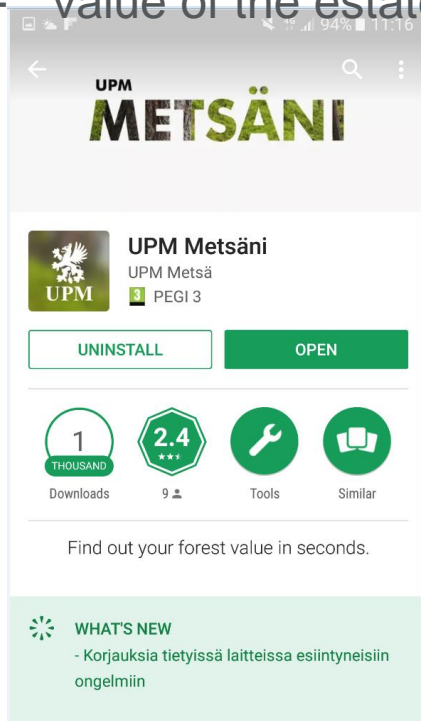
- familiar for most potential users: >1000 map layers, 50 organizations as producers
- based on Open Source software Oskari.org
- 39 mill. views in 2016



Access to Multi-Source NFI data (cont.)

Through a cell phone application

- UPM Ltd (Forest Industry)
- enter the register code of the estate ->
 - location on map
 - volume by tree species (from the latest MS-NFI data)
 - value of the estate



Future plans: NFI Reporting service

Select regional level

Select regional division, e.g. by provinces

Select NFI cycle

Select theme, e.g. volume

Select further classifications, e.g. by species

Result table:

Alue	Puulaji	Omistajaryhmä											
		Yksityiset				Yhteiset				Yhtiö			
		Tukki	Kuuti	Hukkapuu	Kokonaistilavuus	Tukki	Kuuti	Hukkapuu	Kokonaistilavuus	Tukki	Kuuti	Hukkapuu	Kokonaistilavuus
Ahvenanmaa	Mänty	1224	3125	221	4569	39	145	12	197	29	80	11	120
	Kuusi	666	1213	156	2035	61	105	14	181	14	19	2	36
	Rauduskoivu	109	755	99	963	1	41	6	48	1	8	2	11
	Hieskoivu	19	424	185	629	0	16	9	25	0	13	3	17
	Muu lehtipuu	57	876	204	1137	0	31	21	52	0	6	1	6
	Yhteensä	2074	6393	866	9333	102	338	62	502	44	126	20	190
Rannikko	Mänty	9867	23855	1713	35435	1457	2845	152	4453	893	1560	92	2545
	Kuusi	12032	18644	2329	33005	2086	2254	313	4653	586	1044	114	1743
	Rauduskoivu	1083	3344	446	4873	240	907	102	1249	180	572	61	812
	Hieskoivu	509	8285	2324	11118	95	988	191	1274	47	400	90	536
	Muu lehtipuu	558	3046	840	4444	86	889	159	1134	123	386	64	572
	Yhteensä	24049	57174	7653	88876	3963	7883	917	12763	1828	3961	420	6209

- Outline of the system defined
- Programming tools selected
 - R for calculations
 - PostgreSQL data base

Other data services of Luke

English



Statistics database

1 Choose table 2 Choose variable 3 Show table

Search in Statistics database:

- Agricultural statistics
 - Structure
 - Production
 - Economy
 - Other
- Forest statistics
 - Structure and production
 - Economy
- Fishery and game statistics
 - Structure and production
 - Economy
 - Other

Natural Resources Institute Finland - Home page
Natural Resources Institute Finland - Statistics service

Statistics: stat.luke.fi

- free of charge access to official statistics
- PX-Web software
 - tables, graphs
 - permanent web-link

<http://statdb.luke.fi/PXWeb/sq/7343c234-07c0-45d4-bd94-258840c0d3e7>

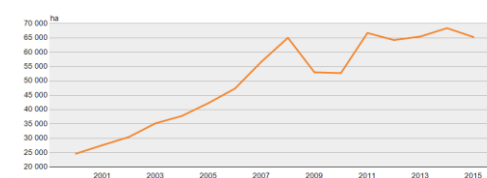
Metsänhoito- ja metsänparannustöiden työmäärät (ha)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
KOKO MAA																
Määstys																
Kaikki omistajaryhmät	24 677	27 633	30 490	35 249	37 823	42 304	47 355	56 706	65 082	53 036	52 762	66 751	64 266	65 512	68 424	65 330

Metsänhoito- ja metsänparannustöiden työmäärät (ha)



Metsänhoito- ja metsänparannustöiden työmäärät (ha)



Experiences from sharing NFI data

- NFI Field data have always been used for research in Luke/Metla and at universities. Experiences are only positive:
 - improvement of inventory methods
 - analyses of forests from different perspectives
 - additional justification for the NFI
- Opening the field plot data to public is seldom requested
 - potential users (other than researchers) are very few
- Necessary to provide good data products:
 - reports
 - **web service for the results in tables & maps**
 - customised calculations service: for ministry, industry, media, scientific community
 - 83 small service requests processed in 2016
 - 7 customer paid projects based on NFI data in 2016
 - readiness to participate in research projects

Further information



Web site
www.luke.fi



Facebook
www.facebook.com/Luonnonvarakeskus



Twitter
twitter.com/LukeFinland



LinkedIn
www.linkedin.com/company/luke-natural-resources-institute-finland



Blogs
www.luke.fi/blogi/



Customer magazine Leia
www.luke.fi/leia/



Newsletter
www.luke.fi/uutiskirje/



Publication series: Natural Resources and Bioeconomy
www.luke.fi/en/publications/



Events
www.luke.fi/tapahtumat/

Thank you!