Chapter 23
Finnish Forest Data-Based Metsään.fi-services

Virpi Stenman

Abstract This chapter introduces the Finnish forest data ecosystem and its role in DataBio project pilots. In these DataBio pilots, the main objective is to improve the use of the Finnish forest resource data. The Finnish forest data provides a foundation for the forest big data-based online and e-services. The technical solution elements for the introduced DataBio pilots are based on standardized XML data sets, X-Road data transfer protocols, open forest data application programming interfaces (APIs) and crowdsourcing applications. The Metsään.fi-services including the open forest data APIs and Wuudis-mobile application are the key components for the customer's user interface. In the end of the chapter, the pilot-specific business benefits and key performance indicators are decribed showing clear positive impacts of the pilots. At the end of this chapter, visions for the future of public online services are discussed.

23.1 Introduction

Private forests are in a key position as raw material sources for traditional and new forest-based bioeconomy. In addition to wood material, the forests produce non-timber forest products (e.g. berries and mushrooms), opportunities for recreation and other ecosystem services.

In Finland, private forests cover roughly 60% of forest land, but about 80% of the domestic wood used by the forest industry. Today, the value of the forest industry production is 2.1 billion euros, which is a fifth of the entire industry production value in Finland. The forest industry export in 2017 was worth about 12 billion euros, which covers a fifth of the entire export of goods. Therefore, the forest sector is important for Finland's national economy [1].

The Finnish Forest Centre (FFC) is a public organization and operates under the steering of the Ministry of Agriculture and Forestry of Finland (https://www.metsakeskus.fi/en/finnish-forest-centre-focusing-people-and-forest). Gathering the forest resource data from privately owned forests in Finland is one of the FFC's

V. Stenman (✉)
Suomen Metsäkeskus, Aleksanterinkatu 18 A, 15140 Lahti, Finland
e-mail: Virpi.Stenman@metsakeskus.fi

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statutory tasks, and today around 1.5 million ha of private forest inventories are annually updated. The inventory cycle for all of the private forests in Finland takes around 10 years and covers 14 million ha of privately owned forestland.

Gathering and maintenance of remote sensing and airborne laser scanning-based forest resource data started in the beginning of 2010 by the FFC. At present, the forest resource data covers almost 90% of the surface area of productive forest land in private forests. The forest resource data is utilized by forest owners and forestry actors. The forest resource data is constantly updated and maintained with the subsidy applications, forest use declaration notifications as well as with the update requests provided by the forest owners via Metsään.fi-service. Furthermore, the stand growth is added to all forest stand compartments in the forest resources database annually, and the forest management or felling proposals are simulated for the compartments accordingly.

The monetary benefits of this forest resource data ecosystem have been estimated by the Natural Resources Institute Finland (https://www.luke.fi/en/) as well as by Metsäteho Oy (https://www.metsateho.fi/briefly-in-english/), and they are annually over 26 million euros [2]. The potential monetary benefits are annually around 110–120 million euros. Furthermore, the forest resource data provides additional and indirect benefits for the forest service providers and via the investments around 1.95 billion euros.

23.2 Background and Objectives

The objectives of the Finnish forest data ecosystem are to ensure the high-quality and comprehensive forest inventory, which is standardized, up-to-date and easy to use. Furthermore, the forest data is an enabler for the FFC to produce the public services as well as data products based on the forestry sector demand.

The Metsään.fi-service is based on forest resources data that has been collected by remote sensing since 2011. Forest data can be utilized in, for example, the regional planning of forests and commercial forestry, to support the assessment of wood use possibilities and generally for developing forest businesses.

The Metsään.fi-service included in the Metsään.fi-website is a free e-service for forest owners and corporate actors (companies, associations and service providers) in the forest sector. The service aims to support active decision-making among forest owners by offering forest resource data and maps on forest properties, by making contacts with the authorities easier through online services and to act as a platform for offering forest services, among other things (Fig. 23.1). In addition to the Metsään.fi-service, the website includes open forest data services that offer the users national forest resource data that is not linked with personal information.

The Metsään.fi-service was launched in November 2012 as a version that was subject to charge, and was changed to a service free of charge for forest owners in 2015. By the end of 2018, about 110,000 forest owners had logged into the service. The forest owners that use the service own forest properties that are larger than

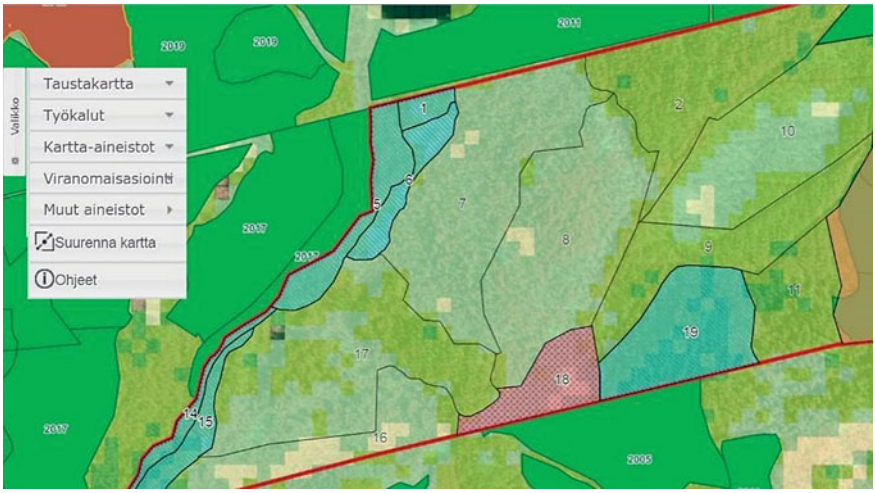

Fig. 23.1 Example of Metsään.fi map layer consisting of multiple data sets

average. The Metsään.fi-service's usage activity was increased in particular by forest owners experiencing that the presented recommendations for forest management matched their own objectives.

A central challenge in developing the website is to integrate several different sources of information into one entity that offers forest owners and actors all forest and nature data simultaneously. From the perspective of both forest owners and actors, the up-to-dateness of forest resource data and improvement of quality is one of the most important development objectives.

It is inherent for a service that is maintained with public funds that it is seen to be necessary and that it is being used. By the end of 2018, already over 100,000 forest owners had logged into the service. This is about a third of forest properties measuring over 2 ha. The forest owners and other industry actors see the service useful in many ways, but there are also areas that need improvement. It is important for future use and usefulness of the service to improve it and its content continuously.

23.3 Services

The Metsään.fi-website was also further developed through the DataBio project, where the objective was to improve the use of forest resource data and Metsään.fi-service [3]. The pilot focused on Metsään.fi databases and e-service integration to the national service architecture of Finland (based on X-road approach) where important features were, for example, data and user security, single-login and easy user role-based authentication and data access permissions (https://esuomi.fi/?lang=en). Furthermore, the launch of open forest data service, as well as related crowdsourcing

services, was included in this pilot. These new types of data gathering methods were also expected to increase the availability of FFC's forest resource data.

The two recognized areas for crowdsourcing solutions were as follows: showing quality control data for young stand improvement and early tending for seedling stand, and storm damage data. Other possible crowdsourced data, such as other forest damage than storm damage data, was also evaluated during the project. Another pilotable topic was the open-data interface to environmental and other public data in Metsään.fi databases. This topic was highly dependent on the development of the Finnish forest legislation.

In these pilots, the requirements were specified for refining and showing the crowdsourced forest data to Metsään.fi users [4]. The implementation of the new functionalities and data presenting was carried out in collaboration with Metsään.fi's development team and other FFC's projects.

23.4 Technology Pipeline

The technology pipeline was specifically tailored for this pilot; however, the Suomi.fi-based data transfer service enables the data transfer in a standardized way between the FFC and other partners [5]. Also standardized forest data can be utilized for other purposes and on different scenarios. Suomi.fi-service is also applied for the user identification and authentication by Metsään.fi-service and many other public organizations in Finland.

The technology pipeline-related components consisted of Metsään.fi-service, open forest data service and Wuudis solution for mobile data gathering (Fig. 23.2).

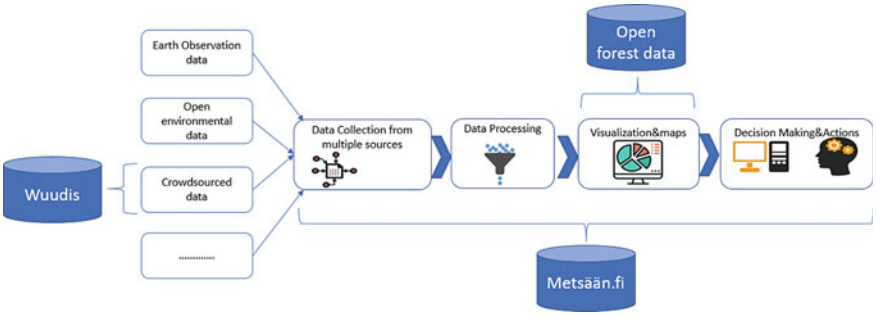

Fig. 23.2 Example of pilot data processing pipeline on a high abstraction level

Table 23.1 List of pilot specific components

Component name	Purpose for the pilot	Available at
Wuudis solution	Data sharing platform between authorities and end users	https://www.wuudis.com/
Metsään.fi-service	To improve the current component by joining the National service architecture for digital services (Suomi.fi) and to implement Suomi.fi e-identification and e-authorization for Metsään.fi users	https://www.metsaan.fi/

Table 23.2 List of pilot specific data assets

Data type	Dataset	Dataset location
Oracle database model in XML standard	Forest resource data	Finnish Forest Centre
Open environmental data in XML and OGC Geopackage standards	Open forest data	Finnish Forest Centre
Finnish Forest Centre CRM database (Legacy system)	Customer and forest estate data	Finnish Forest Centre
Mobile application dataset in XML format	Storm and forest damages observation and possible risk areas	Finnish Forest Centre/Wuudis solutions Oy

23.5 Components and Data Sets

Technical components listed in Table 23.1 and data assets listed in Table 23.2 were utilized in the pilot [6].

23.6 Results

The pilot deliverables consisted of integration of the Metsään.fi-service with the national service architecture of Finland (based on X-road approach). This phase consisted of important features such as data and user security, single-login and easy user-role-based authentication and data access permissions. Open forest data service was launched in March 2018, and related crowdsourcing services, including Wuudis based Laatumetsä mobile application for the forest damages as well as quality control monitoring, were published in the end of 2018.

In the beginning of 2019, the required XML standard schema version was released, and after that, the X-road approach was applied also for the crowdsourcing solutions regarding the forest damages reported by the Laatumetsä mobile application (Fig. 23.3). This activity was successfully implemented and finalized in September

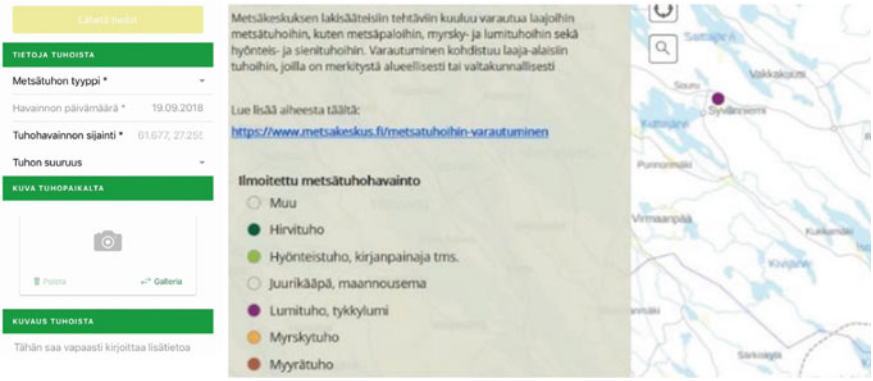

Fig. 23.3 Example of Laatumetsä mobile solution with related map service

2019, and it was mainly a technical solution improvement activity and therefore not visible for the end users.

In the beginning of the project, a top-level evaluation criteria for the pilot were agreed, and these were preliminary based on the Finnish Forest Act at the time being. However, the Finnish Forest Act was revised in March 2018, and the project evaluation criteria were updated accordingly. Additionally, more detailed key performance indicators were chosen to evaluate the results more precisely on the pilot level [7]. The updated top-level evaluation criteria with achieved results were as follows:

- In the beginning of the project 2017, the amount of FFC's forest resource data was around 200 GB. The amount was expected to increase by approximately 100 GB per year during the project, amounting to around 500 GB by the end of 2019. The result in the end of October 2019 was 574 GB.
- The coverage of forest resource data in Metsään.fi-service was in the beginning of 2017 around 11 million ha. The amount was expected to increase by 800,000 ha per year, amounting to around 13.4 million ha by the end of 2019. The result at the end of October 2019 was 12.5 million ha. The target was not completely achieved due to the fact that the data was getting outdated for the areas where the laser scanning was done over 10 years ago.
- The amount of data available for downloading for forestry operators' own information systems was at the beginning of the DataBio project around 1.5 million ha. The amount was expected to increase by 1 million ha per year, amounting to around 4.5 million ha by the end of 2019. The result at the end of October 2019 was 8.2 million ha.
- The amount of forest owners as Metsään.fi end users was at the beginning of the DataBio project around 70,000. The amount was expected to increase as follows: 85,000 in the end of 2017, 100,000 in the end of 2018 and 110,00 in the end of 2019. The result at the end of October 2019 was 119,046 forest owners.
- The amount of forestry service providers, i.e. so-called actors using the Metsään.fi-service, was in the beginning of the project around 380 pcs. The amount was

expected to increase as follows: 550 in the end of 2017, 650 in the end of 2018 and 750 in the end of 2019. The result at the end of October 2019 was 794 users.

Based on the above top-level evaluation, criteria and achieved results can be stated that the pilot targets were well achieved and exceeded. The results of the pilot were very promising, and they clearly indicate that by standardized solutions, i.e. with standardized data and data transfers as well as application programming interfaces, it is possible to build a completely new type of ecosystem, which is utilizing multiple data sources. In this type of ecosystem, the data sources can be scalable from closed data sets to open data as well as the data can be further enriched with crowdsourcing solutions, where citizens are acting as observers. This type of ecosystem consisting of the pilot specific pipelines is fully scalable and exploitable for the European forestry sector or even globally. By applying the same data standards, also the forestry sector businesses could be expanding their business opportunities across country borders.

23.7 Perspective

Related to the launch of the open-data interface to environmental and other public data in Metsään.fi databases, the main finding was that simple solutions do work; however, it is good to plan and reserve enough resources, not only for the development activities but also for the maintenance, end user support as well as training.

Regarding the shared multiuser data environment and Metsään.fi-services, certain purpose limitation factors were hindering to apply similar authorization processes for all of the end users. The backend service provider Suomi.fi could not provide the needed option for the user role specific authorization profiles. This type of factors could have been perhaps identified and mitigated during the pilot's risk management planning phase.

The findings related to the crowdsourcing solutions was that due to the available technologies, it is easy to implement and launch new types of data gathering solutions. However, the difficulty is in motivating the citizens to produce the information with new types of tools especially when the information is not necessarily fully integrated with the processes of the public authorities.

23.8 Benefits and Business Impact

The pilot-specific business impact and benefits were further analysed during the pilot with technical key performance indicators (KPIs), which were identified in the beginning of the pilot (Table 23.3). Most of the indicators are indicating very positive business impacts based on the pilot findings.

Table 23.3 Finnish Forest Data pilot KPI table

KPI short name	KPI description	Goal description	Base value	Target value	Measured value	Unit of value
Net Promoter Score (NPS)	Increased Metsään.fi user satisfaction regarding the e-services flexibility and quality	Measured with the Net Promoter Score (NPS) index on scale -100-0-100	0	>0	48	NPS
Data quality on range 1–5	Improvement in data quality measured via the end user survey and on scale 1–5	Measured on scale 1–5	3	>3	3.65	Scale
Operative cost savings	Based on the fact that utilization of the e-services and especially e-applications will save 75% costs compared to the traditional way of working with paper applications	The baseline value for this indicator is the year 2017 value, when 26% of all the applications were processed as e-applications	26%	>26%	35%	%
Revenue/employee	Employee productivity is expected to increase from the year 2017	Baseline of 59%, which is the amount of the contacted (phone, meeting) forest owners or service providers who joined the Metsään.fi-service	59%	>59%	66%	%
Sustainability	The amount and coverage of the data related to nature objects. This is measured as million hectares	Expected to increase as it is easier to capture high biodiversity profile candidates, for instance valuable habitats via the online services when the related data sets are available online	0	>0	25.73 Mha	Mha

(continued)

Table 23.3 (continued)

KPI short name	KPI description	Goal description	Base value	Target value	Measured value	Unit of value
Data amount for open forest data service	The total amount of open forest data available via the Metsään.fi-service implemented during DataBio project	Expected to increase	0	>0	439.3	GB
Data amount for open forest data service	The total amount downloaded data via the Metsään.fi, open forest data service implemented during the DataBio project	Expected to increase	0	>0	16,295	GB
Quantity of visits in open forest data service	The total quantity of visits and data loadings of open forest	Expected to increase	0	>0	10,928,529	pcs

23.9 Future Vision

The Metsään.fi-service is equated to several other authoritative online services that have been developed in Finland over recent years: Suomi.fi, vero.fi, kanta.fi, among others. The supply of online services is meant to increase the opportunities of citizens, companies and communities to use public services, regardless of time and place. E-services are usually the easiest and fastest way to contact authorities regarding, for example, forest use declarations and cost-sharing applications. When the use of online services increases, the public service production becomes more efficient and common tax money is saved. The starting point is that the public administration's online services are functional, safe and easy to use. The customer-centred planning, renewal of service processes, the interoperability of services and the data security and protection are central when building online services.

The main topics in developing Metsään.fi-webpages and services in future include

- one entity that offers forest owners and actors all forest and nature data simultaneously,
- the service remains free of charge for forest owners and actors with possible supplementary services subject to charge,
- marketing the service especially to new forest owners,
- easy to use, clarity should not decrease and an improved mobile application should be offered to the users,

- informing the users of the purpose, method and limits of the forest resource data offered by the Metsään.fi-website should be emphasized further than before, so that the expectations for the material become more realistic,
- material related to nature and leisure values and more diverse forest treatment options will have their own user base in the future,
- the control of global warming and the support of the biodiversity of nature will likely receive more attention in the future: Metsään.fi-service acts as an important platform for relaying information, and it makes it more effective to focus counselling towards forest owners.

23.10 More Information

Please find more information about Metsään.fi-services on the report prepared jointly with DataBio-project: Finland's model in utilizing forest data—Metsään.fi-website's background, implementation and future prospects (https://www.metsakeskus.fi/sites/default/files/ptt-report-261-finlands-model-in-utilising-forest-data.pdf). Furthermore, information regarding the pilot can be found from the DataBio pilot documentation (https://www.databio.eu/wp-content/uploads/2017/05/DataBio_D2.3-Forestry-Pilot-Final-Report_v1.1_2020-03-04_VTT.pdf). Technical solutions applied in this pilot have been defined as part of the DataBio technical documentation available at DataBioHub website (https://www.databiohub.eu/).

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