BalticSatApps Service Catalogue

This publication has been authored by the following individuals as part of the BalticSatApps — Speeding up Copernicus-based innovation in the Baltic Sea Region - project as a partnership of the following organizations in Estonia, Finland, Poland, Russia and Sweden respectively

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and in gratitude for the funding and resourcing received from

INTERREG - BALTIC SEA REGION PROGRAMME 2014 - 2020
EUROPEAN UNION - EUROPEAN REGIONAL DEVELOPMENT FUND
RUSSIAN FEDERATION - FINANCIAL SUPPORT

Since 2014, the satellites of the European Copernicus programme have delivered Earth observation data free of charge to anyone. The wealth of data holds tremendous potential for new services in the environmental, transport, energy and other sectors.

BalticSatApps (10/2017–3/2021) increased awareness about the data provided by the Copernicus programme, improved access to the data, and stimulated demand and innovation through co-creative and iterative development methodologies. The project also developed an acceleration programme focusing on Earth observation business.

The total budget of the BalticSatApps project was EUR 2.8 million, of which the support from the European Regional Development Fund amounted to EUR 1.8 million and European Neighbourhood Instrument (financial support received from the Russian Federation) to EUR 0.4 million.

Introduction

The BalticSatApps Service Catalogue is compiled as part of the Interreg project BalticSatApps, aiming at increased uptake and use of Copernicus services and data in the Baltic Sea region. The included services are both open and freely available services from governmental bodies in the Baltic Sea region as well as commercial services from services providers in the respective countries.

There are more than 70 services represented within 15 categories, from agricultural analysis to data portals. The service providers range from governmental bodies and well-established companies to start-ups benefiting from the freely available Copernicus data and services.

Data collection

Meta-data on available services and products based on Copernicus data and -services have been compiled to showcase the diversity of services and the multitude of use cases for data and information from the Copernicus programme. A questionnaire was sent out to the services providers identified in the previous activities of the BalticSatApps project. The information about the services have mainly been provided by the service providers in the Baltic Sea region themselves. Information about public services have been collected from the respective governmental organisations Inspire directive[1] meta data portals. The data was collected during spring 2020 and translated to English from the original languages.

The information provided by each service provider is under their responsible regarding accuracy of the descriptions of their services. The BalticSatApps project do not take any responsibility about the content of the services, as they are presented as submitted by the service providers. The catalogue should not be seen as a complete representation of available services, there are likely services that have not been represented and other that have not yet started.

The services have been catalogued and grouped based on the provided information about the services. Some of the services might belong to more than one category, in that case they have been assigned to just one category. Others might be in the periphery of the category, but rather than making one category with just one service they have been assigned to the most resembling category.

[1] Commission Regulation (EU) No 1311/2014 of 10 December 2014 amending Regulation (EC) No 976/2009 as regards the definition of an INSPIRE metadata element

Business opportunities

There are as seen below a large number of available services utilising Copernicus data and Copernicus services. The results from the different mapping activities and user consultations conducted in the BalticSatApp project do however show that there are some obstacles to reach the full potential use, due to both lack of awareness of the potential in Copernicus data and services, but also due the lack of capacity to use data and information in daily management. Both the lack of awareness and capacity of the users are important as business opportunities for service-providing companies. The main challenge is to use existing data, services and algorithms, present them in new and easy to assess ways and to incorporate them in new or existing management services and systems. The business opportunity is to help the users by turning data into management actions or decisions, i.e.to implement data driven management in the user organisations.

The list of services, even if not complete, show a strong bias towards services for forestry, agriculture, fast growing areas with a potential for start-ups or innovative service providers to be competitive in the ongoing race. There are also a large number of services focusing in environmental monitoring, many of these are governmental services, but that gives an opportunity for innovation and leverage with new AI algorithms and cloud computing. There are some services targeting insurance companies and city planning. Areas of interest for new business ideas and there will probably be an expansion of business opportunities in the future. Data from the Copernicus space component and the services are interesting for insurance companies, both regarding risk assessment, but also for early damage estimates. Integration of information derived from Copernicus data and services into the support and management systems used by insurance companies is an interesting business opportunity for both new and existing service providers.

With the current boost of city monitoring systems, integration of geographical information systems (GIS) and building information modelling (BIM) and the rapid development of smart city concepts there should be an expanding market for tools integrating Copernicus data into the city planning and management systems. For example, improved models over nitrous dioxide levels, analyses of city greenness, water quality for baths and freshwater intakes and land subsidence monitoring among others. The integration of information from Copernicus data and services into smart city management systems is hence an area for business development and an opportunity for service providers.

Services for recreational users supporting outdoor activities like hiking, skiing sailing and ice skating are lacking in the service catalogue. For recreational users the packaging is important and there is an opportunity in the integration of information from Copernicus data and services into easy to use applications supporting outdoor activities for example for trip planning and to find the best area to visit or for support regarding rout selection or navigation.

For new start-ups as well as service providers it is important to analyse the revenue streams, i.e. where the value is created The value and the business opportunity can be I data handling and advances algorithm, but it might also bee in knowledge of the sector and an ability to present data for better decisions. No matter which strategy to adopt or business model to use, the Copernicus data and services is a resource to utilise and exploit.

Service catalogue

Copernicus data can, as illustrated by the more than 70 services listed below, be used for a variety of purposes.

Agricultural applications focus to a large extent on precision agricultural making use of space data both for positioning and for the assessment of crop status and support to differentiated fertilisation strategies. There are also other services available such as crop type classification, biomass estimates and monitoring of management practices in relation, for example, to the common agricultural policy requirements.

Water quality assessment is another area where the strength of space data and the monitoring capacity of the Copernicus program is obvious. Algal blooms are readily visible and the amount of chlorophyll can be measured from space as well as the amount of dissolved organic matter and turbidity of the water among other physical aspects. Marine traffic can be followed and monitored from space, the most beneficial routes with regard to winds and currents as well as monitoring of environmental aspects such as oil spill detection and habitat mapping in shallow waters.

Forestry is another sector that can benefit from space data with information to improve the information of tree species composition, insect infestations and the need for different kind of forestry procedures such as clearing, thinning, harvesting and re-forestation. The services are used and produced by both private companies and governmental agencies increasing the efficiency in both forestry activities as well as monitoring of compliance to different regulations.

Data portals are of importance as platforms to perform the analysis that can be used within different sectors, but also to provide data from satellites and other sources for in house analytics. With ever increasing data volumes the importance of data handling and information provision becomes are highlighted.

There are sectors and areas that are developing rapidly, such as disaster risk and insurance management with the help of space data, snow and ice monitoring benefit from space data, environmental monitoring with vegetation mapping and the inclusion of space data in the development of smart cities.

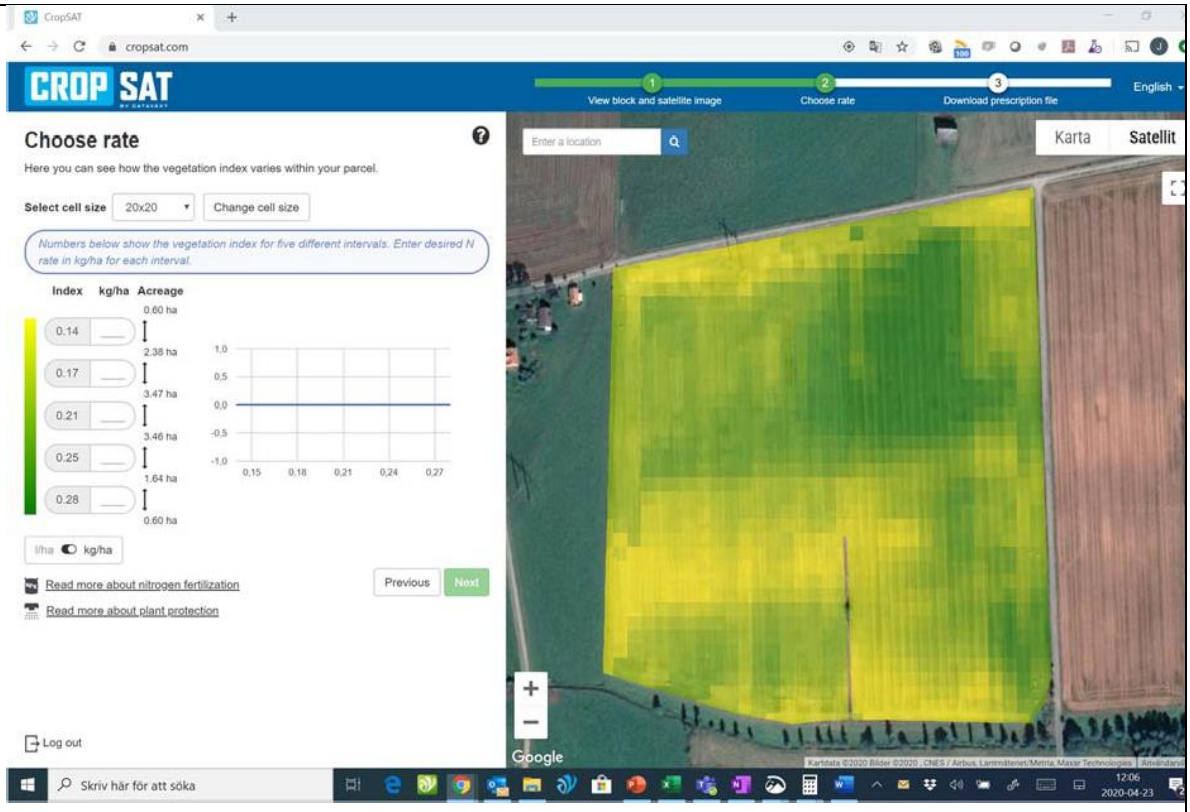
Agriculture

Name of Service	KappaZeta webmap
Service Provider	KappaZeta Ltd
Status	Available since 2019
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	NA
Temporal Resolution	NA
Data used in Service	Satellite
Overview of Service	Visualization platform for different satellite based timeseries. You can let KappaZeta to calculate timeseries over your areas of interest or use your own data. In addition, events and other relevant information about parcels can be visualized. Capability to run as a service with automatic update of data.
Contact	Mihkel Järveoja, e-mail: mihkel.jarveoja@kappazeta.ee
Access to Service	Web portal address: https://demodev.kappazeta.ee/demo/
User Guide	Search parcels on map or from search bar and browse Sentinel-1 and Sentinel-2 timeseries. By clicking on Sentinel-2 timeseries points, can see the actual satellite image from a specific date.
Background information	Developed as an in-house tool for easy data visualization, but already used by Estonian Agricultural Registers and Information Board for checking agricultural subsidy non-compliances.

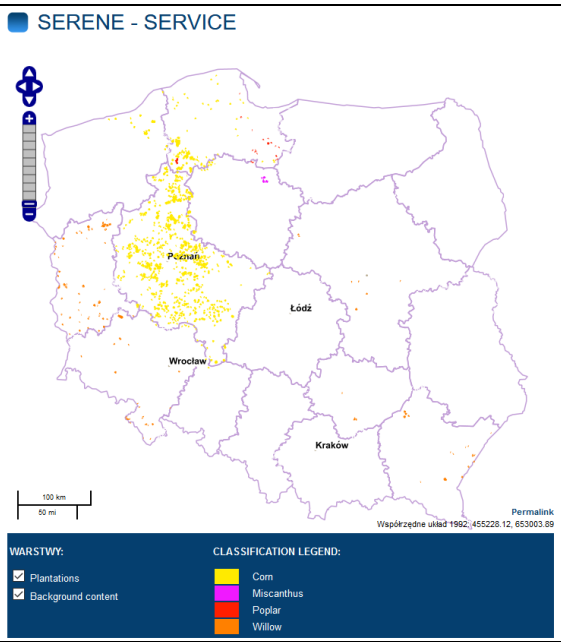
Service Example	 

	
Data license	-
Application Domain(s)	Agriculture, forestry, mining
Use Cases	Agricultural subsidy checks, deforestation monitoring, mining monitoring
FREE KEYWORDS	Agriculture, Sentinel-1, Sentinel-2, environmental monitoring

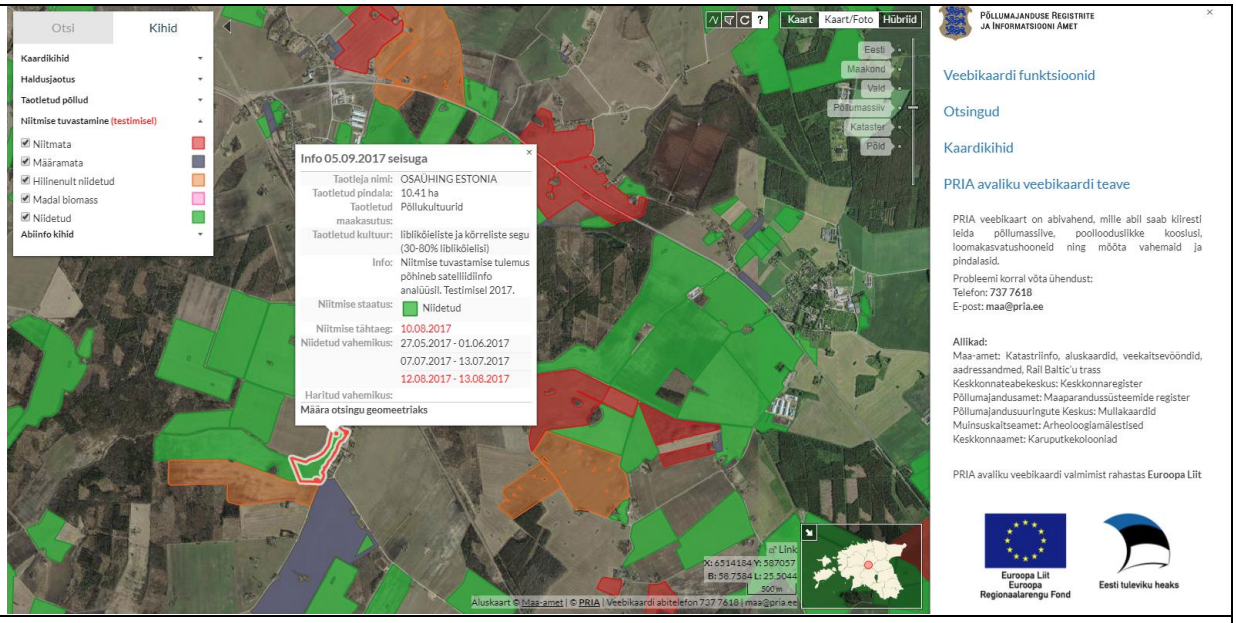
Name of Service	Cropsat.com
Service Provider	Dataväxt AB
Status	2015 and is today a global service with over 35000 users
Type of Provider	public
Cost of Service	Free
Coverage of Service	Global, but with local adjustments depending on background info.
Spatial Resolution	10x10m, 20x20, 30x30
Temporal Resolution	
Data used in Service	Sentinel 2
Overview of Service	farmer tool to see infield variation of crop health to define inputs like fertilizer.
Contact	jm@datavaxt.se
Access to Service	cropsat.com
User Guide	built in systems
Background information	CropSAT was initially developed through financial support from the Swedish Foundation for Agricultural Research (SLF) within the framework of Precisionsodling Sverige (Agroväst Livsmedel AB). The project group consists of Mats Söderström (Swedish University of Agricultural Research, SLU), Henrik Stadig (Hushållningssällskapet Skaraborg) and Johan Martinsson (Dataväxt AB). The web application is developed by Dataväxt.

Service Example	
Data license	e.g. CC0
Application Domain(s)	Cropsat.com/se, /dk, /no, /fi /lt /ru-ru/pl /cz /nl-nl /de-de/fr-fr/ar-ar/
Use Cases	
FREE KEYWORDS	

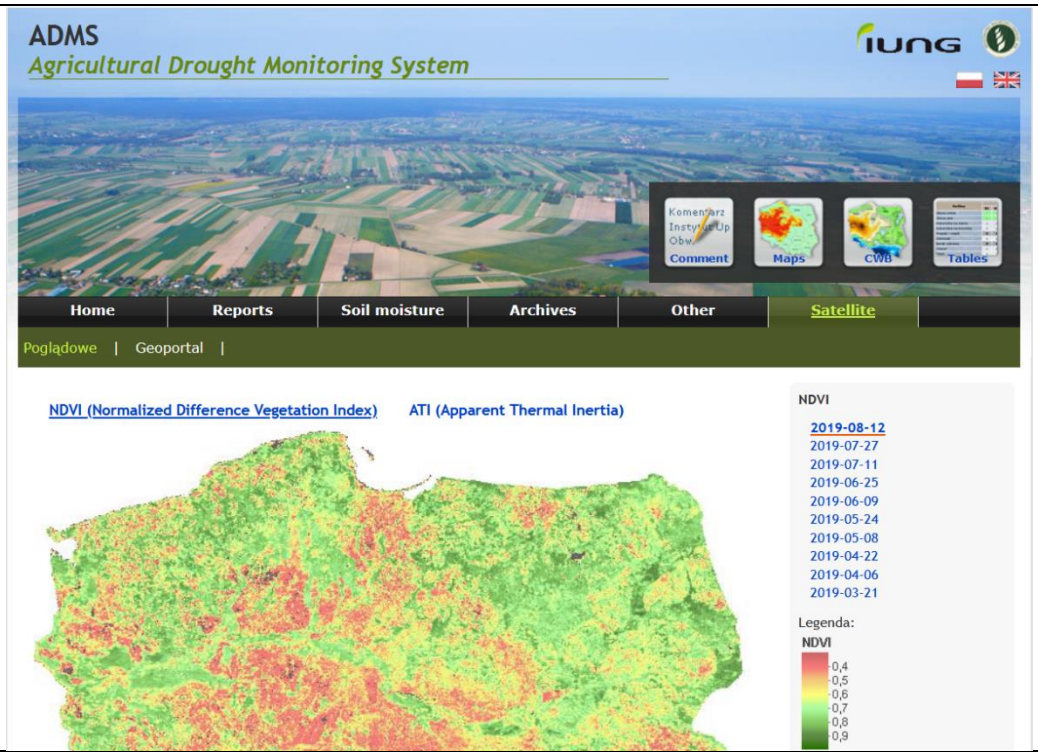
Name of Service	SERENE
Service Provider	Institute of Geodesy and Cartography
Status	Available since 2016
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	1 m
Temporal Resolution	Unregularly
Data used in Service	Both in-situ and satellite
Overview of Service	Service to the assessment of actual information on the energy biomass availability in the regions as well as delivering of information on profitability of energy crops cultivation
Contact	prof. Katarzyna Dabrowska-Zielinska, katarzyna.dabrowska-zielinska@igik.edu.pl
Access to Service	http://www.igik.edu.pl/en/a/SERENE-SERVICE
User Guide	The service provide information and data in the forms of maps (graphical presentations) on the several elements such as: the actual energy crops plantations' localization and cover, the areas having the potential for energy crops cultivation and indication of energy plants cultivation in these areas as well as the estimations of several factors such as: potential biomass yield, energy production from it's utilization and profits.
Background information	The service (available during the project – "*Bioenergy as the key to economic growth of the regions - EO Based Service Supporting Energy Crops Cultivation (SERENE)"* was funded by ESA Programme AO/1-7438/13/NL/SC - execution through the Reo and Farmer portals and through IGiK website) and the products/reports available through are dedicated for various actors such as: energy suppliers including individual farmers (planters) as well as companies which establishes the plantations dedicated for energy plants for their own use on one side and energy recipients: local, regional and national scale energy biomass recipients (bio-gas stations, electro stations and CHPs).

Service Example	
Data license	CC0
Application Domain(s)	
Use Cases	to the assessment of actual information of energy crops cultivation
FREE KEYWORDS	energy crops cultivation, bioenergy, plantations

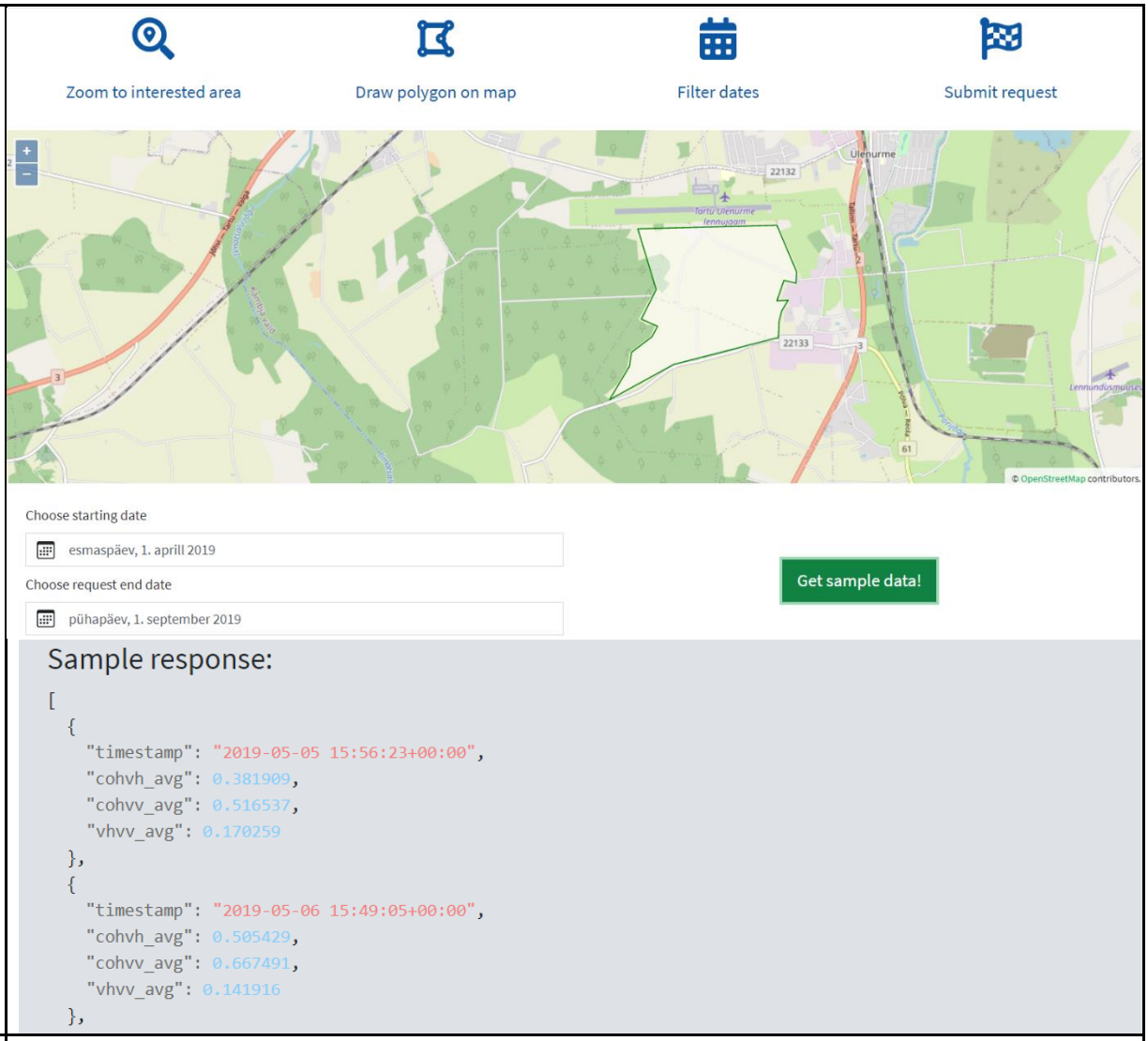
Name of Service	SATIKAS – Mowing detection service for agricultural subsidy checks
Service Provider	Estonian Agricultural Registers and Information Board Service developers: 2016-2018 Tartu Observatory and CGI Estonia, 2018 - … KappaZeta Ltd (Tartu Observatory spin-off) and CGI Estonia
Status	Available since 2018
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National (whole Estonia)
Spatial Resolution	Covering agricultural parcels greater than 1 ha
Temporal Resolution	Weekly (during summer season: 1st of May to 31st of October)
Data used in Service	Satellite
Overview of Service	Mowing detection information about Estonian grasslands based on Sentinel-1 and Sentinel-2 time series measurements.
Contact	Kai Raudvere, e-mail: kai.raudvere@pria.ee
Access to Service	Web portal address: https://kls.pria.ee/kaart/
User Guide	Switch on mowing detection (“Niitmise tuvastamine”) layer on the web map (available in summer and autumn), browse the grasslands. Green grasslands are mown and red ones are not mown, by clicking on the parcel you can query the mowing date(s).
Background information	Applied research for the service development started in Tartu Observatory and University of Tartu in 2011. Since then several research papers have been published in cooperation with DLR Microwaves and Radar Institute and Aalto University researchers. SATIKAS was first run in country-wide operational mode in summer 2017. Since then the service have been iteratively improved with several bug-fixes and updates. In 2019 Estonian government saved 234 000 euros with the help of SATIKAS mowing detection system.

Service Example	
Data license	- (free and open Copernicus data)
Application Domain(s)	Agriculture, governmental service
Use Cases	Agricultural subsidy checks.
FREE KEYWORDS	Agriculture, Sentinel-1, Sentinel-2, Common Agricultural Policy, CAP

Name of Service	ADMS IUNG
Service Provider	Institute of Soil Science and Plant Cultivation
Status	Available since 2009
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	500 m - 1 km
Temporal Resolution	Every 16 days
Data used in Service	Both in-situ and satellite
Overview of Service	The Agricultural Drought Monitoring System in Poland is conducted on the basis of an ongoing assessment of precipitation sums and potential evapotransiration, measured as a climatic water balance (CWB) and evaluation of vulnerability of different soils to drought condition. In practice, quantitative tools to verify the threat of drought in a sixty-day reporting period, which are designated as assessment period in the ADMS for the actual losses of yield, are not freely available
Contact	Prof. Andrzej Doroszewski, ador@iung.pulawy.pl
Access to Service	http://www.susza.iung.pulawy.pl/en/sat/
User Guide	The portal has NDVI (Normalized Difference Vegetation Index) ATI (Apparent Thermal Inertia) spatial distribution maps.
Background information	The Drought Monitoring System for Poland (ADMS) is provided by the Institute of Soil Science and Plant Cultivation - State Research Institute (IUNG-PIB) on behalf of the Ministry of Agriculture and Rural Development. ADMS supports the fulfilment of an insurance policy established by the Polish Government.

Service Example	
Data license	CC0
Application Domain(s)	
Use Cases	To drought monitoring in Poland
FREE KEYWORDS	drought, agriculture,

Name of Service	KappaZeta Sentinel-1 timeseries service
Service Provider	KappaZeta Ltd
Status	Available since 2020
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	5 m * 20 m
Temporal Resolution	6 days or 12 days, depending on the geographical location.
Data used in Service	Satellite
Overview of Service	Sentinel-1 captures images by synthetic-aperture radar (SAR), which can acquire data in all-weather, day and night. We can cover smaller parcels and process reliably up to 50% more parcels than other services on the market. A professional noise correction is conducted to provide high data quality. Parameters and statistics, we deliver: • 6- or 12-day repeat pass interferometric coherence in VH and VV polarization (mean); • VH & VV polarization back-scatter ratio (mean, median, min, max, stddev); • Calibrated and noise corrected back-scatter (sigma0) in VH and VV polarisation (mean, median, min, max, stddev). Our automated processing chain consists of 4 main steps: • Validate input geometry; • Calculate Sentinel-1 parameters for each polygon; • Save the result to database; • Share time series in appropriate format (database dump, .csv) or through API.
Contact	Jürgen Lina, e-mail: jurgen.lina@kappazeta.ee
Access to Service	Webpage: https://kappazeta.ee/time-series API demonstrator: https://demodev.kappazeta.ee/rta/demo/sample-request/
User Guide	Choose your area of interest, draw a polygon on the map or upload your SHAPE-file. Select the time period and submit your request. As a result, you get a sample response which includes averages of coherences in VH and VV polarisation, averages of VV and VH ratio for your time period and polygon.
Background information	The development of country-wide subsidy checks system for Estonian Government gave us a lot of experience in handling large quantities of Sentinel-1 SAR imagery. It underlined the need and value of high quality and dense Sentinel-1 feature set time series. Since then we have further improved our processing chains both in performance (we are about 10x faster than ESA SNAP baseline processing chains) and the accuracy of the derived parameters.

Service Example	 Sample response: [{ "timestamp": "2019-05-05 15:56:23+00:00", "cohvh_avg": 0.381909, "cohvv_avg": 0.516537, "vhvv_avg": 0.170259 }, { "timestamp": "2019-05-06 15:49:05+00:00", "cohvh_avg": 0.505429, "cohvv_avg": 0.667491, "vhvv_avg": 0.141916 },
Data license	- (free and open Copernicus data)
Application Domain(s)	Agriculture, mining, civil engineering, environmental monitoring, governmental service
Use Cases	Event detection in agriculture (mowing, ploughing, harvesting), forestry (logging detection); open area mining observation; monitoring lifecycle of plants – crops, grass, etc.
FREE KEYWORDS	Agriculture, Sentinel-1, environmental monitoring, mining, forestry

Name of Service	Nitrogen Prescription
Service Provider	Vultus
Status	Available since Q1 2019
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	10m
Temporal Resolution	2-3 days in Europe, every 5 days around the equator region.
Data used in Service	Satellite & In-situ data
Overview of Service	Nitrogen Prescriptions clearly show farmers which parts of their fields need more or less fertilizer, based on AI, historical data and years of research. The map is a cost effective solution for variable application of N fertilisers – saving growers up to 1/3 on nitrogen. Understanding the diverse requirements within a field allows for better placement of nutrients and consequently, improved nutrient uptake. By using this precision agriculture technology, farmers can lower their fertilizer costs, increase their crop yields and decrease their greenhouse gas emissions.
Contact	team@vultus.se
Access to Service	http://demo.spatial.farm/
User Guide	• Field Size: 1 ha+, Fertilization Zones accurate up to 10 m. • Crops: Specially adjusted for Wheat, Cotton, Paddy Rice, Sugarcane, Maize/Corn, Barley, Potato, Soybean, Canola/Rapeseed, but also suitable for use with other crops. • Application Method: Top Dressing (Not suitable for Basal Application when sowing) • Crop Growth Stage: Vegetative Stage
Background information	Nitrogen fertilisation is a costly input in a farm. Moreover, excess of fertilisers leads to nitrogen leakage to ground water and emission to the atmosphere with negative effects on the environment. It is therefore essential from an economic and environmental point of view that growers apply the right amount of fertiliser needed by the crops to reach their optimum yield. Due to different variables (soil, topography, weather, pest, etc.) crops can grow in an inhomogeneous way across a field. Their needs of nutrients may therefore be different.

	Based on satellite data and using spectral analysis, zone analysis and spatial analysis of these in-field variations, as compared to historic data, Vultus provides you with complete nitrogen recommendations. The patent pending unique proprietary analysis is based on international research in nitrogen distribution and has been proven to improve efficiency. Through optimization of the in-field distribution, Vultus nitrogen recommendations play a key role in enabling waste-free farming.
Service Example	• Reduces fertilizer costs by 1/3 and increase yields between 3-5%. • Detects both low & high performing areas, understand intra-field variability over time. • Decreases environmental harm, greenhouse gas emissions and stay ahead of increasingly tough legislation for agriculture.
Data license	n/a
Application Domain(s)	Agriculture

Name of Service	Soil Organic Carbon
Service Provider	Vultus
Status	Available since Q2 2020
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	10m
Temporal Resolution	Every 2-3 days in Europe & USA
Data used in Service	Satellite data
Overview of Service	Patent pending Soil Organic Carbon Maps clearly show farmers the amount of SOC present in their fields, based on a 0-10 cm soil depth in measures of g/kg at a 10 m resolution. No field surveys, expensive lab tests or lengthy waits required – growers get year-round instant results. Instead of a snapshot in time, growers can measure changes in soil health over years (with up to 4 years of historical data), gaining deeper insight into fields and helping to create the best possible farming strategy.
Contact	Amy Franck, amy.franck@vultus.se
Access to Service	http://demo.spatial.farm/
User Guide	• Field Size: 1ha+, maps at up to 10 m resolution • Growers in Europe and the United States. • Crop Growth Stage: Before planting season (satellite cannot detect changes in soil when covered by vegetation).
Background information	Soil Organic Carbon (SOC) is an indirect but accurate measure of Soil Organic Matter (SOM). SOM is difficult to measure, so laboratories tend to measure and report SOC, which is an excellent indicator of soil health. A high SOM / SOC content provides nutrients to plants and improves water availability, both of which enhance soil fer- tility and ultimately improve food productivity. This can also be referred to as 'humus' or 'soil fertility'. The rate of SOC in soil heavily influences crop yields. The annual rate of SOC loss can vary greatly, depending on culti- vation practices, the type of plant/crop cover, drainage status of the soil and weather conditions. Traditionally, farmers have to perform expensive and time consuming field surveys, sending samples to labs and facing significant delays whilst gaining essential insight into their soil health.

Name of Service	Geoanalitika.Agro
Service Provider	Sovzond Company, Russia
Status	Available
Type of Provider	Private
Cost of Service	Not Free (Access by request)
Coverage of Service	Area of user interest
Spatial Resolution	Depends on the product
Temporal Resolution	Depends on the product
Data used in Service	Satellite data. Products based on satellite data: – maps on agrometeorological conditions, terrain, soils; – maps on vegetation conditions, parameters of plant and vegetation growth; – boundaries of agricultural areas with one crop type.
Data used in service	In-situ data: Meteorological observations Satellite Data: Landsat-8, RapidEye, Sentinel-2, Sentinel-1, ASTER
Overview of Service	Geoanalitika.Agro is a cloud-based geoinformation service enabling agricultural monitoring and automated analysis to foster effective business decisions. The service provides an access to up-to-date information about state of crops, growing conditions and land use specifics.
Contact	agro@geoanalitika.com, info@geoanalitika.com
Access to Service	http://agro.geoanalitika.com/en/
User Guide	-

Service Example	
Data license	The information needs to be clarified
Application Domain(s)	Agriculture
Use Cases	Agricultural management
FREE KEYWORDS	Geoanalitika.Agro, Sovzond, Agricultural management

Name of Service	Synthetic Aperture Radar
Service Provider	Vultus
Status	Available since Q2 2020
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	10m
Temporal Resolution	1-2 days in Northern Europe, every 6 days in other geolocations
Data used in Service	Satellite & In-situ data
Overview of Service	Our patent-pending Synthetic Aperture Radar technique uses the microwave bands to penetrate the clouds. Vultus uses the motion of the radar antenna over a target region to provide finer spatial resolution than conventional beam-scanning radars. This includes extremely complex signal processing, filtering and analysis to derive useful results. Vultus captures images every 1-2 days in Northern Europe, and every 6 days in other geolocations. By using SAR, Vultus eliminates the cloud cover issue in satellite applications for agriculture. This ensures that every farmer can be guaranteed data on their crops, independent of the weather.
Contact	Amy Franck, amy.franck@vultus.se
Access to Service	http://demo.spatial.farm/
User Guide	• Field size 1 ha+, SAR accurate up to 10 m. • Highly practical for farmers in countries with lots of cloud and/or monsoon season. • Gives up to x4 more images than standard Vultus services, improved accuracy and decreased noise in Time Series Analysis imagery.
Background information	Vultus's patent-pending Synthetic Aperture Radar (SAR) is a cloud-busting technology that typically generates up to x4 more satellite images than the standard optical option. Since SAR-enabled satellites can take cloud-penetrating images, cloudy days and monsoon season are no longer an issue. Over the last few years, satellite imagery has become vitally important in all kinds of industries, including agriculture. Using satellite imagery farmers can check their plant health, water stress, crop performance, and nitrogen requirements – all without time-consuming, expensive field surveys. However, farmers cannot always rely on optical satellite images They are not always available, due to changing weather conditions. When it is cloudy, optical remote sensing satellites cannot provide data for farmers' fields. Optical satellite sensors cannot penetrate clouds. Hence, when weather conditions are cloudy for a long time, farmers lose

	important insights into their crop performance at critical junctures. These clouds are often a problem for farmers using satellite technology in regions of the world that have a monsoon season, or in Northern European coastal areas during the summer months. Cloud cover has been a major stumbling block that limits the use of satellite technology in agriculture across.
Service example:	Escape the frustration of cloudy weather – no more waiting for weeks without valuable insights into your crops. Up to X4 more images than standard Vultus optical satellite services.
Data license	n/a
Application Domain(s)	Agriculture
Use Cases	
FREE KEYWORDS	Agriculture, Farming, Crops, Fertilizer, Precision Farming

Name of Service	Water Stress
Service Provider	Vultus
Status	Available since Q4 2019
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	10m
Temporal Resolution	Every 1-3 days in Europe, every 5-16 days in the rest of the world.
Data used in Service	Satellite data
Overview of Service	Vultus's Water Stress Maps show farmers which areas of their fields are saturated with water, and what areas need more water, with a clear colour coded map going from yellow (water stress) to deep blue (water-saturated). No expensive, time consuming or labour intensive field surveys – Water Stress Maps available to growers every 1-3 days in Europe, every 5-16 days in the rest of the world.
Contact	Amy Franck, amy.franck@vultus.se
Access to Service	http://demo.spatial.farm/
User Guide	• Field Size: 1ha+, accurate up to 10 meters. • Ideal for growers in regions that have less rainfall, ie the Middle East, but available globally. • Maps available for the entire growing season, no gaps.
Background information	Plants need water to grow and thrive. If there is a drought, water stress will adversely impact many aspects of the plant's physiology. Insufficient water will negatively affect nutrient uptake in crops, which will in turn impact on the quality of the crop. Carbohydrates, protein, lipids, and secondary metabolites will be affected. Water is the major medium that moves nutrients into plants. It is critical to monitor crop water status and take action when the crop is under pressure. In different crop growth stages, the water requirement may differ. There is also intra-field variability for crop water stress. Careful monitoring of the plants' water needs is required to ensure the success of the crop and increase crop productivity. To make sure the crops are getting the right amount of water, farmers usually carry out field surveys. However, these are time-consuming and labour intensive.

Service Example	• Instant insights into your crops' water stress levels – reduce your field survey costs with fast, reliable maps that detect problems weeks before the naked eye. • Respond quickly to water stress and maximise your chances of saving your crops during a drought. • Improve the underperforming areas of your field and your crops' quality.
Data license	n/a
Application Domain(s)	Agriculture
Use Cases	
FREE KEYWORDS	Agriculture, Farming, Crops, Water Stress, NDWI

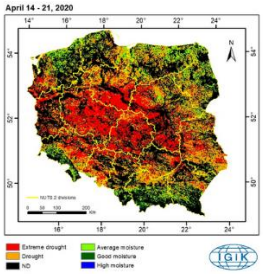
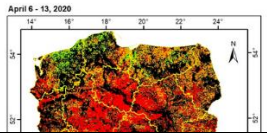
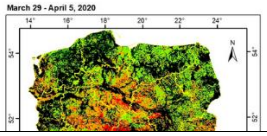
Name of Service	Kosmos Agro
Service Provider	SCANEX, Russia
Status	Available
Type of Provider	Private
Cost of Service	Not Free (Access by request)
Coverage of Service	Areas of user interest
Spatial Resolution	Depends on the product
Temporal Resolution	Depends on the product
Data used in Service	Products based on satellite data
Overview of Service	Service for continuous monitoring of the conditions and use of agricultural land, including obtaining accurate data on field boundaries, crop areas, crop conditions, rapid detection of adverse natural influences (drought, pests and diseases), as well as for information support for the yield forecasting process.
Contact	help@kosmosnimki.ru
Access to Service	http://www.scanex.ru/cloud/kosmosagro/
User Guide	-
Service Example	
Data license	The information needs to be clarified
Application Domain(s)	Agriculture, Environment
Use Cases	Monitoring of vegetation cover for agriculture

FREE KEYWORDS	Agriculture monitoring, SCANEX

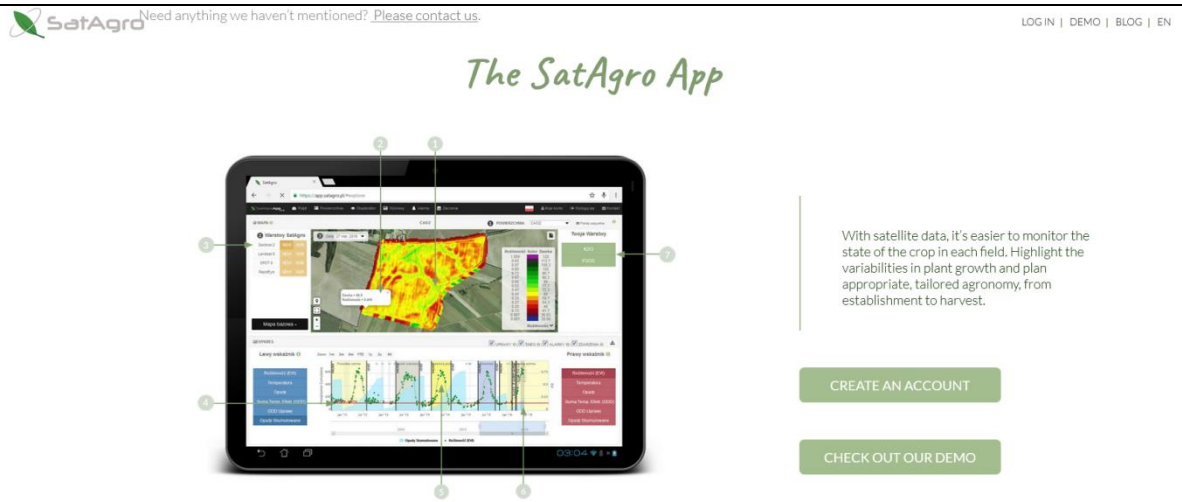
Name of Service	Fertilizatione zoning
Service Provider	Vultus
Status	Available since Q1 2019
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	10m
Temporal Resolution	2-3 days in Europe, every 5 days around the equator region.
Data used in Service	Satellite & In-situ data
Overview of Service	Fertilization Zoning Maps clearly show farmers which parts of their fields need more or less fertilizer, based on AI, historical data and years of research. The field can be divided in up to 5 zones. These zones are classified according to the variable fertilization rate the soil requires. Understanding the diverse requirements within a field allows for better placement of nutrients and consequently, improved nutrient uptake. By using this precision agriculture technology, farmers can lower their fertilizer costs, get the right amount of fertilizer to the right zones of the field, increase their crop yields and decrease their greenhouse gas emissions.
Contact	Amy Franck, amy.franck@vultus.se
Access to Service	http://demo.spatial.farm/
User Guide	• Field Size: 1 ha+, Fertilization Zones accurate up to 10 m. • Crops: Specially adjusted for Wheat, Cotton, Paddy Rice, Sugarcane, Maize/Corn, Barley, Potato, Soybean, Canola/Rapeseed, but also suitable for use with other crops. • Application Method: Top Dressing (Not suitable for Basal Application when sowing) • Crop Growth Stage: Vegetative Stage
Background information	Farmers need to spread fertilizers to ensure that their crops grow, but fertilizers are expensive and farmers' profit margins are very tight. Conventional methods of fertilizer application treat all areas

	of a field uniformly. Some parts of the field need more fertilizer, and other parts of the field need less. However, this is hard to judge and most farmers spread fertilizer evenly, resulting in higher costs and increased greenhouse gas emissions. Vultus captures images through our satellite sources, with a frequency of 2-3 days in Europe and every 5 days around the Equator region. Vultus analyses these images with our state of the art Synthetic Aperture Radar, a cloud penetrating technology ensuring there are no weeks without images. Our patented AI algorithms and a selection of specialised spectral indices make Fertilization Zoning Maps for the field. These recommendations use the latest scientific research and are customised both according to the unique history of each field and the crop type.
Service Example	• Reduces fertilizer costs by 1/3 and increase yields between 3-5%. • Detects both low & high performing areas, understand intra-field variability over time. • Decreases environmental harm, greenhouse gas emissions and stay ahead of increasingly tough legislation for agriculture.
Data license	n/a
Application Domain(s)	Agriculture
Use Cases	
FREE KEYWORDS	Agriculture, Farming, Crops, Fertilizer, Precision Farming

Name of Service	Remote sensing drought detection system
Service Provider	Institute of Geodesy and Cartography
Status	Available since 2000
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	1 km
Temporal Resolution	every 10 days
Data used in Service	Satellite
Overview of Service	System determines crop conditions with the use of the index based on satellite images with 1 km2 spatial resolution (NOAA AVHRR or Terra MODIS). The index, called Drought Identification Satellite System – DISS is a function of Temperature Condition Index – TCI and meteorological index characterizing climatic conditions on the territory of Poland (Hydrothermal Coefficient – HTC). DISS drought index is generated at the succeeding 10-day periods within vegetation season, starting from the end of March and the beginning of May. Index values are divided into five ranges, characterizing particular level of moisture: extreme drought (red); drought (orange); average moisture (light green); good moisture (dark green) and high moisture (dark blue).
Contact	prof. Katarzyna Dabrowska-Zielinska, katarzyna.dabrowska-zielinska@igik.edu.pl
Access to Service	http://www.igik.edu.pl/en/remote-sensing-drought-detection
User Guide	The portal includes maps demonstrate various moisture conditions of crop development based on Temperature Condition Index (TCI) and Vegetation Condition Index (VCI).
Background information	Applying database of drought indices from 21 years, generated on the basis of satellite images with 1 km2 resolution, the following maps characterizing three aspects of drought in Poland were prepared: contribution of drought periods in multiyear period, average duration of agricultural drought and occurrence of agricultural drought in particular parts of vegetation season. The maps are developed on the basis of algorithms: DISS and HTC.

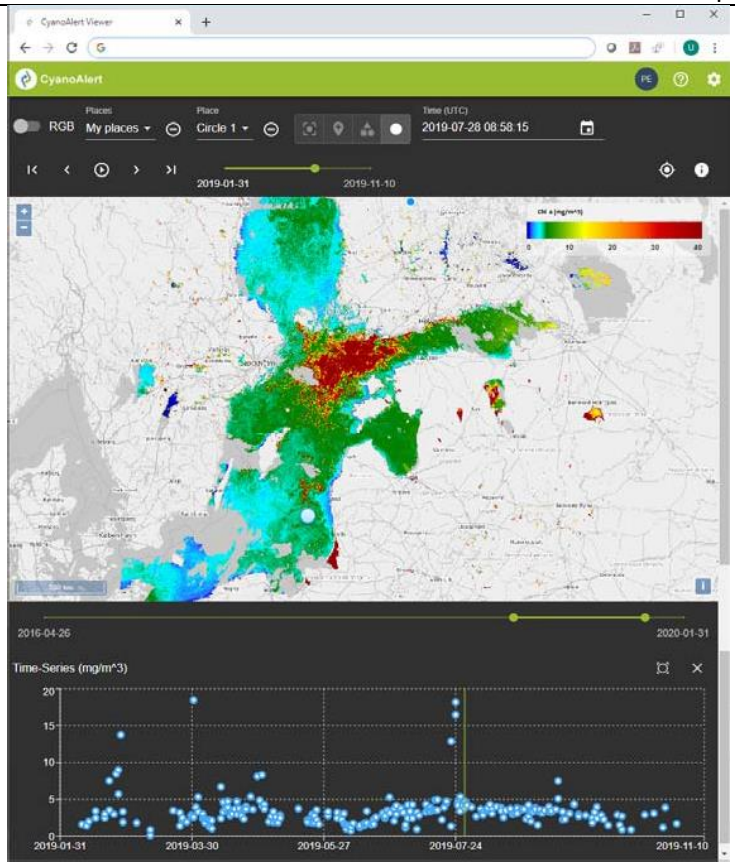
Service Example	**Drought detection** The system for monitoring crop growth conditions has been elaborated at the **Remote Sensing Centre**, Institute of Geodesy and Cartography. It determines crop conditions with the use of the index based on satellite images with 1 km^2 spatial resolution (NOAA AVHRR or Terra MODIS). **The index, called *Drought Identification Satellite System* – DISS** is a function of *Temperature Condition Index* – TCI and meteorological index characterizing climatic conditions on the territory of Poland (*Hydrothermal Coefficient* – HTC). DISS drought index is generated at the succeeding periods within vegetation season, starting from the end of March (Terra MODIS) and the beginning of May (NOAA AVHRR). Index values are divided into five ranges, characterizing particular level of moisture: extreme drought (red); drought (orange); average moisture (light green); good moisture (dark green) and high moisture (dark blue).   
Data license	CC0
Application Domain(s)	
Use Cases	To agriculture drought detection in Poland
FREE KEYWORDS	agriculture, drought, detection, monitoring,

Name of Service	SatAgro
Service Provider	SatAgro Sp. z o.o.
Status	Available since 2018
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	1 m
Temporal Resolution	Unregularly
Data used in Service	Satellite
Overview of Service	SatAgro can monitor your crops' development in near real-time, observe the effects of weather events and agronomic treatments, and use historical data to improve decision-making. Custom-built variable-rate prescription maps allow users to sow, fertilise and spray with unprecedented precision. Automated alarms will warn users about sudden changes in crop condition and weather. Optimise and even reduce the use of agrochemicals, protect the environment, and use SatAgro to help users maximise the land's potential.
Contact	biuro@satagro.pl
Access to Service	https://www.satagro.pl/?lang=en#aplikacja
User Guide	An account is required to be created on the website. One field up to 50 ha is free. There are various options for purchasing the service.
Background information	It is a private company that offers interesting solutions for precision farming.

Service Example	
Data license	CC0
Application Domain(s)	
Use Cases	For precision farming
FREE KEYWORDS	Precision farming, crop, agriculture, commercial

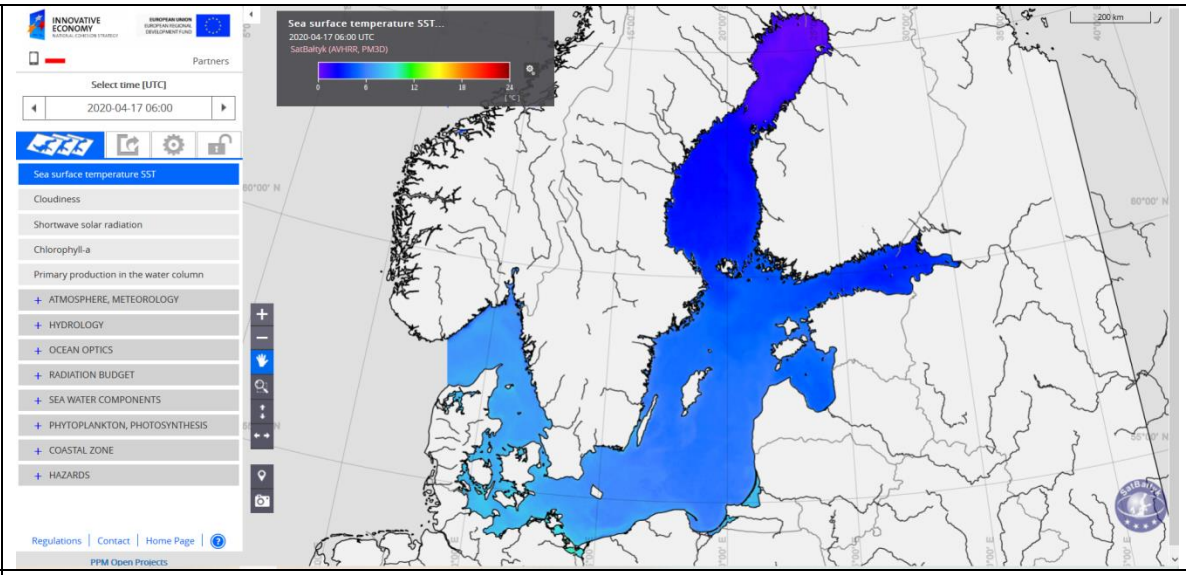
Water and Marine monitoring

Name of Service	CyanoAlert - Space Based Cyanobacteria Information & Services CyanoAlert®
Service Provider	Brockmann Geomatics Sweden AB and Brockmann Consult GmbH
Status	Will be available from summer 2020
Type of Provider	Private
Cost of Service	Free Mobile App / Not free customer tailored service and tools
Coverage of Service	Local / Regional / Global
Spatial Resolution	300 meters (Sentinel-3) / 20-60 meters (Sentinel-2)
Temporal Resolution	Daily (NRT) / Customer specified
Data used in Service	Both in-situ and satellite
Overview of Service	CyanoAlert is a web based service that automatically delivers up-to-date and historical water quality information based on analysis of satellite images, both user-specific information to paying customers and free and open information to the public. The service offers information on cyanobacteria blooms, eutrophication (chlorophyll-a) and supplementary water quality products such as turbidity and transparency, through its web portal, viewer and mobile app. CyanoAlert is directed towards all people interested in the status of water bodies and monitoring of water quality. CyanoAlert is especially useful for those working for environmental authorities and in the commercial sector who are concerned by health risks and quality of water resources and in charge of activities for improvement. The general public who would like to avoid being affected by toxic algal blooms can also benefit from the CyanoAlert service and explore where it might unsafe or unpleasant to swim, go boating or walk the dog. Customers can easily get an overview of water quality status, monitor changes, tailor actions and receive customized results and reports. Based on the service, on-going monitoring efforts can become significantly more effective. CyanoAlert gives you water quality information for entire water bodies on all cloud free days and helps you to more effectively plan where and when to take water samples for analysis. The service can add value and bring new knowledge to traditional field sampling efforts and put scarce field samples in to context. Pilot services have been conducted in Swedish, German, Italian and Romanian lakes and coastal zone.
Contact	Petra Philipson, petra.philipson@brockmann-geomatics.se

Access to Service	https://www.cyanoalert.com/
User Guide	Introductory User Tutorials and User Guides are available at https://www.cyanoalert.com/
Background information	The service has been developed with funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730141. The consortium consisted of three development partners (Brockmann Consult GmbH, Brockmann Geomatics Sweden AB and Odermatt and Brockmann GmbH) in close collaboration with three user organisations (INCDDD - Danube Delta National Institute
	for Research and Development, Romania, InfoBaltic - The Information Office for the Baltic Sea, Sweden and ISS - National Institute of Health, Italy). The service products are derived using a number of state of the art and published open source algorithms and bio-optical models, as well as, project based further developments and refinements. The main achievement is related to the development of data cubes and service tools
Service Example	
Data license	CyanoAlert User license
Application Domain(s)	Environment – monitoring, protection, planning, hazards–vulnerability Governance/Planning – water quality monitoring and mapping Social – tourism, drinking water, health, alert systems
Use Cases	https://www.cyanoalert.com/showcases-en

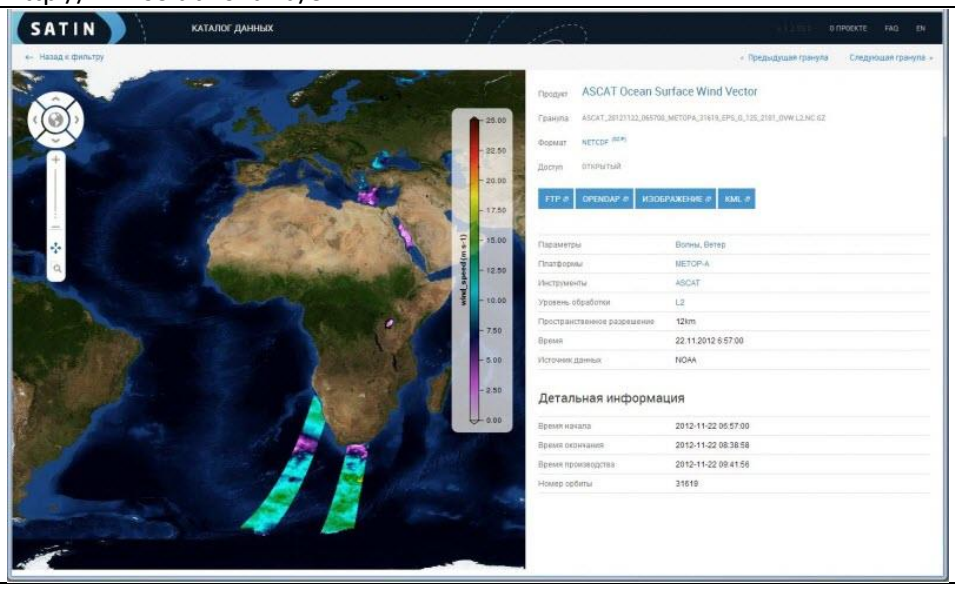
FREE KEYWORDS	Cyanobacteria, algal blooms, blue-green algae, water quality, chlorophyll-a, Copernicus, Sentinel-3, Sentinel-2

Name of Service	SatBałtyk
Service Provider	Institute of Oceanology PAN
Status	Available since 2010
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Baltic Region
Spatial Resolution	10 m – 5 km
Temporal Resolution	daily
Data used in Service	Both in-situ and satellite
Overview of Service	Service SatBałtyk is technical base and practical operational procedures enabling efficient and routine determination of the Baltic environment conditions, i.e. salinity, water temperature, radiation, heat and energy, nutrients, meteorological phenomena and atmospheric parameters, Photosynthesis and primary production, optical properties, phytoplankton pigments.
Contact	PhD Mirosława Ostrowska, ostra@iopan.gda.pl
Access to Service	http://www.satbaltyk.pl/en/
User Guide	The website operates as a geoportal. It has many specialized products. It is possible to generate graphs of individual parameters for a selected area.
Background information	Project SatBałtyk is implemented by Scientific Network of Institute of Oceanology PAN (IO PAN), Institute of Oceanography of the University of Gdańsk (IO UG), the Institute of Physics of the Pomeranian Academy in Słupsk (IF AP) and the Institute of Marine Sciences of the University of Szczecin (INoM US).

Service Example	
Data license	CC0
Application Domain(s)	
Use Cases	to monitor Baltic Sea
FREE KEYWORDS	Baltic, Sea, geoportal, parameters,

Name of Service	Storm, Ice, Oil, Wind, Wave Watch System (SIOWS)
Service Provider	Satellite Oceanography Laboratory (SOLab), Russian State Hydrometeorological University, Russia
Status	Available
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Arctic region
Spatial Resolution	Depends on the product
Temporal Resolution	Depends on the product
Data used in Service	Products based on satellite data Satellite data: Sentinel-1, Sentinel-3, AMSR-2, ASCAT, WRF
Overview of Service	Web GIS, designed to display various satellite, model and in situ data. The system uses uses developed at SOLab storing, processing and visualization technologies for operational and archived data and allows synergistic analysis of both historical data and monitoring of the current state and dynamics of the "ocean-atmosphere-cryosphere" system in the Arctic region, as well as Arctic system forecasting on the basis of thermodynamic models with satellite data assimilation
Contact	sol@rshu.ru
Access to Service	http://siows.solab.rshu.ru/
User Guide	http://siows.solab.rshu.ru/
Service Example	
Data license	The information needs to be clarified

Application Domain(s)	Oceanography
Use Cases	Monitoring of the ocean, atmosphere, cryosphere
FREE KEYWORDS	Oceanography, Monitoring, SOLab

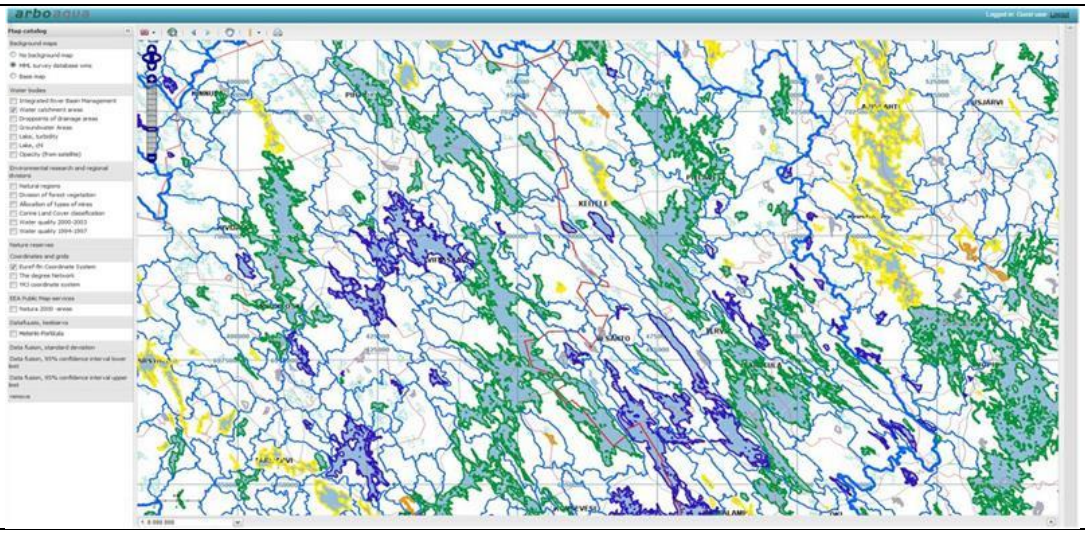
Name of Service	SATIN
Service Provider	Satellite Oceanography Laboratory (SOLab), Russian State Hydrometeorological University, Russia
Status	Available
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Global
Spatial Resolution	Depends on the product
Temporal Resolution	Depends on the product
Data used in Service	Products based on satellite data Satellite data: MODIS, ASCAT, AVHRR, AMSR, AATSR, GOES, CryoSat-2, TOPEX/POSEIDON, Jason-1, OSTM/Jason-2, ENVISAT, ERS, SMMR SSM/I SSMIS, GFO Altimeter, GRACE SCA, TOPEX MICROWAVE RADIOMETER
Overview of Service	Web-catalog developed to search, preview and download remote sensing data. Being mainly an educational resource, it is aimed to give an introduction into the area of satellite oceanography but can also be used for any scientific application.
Contact	sol@rshu.ru
Access to Service	http://satin.rshu.ru/
User Guide	http://wiki.solab.rshu.ru/SATIN
Service Example	
Data license	The information needs to be clarified

Application Domain(s)	Oceanography
Use Cases	Monitoring of the ocean, atmosphere, cryosphere
FREE KEYWORDS	Oceanography, Monitoring, SOLab

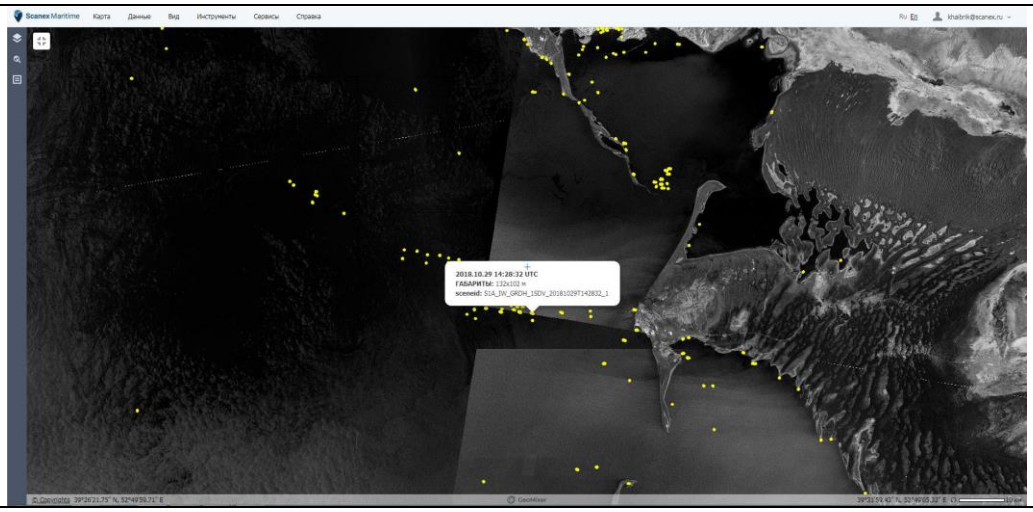
Name of Service	Analysis map sea ice
Service Provider	SMHI
Status	Available
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Baltic Sea
Spatial Resolution	
Temporal Resolution	
Data used in Service	In-situ / Satellite /Both in-situ and satellite
Overview of Service	This product was created using data from EU Copernicus Marine Services. The data set contains a map of the ice situation in the Baltic Sea. The analysis is based on satellite data and in-situ observations, and is manually produced in a GIS software. Data format is ESRI shapefil with the following attribute set: iceact (ice concentration in tenths) 01 - Open Water (<1/10) 10 - 1/10 20 - 2/10 30 - 3/10 40 - 4/10 50 - 5/10 60 - 6/10 70 - 7/10 80 - 8/10 90 - 9/10 91 - 9 + / 10 92 - 10/10 98 - Ice Free icetck (average thickness in cm) icemax (maximum thickness in cm) icemin (minimum thickness in cm) type (ice type according to WMO standard) 0 - Ice Free 1 - Open Water 2 - Very Open Ice 3 - Open Ice 4 - Close Ice 5 - Very Close Ice 6 - Consolidated Ice 7 - Level Ice 8 - Fast Ice 9 - New Ice 10 - Rotten Ice deformation (degree of deformation) 0 - No Deformation 1 - Rafted Ice 2 - Slightly Ridged Ice 3 - Moderately Ridged Ice 4 - Heavily Ridged Ice 5 - Brash Ice Barrier publication (publication date YYYY-MM-DD hh: mm: ss) chartdate (expiration date of the map, YYYY-MM-DD)
Contact	SMHI, 011-4958000, dataleveranser@smhi.se
Access to Service	https://opendata-download-icemap.smhi.se/api
User Guide	https://opendata.smhi.se/apidocs/icemap
Background information	The data represents a visual interpretation of the prevailing ice position based on available data at the time of analysis. The uncertainty in the data thus depends on the quality and scope of the data and cannot be quantified.
Service Example	
Data license	By downloading the data you accept the following license terms, http://www.smhi.se/klimatdata/Openna-data/Information-on-oppna-data/terms-for-anvandning-1.30622. If possible, specify SMHI as the source.

Application Domain(s)	Coast and sea, Sea regions
Use Cases	
FREE KEYWORDS	

Name of Service	ArboAqua
Service Provider	Arbonaut Ltd.
Status	In development
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	Depending on customer requirement
Temporal Resolution	Depending on customer requirement
Data used in Service	Both in-situ and satellite
Overview of Service	ArboAqua is an easy-to-use web platform for centralizing water resource information from multiple data sources. The service is tailorable and always customized to meet the customer-specific needs. Remote sensing data is utilized in the system for estimating the quality of water bodies and to map the changes. Integrated modeling tools allow estimating also future scenarios, helping organizations to make better decisions on the needed activities regarding crucial water resources.
Contact	Heli Hiltunen heli.hiltunen@arbonaut.com
Access to Service	https://arbonaut.com/en/products/arboaqua
User Guide	Please contact our team for further information
Background information	

Service Example	
Data license	Depending on use case
Application Domain(s)	Environment
Use Cases	ArboAqua can be used for various use cases, such as; Storing and analyzing environmental data Water quality monitoring Storm water flow prediction Flood forecasting Water resource management
FREE KEYWORDS	Data portal, water management, water quality management, flood forecasting, flow prediction, remote sensing data

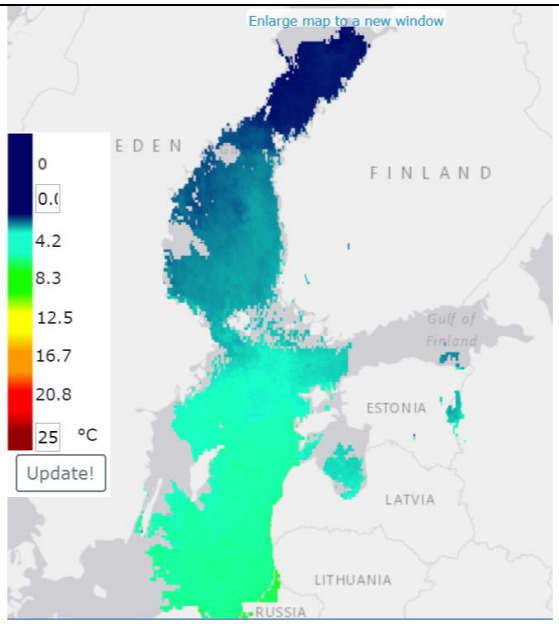
Name of Service	Морской портал (Maritime portal)
Service Provider	SCANEX, Russia
Status	Available
Type of Provider	Private
Cost of Service	Not Free (Access by request)
Coverage of Service	Areas of user interest
Spatial Resolution	Depends on the product
Temporal Resolution	Depends on the product
Data used in Service	Satellite data Products based on satellite data Satellite Data: Radarsat-2, Sentinel-1, GCOM-W1 etc.
Overview of Service	Maritime portal is a set of geoservices for operational monitoring of navigation, engineering and environmental safety of marine objects and water areas, aimed at ensuring an adequate assessment of the situation at sea and rapid response. Geoservices are based on the integration of technologies for processing and interpreting operational satellite data, modeling algorithms, and data from leading global suppliers. Portal includes services on: Monitoring of navigation and ship conditions (monitoring of selected vessels; shipping monitoring in the area of interest; searching for a vessel from satellite images; monitoring of weather conditions). Monitoring of the ecological state of the sea area (oil spill detection). Sea ice monitoring.
Contact	office@scanex.ru
Access to Service	http://scanex.ru/cloud/maritime/ https://maritime.earth/
User Guide	-

Service Example	
Data license	Tne information needs to be clarified
Application Domain(s)	Maritime
Use Cases	Maritime monitoring and management
FREE KEYWORDS	Maritime, SCANEX

Name of Service	Oceanographic analysis: Surface collection of algae
Service Provider	SMHI
Status	Available since 2017-05-31
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Baltic Sea Region
Spatial Resolution	
Temporal Resolution	Daily
Data used in Service	Sentinel 3A och B, Suomi-NPP och EOS Aqua
Overview of Service	DESCRIPTION The maps show the flowering of cyanobacteria detected from satellite data. Flowering can be detected from satellite when it is on or near the sea surface. A flowering that is unclear or difficult to see because it is below the surface is defined as "Risk of surface accumulation", while a "Surface accumulation" defines the areas where the flowering has concentrated on the surface. Areas where clouds obscure the view are shown in gray, and areas where satellite data is missing are designated black. NOTE! Maps from 2002 - 2009 have another designation for the algal blooms. See legend in current map. Since the satellite cannot see the blooms through clouds, there is also a compilation of the last 7 days. This picture shows the number of days that flowering has been observed during the last 7 days, which can be of great benefit when an algal bloom has been going on for a while and the area then becomes cloud covered. The chances are then that the algal bloom is below the cloud cover but that it cannot be detected from the satellite. DELIVERY Daily maps (png) with associated texts (json), or weekly compilations (png) can be downloaded for one year at a time. COORDINATES Coordinates for the area are given by the corners Southwest 53.33N, 6.89E Northwest 65.82N, 3.62E Northeast 64.90N, 33.73E Southeast 52.69N, 27.68E FORMAT Daily maps (png) with accompanying texts (json), alternatively weekly compositions (png) can be downloaded for one year at a time.
Contact	SMHI, 011-4958000, dataleveranser@smhi.se
Access to Service	https://opendata.smhi.se/apidocs/algae/index.html https://opendata-download-algae.smhi.se/api http://opendata-view.smhi.se/algae/ows?layers=algae_extent
User Guide	The maps are mainly based on automatic classification of optical satellite data, supplemented by manual interpretation and editing. Blooms can only be highlighted where the satellite's view is not obscured by clouds..
Background information	

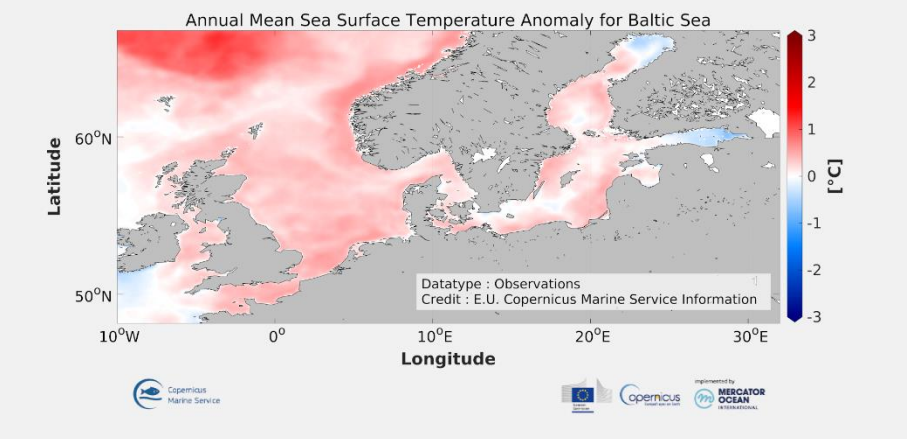
Service Example	
Data license	
Application Domain(s)	
Use Cases	
FREE KEYWORDS	

Name of Service	TARKKA
Service Provider	Finnish Environment institute (SYKE)
Status	Available since 26.06.2017
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Finland and the Baltic Sea Region
Spatial Resolution	Varies from 10 m to 1000 m
Temporal Resolution	Varies from daily observations to seasonal composites
Data used in Service	Satellite, in-situ and GIS
Overview of Service	TARKKA is a map service for visualizing high and moderate resolution satellite images and products. TARKKA contains true color images and water quality, snow and other observations from Finland, the Baltic Sea and Baltic Sea catchment area. In addition, the user can overlay various GIS datasets over the images, and view time series plots.
Contact	eotuki.syke@ymparisto.fi
Access to Service	www.syke.fi/tarkka/en
User Guide	http://wwwi4.ymparisto.fi/i4/eng/tarkka/tarkka_guide.pdf
Background information	The service was developed at SYKE during various projects. The main goal was to have a convenient tool for visualizing and browsing EO images. Link to Metadata.

Service Example	 Example of Sea Surface Temperature (SST) values in the Baltic Sea.
Data license	Creative Commons Attribution 4.0 International
Application Domain(s)	Water quality, lake ice, snow cover, land cover
Use Cases	Environmental monitoring
FREE KEYWORDS	Copernicus, Sentinel, Earth Observation, Landsat, Satellite imagery, Remote sensing, Water quality, Lake ice, Snow cover, Land cover, Surface Temperature

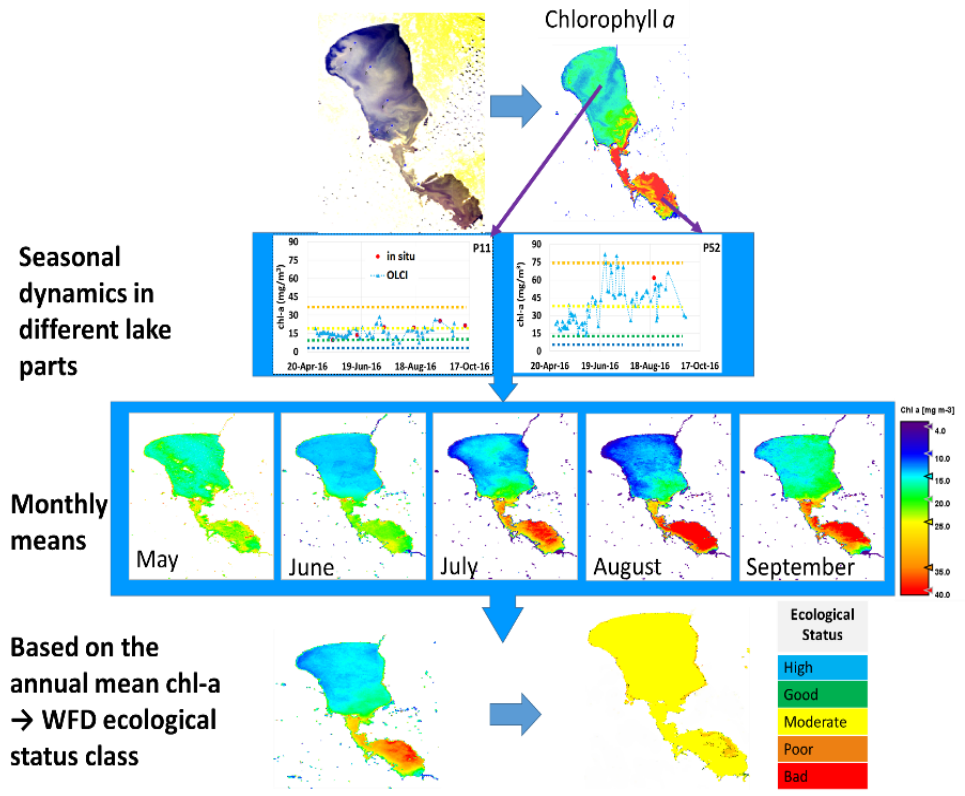
Name of Service	CMEMS Downstream Ice Service in the Baltic Sea: Land Fast Ice Extent and Thickness
Service Provider	Finnish Meteorological Institute
Status	Demonstration since Feb 2019
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Baltic Sea during ice season, from Nov/Dec to May
Spatial Resolution	500 m
Temporal Resolution	Daily
Data used in Service	Sentinel-1 and RADARSAT-2 SAR imagery, a sea ice thermodynamic model run at FMI, CMEMS Baltic Sea Physics Analysis and Forecast product
Overview of Service	Finnish Meteorological Institute (FMI) demonstrates a new service for the Baltic Sea: Baltic Sea landfast ice extent and thickness (BALFI). The service incudes maps of snow and ice thickness and ice deformation map on the landfast ice. The ice thickness map also shows the full extent of the landfast ice. The maps are based on three Baltic Sea products of the Copernicus Marine Environment Monitoring Service (CMEMS), SAR imagery, and a sea ice thermodynamic model (called HIGHTSI) run at FMI.
Contact	balfi@fmi.fi
Access to Service	https://balfi.nsdc.fmi.fi/
User Guide	https://balfi.nsdc.fmi.fi/ https://nsdc.fmi.fi/services/Copernicus_Marine_Service/BALFI
Background information	The Baltic Sea landfast ice zone may extend from a few hundred meters to several tens of kilometres from the coast and is place for many recreational activities such as skiing, skating, and ice fishing. Over thick landfast ice roads can be established between main land and populated islands (e.g. Hailuoto in the Bay of Bothnia) to speed up transportation compared to the use of ferries. Landfast ice also allows transport of material to or from islands without piers for large ships or usage of slow and costly barges. For all these activities extent and thickness of landfast ice are very important. Other important parameter includes snow thickness on sea ice and degree of ice deformation (e.g. location of ice ridges). Before the BALFI service the Baltic Sea landfast ice extent and thickness information in fine scale (~ 1 km) was not directly available from any product or source.
Service Example	see https://balfi.nsdc.fmi.fi/
Data license	The Creative Commons Attribution 4.0 International license (CC BY 4.0) is applied for the BALFI products.

Application Domain(s)	Targeted end-users include 1) people living on the Baltic Sea coast and islands who require information on landfast ice properties for recreational activities such as skiing, skating, snowmobiling and ice fishing, and for transporting people and goods along ice roads to/from islands; and 2) governmental and local authorities/institutions like 3) national Ice Services, icebreaker management, harbour authorities, search and rescue operators, and commercial activities, like tourism.
Use Cases	-
FREE KEYWORDS	Baltic Sea, sea ice, remote sensing

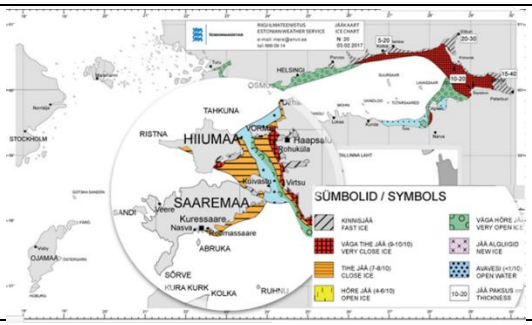
Name of Service	Ocean monitoring indicators of the Baltic Sea
Service Provider	Copernicus Marine Environment Monitoring Service
Status	Available since 2019
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Baltic Sea
Spatial Resolution	Spatial resolution is 1km for statistical maps. In case of climate change time series the Baltic Sea is considered as one statistical unit.
Temporal Resolution	Annual
Data used in Service	In-situ, satellite, model
Overview of Service	Ocean Monitoring Indicators (OMIs) are free downloadable trends and data sets covering the past quarter of a century. OMIs are used to track the vital health signs of the Baltic Sea and signals in line with climate change. The indicators include: Baltic Sea ice extent, temperature anomaly, temperature trend etc.
Contact	Priidik Lagemaa, priidik.lagemaa@taltech.ee
Access to Service	https://marine.copernicus.eu/science-learning/ocean-monitoring-indicators/
User Guide	Data can be downloaded from Copernicus Marine Environment Monitoring Service web site
Background information	Baltic Sea OMIs are calculated by Baltic Sea monitoring and Forecasting Centre (BAL MFC) which includes Marine Systems Institute at Tallinn University of Technology).
Service Example	
Data license	Free of charge: https://marine.copernicus.eu/services-portfolio/service-commitments-and-licence/
Application Domain(s)	Oceanography, Cryospher

Use Cases	Climate change monitoring
FREE KEYWORDS	Sea ice, sea temperature, climate change, time series

Name of Service	Downstream service development for supporting implementation of EU Water Framework Directive in Estonia
Service Provider	Tartu Observatory of University of Tartu
Status	In development, will be available on 2023.
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	20 m for S2/MSI data 300 m for S3/OLCI data
Temporal Resolution	Depends on cloud cover. Potentially available every 1-2 day during May-September for S3/OLCI data and every 4-5 days for S2/MSI
Data used in Service	Satellite
Overview of Service	Based on S2/MSI and S3/OLCI data processing chains will be developed to estimate transparency and phytoplankton related parameters in Estonian lakes. This data can be freely used to analyse the ecological status class estimation based on these parameters as required by EU Water Framework Directive.
Contact	Krista Alikas, e-mail: krista.alikas@ut.ee
Access to Service	Web portal address is not yet available
User Guide	Data will be freely available and directions will be given once the development of the service has been completed
Background information	Sentinel-3 /OLCI and Sentinel-2/MSI data will be used as an input and algorithms for transparency and phytoplankton will be applied. National ecological status class thresholds will be applied for specific lakes.

Service Example	
Data license	Not decided yet
Application Domain(s)	Limnology, ecological status assessment, spatial and temporal trends
Use Cases	Lakes
FREE KEYWORDS	Sentinel-3, Sentinel-2, Copernicus, lakes, ecological status class

Name of Service	Improved sea ice service using remote sensing data and methods.
Service Provider	Estonian Environment Agency (Estonian Weather Service)
Status	Currently the project is under development Service improvements will be available by 2021.
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	Ice products & satellite imagery with different resolution: 20m, 100m and 1000m
Temporal Resolution	Daily sea ice charts, satellite imagery and ice products.
Data used in Service	In-situ and satellite
Overview of Service	Enhanced service will provide operational and accurate sea ice charts, lake ice extent, as well as ice measurements to professional users (Estonian Maritime Administration, Rescue Board, Police and Border Guard Board, Estonian Road Administration) and public. Operational processing of the EO data ensures timely distribution of ice information via Web Map Service (WMS) and interactive webpage for public use (navigation, safety, tourism).
Contact	Jekaterina Služenikina, Jekaterina.Sluzenikina@Envir.ee Rivo Uiboupin, rivo.uiboupin@taltech.ee
Access to Service	https://www.ilmateenistus.ee/?lang=en
User Guide	The sea ice, lake ice and snow cover data retrieved from Sentinel-1, -2 and -3 missions will be available via Estonian Environment Agency's webpage and WMS service.
Background information	Marine Systems Institute at Tallinn University of Technology and CGI Estonia are responsible for: (1) development of the operational algorithms that enable to derive ice extent, type, concentration, thickness and snow cover from the Sentinel-1,-2 and-3 imagery; (2) the ICT modules which enable to archive the satellite sea ice products, deliver the products to expert users and distribute the ice info to general public via WMS service and web page. Estonian Environment Agency and IT Centre of the Ministry of the Environment are responsible for the routine operations of the ice monitoring service.

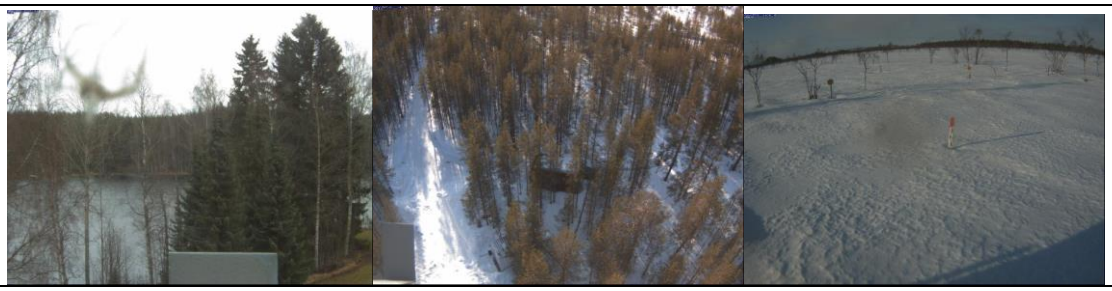
Service Example	
Data license	Not decided yet
Application Domain(s)	Marine weather, Oceanography, Sea ice, Cryosphere, Hydrology.
Use Cases	Safe winter navigation; Ice breaking service; Search and rescue activities on Baltic Sea and Estonian lakes; Tourism and fishing
FREE KEYWORDS	Copernicus, ESTHub, WMS service, sea ice

Scientific services

Name of Service	LPVP
Service Provider	Institute of Geodesy and Cartography
Status	Available since 2017
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	10 m – 1 km
Temporal Resolution	once a year
Data used in Service	In-situ and satellite
Overview of Service	The website contains the information about the land products validation and characterization in support to Proba-V, S-2 and S-3 mission. The page presents algorithms for estimating biophysical parameters such as LAI, fPAR, soil moisture. Two test sites are used – agriculture (JECAM-Wielkopolska) and wetlands (Biebrza NP). On the page user could find the map of land surface temperature, evapotranspiration and vegetation indices. It is possible to download the database with ground measurements The list of type of ground measurements which have been done during the fields campaigns is published.
Contact	prof. Katarzyna Dabrowska-Zielinska, katarzyna.dabrowska-zielinska@igik.edu.pl
Access to Service	https://lpvp.eu/
User Guide	The tabs contain links to individual sections: algorithms, maps, databases. Before downloading the database, contact the site administrator to get the password.
Background information	The portal was created as part of the project *Land Products Validation and Characterisation in support to Proba-V, S-2 and S-3 missions* funded by European Space Agency (ESA) [ESA-IPL-POE-SBo-sp-RFP-2015-708]. The contractors of the products are employees of Remote Sensing Centre in Institute of Geodesy and Cartography in Poland.

Service Example	
Data license	CC0
Application Domain(s)	
Use Cases	to estimate biophysical parameters, to classify
FREE KEYWORDS	biophysical parameters, vegetation indices, agriculture, wetlands, JECAM, in-situ data

Name of Service	MONIMET Camera Network
Service Provider	Finnish Meteorological Institute
Status	Available since 2016
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	N/A
Temporal Resolution	30 minutes
Data used in Service	Webcam
Overview of Service	MONIMET Camera network is a network of digital surveillance cameras for automated monitoring of phenological activity of vegetation and snow cover in the boreal ecosystems of Finland. Cameras were mounted at 14 sites, each site having 1-3 cameras. Detailed information for the camera network and the data can be found in MONIMET webpage.
Contact	Cemal Melih Tanis, Ali Nadir Arslan
Access to Service	https://zenodo.org/communities/phenology_camera/ https://monimet.fmi.fi/?page=Cameras
User Guide	Image datasets can be found under the Zenodo community 'Phenological time lapse images and data from MONIMET EU Life+ project (LIFE12 ENV/FI/000409).' Datasets in Zenodo are updated every year. For access to the data by FMIPROT over direct FTP (only for operational monitoring), contact MONIMET project team with the information implying your purpose and duration of your study.
Background information	Finnish Meteorological Institute, Natural Resources Institute of Finland, Finnish Environmental Institute and University of Helsinki has established a network of digital surveillance cameras for automated monitoring of phenological activity of vegetation and snow cover in the boreal ecosystems of Finland. Cameras were mounted at 14 sites, each site having 1–3 cameras. Peltoniemi et al. has documented the network, basic camera information and access to images in the permanent data repository in https://www.earth-syst-sci-data.net/10/173/2018/ .
Service Example	

	
Data license	CC4
Application Domain(s)	Land, vegetation, hydrology.
Use Cases	Phenology monitoring, snow cover monitoring
FREE KEYWORDS	camera network, vegetation phenology, snow cover, webcam monitoring, phenocam.

Forestry

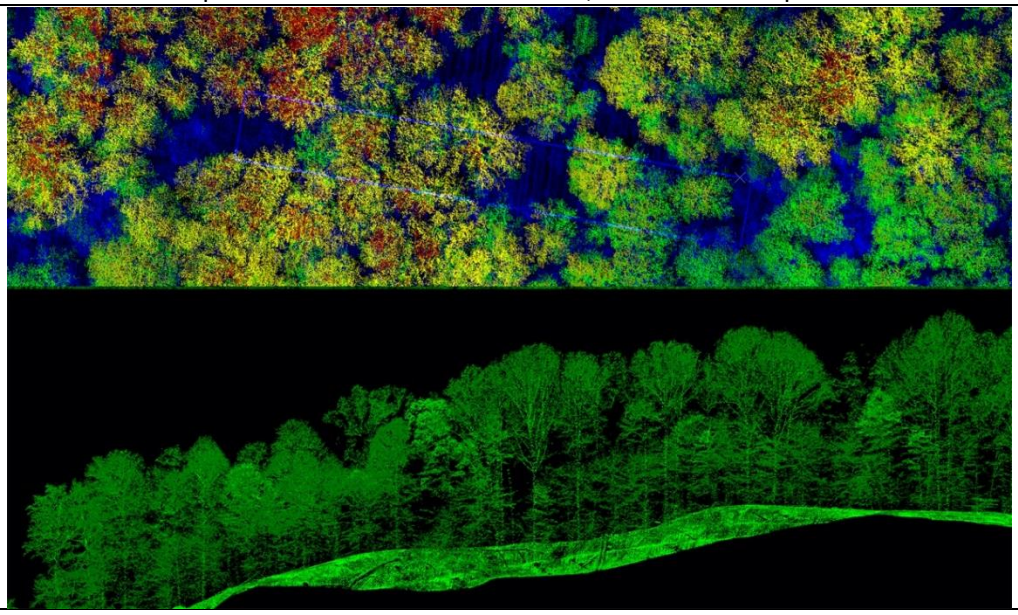
Name of Service	SAT4EST
Service Provider	Taxus IT / Institute of Geodesy and Cartography
Status	Available since 2018
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Local
Spatial Resolution	10 m
Temporal Resolution	Every 5 days
Data used in Service	Satellite
Overview of Service	The SAT4EST is the service which to administer non-state forest and dedicated to the local government administration in Poland. The EO based service provides a simple, intuitive and low-cost tool in a form of a web-based application easy to use and expand for another dataset. It integrates EO based products, ancillary data and allows calculating statistics over a given area and generating simple reports.
Contact	PhD Agata Hościło, agata.hoscilo@igik.edu.pl
Access to Service	http://www.sat4est.pl/?page_id=13&lang=en
User Guide	Service supports users in: preparing a tender for assembling forest inventory plans; identifying discrepancies between cadastral land records and actual status on the ground; verifying and accepting the existing forest inventory plan; monitoring execution of the tasks assigned in the inventory plans; verifying the whole plan after ten years; monitoring the forest changes and the service is easy to extend far beyond the scope and timespan of the project.
Background information	Earth observation based service supporting local administration in non-state forest management. The SAT4EST demonstration service is implemented in three selected districts: Nowy Targ, Sieradz and Legionowo. The proposed system consists of the separate elements: remote sensed data component, ancillary data storage component, data processing and map server component and Earth Observation viewing component

Service Example	 *Display and visual comparison of images from different dates using a vertical slider; right image is presented in natural colour composite and left in NIR composite.*
Data license	CC0
Application Domain(s)	
Use Cases	To supporting local administration in non-state forest management
FREE KEYWORDS	non-state forest, local administration, management

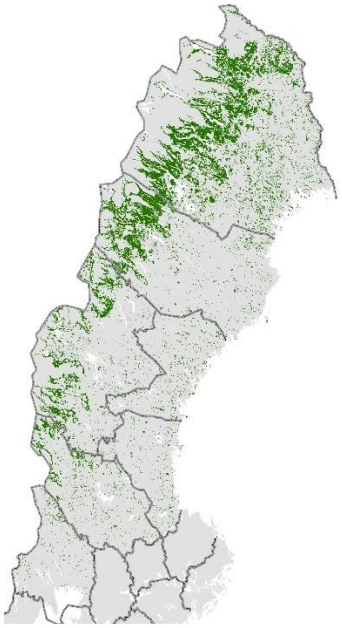
Name of Service	Change Detection Service
Service Provider	Bitcomp Oy
Status	Available since June 2019
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Finland and Germany
Spatial Resolution	10 m
Temporal Resolution	Updated whenever cloudless-enough images are available from Sentinel 2 (during summer time)
Data used in Service	Both in-situ and satellite satellite
Overview of Service	Service for detecting changes in forest land. Provides changed areas, estimated change type, change intensity. Results are available as shapefiles and map layers via WMS interface. Also available via WMS: RGB and false colour maps
Contact	R&D Manager Sanna Härkönen, sanna.harkonen@bitcomp.fi
Access to Service	https://bitcomp.com/change-detection-service/
User Guide	
Background information	Change detection service uses time series from ESA Sentinel 2 satellite images. The service is used by Finnish Forest Centre for legislation monitoring.
Service Example	

Data license	
Application Domain(s)	
Use Cases	Detecting changes in forests
FREE KEYWORDS	Change detection, cuttings, damages, illegal logging

Name of Service	ArboLiDAR forest inventories
Service Provider	Arbonaut Ltd.
Status	Available since 2005
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	Depending on customer requirement
Temporal Resolution	Depending on customer requirement
Data used in Service	In-situ / Satellite / Lidar / Aerial imagery
Overview of Service	Arbonaut's ArboLiDAR tool suite is developed for conducting remote sensing-based forest inventories and survey at various scales. Variety of data types, from high-resolution UAV images to medium-resolution satellite images, can be used for resources assessment purposes. ArboLiDAR tool suite can fuse and process different types of data simultaneously. UAV-based data can be used for small-scale forest inventories and operational planning. Combination of LiDAR data and aerial images are used for forest inventory and forest management planning at forest stand level. Data collected for forest inventories can be further utilized for other management and decision-making processes, such as forest road construction and harvesting planning, ditch and drainage management, hydrological analysis and biodiversity hot spot detection. The accuracy and cost efficiency of our airborne inventories has been proven in variety of conditions in Canada, Finland, Russia, Ireland, Uruguay, Sweden and in many other countries. Satellite-based resource assessment for large area measurements provides up to date information for strategic planning and decision-making. Combination of high-resolution satellite data together with field data allows to produce reliable information about the availability of forest resources.
Contact	Jussi Peuhkurinen jussi.peuhkurinen@arbonaut.com Russian market: Kseniia Plevak Kseniia.plevak@arbonaut.com
Access to Service	https://arbonaut.com/en/services/forest-inventory https://www.arbonaut.com/en/services/redd-climate-change

User Guide	Please contact our team for further information
Background information	In 1998, Arbonaut was the first company in the world to introduce an automatic single-tree forest inventory method. Some 7 years later, the new ArboLiDAR remote sensing technology allowed even more effective forest inventories for large areas. Ever since then Arbonaut has been working globally with inventories in natural and semi-natural forests in Europe, tropical forests in Asia and Africa as well as plantations in Southern America, Africa and Europe.
Service Example	
Data license	Depending on use case
Application Domain(s)	Forestry, REDD+
Use Cases	Used by public and private organization: Forest management Operational planning Strategic planning Biomass resource assessment Carbon stock assessment
FREE KEYWORDS	Forest inventory, LiDAR, Airborne Laser Scanning, remote sensing, UAV, forest management

Name of Service	Mapping continuity forest in boreal region - working material
Service Provider	Naturvårdsverket
Status	Available since 2017-03-31
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Sweden
Spatial Resolution	10 m
Temporal Resolution	-
Data used in Service	Both in-situ and satellite
Overview of Service	The mapping shows continuity forests / potential continuity forests in the boreal region. The aim has been to map continuity forests / potential continuity forests to give a current picture of areas with a high probability of forest continuity based on tried methods and new data. The counties covered by the project are Dalarna, Gävleborg, Jämtland, Norrbotten, Värmland, Västerbotten and Västernorrland. The substrate can be used for precise analysis of continuity forest. Data should be regarded as a work material that can be used as a starting point for more detailed analyzes and work
Contact	Naturvårdsverket, data@naturvardsverket.se
Access to Service	http://gpt.vic-metria.nu/data/land/kontinuitetsskog_boreal_region.zip
User Guide	http://gpt.vic-metria.nu/data/land/Slutrapport_Kartering_av_kontinuitetsskog_boreal_region_20170117.pdf
Background information	The mapping is carried out with comprehensive input in an automated production process. The analysis is performed in woodland according to delimitation from map data. In the area of analysis, the principle is to remove areas that in different image bases have been bare or are young during the time period from the first image substrate (approx. 60s) until today. The following documents have been used: historical orthophotos (1960s), satellite data (1970s, around 1990 and 2000 and current satellite data), laser scanning and existing mappings (large area mapping, actually cut from the forest board and KNAS in the mountains). The end result is a grid product in the boreal region with a resolution of 10 x 10 meters where the minimum mapping unit is greater than or equal to 0.5 hectare and wider than 20 meters,

Service Example	
Data license	No applicable conditions
Application Domain(s)	Environment, Biology and Ecology, Land cover
Use Cases	
FREE KEYWORDS	NMD National Ground Cover Data Ground Cover Data CadasterENV

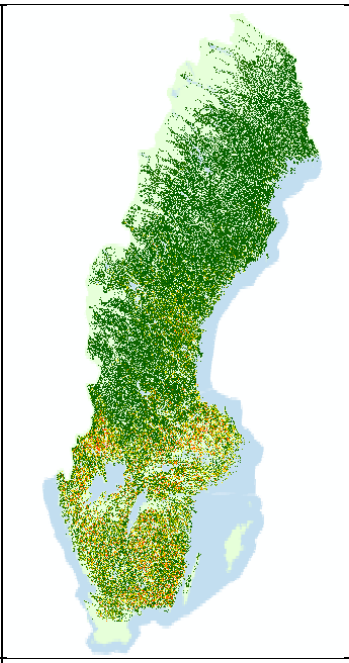
Name of Service	Forest Fellings
Service Provider	Foran Sverige AB
Status	In development
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	National
Spatial Resolution	10 m
Temporal Resolution	Monthly
Data used in Service	Satellite
Overview of Service	Automatically detects felled forest stands and provides coverage polygons with felling date
Contact	information@foran.se
Access to Service	www.foran.se
User Guide	Provided as WMS or WFS
Background information	A continuously change analysis on cloud free satellite images gives forest managers a complete and updated collection of harvested areas.
Service Example	
Data license	CC-BY
Application Domain(s)	
Use Cases	Forest inventories, power line management
FREE KEYWORDS	

Name of Service	Forest resource maps using remote sensing data and methods.
Service Provider	Estonian Environment Agency
Status	Currently the project is under development. Service will be available at the second half of 2020.
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	Forest resource products with resolution: 10m
Temporal Resolution	Annual forestry maps
Data used in Service	In-situ (NFI), satellite and LiDAR
Overview of Service	Service will provide raster maps for forest height, growing stock volume, tree species composition and vector map for clear cuts.
Contact	Allan Sims allan.sims@envir.ee
Access to Service	https://register.metsad.ee/
User Guide	Maps will be available via Forest Register.
Background information	Tartu Observation at Tartu University and Reach-U are responsible for development of the operational algorithms that enable to derive forest height, growing stock volume, tree species composition maps from the Sentinel-2 imagery and LiDAR data. Estonian Environment Agency and IT Centre of the Ministry of the Environment are responsible for the data processing and distribution via Forest Register.
Service Example	
Data license	Not decided yet
Application Domain(s)	Forestry

Use Cases	Forest management, LULUCF
FREE KEYWORDS	Copernicus, ESTHub, forest resource maps

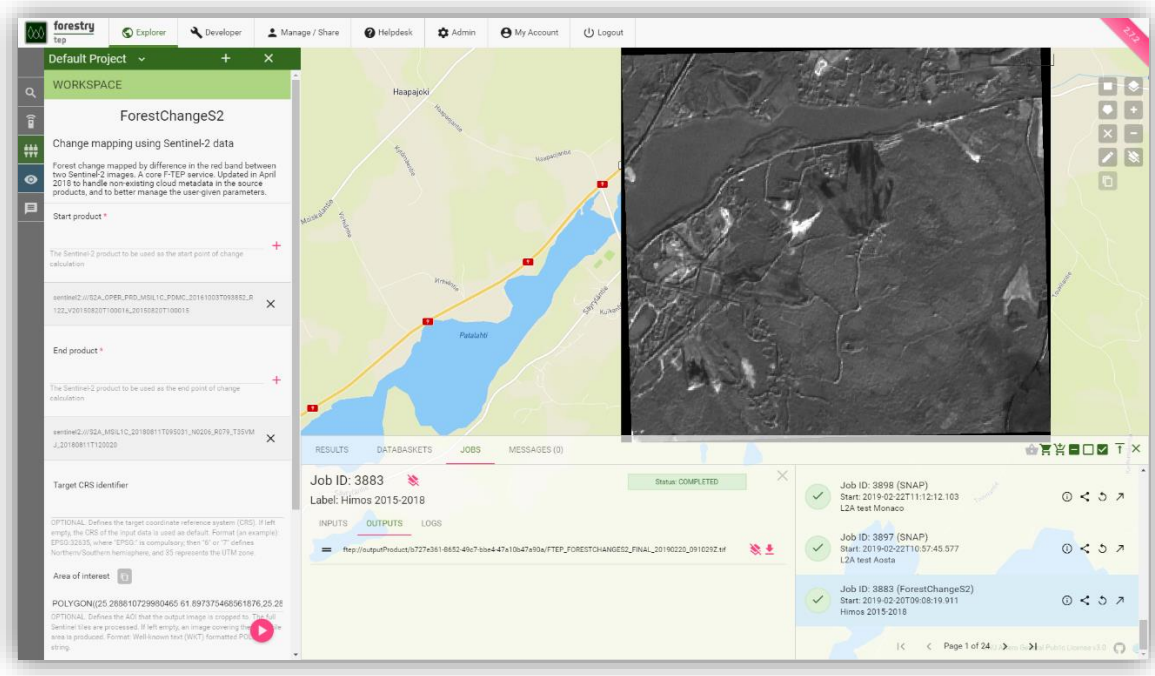
Name of Service	Actual harvests - Forest Agency
Service Provider	Swedish Forest Agency
Status	Since 2003
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Sweden
Spatial Resolution	10 m
Temporal Resolution	Yearly
Data used in Service	Sentinel 2, Landsat, IRS, Spot 4 och 5
Overview of Service	Harvested areas according to difference analysis between satellite images.
Contact	Swedish Forest Agency, skogsstyrelsen@skogsstyrelsen.se
Access to Service	http://geodpags.skogsstyrelsen.se/geodataport/feeds/UtfordAvverk.xml http://geodpags.skogsstyrelsen.se/arcgis/services/Geodataportal/GeodataportalVisaUtfordavverkning/MapServer/WmsServer?
User Guide	
Background information	
Service Example	
Data license	
Application Domain(s)	
Use Cases	
FREE KEYWORDS	Forestry, harvested areas, forest management

Name of Service	Risk index over forest attractive to spruce bark beetle (Ips typographus)
Service Provider	Metria AB
Status	Available since 2019…
Type of Provider	Private
Cost of Service	Not free
Coverage of Service	Nordic and Baltic Region
Spatial Resolution	10 m
Temporal Resolution	On demand
Data used in Service	Both in-situ, LiDAR and satellite
Overview of Service	Analyze service with AI-model to detect which forests that are attractive for spruce bark beetle. Using areas detected with bark beetle as reference data the AI model is trained to detect similar areas as risk forests. Use case can be found on Swedish forest agency's map service website: https://www.skogsstyrelsen.se/sjalvservice/karttjanster/skador-pa-skog/
Contact	Gustav Friberg, gustav.fribeg@metria.se
Access to Service	www.metria.se
User Guide	Contact Metria AB
Background information	Neural network has been developed by Metria AB from open published information from SLU about bark beetle habitat (Swedish University of Agricultural Sciences).

Service Example	
Data license	e.g. CC0
Application Domain(s)	Forestry
Use Cases	Swedish forest agency: https://www.skogsstyrelsen.se/sjalvservice/karttjanster/skador-pa-skog/
FREE KEYWORDS	Bark beetle, Ips typographus, Risk index.

Name of Service	SLU Forest Map (kNN-Sweden)
Service Provider	Swedish University of Agricultural Sciences
Status	
Type of Provider	
Cost of Service	free
Coverage of Service	Sweden
Spatial Resolution	10 m
Temporal Resolution	
Data used in Service	
Overview of Service	Extensive information with a high degree of detail over most of Sweden's forest land. Contains information on age, height, tree type, wood supply and biomass. The format is grid data (geotif) with a resolution of 25 × 25 meters in the projection RT90. The satellite images used come from LANDSAT 5 and LANDSAT 7 for the year 2000 and from SPOT 4 and SPOT 5 for the years 2005 and 2010. The raster layers can be used in GIS to make descriptions and analyzes at local, regional and national level. The name kNN-Sweden comes from the method, called Nearest Neighbors, and is based on the co-operation of satellite images and field data from the National Forest Assessment
Contact	
Access to Service	http://inspire2-1.slu.se:8080/geoserver/slu/ows?service=wfs&version=2.0.0&request=GetCapabilities
User Guide	
Background information	
Service Example	
Data license	
Application Domain(s)	
Use Cases	
FREE KEYWORDS	Forest, Environment

Name of Service	Forestry Thematic Exploitation Platform (Forestry TEP)
Service Provider	VTT Technical Research Centre of Finland Ltd.
Status	In pre-operations (publicly available) since 2017
Type of Provider	Public
Cost of Service	Subscription packages and pricing to be introduced in Q2 2020
Coverage of Service	Global
Spatial Resolution	As a processing and application platform, can accommodate processing in any spatial resolution
Temporal Resolution	As a processing and application platform, can accommodate processing in any temporal resolution
Data used in Service	Both satellite and in-situ data can be used. Provides direct access to various datasets (e.g. Copernicus Sentinel 1 and 2 data), and enables uploading of datasets by the users.
Overview of Service	Forestry TEP enables commercial, research and public sector users in the forestry sector globally to efficiently access satellite data based processing services and tools for generating value-added forest information products. Via the platform, the users can also create and share their own services, tools and generated products.
Contact	info@f-tep.com
Access to Service	https://f-tep.com/
User Guide	https://f-tep.com/usermanual
Background information	Forestry TEP was initiated in a project commissioned by the European Space Agency (ESA), as one of several TEP platforms to facilitate more effective use of Copernicus and other data in support of forest ecosystem monitoring and sustainable forest management. ESA continues to support the platform development. The platform is operated by VTT in cooperation with CGI in UK. It runs on CREODIAS, one of the Copernicus Data and Information Access Services (DIAS).
Service Example	The available processing services and tools: https://f-tep.com/content/service-portfolio Below, an example of forest change mapping.

	
Data license	As defined by each data producer. E.g., the Copernicus data can be exploited on a free, full and open basis.
Application Domain(s)	Primarily developed to provide online processing capabilities and applications for the forestry community (research, commercial and public entities). However, technically the platform is not domain specific, but can serve any image processing needs regardless of the domain. Users can create their applications within the platform that suit their requirements.
Use Cases	Currently used as the major processing environment for the VTT remote sensing team, and utilized by several private and public teams for their processing needs. Use case examples include e.g. forest inventory and carbon flux estimation in boreal and temperate regions, as well as land cover mapping and forest monitoring methodological development in tropical countries.
FREE KEYWORDS	Online processing; Platform; Copernicus; Sentinel; Satellite imagery; Remote sensing; Forestry; Forest inventory; Biomass; Carbon

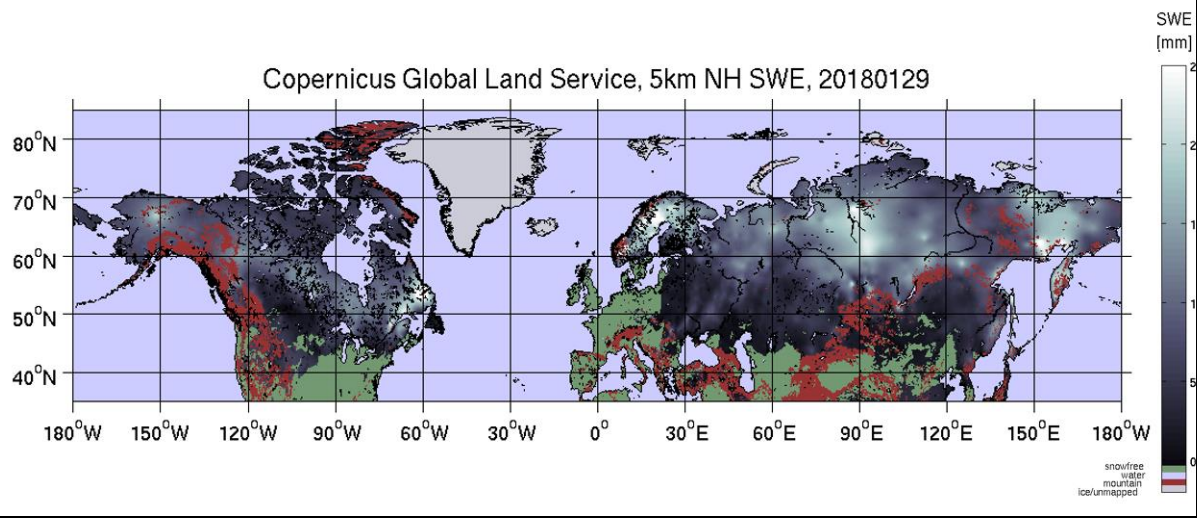
Name of Service	ArboFiRM
Service Provider	Arbonaut Ltd.
Status	Available since 2017
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	Depending on customer requirement
Temporal Resolution	Depending on customer requirement
Data used in Service	Both in-situ and satellite, LiDAR, aerial imagery
Overview of Service	ArboFiRM – Arbonaut Fire Risk Management – is providing critical information for strategic planning and decision-making for wildfire prevention and suppression in both wildland and wildland-urban interface areas. With ArboFiRM, LiDAR and satellite technologies are effectively utilized for analyzing the key natural and artificial factors that help organizations on both local and regional levels to make prevention and suppression decisions. All the analyzed information is available through web- and mobile interfaces, which allows accessing the critical data when most needed for decision making. With ArboFiRM, it is also possible to download data on a mobile device for offline use on the field.
Contact	Alejandro Barrios alejandro.barrios@arbonaut.com
Access to Service	https://arbonaut.com/en/products/arbofirm
User Guide	Please contact our team for further information
Background information	

Service Example	
Data license	Depending on use case
Application Domain(s)	Forestry, Environment, Infrastructure
Use Cases	Used by forest fire officers (decision makers) for: Wildland and wildland-urban interface fire prevention Wildland and wildland-urban interface suppression planning
FREE KEYWORDS	Wildfire prevention, wildfire suppression, forest fire prevention, forest fire suppression, LiDAR data, satellite data, wildland-urban interface

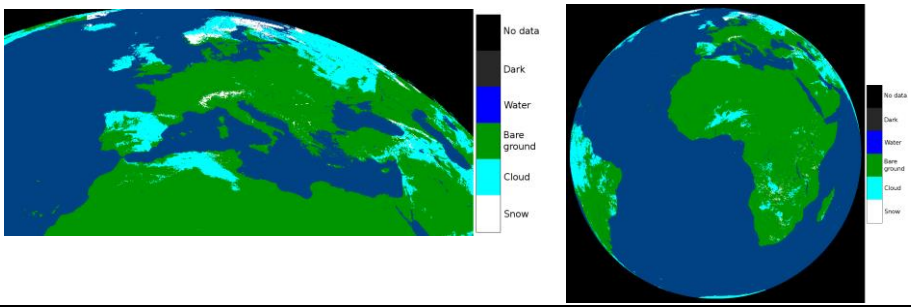
Snow monitoring

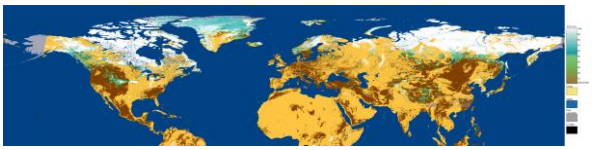
Name of Service	Snow in Europe
Service Provider	Space Research Center Polish Academy of Sciences
Status	Available since 2004
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Europe
Spatial Resolution	4 km
Temporal Resolution	daily
Data used in Service	Satellite
Overview of Service	Presented analyses are based on satellite observations, provided by NOAA Interactive Multisensor Snow and Ice Mapping System (IMS). They are daily updated and report snow cover conditions during current winter season.
Contact	Andrzej Kotarba, zoz@cbk.waw.pl
Access to Service	Web portal address / webpage
User Guide	On this website you may also find a historical data for past winters and climatological averages. Based on them you can independently assess how much current winter differs from a typical one.
Background information	Information presented on this website - i.e. the snow cover map for Europe and plots of snow cover extent - will help to find informations about snow cover. The information results from satellite monitoring of climate conditions in Poland (and Europe), conducted by Earth Observation Group at Space Research Centre of the Polish Academy of Sciences (CBK PAN)..

Service Example	
Data license	CCO
Application Domain(s)	
Use Cases	To monitor snow cover extent in Europe
FREE KEYWORDS	snow, cover, Europe

Name of Service	Copernicus Global Land Service, NH Snow Water Equivalent
Service Provider	Finnish Meteorological Institute for the Copernicus Land Service
Status	Operational, available since 03/2017.
Type of Provider	Public, via Copernicus
Cost of Service	Free
Coverage of Service	Northern Hemisphere, excluding mountains, Greenland and glaciers
Spatial Resolution	5 km
Temporal Resolution	Daily
Data used in Service	Both in-situ and satellite (ground-based snow depth observations, combined with satellite-based data)
Overview of Service	Daily Northern Hemisphere Snow Water Equivalent product
Contact	Kari Luojus / kari.luojus@fmi.fi
Access to Service	https://land.copernicus.eu/global/products/swe
User Guide	https://land.copernicus.eu/global/products/swe https://land.copernicus.eu/global/products/swe?qt-swe5k_characteristics=4#qt-swe5k_characteristics
Background information	SWE retrieval methodlology according to Takala et al. 2011 (doi:10.1016/j.rse.2011.08.014) and Pulliainen 2006 (doi:10.1016/j.rse.2006.01.002). Developed by FMI, in e.g. ESA GlobSnow and EC GlobLand frameworks.
Service Example	

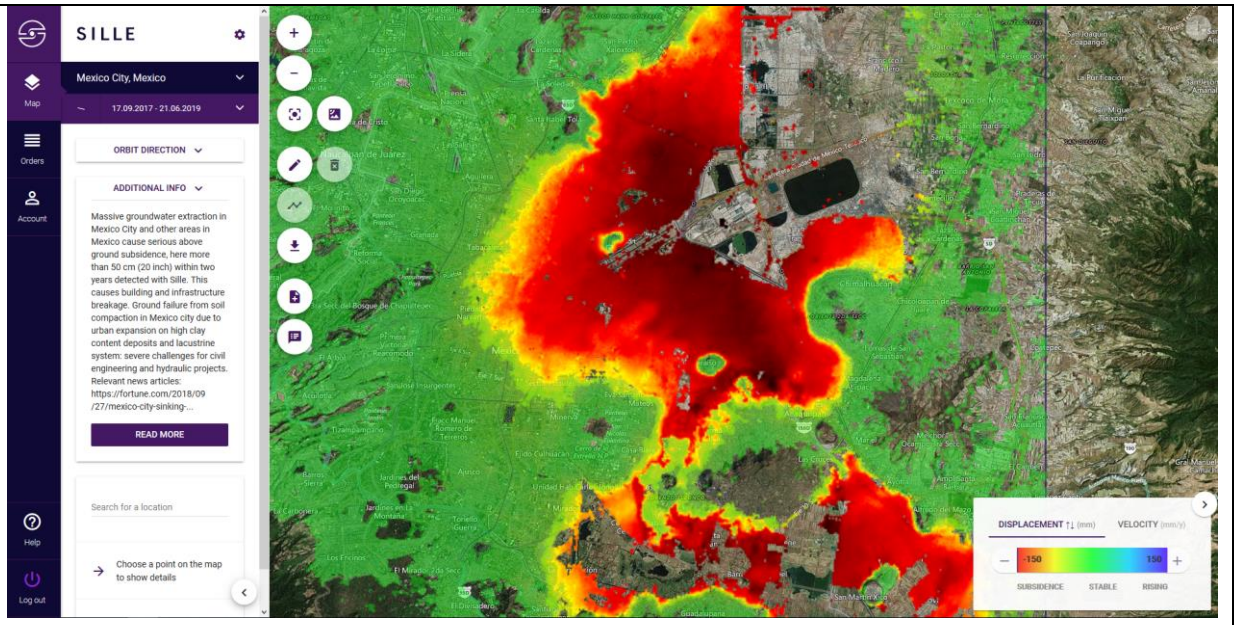
Data license	CC-BY: Creative Commons Attribution 4.0 International (free, openly available)
Application Domain(s)	Operational Hydrological and meteorology forecasting and analyses Climate Change monitoring
Use Cases	Applied as input for hydrological models by Finnish Environment Institute for operational forecasting. Applied by Swedish Meteorological and Hydrological Institute for hydrological (E-Hype) analyses. Applied for hydropower management and optimization by Kemijoki Oy, applied for climate change analyses.
FREE KEYWORDS	Snow Water Equivalent, Copernicus, Snow Cover, Snow Mass

Name of Service	H-SAF Snow Products
Service Provider	EUMETSAT
Status	Operational (H10, H11, H12, H13), In Development (H34, H35)
Type of Provider	Public
Cost of Service	Free
Coverage of Service	**H10, H11, H12, H13:** Pan-European region covering between latitudes [25, 75] and longitudes [-25, 45] **H34:** MSG Disk **H35:** Northern Hemisphere
Spatial Resolution	**H10, H34:** 5 km **H12, H35:** 0.01 degrees, **H11, H13**: 0.25 degrees
Temporal Resolution	Daily
Data used in Service	Satellite
Overview of Service	**H10, H34:** Daily snow extent (snow/nosnow) products, **H13**: Snow water equivalent **H12, H35:** Daily fractional snow cover products, **H11**: Snow status (dry/wet)
Contact	us_hsaf@meteoam.it
Access to Service	http://hsaf.meteoam.it/
User Guide	After creating an account at the project website, http://hsaf.meteoam.it/, "Download Products" button on top right or the "Products" menu can be used to access last 2 months of data
Background information	http://hsaf.meteoam.it/snow.php
Service Example	

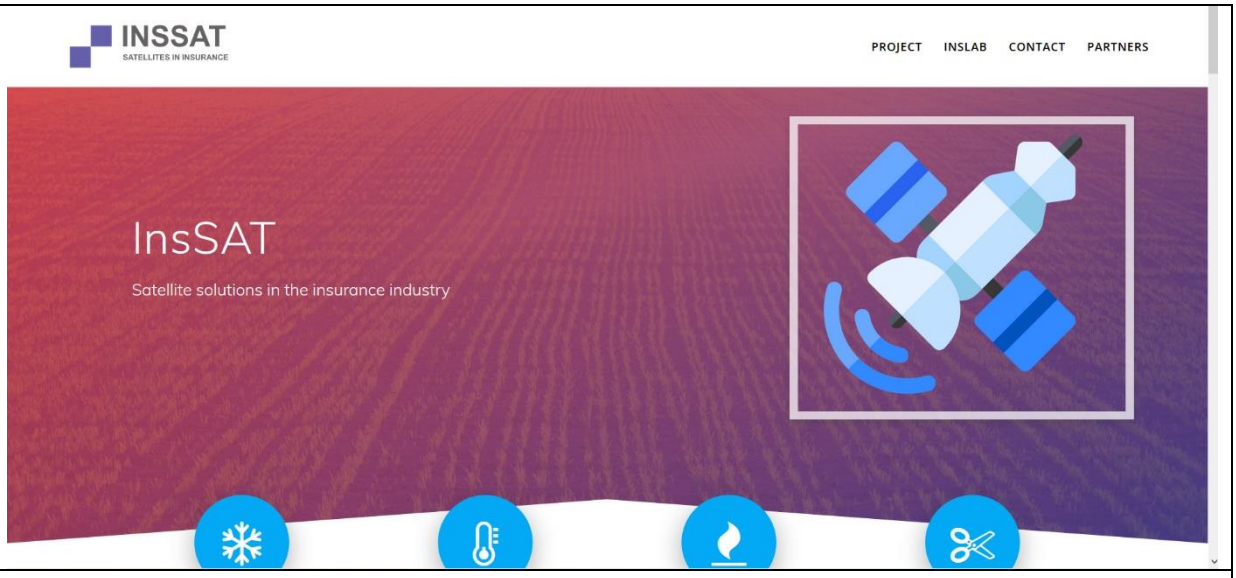
	 
Data license	All intellectual property rights of the H-SAF products belong to EUMETSAT. The use of these products is granted to every interested user, free of charge. If you wish to use these products, EUMETSAT's copyright credit must be shown by displaying the words "copyright (year) EUMETSAT" on each of the products used.
Application Domain(s)	Hydrology, Meteorology, Climate Change etc.
Use Cases	Water management, Flood monitoring
FREE KEYWORDS	Snow Cover; Satellite; SEVIRI; Meteosat; Geostationary

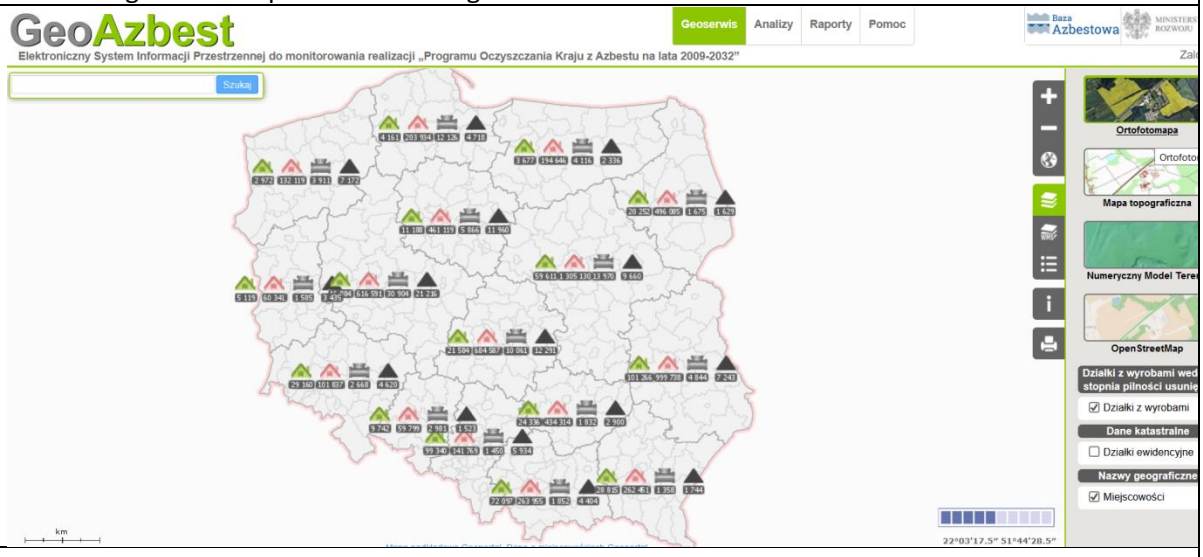
Insurance, Security and Risk

Name of Service	SILLE
Service Provider	AS Datel
Status	Available since April 2018
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	5x20 m
Temporal Resolution	6-12
Data used in Service	In-situ / Satellite
Overview of Service	Systematic monitoring of large and small areas using Sentinel 1 data with InSAR method. SILLE provides early warning information for critical infrastructure object like dams, bridges and also buildings.
Contact	https://www.sille.space/en/contact
Access to Service	sille.space
User Guide	SILLE has a very simple to use web interface. Read more about how to get started with SILLE: https://www.sille.space/app/#/help/manual
Background information	SILLE is developed by AS Datel that is one of the oldest IT companies in Estonia. AS Datel is based in Tallinn and has more than 100 employees. Through delivering multiple e-government systems, Datel has enabled the transformation of traditionally analog and manual services to digital and efficient systems across continents. The company works with leading organizations such as the European Space Agency, Federal Emergency Management Agency (FEMA), and the United Nations. SILLE was developed in co-operation with European Space Agency and is one of the few InSAR services in the world. Read more about InSAR technology: https://www.sille.space/app/#/help/technology

Service Example	 Massive groundwater extraction in Mexico City and other areas in Mexico cause serious above ground subsidence, here more than 50 cm (20 inch) within two years detected with SILLE. This causes building and infrastructure breakage. Ground failure from soil compaction in Mexico City due to urban expansion on high clay content deposits and lacustrine system: severe challenges for civil engineering and hydraulic projects. See example: https://www.sille.space/app/#/map/327/929
Data license	Results of the data analysis are the property of the client. More detailed terms and conditions can be found here: https://www.sille.space/app/#/terms
Application Domain(s)	Critical infrastructure objects (dams, bridges, roads), oil and gas fields, building monitoring, harbours, tunnels
Use Cases	See more uses cases at SILLE web page sille.space
FREE KEYWORDS	InSAR, Sentinel 1, Copernicus, deformation, monitoring, early warning

Name of Service	INSSAT
Service Provider	Consortium
Status	Available since 2016
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	1 m – 20 m
Temporal Resolution	Unregularly
Data used in Service	Both in-situ and satellite
Overview of Service	It is solutions based on spatial and satellite data build in cooperation with insurance companies. Developed products are the integration of multisource, verified and processed data. Services are tailored to the needs and requirements of insurance companies' departments: sales, damage handling, overwriting, management/
Contact	Karol Paradowski, karol.paradowski@igik.edu.pl
Access to Service	http://www.inssat.eu/#project-1
User Guide	InsLAB is a built and constantly developed portal for insurance companies. The tool allows for the implementation of end products, which are the results of cooperation with the client. The created solution has flexible functionalities adjusted to the specific needs of each company.
Background information	InsSAT implemented by the Institute of Geodesy and Cartography, OPEGIEKA, Sustainable Innovation. The project is co-financed by the European Space Agency.

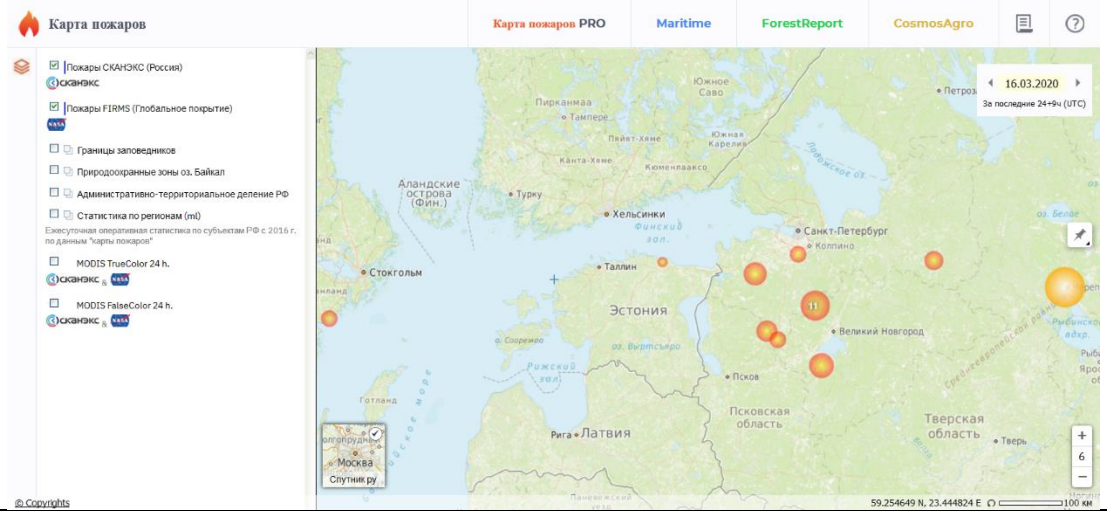
Service Example	
Data license	CC0
Application Domain(s)	
Use Cases	For precision farming
FREE KEYWORDS	Precision farming, crop, agriculture, commercial

Name of Service	ASBESTOS DATABASE
Service Provider	Ministry of Economic Development
Status	Available since 2017
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	1 m
Temporal Resolution	once a year
Data used in Service	Both in-situ and satellite
Overview of Service	ASBESTOS DATABASE is a tool for collecting and processing information about asbestos-containing products on territory of Poland.
Contact	SmallGIS Sp. z o.o., admin@bazaazbestowa.gov.pl
Access to Service	https://www.bazaazbestowa.gov.pl/en/
User Guide	The service provides multiple information and data in the forms of maps (graphical presentations) and reports (graphs, charts, tables, diagrams).
Background information	The database is maintained by the Ministry of Economic Development and it is one of the tools for monitoring the assumptions of the Programme for Asbestos Abatement in Poland 2009-2032.
Service Example	
Data license	CC0

Application Domain(s)	
Use Cases	To collect and process information about asbestos-containing products
FREE KEYWORDS	asbestos, database,

Name of Service	SAFEDAM
Service Provider	Consortium
Status	Available since 2017
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	10 m
Temporal Resolution	Once a year
Data used in Service	Satellite
Overview of Service	System SAFEDAM is for levees monitoring using a non-invasive, unmanned aerial platform, which scans from low-altitude, and satellite and aerial imagery. For this purpose innovative, photogrammetry and remote sensing technologies are used. Endangered areas, detected preliminarily by images are measured by non-invasive, flying measuring platform with centimeter accuracy using 3D measurement technique.
Contact	Prof. Zdzisław Kurczyński, zdzislaw.kurczynski@pw.edu.pl
Access to Service	https://safedam.astripolska.net/SafedamPortal/
User Guide	The website operates as a geoportal. It has many specialized products.
Background information	The project has received funding from Polish National Centre for Research and Development. Consortium: Warsaw University of Technology, Geodesy and Cartography Department (leader), Astri Polska, Institute of Meteorology and Water Management, The Central School of State Fire Service in Częstochowa, MSP Marcin Szender.

Service Example	
Data license	e.g. CC0
Application Domain(s)	
Use Cases	for levees monitoring
FREE KEYWORDS	Levees, dam, flood

Name of Service	Карта пожаров (Fire map)
Service Provider	SCANEX, Russia
Status	Available
Type of Provider	Private
Cost of Service	Free / By request
Coverage of Service	Global
Spatial Resolution	1 km × 1 km (size of fire seat)
Temporal Resolution	2-6 times per day
Data used in Service	Satellite Data Products based on satellite data: coordinates of fire seats Satellite Data: Terra, Aqua, NPP, NOAA-20
Overview of Service	System of rapid fire monitoring based on satellite data and providing data on coordinates of fire seats to a wide range of interested users. Global coverage is provided by data from the FIRMS system (https://earthdata.nasa.gov/firms): source products are downloaded from NASA (LANCE) servers immediately after they are published, and post-processing is performed on SCANEX servers. Automatic detection of fires using satellite data obtained in thermal bands: https://fires.ru/help.html
Contact	help@kosmosnimki.ru
Access to Service	https://fires.ru/
User Guide	https://fires.ru/help.html
Service Example	

Data license	The information needs to be clarified
Application Domain(s)	Emergency
Use Cases	Emergency management
FREE KEYWORDS	Fire monitoring, SCANEX, emergency management

Data portals

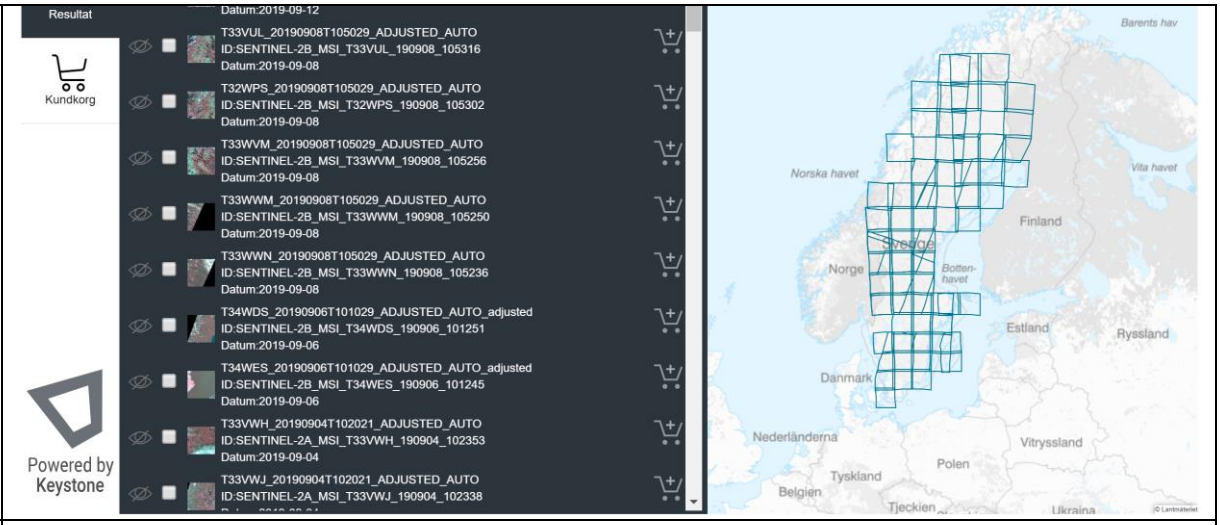
Name of Service	Estonian national mirror site (ESTHub)
Service Provider	Land Board, Republic of Estonia
Status	Available since 2019
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Estonian territory and a buffer zone of about 200 km
Spatial Resolution	~20 m for Sentinel 1 data 10-20 m for Sentinel 2 data 300 m for Sentinel 3 data
Temporal Resolution	Fast updates according to the satellite overfly
Data used in Service	Copernicus Sentinel satellites and Landsat 8
Overview of Service	The Land Board has been assigned the task of setting up and operating a national mirror site (ESTHub). Services: (1) view and download Copernicus data sets; (2) Computational capabilities for the scientific and governmental users
Contact	esthub@maaamet.ee
Access to Service	https://esthub.maaamet.ee/ https://ehdatahub.maaamet.ee/dhus/#/home
User Guide	These datasets will be freely available and downloadable for anyone, but the required notices on the data source must be provided.
Background information	The vast majority of Sentinel satellite data and the Copernicus services are made available and accessible on a free, full and open access basis with the aim of facilitating the exploitation of remote sensing data in different application domains. However, it is up to every country to create conditions for the optimum use of the data among its agencies and companies.

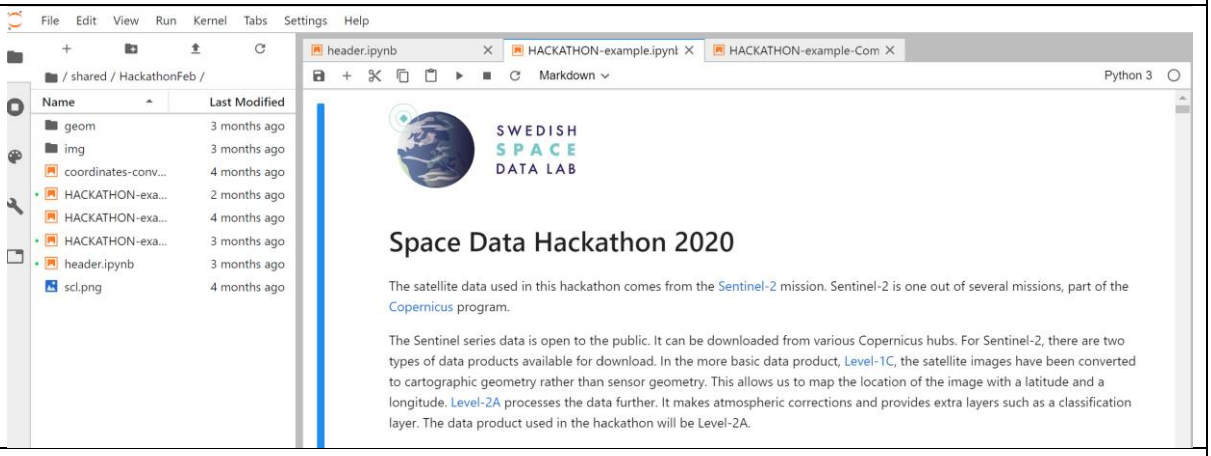
Service Example	  Sentinel 1, 2 and Landsat-8 data coverage Sentinel 3 data coverage
Data license	Open data policy
Application Domain(s)	Operational services based on Earth Observation data Education, Research
Use Cases	Operational services for the governmental institutions in the field of environment monitoring and agriculture are under development
FREE KEYWORDS	Mirror site, national space data hub, Sentinel data

Name of Service	Arbonaut ProMS
Service Provider	Arbonaut Ltd.
Status	Available since 2017
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	Depending on the customer requirement
Temporal Resolution	Depending on the customer requirement
Data used in Service	Both in-situ and satellite, LiDAR, aerial imagery
Overview of Service	Arbonaut ProMS (Project Management System) is a cloud-based platform for hosting various kind of geospatial information. User-specific data is added to the platform, allowing the user to maintain, update and share desired information conveniently through the platform's web- and mobile user interfaces. External API connections to various GIS data sources, other platforms and customer systems further increase the possibilities of the service. ProMS also provides different tools for analyzing user-specific data and handling project management. The platform is globally utilized as a public data portal, as well as in powerline and railroad vegetation management, crossing safety management, reforestation/afforestation activity monitoring and for roadside timber management, to mention a few.
Contact	Elisa Korpelainen elisa.korpelainen@arbonaut.com
Access to Service	proms.arbonaut.com
User Guide	Please contact our team for further information
Background information	ProMS web service was initially developed for Arbonaut Ltd.'s internal project management already in early 2010. Since then, the redevelopment of the system has taken it to successfully support both private and public organizations in geospatial data management and decision making across multiple industries.

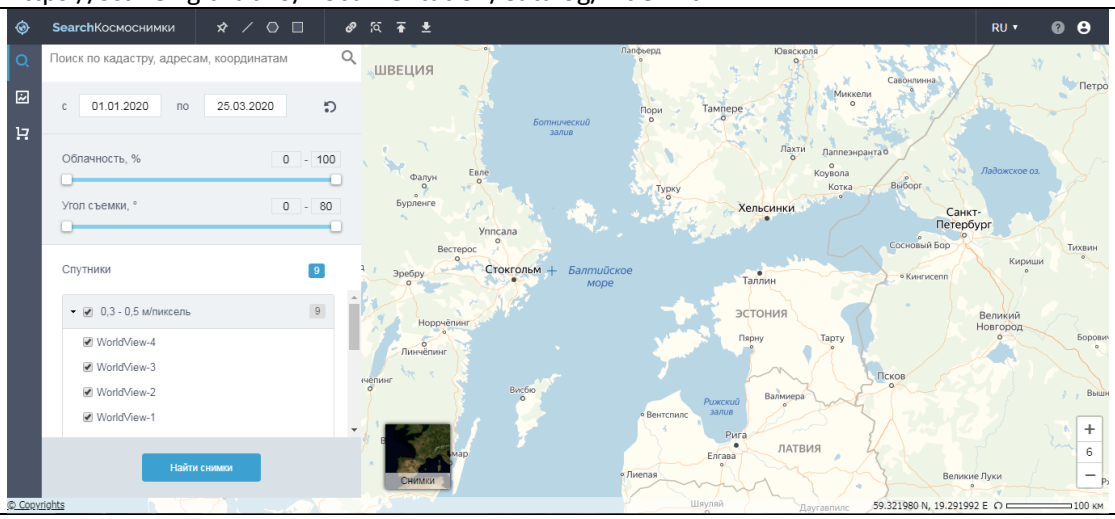
Service Example	 
Data license	Depending on use case
Application Domain(s)	Forestry, Environment, Infrastructure
Use Cases	ProMS is widely utilized for example in; Geospatial information management and sharing As a public data portal Powerline and Railroad vegetation management Crossing safety management Reforestation and afforestation activity monitoring Roadside timber management
FREE KEYWORDS	Data portal, geospatial information, geospatial data, project management, cloud-based platform, mobile platform

Name of Service	Saccess
Service Provider	Lantmäteriet.
Status	Available since 2007
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Sweden and Denmark
Spatial Resolution	10 to 80 m
Temporal Resolution	Yearly
Data used in Service	Landsat, SPOT, IRS and Sentinel data
Overview of Service	SACCESS means: • the Swedish National Satellite Database comprising satellite image coverages from various sensors over Sweden from 1970-ies, 1980-ies, turn of the Millennium, 2005 and yearly as of 2007. • the Danish National Satellite Database comprising satellite image coverages from various sensors over Denmark from 1980-ies, 2005 – 2007 and other periods as per separate decisions.
Contact	saccess@lm.se
Access to Service	saccess.lantmateriet.se
User Guide	https://www.lantmateriet.se/sv/Kartor-och-geografisk-information/geodataprodukter/produktlista/satellitbilder/#steg=1
Background information	

Service Example	
Data license	Saccess is available only to end users residing in the countries of Sweden, Norway, Finland or Denmark and registered by Lantmäteriet.
Application Domain(s)	Forestry, Environment, Infrastructure
Use Cases	
FREE KEYWORDS	Satellite imagery,

Name of Service	Swedish Space Data Lab
Service Provider	Nationellt rymddatalabb
Status	Available since 2019
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Sweden
Spatial Resolution	Depends on data source
Temporal Resolution	Depends on data source
Data used in Service	Open Space Data
Overview of Service	
Contact	ann-christin.eriksson@ri.se
Access to Service	https://www.ri.se/en/what-we-do/projects/swedish-space-data-lab
User Guide	
Background information	The objective of the Swedish Space Data Lab is to increase the use of data from space for the development of society and industry and for the good of the planet. Swedish Space Data Lab, is a collaboration project between AI Innovation of Sweden, the Swedish National Space Agency, Rise and Luleå University of Technology
Service Example	
Data license	Saccess is available only to end users residing in the countries of Sweden, Norway, Finland or Denmark and registered by Lantmäteriet.

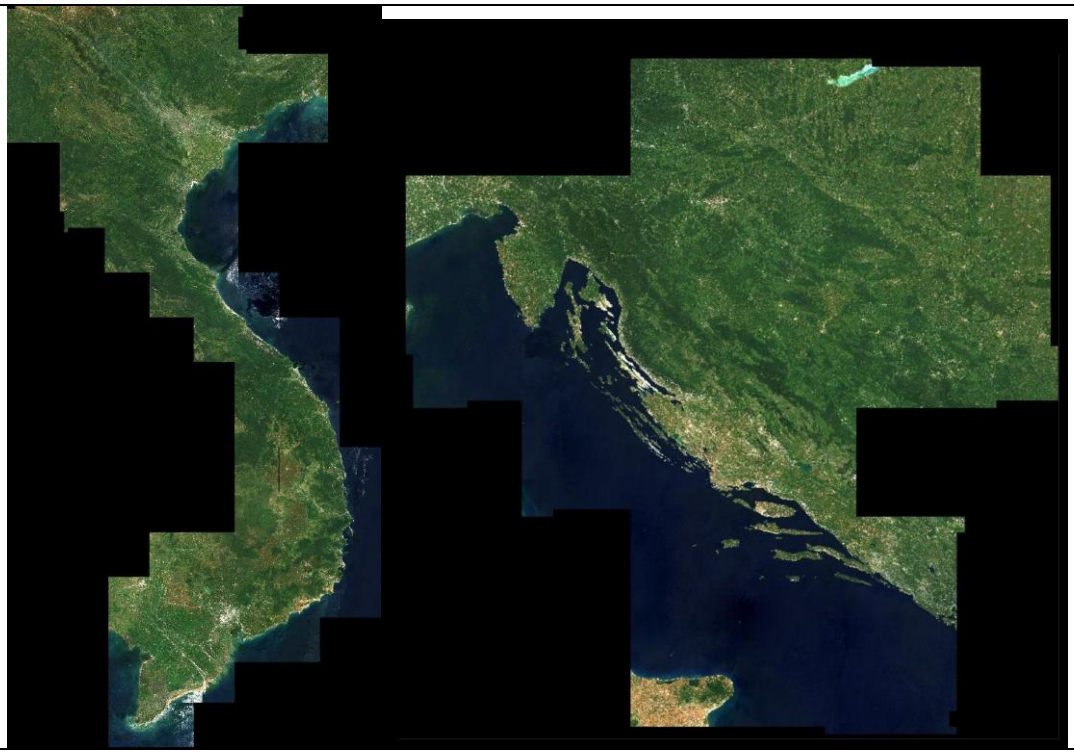
Application Domain(s)	Forestry, Environment, Infrastructure, etc.
Use Cases	
FREE KEYWORDS	Satellite imagery, AI, Data processing

Name of Service	Scanex Catalog
Service Provider	SCANEX, Russia
Status	Available
Type of Provider	Private
Cost of Service	Not Free (Access by request)
Coverage of Service	Areas of user interest
Spatial Resolution	Depends on the product (from 0.3 m)
Temporal Resolution	Depends on the product
Data used in Service	Satellite data: Resurs-P, Kanopus-V, WorldView 1/2/3/4, GeoEye-1/2/4, Pleiades A-B, Quickbird, KOMPSAT-2/3A, Superview-1, 1ATLAS, IKONOS, GaoFen-2, SPOT 6/7, ZiYuan 3 etc.
Overview of Service	Service provides access to satellite data
Contact	help@kosmosnimki.ru
Access to Service	http://search.kosmosnimki.ru/
User Guide	https://scanex.github.io/Documentation/Catalog/index.html
Service Example	
Data license	The information needs to be clarified
Application Domain(s)	Basic maps
Use Cases	Search and order of satellite data

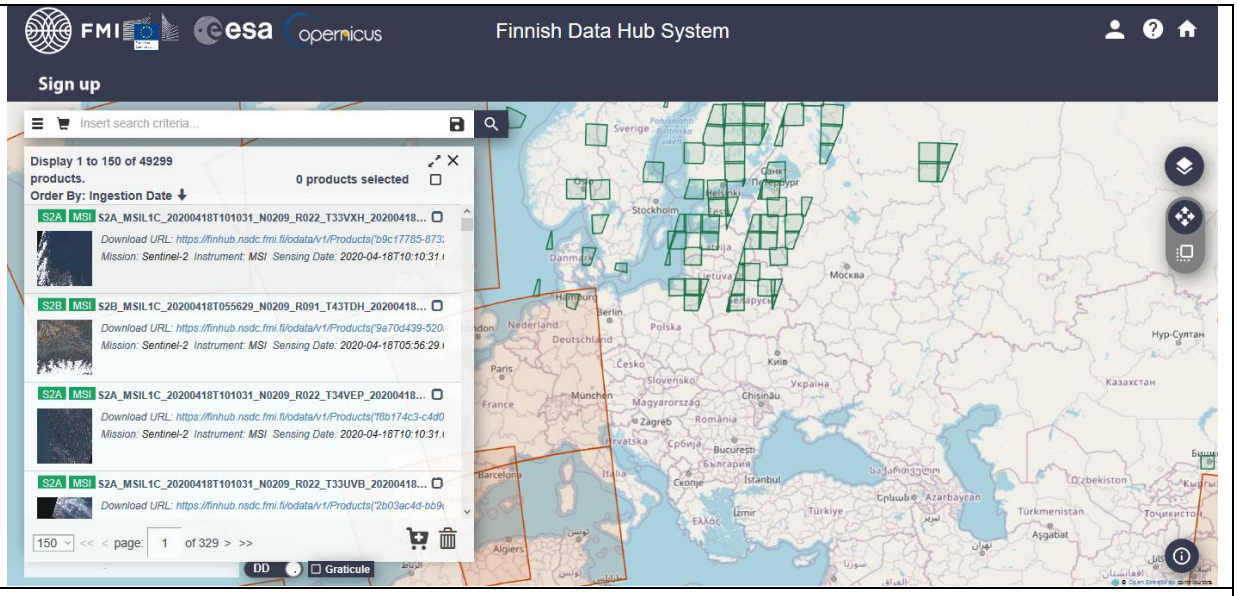
FREE KEYWORDS	Monitoring, SCANEX

Name of Service	Satellatest – Latest Satellite images
Service Provider	Foran Sverige AB
Status	will be available on Q2 2020
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	National
Spatial Resolution	10 m
Temporal Resolution	Daily where available
Data used in Service	Satellite
Overview of Service	Latest cloudless satellite images as a service
Contact	information@foran.se
Access to Service	www.foran.se
User Guide	Available as direct access, download and WMS through Forans map E-commerce site ForanFabriken.
Background information	Daily cloud free images from Sentinel-2 are added to a nationwide mosaic, providing an up-to-date map in an ever-changing world.
Service Example	
Data license	CC-BY
Application Domain(s)	
Use Cases	Visualizations, base maps
FREE KEYWORDS	

Name of Service	Analysis Ready satellite image mosaics
Service Provider	Terramonitor
Status	Available since 2019
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	10 m
Temporal Resolution	Monthly
Data used in Service	Satellite
Overview of Service	Analysis ready satellite image mosaics for large areas.
Contact	Lauri Häme, lauri.hame@terramonitor.com
Access to Service	terramonitor.com
User Guide	terramonitor.com
Background information	Terramonitor is a startup specialized in satellite data processing. The Analysis Ready service was released in 2019. The Analysis Ready product is atmospherically corrected orthomosaic with radiometric normalization and it contains 10-band multispectral data. The product is ready to use for different purposes, eg. monitoring land areas, vegetation, forests, agriculture, calculating indices and many more.

Service Example	
Data license	
Application Domain(s)	Forestry, Infrastructure, Environment, Agriculture
Use Cases	Forest evaluation, Land cover analysis, Carbon sink monitoring
FREE KEYWORDS	

Name of Service	Finnish Data Hub (FinHub)
Service Provider	Finnish Meteorological Institute's National Satellite Data Centre
Status	In operation (publicly available) since 24.5.2016
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Main focus is Finland. Some datasets are also available from various regions Baltic sea, Northern Hemisphere and Global coverage
Resolution	The spatial resolution varies for each satellite product type, for example Sentinel-1 depends on the acquisition mode and the level of processing. While the spatial resolution of Sentinel-2 is dependent on the particular spectral band. The revisit frequency varies for each mission. More details on the description of each mission is available from https://sentinels.copernicus.eu/web/sentinel/user-guides.
Data provided in Service	Provides access to Copernicus Sentinel 1, 2 , 3 and FMI Sentinel-5p L2 Surface UV product
Overview of Service	The Finnish Data Hub System is a web based system designed to provide EO data users with distributed mirror archives and bulk dissemination capabilities for the Sentinels products. It is hosted by the National Satellite Data Centre NSDC at the FMI Artic Space Centre. It provides unlimited free and open access to Sentinel-1, Sentinel-2, Sentinel-3 and Sentinel 5p. As part of the Copernicus Sentinel Collaborative Ground Station, the NSDC serves national and international partners with Copernicus Sentinel data, by hosting long-term archive of Sentinels' data.
Contact	finhub-support@nsdc.fmi.fi
Access to Service	https://finhub.nsdc.fmi.fi/
User Guide	https://nsdc.fmi.fi/services/service_finhub_help

Service Example	
Data license	Any Sentinel data available through the Finnish Data Hub will be governed by the Legal Notice on the use of Copernicus Sentinel Data and Service Information. https://sentinels.copernicus.eu/documents/247904/690755/Sentinel_Data_Legal_Notice
Application Domain(s)	Atmospheric, Oceanic, and Land monitoring
KEYWORDS	FINHUB;NSDC; Data dissemination Platform; Copernicus; Sentinel; Satellite imagery;

Name of Service	Up-to-date Satellite maps
Service Provider	Terramonitor
Status	Available since 2018
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	1 cm to 10 m with different temporal resolutions
Temporal Resolution	Daily updates with 10 m resolution, higher resolutions on demand
Data used in Service	Satellite
Overview of Service	Up-to-date cloudless satellite maps with date information delivered via WMTS protocol
Contact	Lauri Häme, lauri.hame@terramonitor.com
Access to Service	terramonitor.com
User Guide	terramonitor.com
Background information	Terramonitor is a startup specialized in satellite data processing. The up-to-date satellite map service was released in 2018 for land areas globally.
Service Example	
Data license	

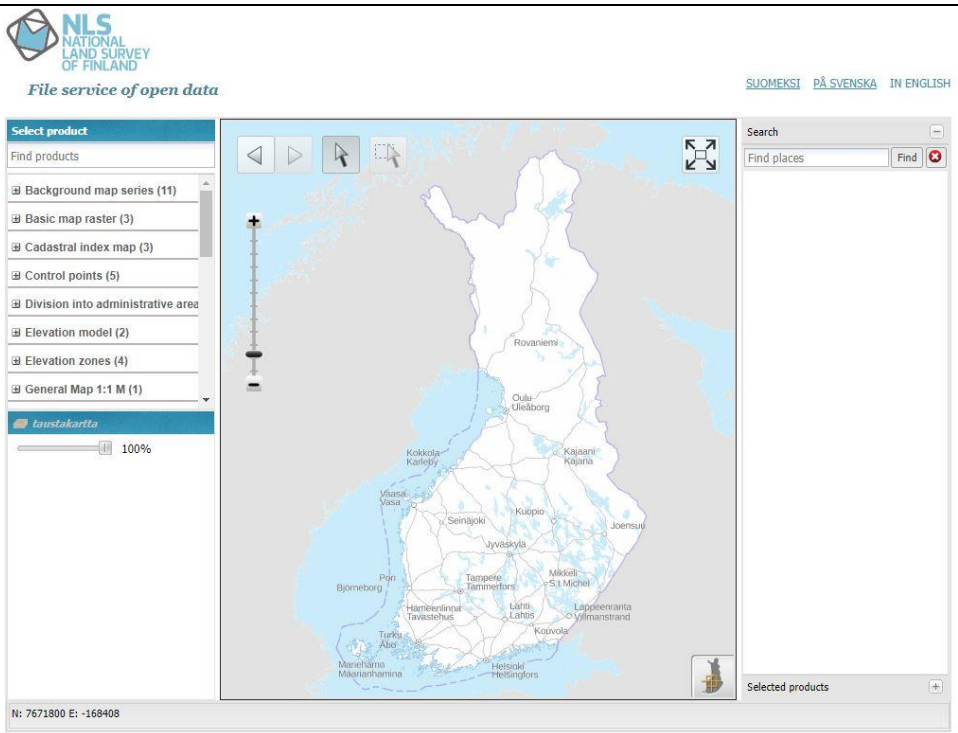
Application Domain(s)	Forestry, infrastructure
Use Cases	Forest monitoring, power line monitoring
FREE KEYWORDS	

Name of Service	Karttakuvapalvelu (Map service)
Service Provider	Maanmittauslaitos (National Land Survey of Finland)
Status	Available since 2013
Type of Provider	Public
Cost of Service	Not Free (Open WMTS is free of charge)
Coverage of Service	National
Spatial Resolution	0,25 m – 1 m
Temporal Resolution	Continuous
Data used in Service	In-situ
Overview of Service	Karttakuvapalvelu is a basic map API where you can get Background maps, cadastral index maps, orthophotos and topographic maps.
Contact	Internet service e-mail: verkkopalvelut@maanmittauslaitos.fi
Access to Service	https://www.maanmittauslaitos.fi/karttakuvapalvelu
User Guide	https://www.maanmittauslaitos.fi/karttakuvapalvelu
Background information	WMS: https://www.maanmittauslaitos.fi/kartat-ja-paikkatieto/asiantuntevalle-kayttajalle/kartta-ja-paikkatietojen-rajapintapalvelut-11 WMTS: https://www.maanmittauslaitos.fi/kartat-ja-paikkatieto/asiantuntevalle-kayttajalle/kartta-ja-paikkatietojen-rajapintapalvelut-1
Service Example	
Data license	CC 4.0
Application Domain(s)	-
Use Cases	Show different types of maps in a web service or page.

FREE KEYWORDS	map, service, karttakuvapalvelu, WMS, WMTS, Finland

Name of Service	Paikkatiedon kyselypalvelu (Geographic information service)
Service Provider	Maanmittauslaitos (National Land Survey of Finland)
Status	Available since 2019
Type of Provider	Public
Cost of Service	Some sub services are free
Coverage of Service	National
Spatial Resolution	-
Temporal Resolution	Continuous
Data used in Service	In-situ
Overview of Service	Has four (4) sub API's: cadastral information, geographic names, topographic data and buildings.
Contact	Internet service e-mail: verkkopalvelut@maanmittauslaitos.fi
Access to Service	https://www.maanmittauslaitos.fi/paikkatiedon-kyselypalvelu
User Guide	https://www.maanmittauslaitos.fi/paikkatiedon-kyselypalvelu
Background information	https://www.maanmittauslaitos.fi/kartat-ja-paikkatieto/asiantuntevalle-kayttajalle/kartta-ja-paikkatietojen-rajapintapalvelut-12 https://www.maanmittauslaitos.fi/kartat-ja-paikkatieto/asiantuntevalle-kayttajalle/kartta-ja-paikkatietojen-rajapintapalvelut-5 https://www.maanmittauslaitos.fi/kartat-ja-paikkatieto/asiantuntevalle-kayttajalle/kartta-ja-paikkatietojen-rajapintapalvelut-3 https://www.maanmittauslaitos.fi/kartat-ja-paikkatieto/asiantuntevalle-kayttajalle/kartta-ja-paikkatietojen-rajapintapalvelut-2
Service Example	-
Data license	CC 4.0 and Maanmittauslaitos
Application Domain(s)	https://www.maanmittauslaitos.fi/paikkatiedon-kyselypalvelu
Use Cases	Get geographic information via API.
FREE KEYWORDS	paikkatieto, GIS, Finland

Name of Service	Avoimien aineistojen tiedostopalvelu (File service of open data)
Service Provider	Maanmittauslaitos (National Land Survey of Finland)
Status	Available since 2012
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	1 m
Temporal Resolution	Continuous
Data used in Service	In-situ
Overview of Service	Download service for all open data of National Land Survey.
Contact	Internet service e-mail: verkkopalvelut@maanmittauslaitos.fi
Access to Service	https://tiedostopalvelu.maanmittauslaitos.fi/tp/kartta?lang=en
User Guide	https://www.maanmittauslaitos.fi/en/e-services/open-data-file-download-service
Background information	https://www.maanmittauslaitos.fi/en/e-services/open-data-file-download-service

Service Example	
Data license	CC 4.0
Application Domain(s)	https://tiedostopalvelu.maanmittauslaitos.fi/tp/kartta?lang=en
Use Cases	Download all free data in Finland.
FREE KEYWORDS	open, map, tiedostopalvelu, Finland

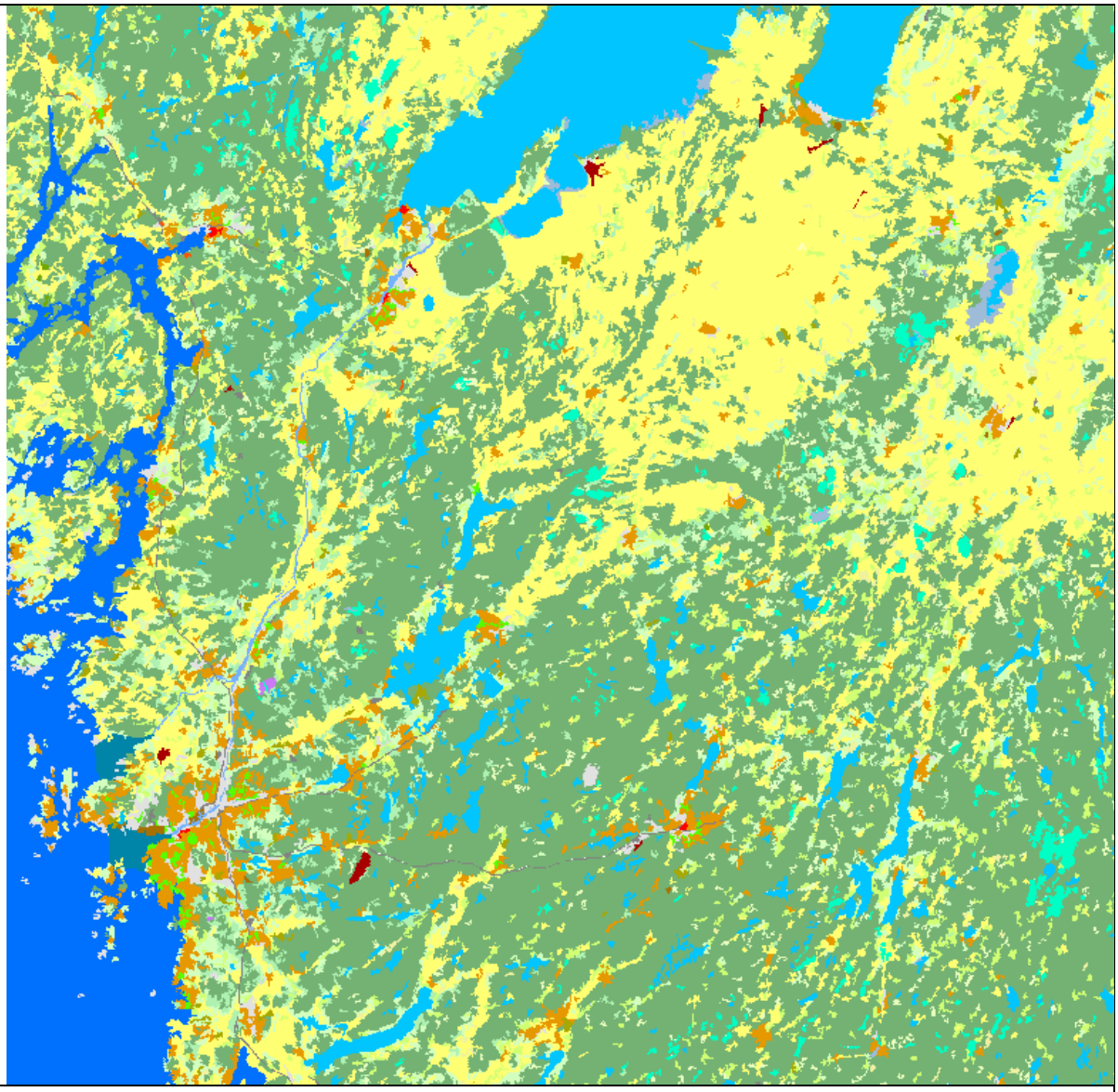
Name of Service	Global Watch Center
Service Provider	Swedish Space Corporation
Status	In development
Type of Provider	Private
Cost of Service	Mix of free/not free services
Coverage of Service	Global
Spatial Resolution	Depends on need
Temporal Resolution	Depends on need
Data used in Service	Both in-situ and satellite
Overview of Service	The fast development of space presents new opportunities to meet the big global challenges we are all faced with. An increasing number of satellites carrying advanced sensors provides huge amounts of data telling us about the situation on our planet. Today only a fraction of this data is used. With modern technology vast amounts of data from satellites could be collected, fused and analyzed. A view of the global situation can be created and shared around the world to help reach the goals of Agenda 2030. Examples would be to mitigate effects of climate change, as well as to contribute to an enhanced global cooperation and to strengthen international institutions such as the UN. SSC's initiative Global Watch Center aims to realize such a development. A preparatory study that was performed in 2019 and today a first application is on its way to be realized.
Contact	stefan.gustafsson@sscspace.com
Access to Service	Not launched yet
User Guide	Not launched yet
Background information	
Service Example	Environmental security, forestry, agriculture, migration, societal planning, etc.
Data license	
Application Domain(s)	
Use Cases	
FREE KEYWORDS	Global sustainability, climate change, cooperation, global, health, Agenda 2030

Vegetation mapping

Name of Service	Land cover mapping
Service Provider	Metria AB
Status	Available since 2017
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Nordic and Baltic Region. Sweden available free of charge through Swedish Environmental Protection Agency.
Spatial Resolution	10 m
Temporal Resolution	At request
Data used in Service	Sentinel-1, Sentinel-2 and Lidar
Overview of Service	Multi-scale and multi-purpose Land Cover mapping and monitoring systems for large areas of interest according to user specifications in close cooperation with user to provide high accuracy and quality.
Contact	Camilla Jönsson, Camilla.jonsson@metria.se
Access to Service	https://metria.se/
User Guide	Contact Metria AB
Background information	Service developed based on ESA funding in the CadasterENV-project.

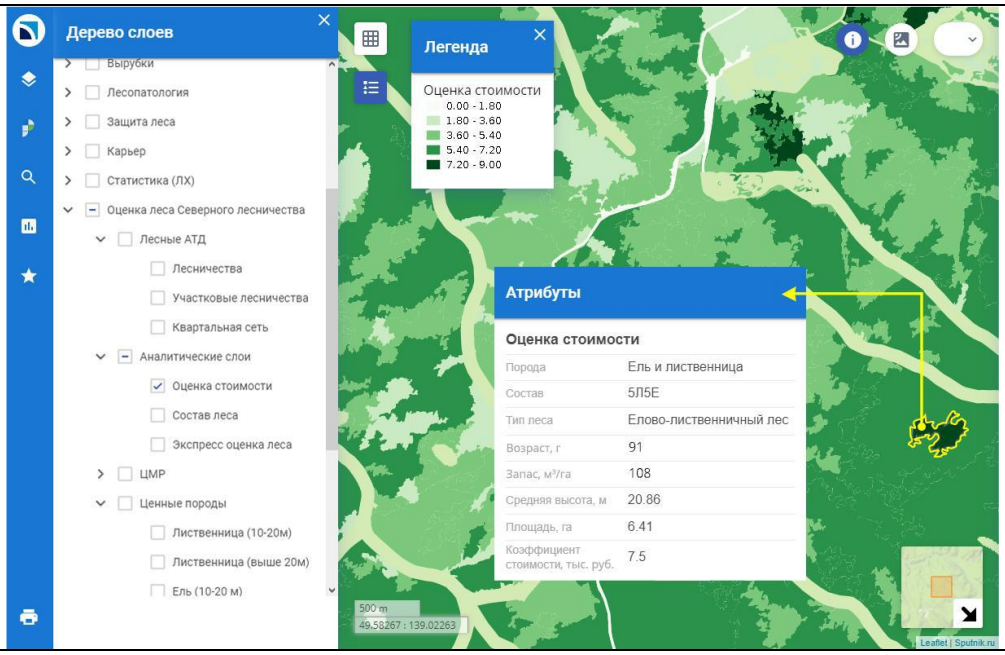
Service Example	
Data license	e.g. CC0
Application Domain(s)	Environment, Forestry, Climate
Use Cases	Swedish Environmental Protection Agency: Metria produced a national land cover database, Swedish National Land Cover Data (SLCD). More information and download: https://www.naturvardsverket.se/Sa-mar-miljon/Kartor/Nationella-Marktackedata-NMD/Ladda-ned/
FREE KEYWORDS	Land Cover Map, CadasterENV

Name of Service	Corine Land Cover
Service Provider	Lantmäteriet
Status	2015-11-03
Type of Provider	Public
Cost of Service	Free / Not Free
Coverage of Service	Sweden
Spatial Resolution	25 ha
Temporal Resolution	Six years
Data used in Service	In-situ / Satellite /Both in-situ and satellite
Overview of Service	Corine Land Cover reports for vegetation and soil types in 35 different classes for Sweden and the classification is three-digit with the following main classes: • Landscaped areas • Agricultural land • Forest • Wetlands • Water CLC 2018 consists of the following three layers: • CLC 2012 - A revised version of 2012 update. The minimum accounting unit is 25 hectares. • CHA 2018 - The changes detected in comparisons between satellite images from base year 2012 and images from base year 2018. The smallest accounting unit is 5 hectares in this layer. • CLC 2018 - An amalgamation of the revised CLC 2012 base and the change layer CHA 2018. The areas are generalized to a minimum size of 25 hectares. CLC 2012 consists of the following three layers: • CLC 2006 - A revised version of the 2006 update. The minimum accounting unit is 25 hectares. • CHA 2012 - The changes detected in comparisons between satellite images from the base year 2006 and images from the base year 2012. The minimum accounting unit is 5 hectares in this layer. • CLC 2012 - A merger of the revised CLC 2006 base and the change layer CHA 2012. The areas are generalized to a minimum size of 25 hectares.
Contact	Lantmäteriet, 026-633600, geodatasupport@lm.se
Access to Service	http://www.lantmateriet.se/sv/Om-Lantmateriet/Samverkan-med-andra/internationell-samverkan/corine-land-cover-clc-2012/
User Guide	
Background information	For CLC2012, mainly images recorded by SPOT 4 and 5 from the years 2011-2012 were used and visually compared with the images used in the production of CLC 2006 to identify the changes that occurred between the reference years 2006 and 2012. For CLC2018, images from Sentinel 2, registered in 2017, used and compared with the images used in the production of CLC2012.

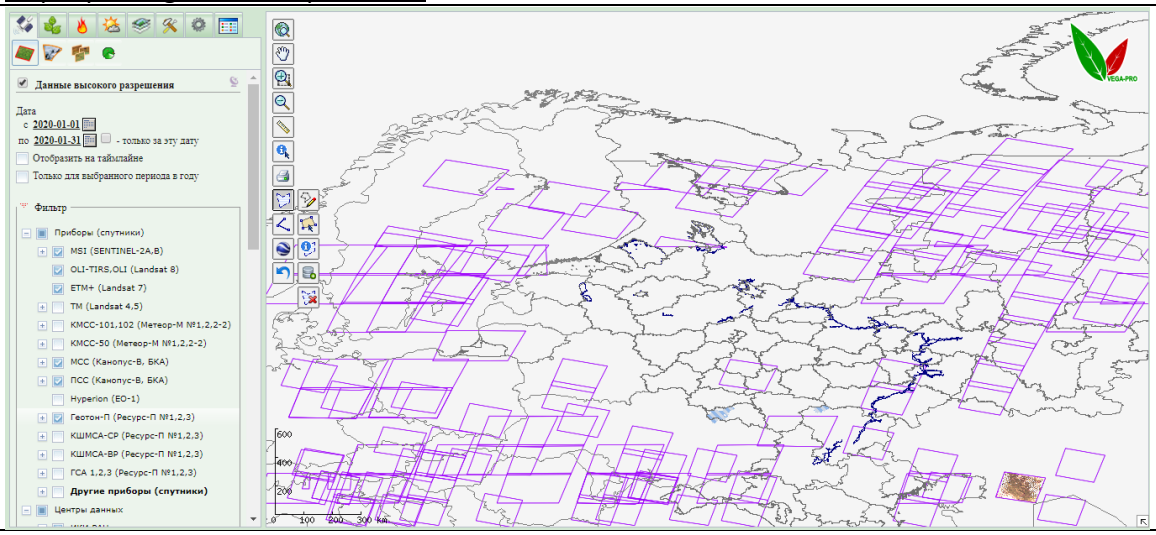
Service Example	
Data license	Access to this data is subject to the following conditions: 1.When data is disseminated or published, users should be informed of the source of this data, which is the European Union (EU). 2.Users shall ensure that they do not give the impression that the Union will officially support the activities of the user. 3.If the data has been adjusted or changed, the users must clearly indicate this. 4.Data remains the property of the European Union.
Application Domain(s)	Environment, Area-wide images and background maps, Land cover
Use Cases	
FREE KEYWORDS	

Name of Service	National land cover data 2018; base layer
Service Provider	Naturvårdsverket
Status	Available since 2019-03-12
Type of Provider	Public
Cost of Service	Free
Coverage of Service	Sweden
Spatial Resolution	10 m
Temporal Resolution	-
Data used in Service	Both in-situ and satellite
Overview of Service	National ground cover data (NMD) is a comprehensive mapping of Sweden. The purpose is to get basic information about the landscape and how it is changing. The mapping was carried out in 2017- February 2019 and thereafter the plans are for data to be updated every 5 years. NMD consists of a base mapping in 25 thematic classes in three hierarchical levels. The mapping is in grid format with 10 meters resolution and with a minimum mapping unit down to 0.01 hectares. The base mapping is available in two versions un generalized and one generalized version. In addition to the base mapping, the following additional layers are included: object height and coverage productivity (forest productivity) land low mountain forest These additional layers have separate metadata descriptions and download services.
Contact	Naturvårdsverket, data@naturvardsverket.se
Access to Service	http://gpt.vic-metria.nu/data/land/NMD/NMD2018_basskikt_ogeneraliserad_Sverige_v1_0.zip
User Guide	http://www.naturvardsverket.se/Samarmiljon/Kartor/Nationella-Marktackedata-NMD/
Background information	NMD base layers are mainly produced from satellite data and information from laser scanning. To a lesser extent, the mapping is delineated with the support of existing map data. Timeliness is shown in the product description for NMD base layers and metadata.

Service Example	
Data license	No applicable conditions
Application Domain(s)	Lake Water, Biology and Ecology, Coast and Sea, Areal-wide images and basic maps, Environment
Use Cases	
FREE KEYWORDS	NMD National Ground Cover Data Ground Cover Data CadasterENV

Name of Service	TerraTech Services
Service Provider	TerraTech, Russia
Status	Available
Type of Provider	Private
Cost of Service	Not Free (Access by request)
Coverage of Service	Areas of user interest
Spatial Resolution	Depends on the product
Temporal Resolution	Depends on the product
Data used in Service	Satellite data: Resurs-P, Kanopus-V, Sentinel-1, Sentinel-2, Airbus Defence and Space satellites, DigitalGlobe satellites etc. Products based on satellite data
Overview of Service	Thematic services based on satellite and UAV data and providing data on analysis and monitoring of infrastructure objects, agricultural lands, forestry, mining areas, terrain etc.
Contact	info@terratech.ru
Access to Service	https://terratech.ru/services/
User Guide	-
Service Example	

Data license	The information needs to be clarified
Application Domain(s)	Basic maps, Agriculture, Forestry, Environment, Industry, Construction
Use Cases	Monitoring of agriculture, forestry, industrial objects
FREE KEYWORDS	Monitoring, TerraTech

Name of Service	VEGA-PRO
Service Provider	Space Research Institute, Russia IKIZ LLC, Russia
Status	Available
Type of Provider	Public / Private
Cost of Service	Free (for scientific research) By request/payment
Coverage of Service	Global (satellite data) Russia and neighboring countries (thematic products)
Spatial Resolution	Depends on the product
Temporal Resolution	Depends on the product
Data used in Service	Satellite data: Resurs-P, Kanopus-V, Sentinel-2, Landsat 8, Hyperion Products based on satellite data
Overview of Service	Service for professional work with satellite data archives and other geospatial information, which provides a wide range of tasks for assessing and monitoring renewable biological resources, related primarily to the interests of the agro-industrial complex and forestry. The service is based on archives of vegetation status data updated in near-real-time on the territory of Russia and neighboring countries, obtained on the basis of satellite remote sensing data. For any district of this territory, the archives have daily updated data from the beginning of the 21st century to the present.
Contact	vega@smis.iki.rssi.ru
Access to Service	http://pro-vega.ru/
User Guide	http://pro-vega.ru/descriptions.sht
Service Example	
Data license	The information needs to be clarified

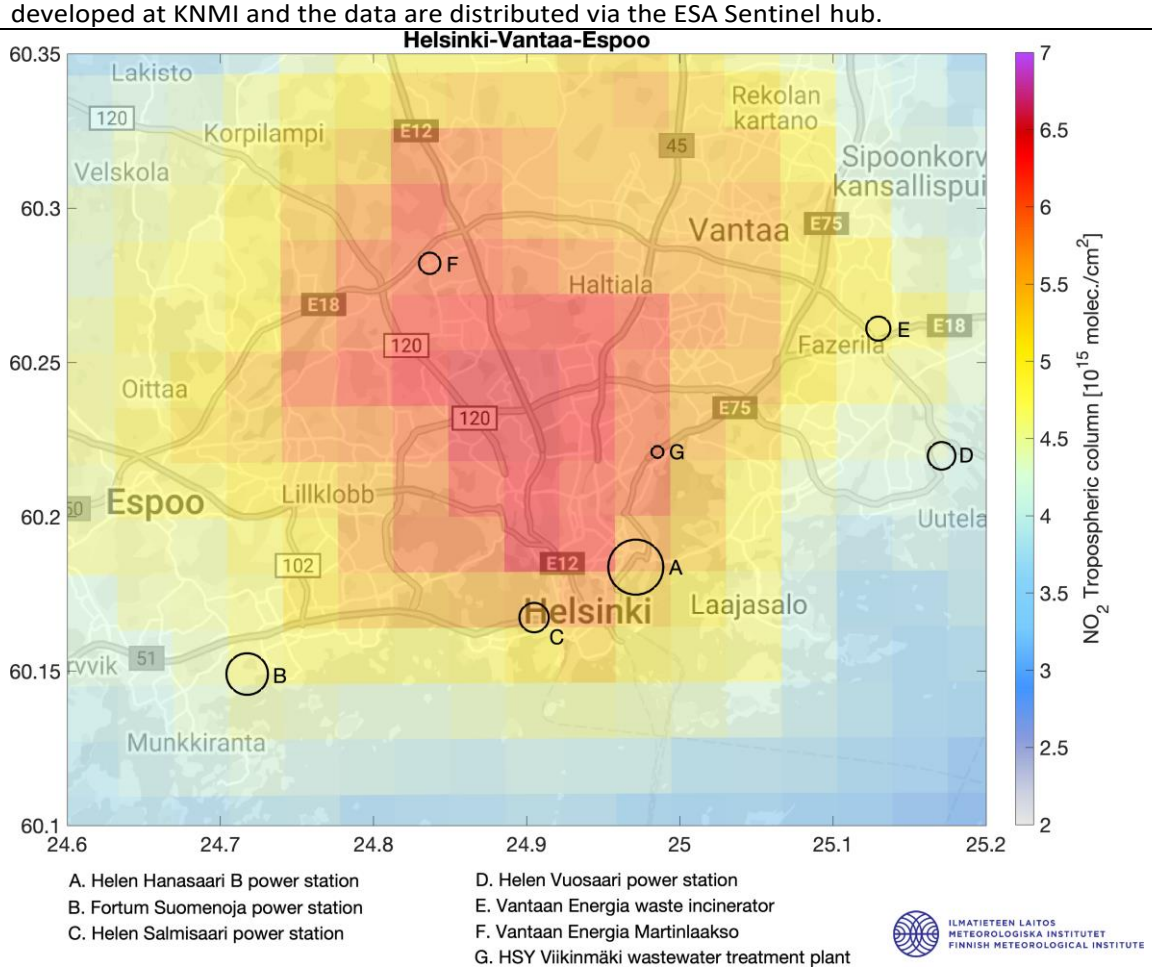
Application Domain(s)	Agriculture, Forestry, Environment
Use Cases	Monitoring of vegetation cover for agriculture and forestry management
FREE KEYWORDS	Monitoring, Vega-Pro

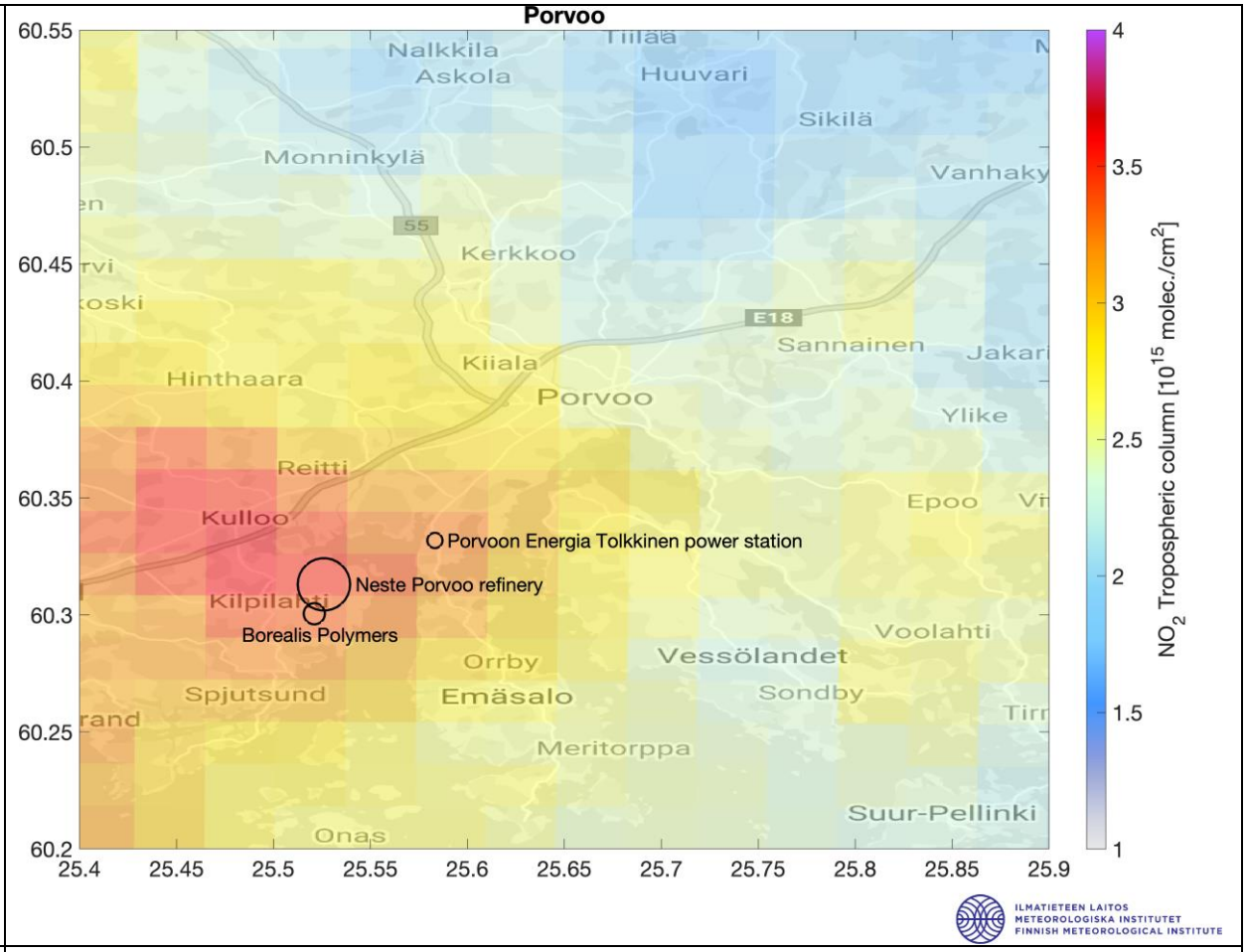
City Planning

Name of Service	AeroZee
Service Provider	UrbanZee
Status	In development
Type of Provider	Private
Cost of Service	Not free
Coverage of Service	Global
Spatial Resolution	Our service uses mobile sensors, and spatial resolution can be as good as GPS allows.
Temporal Resolution	Our service uses a sensor that measures every minute.
Data used in Service	Both in-situ and satellite
Overview of Service	Our service uses mobile sensors which can used to measure single streets or even entire cities in detail, for instance by deployment on public buses.
Contact	Aschwin van der Woude, aschwin@urbanzee.com
Access to Service	http://urbanzee.com
User Guide	Not currently available
Background information	UrbanZee is a startup located in Turku, aimed at not only measuring entire cities in detail but also involving citizens through a unique gamified crowd-sourcing approach.
Service Example	 Example: Detailed measurement of a local shopping-mall

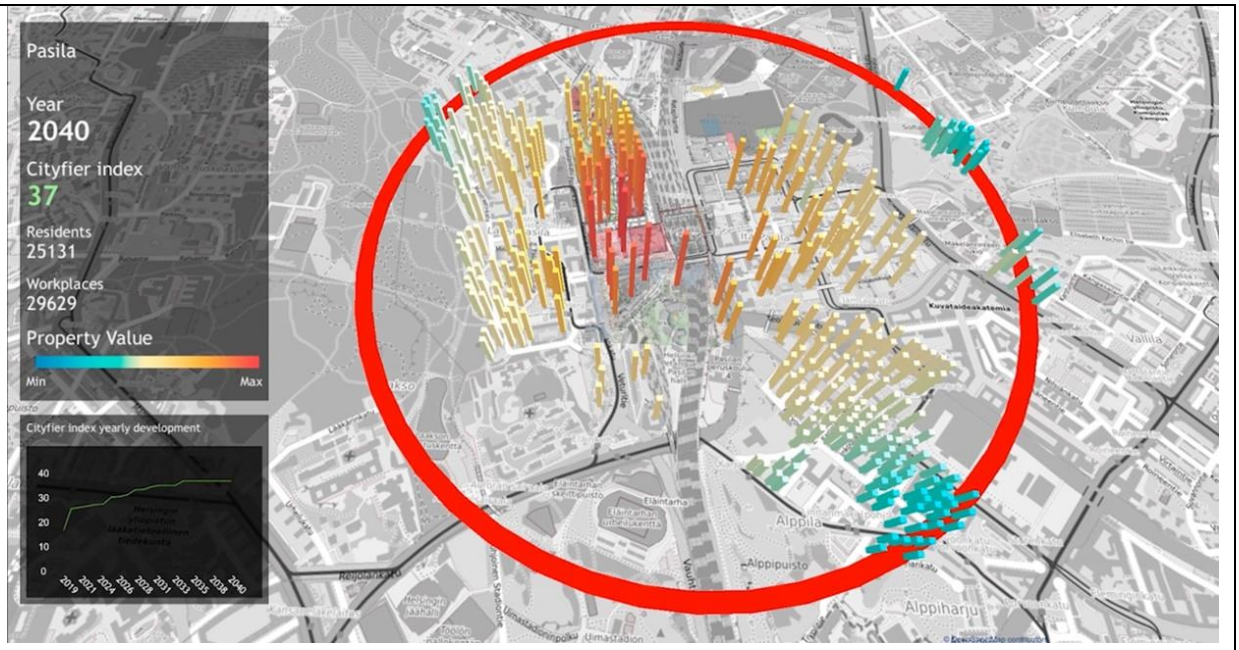
Data license	e.g. CC0
Application Domain(s)	
Use Cases	
FREE KEYWORDS	Air-quality, IoT, Internet of Things, Smart city

Name of Service	TROPOMI/S5P tropospheric NO2 maps over Finland
Service Provider	Finnish Meteorological Institute (FMI)
Status	Available since 2020
Type of Provider	Government
Cost of Service	Free
Coverage of Service	Finland
Spatial Resolution	2x2 km^2
Temporal Resolution	Annual averages (2019)
Data used in Service	Satellite: TROPOMI NO2 tropospheric columns Emission point sources: E-PRTR inventory Upcoming: in situ NO2 from AQ station
Overview of Service	The website provides maps of nitrogen dioxide (NO2) concentrations over Finnish cities for monitoring the distribution of air polluting emissions. Users might include city or other environmental authorities as well as private companies and citizens.
Contact	Iolanda Ialongo, Senior researcher at FMI Email: iolanda.ialongo@fmi.fi
Access to Service	Web portal address / webpage https://sampo.fmi.fi/airpollution/no2/
User Guide	https://sampo.fmi.fi/airpollution/no2/ About the data
Background information	The maps are based on the average of the satellite-based NO2 tropospheric columns retrieved by the Copernicus TROPOMI/Sentinel-5P satellite instrument over the period 1.4.-30.9.2019. Nitrogen dioxide (NO2) is an air pollutant mainly generated by combustion processes from anthropogenic pollution sources (including transportation, energy production and other industrial activities). Concentrations of short-lived gases like NO2 can be used as proxies of NO2 emissions when averaged in time and space as done in this website's maps, since averaging removes some of the short-term variability due to changing meteorological conditions. TROPOMI observations are only available 2-3 times a day over Finland, around 11-15 local time. The S5P satellite overpass time typically corresponds to the NO2 daily local minimum between the morning and afternoon peaks due to commuter traffic, while in situ air quality measurements are available at high temporal resolution throughout the day. In addition, since satellite-based NO2 retrievals are based on the solar light reflected from the earth's surface and atmosphere back to the satellite, TROPOMI NO2 retrievals are not available during the night, during winter at high latitudes or under cloudy conditions. On the other hand, satellite retrievals have daily global coverage and can complement traditional air quality information where the latter are not available.

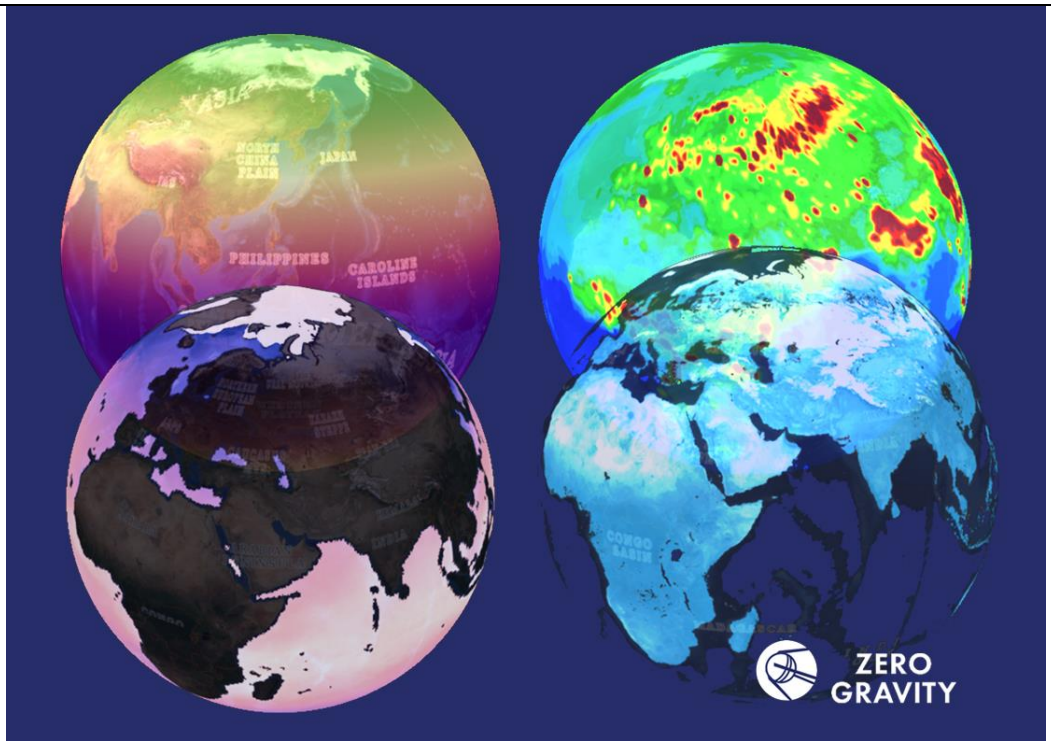
	The service maintenance and the data analysis are carried on at the Space and Earth Observation Centre at the Finnish Meteorological Institute. The retrieval of the TROPOMI NO2 product was developed at KNMI and the data are distributed via the ESA Sentinel hub.
Service Example	 NO2 tropospheric columns retrieved by the Copernicus TROPOMI/Sentinel-5P satellite instrument averaged over the period 1.4.-30.9.2019. The black circles indicate the known stationary NO2 emission sources from the E-PRTR database. The size of the circle is proportional to the 2017 annual emissions. The rest of the emissions come from the transportation sector (road and shipping).
Data license	Open access according to Copernicus/ESA terms and conditions for the use of Sentinel data
Application Domain(s)	Environmental monitoring, air quality
Use Cases	Support local authorities and private companies in monitoring environmental effect of industrial activity. Example: consulting and supporting the city of Porvoo and energy company NESTE in monitoring polluting emissions from NESTE refinery and from traffic.

	
FREE KEYWORDS	Air quality, air pollution, emissions, city, environment, satellite, Copernicus, Sentinel.

Name of Service	Cityfier
Service Provider	A-Insinöörit Rakennuttaminen Oy
Status	Available since 2017
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Finland for the moment
Spatial Resolution	Helsinki, Espoo, Vantaa, Tampere
Temporal Resolution	Year round
Data used in Service	Both in-situ and satellite
Overview of Service	e.g. content and use cases Cityfier a digital analysis service for visualising city development and forecasting the future value of urban districts and properties.
Contact	name and email jukka.kettunen@cityfier.com
Access to Service	Web portal address / webpage http://www.cityfier.com/
User Guide	http://www.cityfier.com/
Background information	Background of the service e.g. algorithms, scientific background, organsition behind etc. Location is the key in the real estate market. The value of the location is based on accessibility and distances between different urban components, such as homes, public & private services, workplaces and transport. These factors tell you where to invest. The other important factor is timing. It is essential to know when to invest. However many of the tools used for analysing the property or district values are based on the present. The evaluation models do not take into account the future development of the area. In other words currently there are no forward-looking valuation models available. Cityfier uses city master plans to simulate the future development of a certain area. Tool combines city master plans, property data and housing market data with urban research. It analyses relations between the different urban components and forecasts the future value of your location. The analysis results can be used by landowners, property investors and city developers.
Service Example	

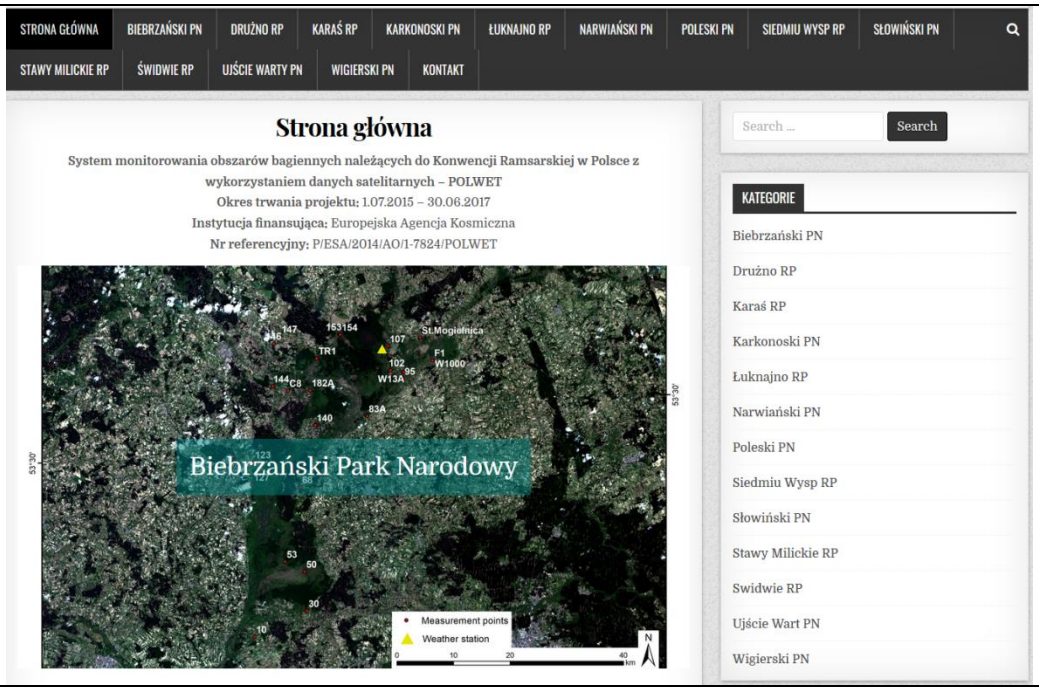
	 Housing price forecast Helsinki Pasila station area 2020-40.
Data license	SaaS
Application Domain(s)	http://www.cityfier.com/
Use Cases	http://www.cityfier.com/#cases
FREE KEYWORDS	https://business.esa.int/projects/cityfier Ongoing: Housing price and Green areas -study 2020 with **ESA** The objective of this study is to prove the feasibility of introducing new input data sources (= earth observation data) into Cityfier by evaluating their predictive power in the applied context and their cost impact to the service or product prices. The proposed approach combines information about green areas and water bodies extracted from earth observation data, housing prices and the proximity of private and public services and analyzes them using machine learning. Expected outcomes of the study are the proof-of-concept and technical feasibility assessment of the proposed solutions The study will provide answers to the questions: What is the relevance of each EO data source in predicting apartment prices? What is the cost of the anticipated EO data usage for Cityfier service? Research project will be ready by the end of 2020 and is funded by **European Space Agency**

Name of Service	Earth at your fingertips App
Service Provider	Zero Gravity Oy (https://www.zerogravity.fi)
Status	Available since 01.12.2020 under request
Type of Provider	Private
Cost of Service	Not Free
Coverage of Service	Global
Spatial Resolution	Layer dependent
Temporal Resolution	Layer dependent
Data used in Service	Satellite data
Overview of Service	Find out close to real time heartbeat of our planet. Earth at your fingertips provide a global picture of how our planet looks from space in variety of dimensions from atmospheric pollution to night time illumination, surface temperature and active fires, etc.
Contact	contact@zerogravity.fi
Access to Service	Invited download at Apple store and Google play, write an email contact@zerogravity.fi
User Guide	
Background information	We are team with PhDs, roots in R&D and space data technologies. We have more than 10 years of software development experience and data science. We won top world space technology software development hackathons with our mobile Apps based on earth observation data. Our mission is to help building sustainable cities and communities by means of satellite data and increase awareness towards climate change by our products.

Service Example	
Data license	commercial
Application Domain(s)	Environmental awareness, air quality, marine, etc.
Use Cases	You can ask for demo by writing an email contact@zerogravity.fi
FREE KEYWORDS	Earth, satellite data, awareness, sustainability, environment, satellite imagery

Wetlands

Name of Service	POLWET
Service Provider	Institute of Geodesy and Cartography
Status	Available since 2020
Type of Provider	Public
Cost of Service	Free
Coverage of Service	National
Spatial Resolution	10 m – 1 km
Temporal Resolution	once a year
Data used in Service	Satellite
Overview of Service	The information service based on Earth Observation (EO) data, capable to generate in an operational way a set of products as geo-information maps and indicators for the Ramsar sites in Poland. These are useful for appropriate sustainable wetlands management and conservation, by offering the products such as: land use/land use changes, changes of water surface, floods extend, moisture conditions, biomass development and changes.
Contact	prof. Katarzyna Dabrowska-Zielinska, katarzyna.dabrowska-zielinska@igik.edu.pl
Access to Service	http://polwet.com/
User Guide	In individual tabs of Ramsar sites in Poland, there are ready products to download in JPG or PNG file format. Then manual geo-coding is required.
Background information	The portal was created as part of the project *System for new space-based products for wetlands under Ramsar Convention – pilot Project for Poland supporting future GlobWetland* funded by European Space Agency (ESA) [P/ESA/2014/AO/1-7824/POLWET]. The contractors of the products are employees of Remote Sensing Centre in Institute of Geodesy and Cartography in Poland.

Service Example	
Data license	CC0
Application Domain(s)	
Use Cases	to support wetland management
FREE KEYWORDS	wetlands, monitoring, Ramsar sites, classification

Name of Service	National environmental monitoring: Satellite-based wetland monitoring
Service Provider	Naturvårdsverket
Status	Since 2019-03-12
Type of Provider	Public
Cost of Service	free
Coverage of Service	Sweden
Spatial Resolution	10 m
Temporal Resolution	
Data used in Service	
Overview of Service	The satellite-based monitoring is designed to detect land use-related changes in open marshes in the form of increased biomass / regrowth. Two sets of satellite data are used for the change analysis for a period of time, one from an older time and one from a younger time. Changed areas are divided into two classes of change; potential and safe change indication with a minimum mapping unit of 0.5 ha. The change classes give a direct indication of the strength and extent of the change. The change classification is also reported as change maps: the proportion of safe change indication per analyzed open marsh presented in different area or regional divisions. The change classification is also reported as change maps: the proportion of safe change indication per analyzed open marsh presented in different area or regional divisions.
Contact	data@naturvardsverket.se
Access to Service	http://gpt.vic-metria.nu/data/land/ vatmark_ac_t01t02_fkartor.20150630.zip vatmark_ac_t01t02_fklass.20150630.zip vatmark_bd_t01_myrvegetationstypskarta.20160316.zip vatmark_bd_t01t02_fkartor.20150630.zip vatmark_bd_t01t02_fklass.20150630.zip vatmark_sot_t01t02_fkartor.20160316.zip vatmark_sot_t01t02_fklass.20160316.zip vatmark_syd_t01t02_fkartor.20180410.zip vatmark_syd_t01t02_fklass.20180410.zip vatmark_sydost_t01t02_fkartor.20170412.zip vatmark_sydost_t01t02_fklass.20170412.zip vatmark_wx_t01t02_fkartor.20160422.zip vatmark_wx_t01t02_fklass.20150630.zip vatmark_wx_t01t03_fkartor.20160422.zip vatmark_wx_t01t03_fklass.20150630.zip

	vatmark_wx_t02_myrvegetationstypskarta.20160316.zip vatmark_wx_t02t03_fkartor.20160422.zip vatmark_wx_t02t03_fklass.20150630.zip vatmark_yz_t01t02_fkartor.20160422.zip vatmark_yz_t01t02_fklass.20150630.zip
User Guide	
Background information	http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Sveriges-miljomal/Miljokvalitetsmalen/Myllrande-vatmarker/
Service Example	
Data license	
Application Domain(s)	
Use Cases	
FREE KEYWORDS	Wetlands, Land cover,Change detection wetlands