



SeBs Results Workshop

Virtual Event 18th/19th November 2021

Day 2.





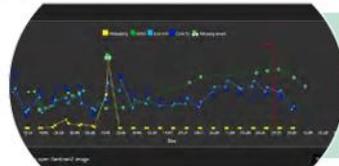
SeBS Case Study: Grassland monitoring in Estonia

Grassland Monitoring in Estonia



The Satellite Data

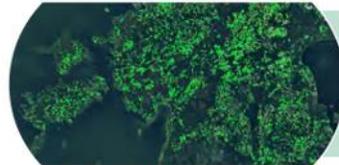
Copernicus Sentinel-1 provides free-of-charge frequent, all-weather, day-and-night C-band radar images. Copernicus Sentinel-2 provides free-of-charge frequent wide-swath, high-resolution multispectral imagery with 13 spectral bands over Estonia.



The Service Provider

KappaZeta, an Estonian company who specialise in remote sensing-based agricultural monitoring services leverages Copernicus Sentinel-1 and Sentinel-2 data to help clients map, monitor and detect CAP related grassland mowing requirements.

✓ €53k-106k pa



The Primary User

The Agricultural Registers and Information Board (ARIB) are the Estonian paying agency in charge of CAP activity monitoring and subsidy distribution. The Sentinel-derived system has replaced on-the-spot mowing checks, allowing them to monitor all claimants' fields remotely.

✓ €50k-1M pa



Secondary Benefits

Claimant farmers and landowners benefit from the fairer and more transparent evaluation system. Uncompliant claims have less chance of "slipping through the net", meaning more public funds reach deserving, compliant claimants.



End User Beneficiary

Citizens and society benefit from the system because it ensures that public funds are used correctly and the environmentally beneficial regulations of the CAP are upheld.

Grassland Monitoring in Estonia

The importance of grasslands

- Grassland makes up over 20% of all land cover in the EU
- Provide beautiful landscapes and habitats for multiple species
- Act as giant carbon “sinks”, helping to reduce the CO₂ levels in our atmosphere
- When grasslands are converted to arable lands - **soil carbon stocks decline by an average of 60%**



Grassland Monitoring in Estonia

The Common Agricultural Policy (CAP)

- Provides farmers with income support, through both direct payments and through remunerations
- The “**green direct payment**” supports farmers who adopt environmentally friendly practices with direct payments (EU Regulation No. 1307/2013)
 - Crop diversification
 - Ecological Focus Areas (EFAs)
 - **Permanent grassland**



Grassland Monitoring in Estonia

Rules and compliance checks in Estonia

Registered producing lands

- Permanent grassland **must not** be mowed before the 5th of July.
- Permanent grassland **must** be mowed by the 20th of August.

Registered non-producing lands

- Permanent grassland **must not** be mowed before the 10th of July.
- Permanent grassland **must** be mowed by the 1st of September.

EU Regulation No 809/2014 mandates a **5% sample** of all beneficiaries within each member state must be subject to on-the-spot checks each year.

Grassland Monitoring in Estonia

Service Provider - KappaZeta

- Radar remote sensing company which were founded in 2015 as a spin-off from Tartu Observatory
- KappaZeta's software uses **Sentinel-1** and **Sentinel-2** data (SAR coherence and optical NDVI)
- Constantly and automatically monitors around 100,000 fields of grassland



Grassland Monitoring in Estonia

Primary User - Agricultural Registers and Information Board (ARIB)

- Estonian government agency responsible the granting of national and EU subsidies
- ARIB is also responsible for maintaining national registers and other databases related to agriculture.



Grassland Monitoring in Estonia



Grassland Monitoring in Estonia

Tier 3 – Farmers & Landowners

- The overall budget for grassland mowing support in Estonia was €6,500,000 for 2020
- Money that was held back from uncompliant claimants is distributed evenly amongst compliant claimants

Tier 4 – Citizens & Society

- Maintenance of biologically diverse and beautiful landscapes
- Fairer and transparent use of taxpayers' money



Grassland Monitoring in Estonia

	TIER 1	TIER 2	TIER 3	TIER 4
Services	Free and openly available satellite imagery (Sentinel-1 & 2)	Accurate and automatic detection of grass mowing events across huge areas	Transparent and fair payments of CAP income support	Maintenance of ecological biodiversity, landscapes and transparent use of public money
Beneficiaries	<u>Service Provider:</u> KappaZeta	<u>Primary User:</u> Estonian Agricultural Registers and Information Board (ARIB)	Farmers / Landowners	Citizens & Society
Other Actors	<i>The European Union – Developer and manager of the Common Agricultural Policy</i>			
Type of Benefit	Access to free and high-quality datasets allowing the delivery of valuable services	Ability to distribute CAP payments more accurately and fairly. Reduced requirement for in-person field inspections. Efficient regulation monitoring.	Transparency and accuracy in the evaluation of their greening activities.	(i) Environmental protection ; (ii) increased trust in public authorities;
Manifestation of value	Savings and simplicity in sourcing data enables a profitable and expanding business (revenues)	Enhanced ability to fulfil compliance check mandates. Savings on in-person man-hours associated with fields inspections.	Portion of subsidy budget not distributed to uncompliant claimants now distributed evenly as extra subsidy to compliant claimants. (revenues)	Increased sustainability of natural resource management, maintenance of landscapes and transparency in public spending.

Grassland Monitoring in Estonia

Economic benefits

- **Tier 1** - Employment of 2 to 4 full-time employees
- **Tier 2** - Saving on costs associated with in-person compliance checks



- Employment of full-time workers (tier 1)
- Cost savings from person-hours associated with in-field inspections (tier 2)

Tier	Benefits identified	Annual economic value stemming from the use of Sentinel-enabled services (in €)	
		Low	High
Tier 1 (KappaZeta)	Employment of full-time workers	€53,000	€106,000
Tier 2 (ARIB)	Savings on person-hours associated with in-field inspections	€50,000	€1,000,000

Grassland Monitoring in Estonia

Environmental benefits

- Maintenance and permanent grasslands, biodiversity and landscapes



- Upholding of sustainable CAP regulations (tier 2 & 3)
- Maintenance of rural biodiversity and landscapes (tier 4)

Regulatory benefits

- Monitoring, enforcement and reporting of CAP compliance is enhanced dramatically



- Better monitoring and enforcement of CAP regulation (tier 2)
- Increased regulatory vigilance and compliance (tier 3)

Grassland Monitoring in Estonia

Entrepreneurship & Innovation benefits

- Creation of innovative service & change of work practices



- Creation of innovative services (tier 1)
- Changed operational practices (tier 2)

Societal benefits

- Taxpayers' money being used efficiently



- Transparent use of public funds (tier 3 & 4)

Science & Technology benefits

- Contributions to scientific research



- Publication of scientific research (tier 1)

Forest Management in Sweden



Discussion with: Anders Persson (SFA) and Erik Willen (Skogforsk)

Ground Motion Monitoring in Norway



Discussion with: Dag Anders Moldestad (Norwegian Space Office); John Dehls (Norwegian Geological Survey) and Heidi Bjordal (Vegvesen) / Javier Guzman (Vegvesen)

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Water Quality Management in Germany



Discussion with: Thomas Wolf (LUBW) and Thomas Heege (EOMAP)

Aquifer Monitoring in Spain



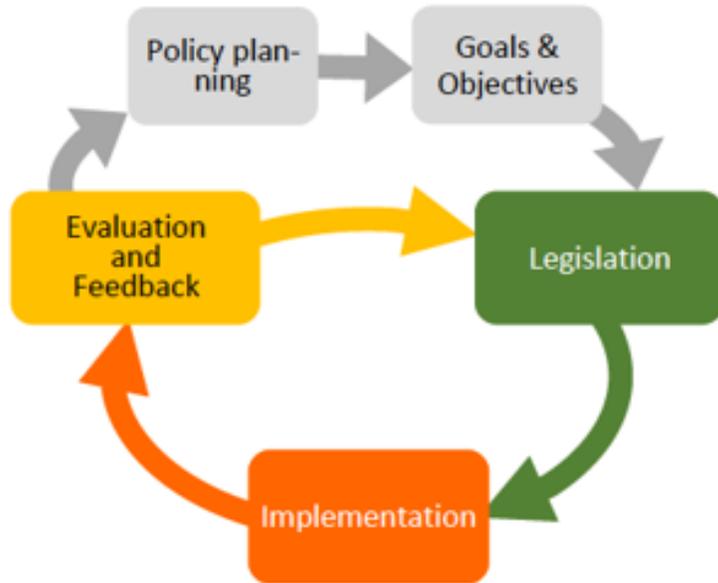
Discussion with: Pablo Ezquerro (Geological Survey of Spain – IGME)

Panel Debate: Benefits to environment and policymaking

Cross-cutting report

Copernicus Sentinel data supporting Environmental Compliance Assurance

Policy Cycle



- Preparation & Design of Legislation
- Policy Implementation
 - Compliance Monitoring
 - Compliance Reporting
 - Follow-up and Enforcement
 - Compliance Promotion
- Evaluation of the Impact



Panel Debate: Copernicus benefits to environment and policymaking

Moderated by:

- **Dimitri Papadakis, Co-founder and Director at Evenflow**
- **Stefka Domuzova, Consultant at Evenflow**

Panelists:

- **Thomas Wolf, State Institute for the environment of Baden-Wurttemberg (LUBW)**
- **Anders Persson, Swedish Forest Agency (SFA)**
- **Pablo Ezquerro, Geological and Mining Institute of Spain (IGME)**
- **John Dehls, Geological Survey of Norway (NGU)**

Panel Debate: Benefits to environment and policymaking

Extract from [cross-cutting report](#)
Copernicus Sentinel data supporting Environmental Compliance Assurance

Case study	Case type		Impact of EO throughout the showcased policy cycle					
	Operational case	Feasibility assessment	Preparation/ Design	Implementation: Compliance promotion	Implementation: Compliance monitoring	Implementation: Follow-up and enforcement	Implementation: Reporting	Evaluation
Use of Copernicus in environmental crime court proceedings		X						
Use of Copernicus in environmental audits conducted by supreme audit institutions		X						
Use of Copernicus by EU Member States implementing the Water Framework Directive	X	X						
Use of Copernicus by the European Maritime Safety Agency	X	X						
Use of Copernicus by EU Member States for monitoring and enforcement of local environmental measures: dredging in Finland	X							
Use of Copernicus-based products by national institutions: monitoring of CAP grassland mowing compliance in Estonia	X							

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Flood Management in Ireland



Discussion with: Domenico Grandoni (E-Geos)

Pipeline Monitoring in the Netherlands



Discussion with: Ivo Visser (Stedin)

Dredging in the Maldives



Dredging in the Maldives

EOMAP

Mapping and Monitoring
Aquatic Environments

eomap.com

Dredging in the Maldives

- There is constant need for dredging to protect island areas
- Problem: hydrological maps are out of date/not accurate enough to guide dredgers
- S-2 data is used to generate usable maps (satellite-derived bathymetry) by EOMAP
- Benefits accrue to:
 - Dredging companies
 - Government
 - Environment
 - Local citizens



Wild Boar in Lithuania





Illegal Wild Boar Activity in Lithuania

- A farmer suspected a local hunting club had driven wild boars into his fields destroying his corn yield
- With EO company GEOMATRIX, the farmer could prove in court that the crop damage resulted from localized animal activity and not widespread disturbances such as storms or heavy rain
- The farmer won his case and the hunting club were held liable for damages. The judge in this case recommended Sentinel imagery be used for other cases involving crop damage in the future.
- **Direct beneficiaries:**
 - Service provider: GEOMATRIX
 - Primary users:
 - Farmer
 - Vilkauskis Municipality Department of Agriculture
 - Society benefits from a fairer, more objective judicial system



Insurance & Risk Management in Slovenia



Insurance & Risk Monitoring in Slovenia

- Flycom Technologies uses Sentinel data to conduct risk assessments for insurance companies.
- In the wake of natural disasters, the data also allows for rapid mapping of impacted areas and helps in determining future exposure to similar events.
- The largest Slovenian insurer Zavarovalnica Triglav uses the Sentinel-derived mapping service to understand the impact of natural disasters and assess exposure to future risks.

Benefits:

- Swifter, fairer and unbiased processing of claims
- Fair and efficient insurance services that protect customers in the wake of natural disasters and help restoration/rebuilding of affected areas
- Better assessment of damages and future risks over large areas remotely, reducing the need for costly and sometimes dangerous in-person assessments
- Easier diversification of service offerings by insurers and entering of new markets without major cost implications due to the free and open Copernicus data



Global Oil Industry Activity Monitoring



Global Oil Industry Activity Monitoring

- Kayrros has leveraged Copernicus Sentinel-1 data to measure the heights of crude oil storage tank roofs globally. They have developed algorithms that can produce continuous and accurate estimates of where oil inventories are currently situated and how they are changing.
- Energy companies & commodity traders can all benefit from having more precise and timely information on movements within the crude oil market to make better decisions and plan their strategy.

Benefits:

- TOTAL's Market Analysis team use the service to make better informed decisions, not only when it comes to their trading, but for their planned production volumes, as well as the short to medium term strategy of the company as a whole.
- Better information for market participants to make better informed business decisions, encouraging market competition and ultimately driving prices lower for end users.



Global Forest Monitoring

Case not yet published

Discussion with: Arjen Vrielink
(Satelligence)



Panel Debate: Copernicus benefits to environment and policymaking

Moderated by:

- **Nikolay Khabarov, Research Scholar at the International Institute for Applied Systems Analysis (IIASA)**

Panelists:

- **Alessandro Bonella, ANAS**
- **Jarkko Toivola, Head of Maritime Unit and Director Waterways at FTIA**
- **Heidi Bjordal, Vegvesen**
- **Arjen Vrielink (Satelligence)**