SeBS Case Study: Grassland monitoring in Estonia
Grassland Monitoring in Estonia

**The Satellite Data**

**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.

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

**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.
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%
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

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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.
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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
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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.
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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
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<table>
<thead>
<tr>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>Tier 4</th>
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<tbody>
<tr>
<td><strong>Services</strong></td>
<td><strong>Benefits</strong></td>
<td><strong>Other Actors</strong></td>
<td><strong>Manifestation of value</strong></td>
</tr>
<tr>
<td>Free and openly available satellite imagery (Sentinel-1 &amp; 2)</td>
<td>Accurate and automatic detection of grass mowing events across huge areas</td>
<td>Farma ner / Landowners</td>
<td>Savings and simplicity in sourcing data enables a profitable and expanding business (revenues)</td>
</tr>
<tr>
<td><strong>Primary User:</strong> KappaZeta</td>
<td><strong>Primary User:</strong> Estonian Agricultural Registers and Information Board (ARIB)</td>
<td>The European Union – Developer and manager of the Common Agricultural Policy</td>
<td>Enhanced ability to fulfill compliance check mandates. Savings on in-person man-hours associated with field inspections.</td>
</tr>
<tr>
<td><strong>Primary User:</strong> Estonian Agricultural Registers and Information Board (ARIB)</td>
<td><strong>Primary User:</strong> Farmers / Landowners</td>
<td></td>
<td>Portion of subsidy budget not distributed to uncompliant claimants now distributed evenly as extra subsidy to compliant claimants. (revenues)</td>
</tr>
<tr>
<td><strong>Primary User:</strong> Citizens &amp; Society</td>
<td></td>
<td></td>
<td>Increased sustainability of natural resource management, maintenance of landscapes and transparency in public spending.</td>
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</tbody>
</table>

**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.
- Environmental protection; (ii) increased trust in public authorities.
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**Economic benefits**

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

<table>
<thead>
<tr>
<th>Tier</th>
<th>Benefits identified</th>
<th>Annual economic value stemming from the use of Sentinel-enabled services (in €)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tier 1</strong> (KappaZeta)</td>
<td>Employment of full-time workers</td>
<td>Low: €53,000 / High: €106,000</td>
</tr>
<tr>
<td><strong>Tier 2</strong> (ARIB)</td>
<td>Savings on person-hours associated with in-field inspections</td>
<td>Low: €50,000 / High: €1,000,000</td>
</tr>
</tbody>
</table>
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Environmental benefits

• Maintenance and permanent grasslands, biodiversity and landscapes

Regulatory benefits

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

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

• Better monitoring and enforcement of CAP regulation (tier 2)
• Increased regulatory vigilance and compliance (tier 3)
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Entrepreneurship & Innovation benefits

• Creation of innovative service & change of work practices

Societal benefits

• Taxpayers’ money being used efficiently

Science & Technology benefits

• Contributions to scientific research
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)

SeBS Results Workshop – 18 and 19 November 2021
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

Policy Cycle

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

Cross-cutting report
Copernicus Sentinel data supporting Environmental Compliance Assurance

Image credits: IMPEL

SeBS Results Workshop – 18 and 19 November 2021
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)
<table>
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<th>Case study</th>
<th>Case type</th>
<th>Impact of EO throughout the showcased policy cycle</th>
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<tr>
<td>Use of Copernicus in <em>environmental crime court proceedings</em></td>
<td>X</td>
<td>Preparation/Design: Compliance promotion</td>
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<tr>
<td>Use of Copernicus in <em>environmental audits conducted by supreme audit institutions</em></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Use of Copernicus by the <em>European Maritime Safety Agency</em></td>
<td>X X</td>
<td></td>
</tr>
<tr>
<td>Use of Copernicus by EU Member States for monitoring and enforcement of local environmental measures: dredging in Finland</td>
<td>X</td>
<td>Preparation/Design: Compliance promotion</td>
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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

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
  - Vilkaviškis Municipality Department of Agriculture
- Society benefits from a fairer, more objective judicial system.
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
• 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)