SeBS Results Workshop

Virtual Event 18th/19th November 2021

Day 1.

EARSC
European Association of Remote Sensing Companies

Introduction to SeBS

Sentinel Benefits Study

Showcasing the benefits brought by the use of Sentinels data to society, environment and economy: a bottom-up assessment based on traceable impacts along selected value chains.

Nearing the end of the current phase of work

Methodology is open to all to use ..... and improve!

Introduction to SeBS

1. A sound methodology for measuring the value of EO and a rich portfolio of cases have been developed within the Sentinel Benefits Study (SeBS).

2. Over the last 4 years, more than 250 potential cases have been identified with 24 selected as sufficiently mature for a sound analysis with express support throughout the organisations concerned especially the primary user.

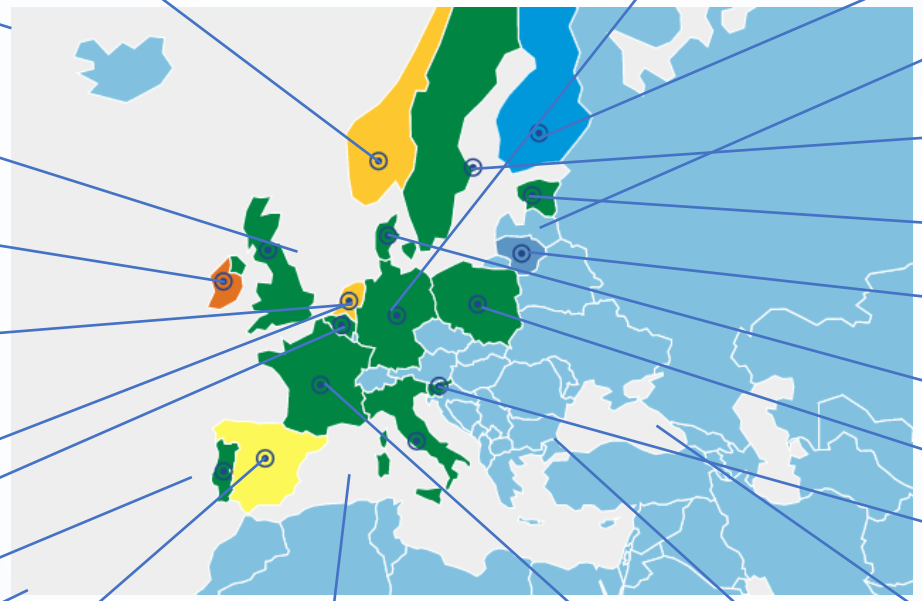
3. Evaluation of the benefits has moved beyond “just” Economics to include also benefits that cannot be easily monetized.

4. Cross-cutting analyses, leveraging on understandings developed within each case, leads to a rich set of insights.

A rich portfolio of cases

Cases Completed

Cases in Progress



Ground Motion Monitoring (No)

Water Quality (D)

Ice Navigation (Greenland)

Winter Navigation (Baltic)

CleanAir (Lv)

Peatland Management (UK)

Forestry Management (Sw)

Flood Management (Ir)

Grassland Monitoring for CAP (Est)

Illegal Wild Boars Activity (Li)

Infrastructure Monitoring (Nl)

Farm Management (Dk)

Farm Management (Po)

Assessing Geese Damage (Nl)

Insurance & Risk Monitoring (Sk)

Growing Potatoes (Be)

Dredging (Maldives)

Forest Monitoring (P)

Aquifer Management (Es)

Global Oil Industry Activity Monitoring

Golf Course Monitoring (It)

Deforestation Monitoring for Palm Oil Production

CleanSeas in the Mediterranean

Highways Management(It)

The pillars of SeBS methodology

- Bottom-up approach resting on specific and real use-cases for a defined Copernicus data product.
- "Value chain" approach based on the primary user (PU) and others which benefit from its work

1. Danish Meteorological Institute (DMI) produces daily maps of the ice conditions that help ships navigate through the ice off Greenland.

Service provider

€800k pa

2. Royal Arctic Line use the maps to avoid the ice off Greenland, they have an exclusive concession for the sea transportation of all cargo to and from Greenland. As a result, the shipping company is Greenland's bridge to the rest of the world.

Key Actor

Primary User

€2.75-3.65m

3. Other sectors depending on shipping such as local fisheries and oil transport save time and fuel and operate more safely.

Secondary beneficiaries

€560k-1.02m

4. Business and the local economy operate more efficiently and safely, stimulating economic growth.

Citizens & Society

€200k-1m pa

5. Citizens can be sure that the supermarkets and other important shops will be stocked, jobs are assured through reliable navigations so increasing living standards.

€4.31-6.45m

Greenland has a large geo-political strategic value which is enhanced by safe effective sea transportation.

Non-Monetary Benefits

As our study has developed, the methodology has been refined drawing upon the lessons learned from each case studied.

Every case contains an analysis of the monetized benefits.

However, as we progressed, it became clear that the monetized elements were found to not reflect fully the value being generated and the non-monetary benefits have been introduced progressively.

Full details and explanations can be found in the SeBS Methodology Report

Often it is the non-monetary benefits which are the main driver for adoption particularly by Public Authorities.

Richness of the Cases bring new insights

Consistent framework for the analysis of more and more cases allows transversal analyses yielding highly valuable conclusions – some examples of non-monetary benefits are:

Working together

In **Ireland**, flood mapping with shared information helps services co-ordinate their activities better through a common operating picture

In **Belgium**, having a common picture helps to bring together many different stakeholders across the potato industry, cutting across political and administrative lines.

Strategic Picture

In **Sweden**, families can plan their future as a result of knowing better the evolution of their woodland and when it may be harvested.

In **Greenland**, knowing where the ice has formed and when supply ships can pass, allows whole communities, living in isolated areas, to plan their lives better and to develop the strategic value of the island.

Better Regulation

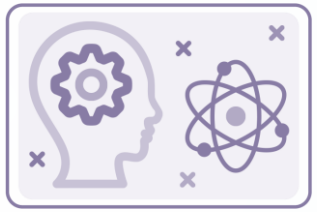
In **Norway,** liabilities for co-lateral damage coming from road works are more easily managed by knowing <u>when</u> movement took place as well as the precise location. Allows better definition in regulations; ie 20 years limits rather than 5 years.

6 Dimensions of Value

ECONOMIC
Impacts related to the production of goods or services, or impacts on monetary flow or volume, such as revenue, profit, capital and (indirectly, through turnover generation) employment.

INNOVATION AND ENTREPRENEURSHIP
Impacts linked to the development of new enterprises, business or jobs and/or the introduction of technological innovation into the market.

ENVIRONMENTAL
Impacts related to the state and health of the environment, particularly as regards the ecosystem services on which human societies depend.



ADVANCEMENTS IN SCIENCE AND TECHNOLOGY
Impacts linked to academic, scientific or technological research and development, the advancement of the state of knowledge in a particular domain.

REGULATORY
Impacts linked to the development, enactment or enforcement of regulations, directives or other legal instruments by policy makers.

SOCIETAL
Impacts related to societal aspects such as increased trust in authorities, better public health or secured geostrategic position.

Assessment of non-monetary benefits

NULL – There are no perceivable benefits in this dimension, and no potential for such benefits to emerge is anticipated.

LATENT – There are, in general, potential benefits, but none concrete has been identified or described in this particular instance.

MANIFEST - At least one benefit has been identified, with overall significance LOW/MODERATE/HIGH/EXCEPTIONAL

LOW

MODERATE

HIGH

EXCEPTIONAL

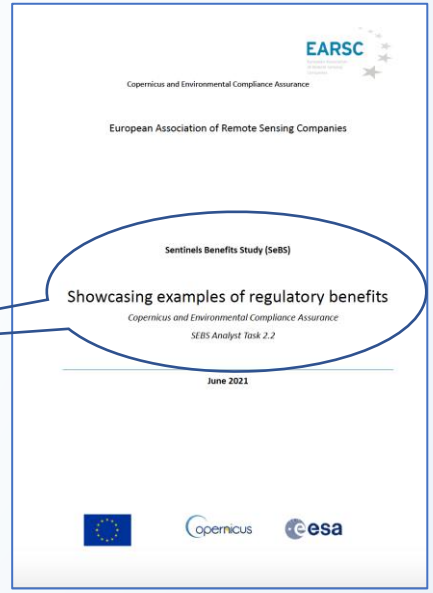
Complementary Cross-cutting Analyses

Use cases are supported and complemented by cross-cutting analyses with the goal to:

- Analyse commonalities across different cases and potential for extrapolation.
- Bring additional perspectives (e.g. academic publications, innovation and start-ups)
- Increasingly strengthen the SeBS methodology.

SeBS Methodology

Showcasing Examples of Regulatory Benefits



SeBS Results

- **For each Full case,**
  - a full report containing detailed economic analysis plus qualitative assessment against all 6 dimensions,
  - 2-sided flyer summarising the key elements of the case
- **For each short case:**
  - A 6-page report discussing the benefits but without detailed analysis
  - 2-sided flyer summarising the key elements of the case
- **SeBS Methodology Report**
- **Cross-cutting analyses**
- **All are available on the SeBS website:** **www.earsc.org/sebs**

Guide to the Workshop

- **Presentation of all cases with key figures from each one.**
  - 16 Full cases (15 minutes);
    - Animation:
    - Discussion with key stakeholders mostly the primary users.
  - 8 Short cases
    - Short presentation
    - Statement from key stakeholders mainly service providers
  - 3 Panels :
    - Moderators with slides from cross-cutting analyses
    - Questions and exchange for each panel.
- **Drawing this together will be a simple narrative which will be used to introduce each of the cases in turn.**

The Workshop Team

Geoff Sawyer

Elefteris Mamais

Christopher Oligschlager

Daire Boyle

Dimitris Papadakis

Nikolay Khabarov

Stefka Domuzova

Supported by:

Martin Utray

Weronika Borejko

Delphine Miramont

Polina Gerelchuk

ESA:

Alessandra Tassa

Laura Estrada Prada

ESA Graphics Department

CleanSeas in the Mediterranean

Case not yet published

Discussion with Teresa Cunha,

Senior Project Officer with the European Maritime Safety Agency (EMSA)

Highways Management in Italy

Case not yet published

Discussion with

Flavio Capozucca

Alessandro Bonella

Azienda Nazionale Autonoma delle Strade (ANAS)

Wine Making in France

Discussion with: Jacques Rousseau (Institut Coperatif du Vin)

Marc Tondriaux (TerraNIS)

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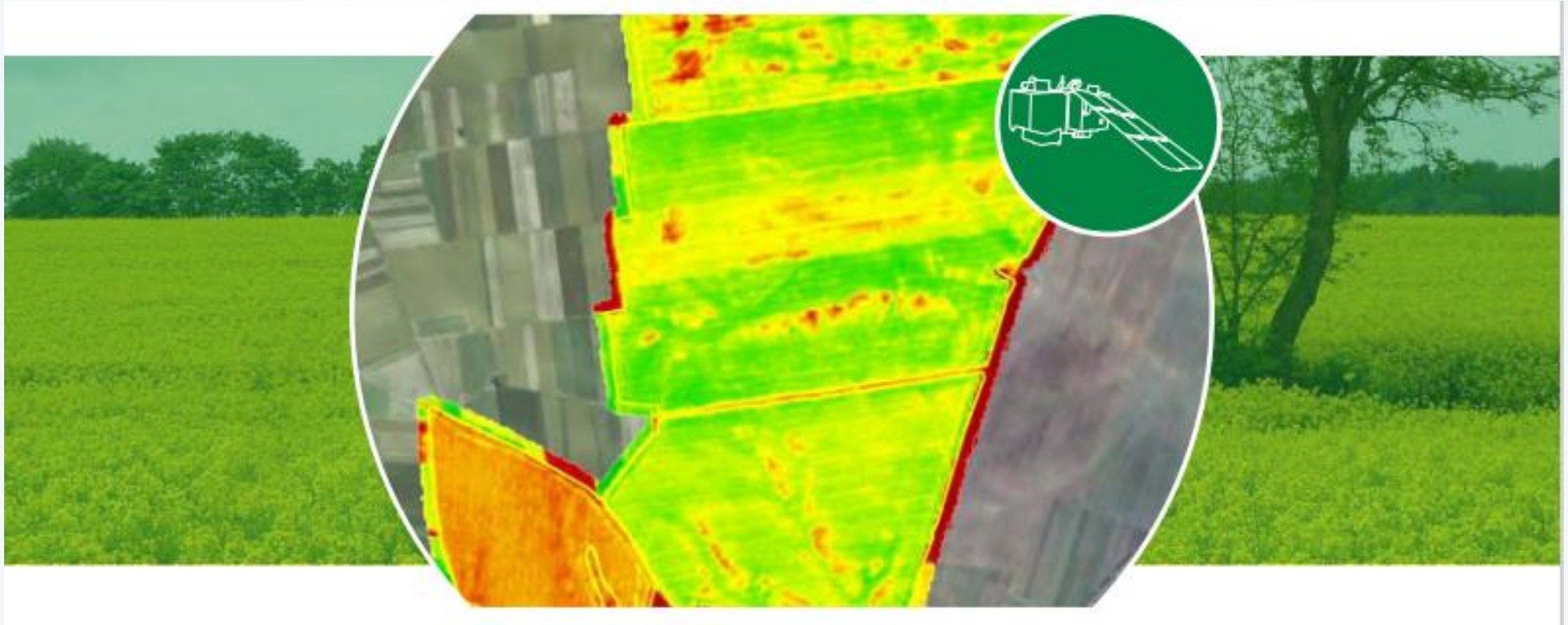
Copernicus
Europe's eyes on Earth

Farm Management Support in Poland



Discussion with: Przemysław Żelazowski (Satagro)

Farm Management Support in Poland

- Polish farmers are increasingly striving towards sustainable productivity whilst reducing their environmental impact
- SatAgro uses Sentinel data for precision farming activities and VRA
- SatAgro partnered with Grupa Azoty to offer Sentinel-based services to their clients
- The cooperation benefits both partners by strengthening their corporate profiles
- Farmers, the environment and the general public benefit from the reduced use of fertilisers & increases in yield

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SatAgro

Grupa Azoty

Farm Management Support in Poland

- **Direct beneficiaries:**
  - The service provider: SatAgro
  - The primary user: Grupa Azoty
  - Farmers & Governmental agencies
  - Citizens & Society for the improved environment
- **Main findings:**
  - Current benefits: €1.1m pa
  - Full potential: €10.5m pa

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SatAgro

Grupa Azoty

Farm Management Support in Denmark

Discussion with: Stefan Pedersen (Fieldsense)

Farm Management Support in Denmark

- Farmers with large cereal farms are using Fieldsense service maps to aid decision making
- S-2 data is processed into crop stress maps which are overlaid onto the farm field boundaries
- Farmers access the stress maps from their office or from their phones.
- As a history builds up over a few seasons, data analysis (and AI) will allow the cause of the stress to be identified.
- Groups of farmers exchanging information raise awareness amongst other farmers.
- Benefits today are modest, but the potential is high

FIELDSENSE

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Farm Management Support in Denmark

- **Benefits for:**
  - Farmers – save time from field walking and save money from reduced inputs with even increased cropping.
  - Environment is improved due to the reduced use of chemicals
  - Direct economic benefits between €3.8m-€7.9m
  - Societal benefits through less chemical leaching, reduced water use and better environment.
  - Full potential due to improved knowledge and better savings as well as increased market penetration (used by more farmers): €23.7- €54.5m pa

FIELDSENSE

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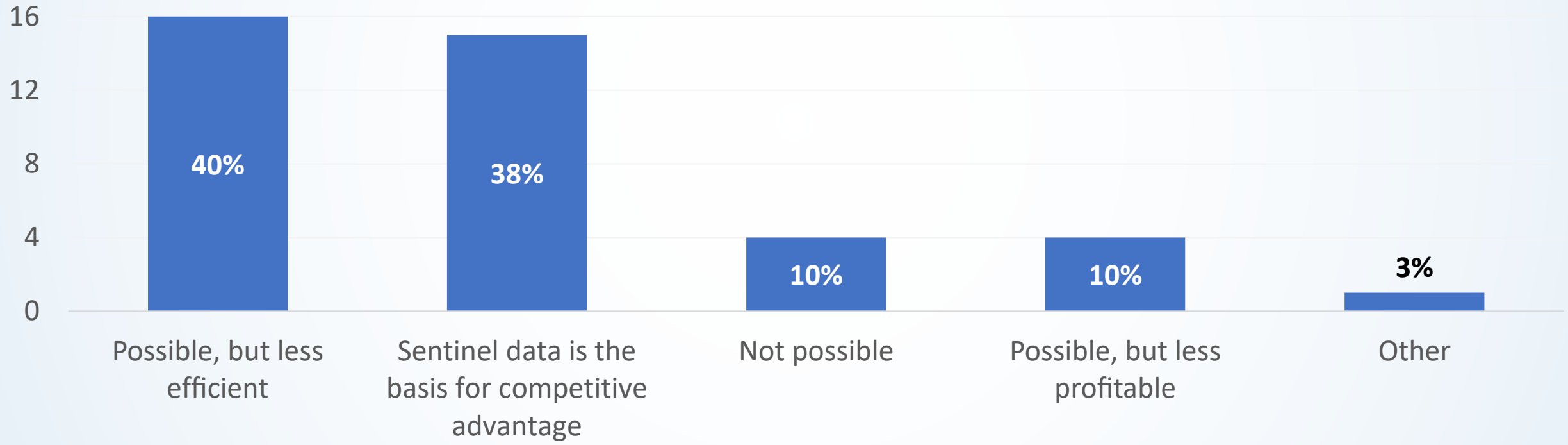
Panel 1:

Panel 1:

Extract from upcoming cross-cutting report

Survey of EO start-ups in Europe

Would your business model be possible without Copernicus?



Panel 1:

Extract from upcoming cross-cutting report

Survey of EO start-ups in Europe

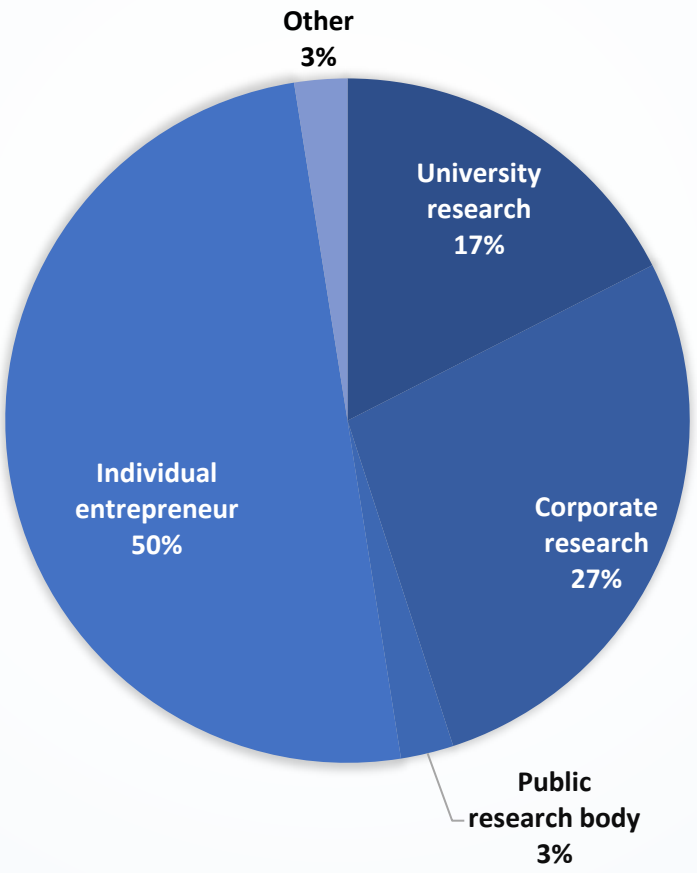
What are the most significant barriers related to customer uptake?

Panel 1:

Extract from upcoming cross-cutting report

Survey of EO start-ups in Europe

Origins of the business idea



Growing Potatoes in Belgium

Peatland Management in the UK

Peatland Management in the UK

- 80% of UK peatland are in poor condition (drained or damaged by over-extraction)
- The problem faced by water companies is to localise areas of degraded peat
- Rezatec is using Sentinel-1 data to derive maps showing the extent and depth of peat across moorlands
- Water utilities are the primary users of the peat maps that help them improve the quality of the peat so reducing the peat pollution
- Other involved stakeholders are nearby farmers and landowners as well as wildlife and heritage trusts

Peatland Management in the UK

- **Benefits:**
  - **Financial**: water companies save costs through the use of less chemicals
  - **Climatic**: Carbon storage varies by peatland but generally is 30–70kg of carbon per cubic meter
  - **Heritage**: good environment for conservation of archaeological sites
  - **Environmental**: habitat offered by peatlands is home to many species of flora and fauna
  - **Water Availability**: peat soils control the flow of water so reducing the risk of drought in the summer and the risk of floods during heavy rains
  - **Citizens** enjoy better water quality & environment

Peatland Management in the UK

Placeholder for pre-recorded statement

Golf Course Monitoring in Italy

Golf Course Monitoring in Italy

centrale valutativa

- Water scarcity is an important issue in Italy since most of the country is under extremely high water-stress
- Environmental protection and the efficient use and management of water resources has become a pressing topic among sports clubs and associations
- Among others, golf courses are major water consumers
- Centrale Valutativa developed the decision-support application TETHYS that makes use of Sentinel-2 data to monitor the health status of fields and grasslands
- TETHYS helps greenkeepers do their job better, cheaper and in a time-efficient manner

Golf Course Monitoring in Italy

centrale valutativa

Benefits:

- **Financial**: Reduced use of water and energy drives down costs
- **Efficiency**: Efficient use of resources reduces energy and water consumption (c. 20%) within water-stressed environment
- **Timesaving**: more efficient golf course inspections
- **Environmental**: Reduced use of water benefits the environment
- **Sportive**: better turf and irrigation management leading to optimal conditions
- **Societal**: Meeting societal expectations through responsible water use

Golf Course Monitoring in Italy

Placeholder for Video

Wild Geese in the Netherlands

Assessing Geese Damage in the Netherlands

provinsje fryslân
provincie fryslân

ilionx
Your partner in digital business

- Geese have discovered the NL as a winter paradise for breeding thanks to an abundance of food
- This has resulted in an extreme field damages to Dutch farmers
- Government set up the Fauna Fund to compensate farmers for damages (c. €17m in 2015 & several thousand appraisals pa)
- Using S-2, ilionX developed a tool for geese damage detection and assessment, allowing for a global overview over a farmer's fields and for remote appraisals
- This helped the Province of Fryslân to automate appraisals saving time and cost for inspectors
- Automation leads to faster payments from the Fauna Fund & mitigation measures to curtail damage

Assessing Geese Damage in the Netherlands

provinsje fryslân
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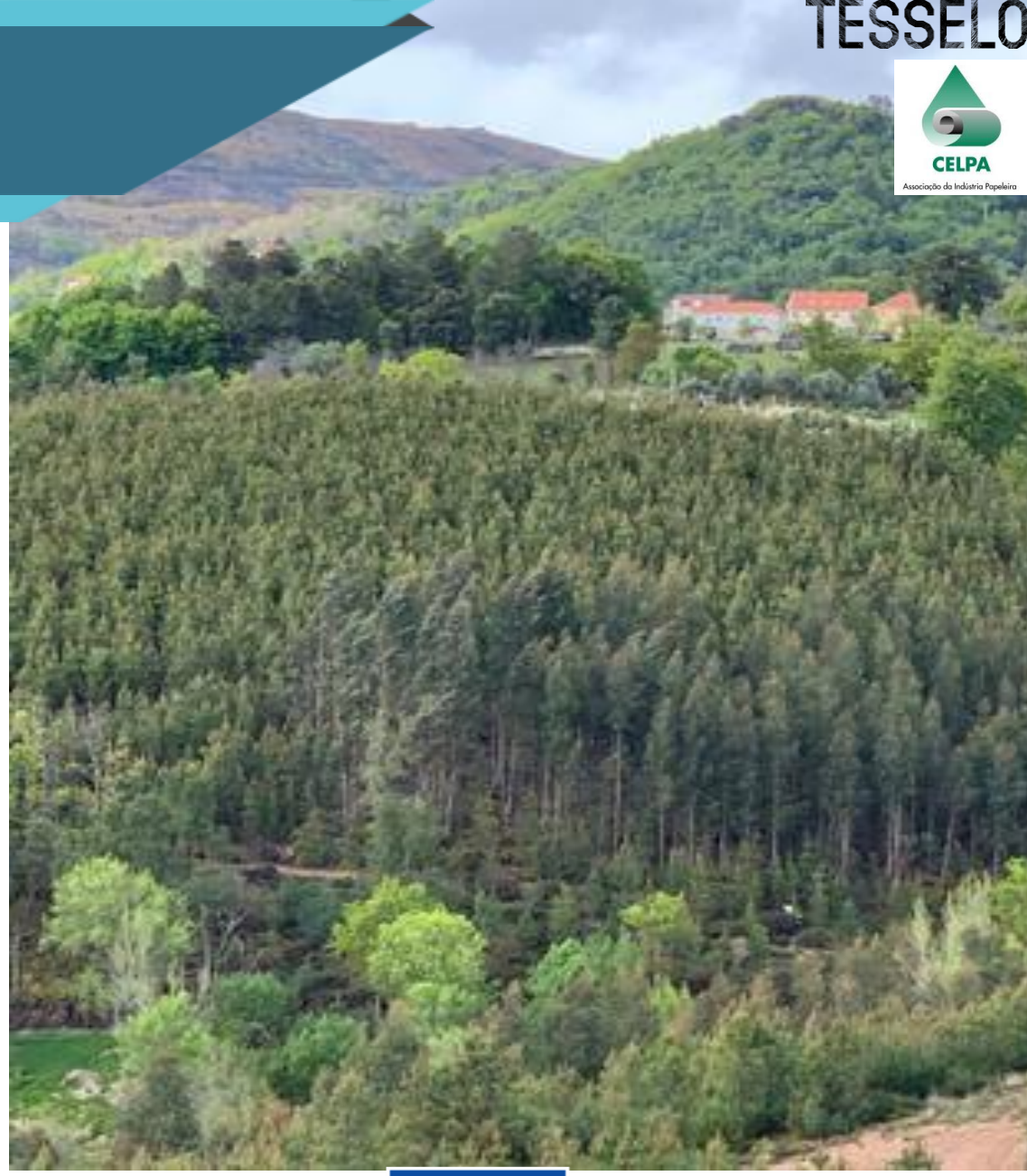
Your partner in digital business

- **Benefits for:**
  - **Financial**: faster payment of damage compensation and less damage thanks to mitigation measures
  - **Efficiency**: faster and improved appraisals due to automation → field visits only in cases of uncertainty
  - **Societal**: improved detection of fraudulent claims undermining the system of compensation
  - **Awareness**: improved knowledge about the state of the fields between September and April

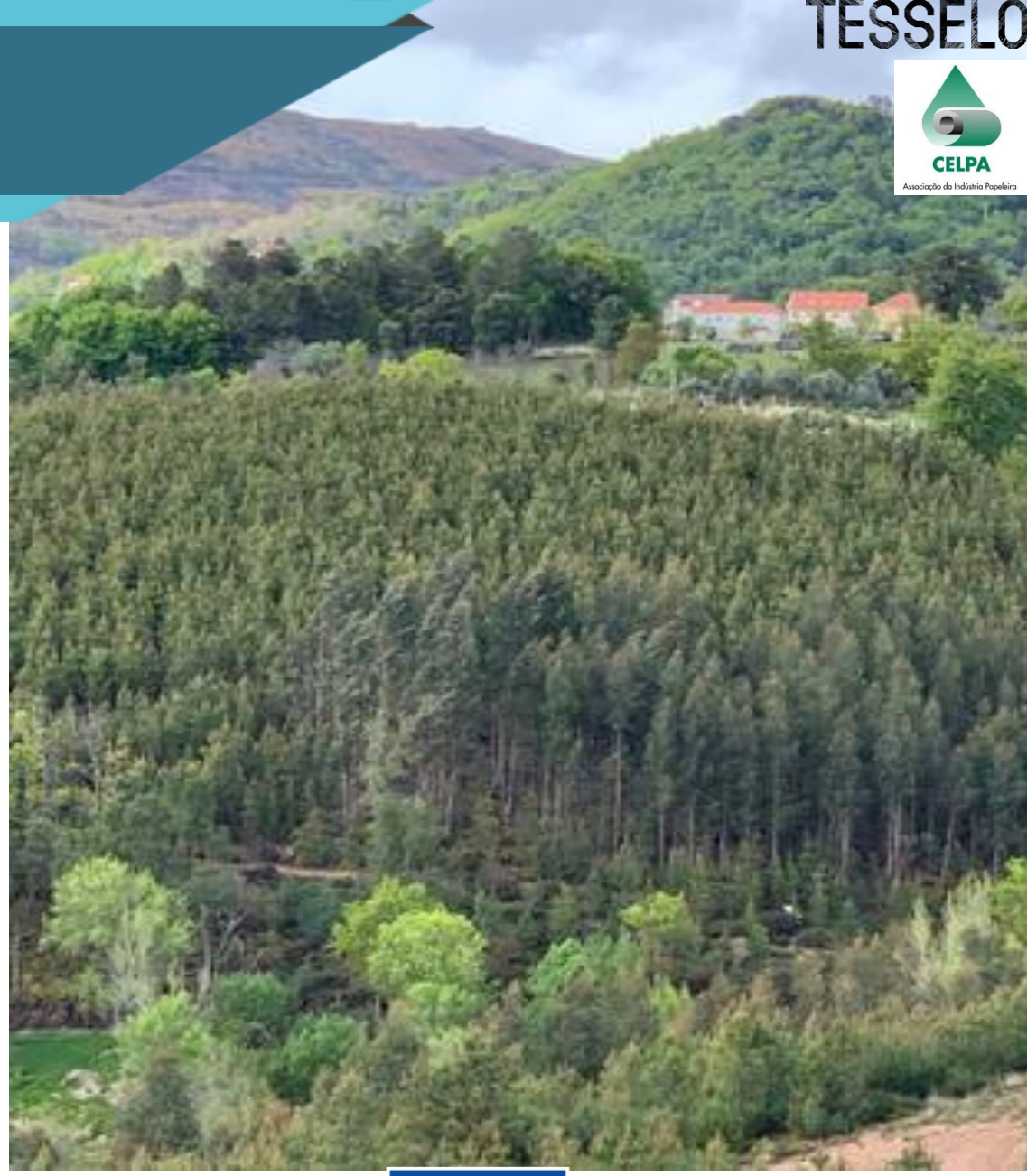
Forest Monitoring in Portugal

Forest Monitoring in Portugal

- Pulp & paper industry → 200,000 ha of forests and tree plantations in Portugal
- As plantations are dispersed all over the country, it is expensive and time-consuming to monitor their lifecycle growth
- Wildfires & government regulations are further drivers to use innovative forest management solutions
- Tesselo monitors the lifecycle of tree plantations (new plantations, harvested & burnt areas), tree age as well as national land use (changes) using Sentinel-2 data and AI techniques
- Forest managers & CELPA can access the platform to check tree health remotely, prioritising their work and to understand more effectively the state of the tree plantations country-wide as well as overall market dynamics



Forest Monitoring in Portugal



Benefits:

- **Economic:** increased employment; efficiency gains and cost savings due to needs-based field inspections by at least 25%; increased revenues due to better tree care and maintenance increasing the yield

- **Environmental**: reduced pollution due to decreased use of fertilizer/pesticides; reduced pollution due to 25% less car trips

- **Innovation & Entrepreneurship:** creation of a new, profitable business; changed, more efficient business practice

- **Science & Technological Research:** increased student research on EO due to partnership between Tesselo and universities

Forest Monitoring in Portugal

Placeholder for pre-recorded interview

Navigation Through Sea-Ice off Greenland

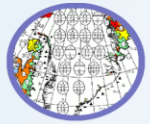
Navigation through Sea-Ice off Greenland

ROYAL ARCTIC

DMI Ice Service

- **Sea-ice & icebergs pose a constant threat when shipping between villages and with Europe**
- **Navigators need latest information about locations of ice to navigate safely**
- **Using S-1 data, frequent ice charts are created for Royal Artic Line and other maritime stakeholders**
- **Benefits for:**
  - Primary user: Royal Artic Line
  - Other direct users in transport
  - End use beneficiaries: businesses & local economy
  - Tertiary beneficiaries: citizens are assured of stocked shops
- **Overall Economic Benefits of <u>€8.6-12.5m pa</u>**

The Value-Chain Methodology Example



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€2.75-3.65m

3. Other sectors depending on shipping such as local fisheries and oil transport save time and fuel and operate more safely.

€560k-1.02m

4. Business and the local economy operate more efficiently and safely, stimulating economic growth.

total
€8.6m-€12.5m

€200k-1m pa

5. Citizens can be sure that the supermarkets and other important shops will be stocked, jobs are assured through reliable navigations so increasing living standards.

€4.31-6.45m

Greenland has a large geo-political strategic value which is enhanced by safe effective sea transportation.

Navigation through Sea-ice

In Greenland

- RAL has a monopoly on shipping between Greenland and Denmark – the only connection – and provides the “bridge” to the rest of the world.
- Isolated, coastal settlements are akin to islands only connected by ship or helicopter. RAL provides the shipping service.
- Communities main commercial activities are hunting and fishing often over the ice and seaways through the ice are unwelcome
- Hence, no icebreakers are used and hardened ships sail through broken and thin sea-ice but not during the winter months.
- The ships supply the settlements and carry their produce out to be sold in Denmark and exports.

Navigation through Sea-ice

In Greenland

- RAL provides the “bridge” to the rest of the world.
- Isolated settlements served by RAL
- Sail through broken and thin sea-ice
- Ships (hardened) and no ice-breakers
- Communities hunt and fish over the ice so seaways are unwelcome

In the Baltic

- Large towns and industry need to be served all the year round.
- Sail through thick winter ice
- Use ice-breakers to lead ships carrying freight
- Seaways are maintained to ease passage and serve local industry all year round

Winter Navigation in the Baltic