VALUE OF INFORMATION FOR SMARTER LAND MANAGEMENT: EXPERIENCE FROM APOLLO, BEACON AND CORINE LAND COVER PROJECTS

Dragutin Protic

24. JUNE 2019, NOVI SAD
SCERIN-7 Capacity Building Workshop on Earth System Observations

APOLLO

Advisory services for small farmers based on EO

APOLLO's **team**

9 Partners

5 Countries

3 Universities,
4 SMEs,
2 Agricultural Cooperatives

June 2016 - February 2019

APOLLO’s **vision**

From large farms to small farms,

We want to help farmers to:

- better **exploit** financial and natural **resources**
- improve **production levels**
- access understandable information resulting from **high-tech technologies**

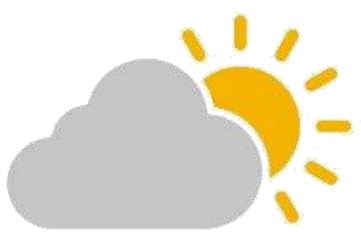
APOLLO **Concept**

EARTH OBSERVATION

+

CROP MODELS

+



WEATHER DATA

+

FARMER'S DATA
(future feat./optional)

Exploiting FREE Sentinel-1 & Sentinel-2 data

High quality data in short time windows for all critical activities during the growing season

APOLLO PLATFORM

MAPS

REPORTS

ALERTS

APOLLO **Services**

- Tillage Scheduling
- Irrigation Scheduling
- Crop Growth Monitoring
- Crop Yield Estimation
- Weather Forecast & Alerting
- Management Zoning

AFFORDABLE

based on Sentinel data

EASY TO USE

ACCESSIBLE

everywhere for effective decision making

With farmers for farmers

APOLLO **Pilots**

Arable crops

Orchards

Vineyards

>500 Small holder Farmers

>3 Agricultural Consultants

>2 Agricultural Cooperatives

With farmers for farmers

2 NEW Services!

Based on farmers’ enthusiastic involvement

- Weather Forecast & Alerting
- Management Zoning

BEACON

Breakthrough Agricultural Insurance based on Earth Observation data

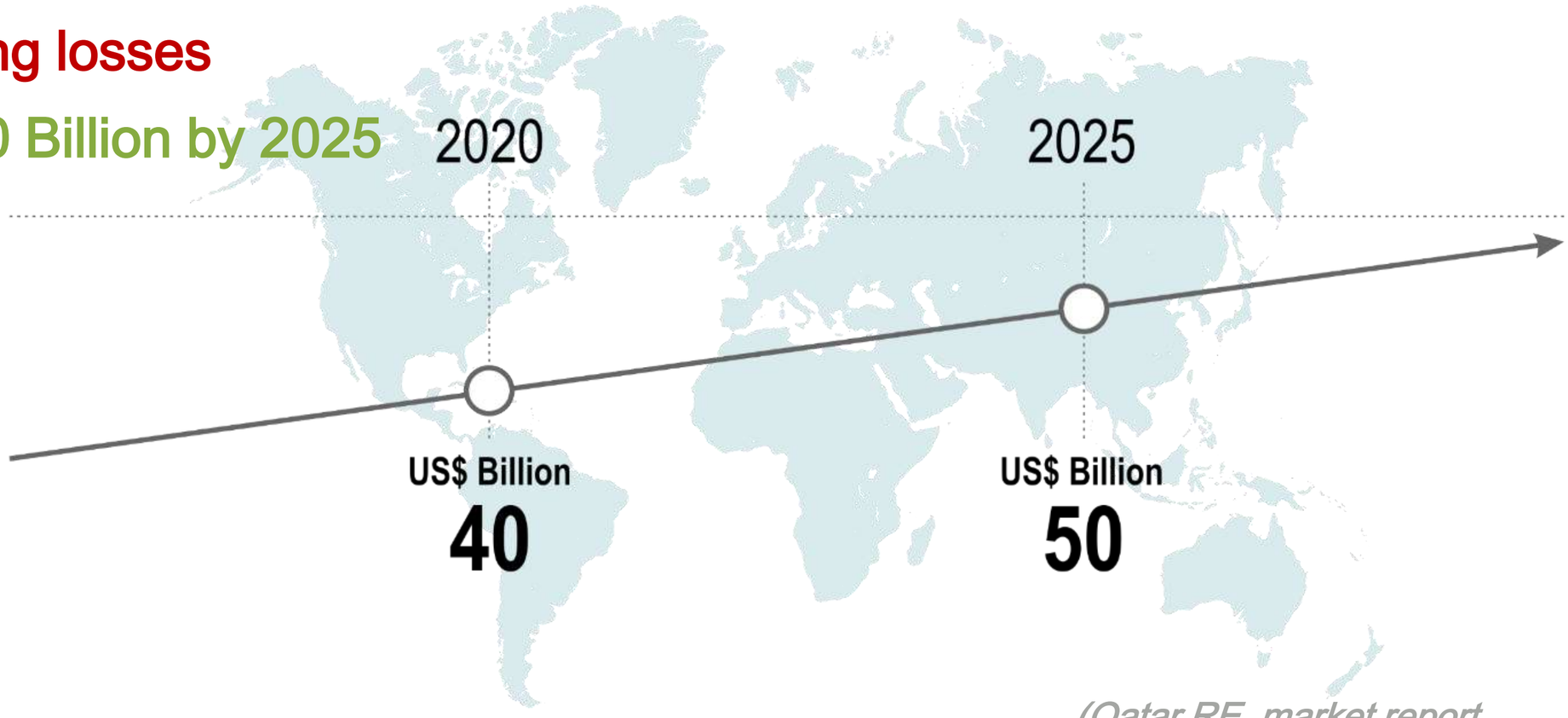
Project Overview

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821964.

Agricultural Insurance Sector

Costs and underwriting losses

Expected growth: $50 Billion by 2025



(Qatar RE, market report 2018)

Agricultural Insurance Sector

Challenges:

1. Historic claim records are **not sufficiently accurate**
2. Climate change & weather **uncertainty**
3. **Absence** of available & reliable seasonal weather forecast data
4. On-site damage assessment is **rather costly**
5. Claim verification can be **less objective**

BEACON as a solution

Knowledge of future Risk

Weather Risk Probability function

Localized Extreme Weather probabilities

Lower Operational & Administrative costs

Damage Assessment Calculator

Remote Damage Assessment using EO data

High market uptake & affordable Premiums

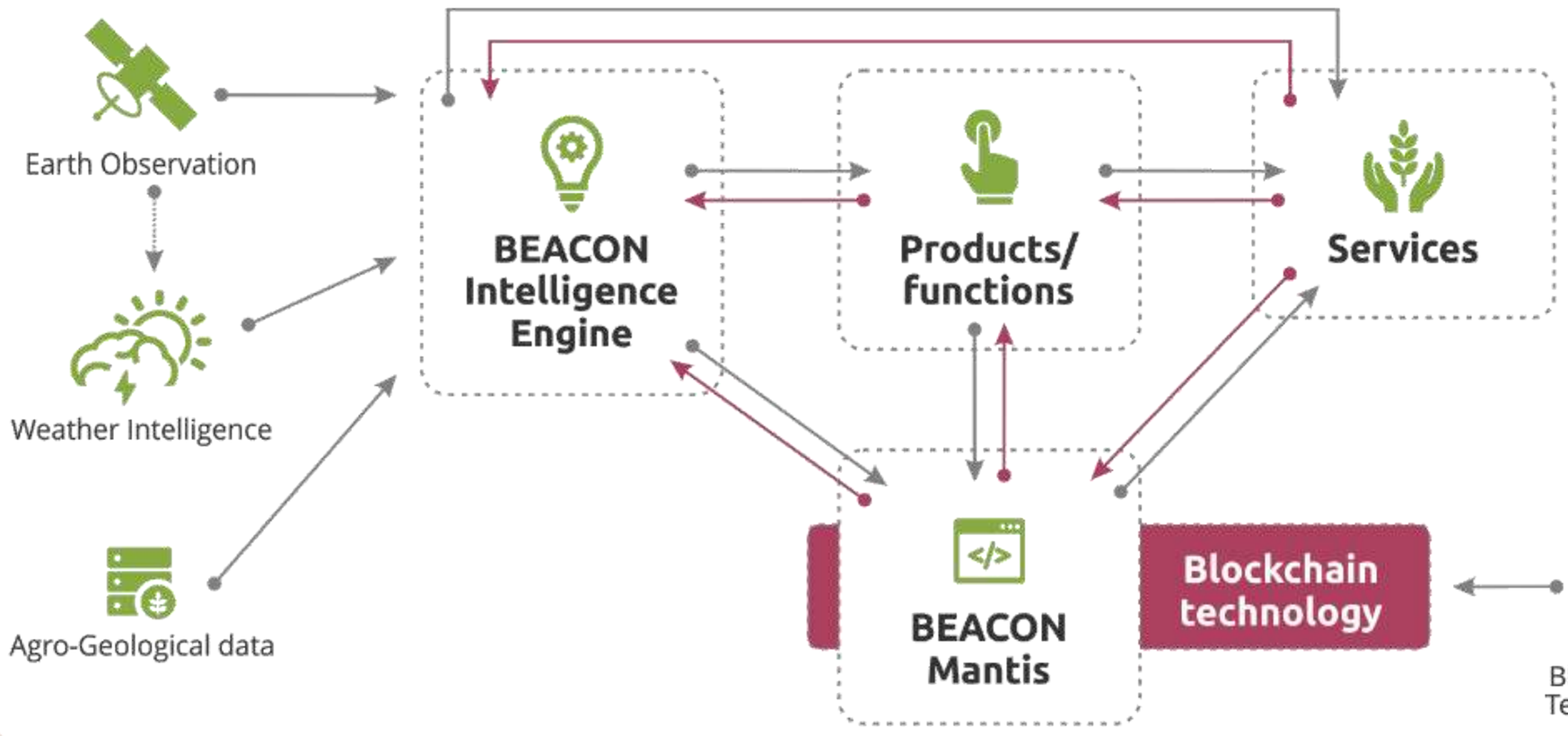
Services

- Crop Monitoring
- Damage Assessment Calculator
- Parcel Anti-fraud Inspector
- Damage Prevention-Prognosis
- Early Warning System
- Weather Risk Probability function

BEACON Concept

BEACON

How does it work?



Where do we wish to go…

To empower the design of **more accurate** and **personalized contracts**, providing **localized extreme weather probabilities**.

To decrease operational costs and reduce the number of on-site visits, providing **remotely crop damage** and **loss estimation**.

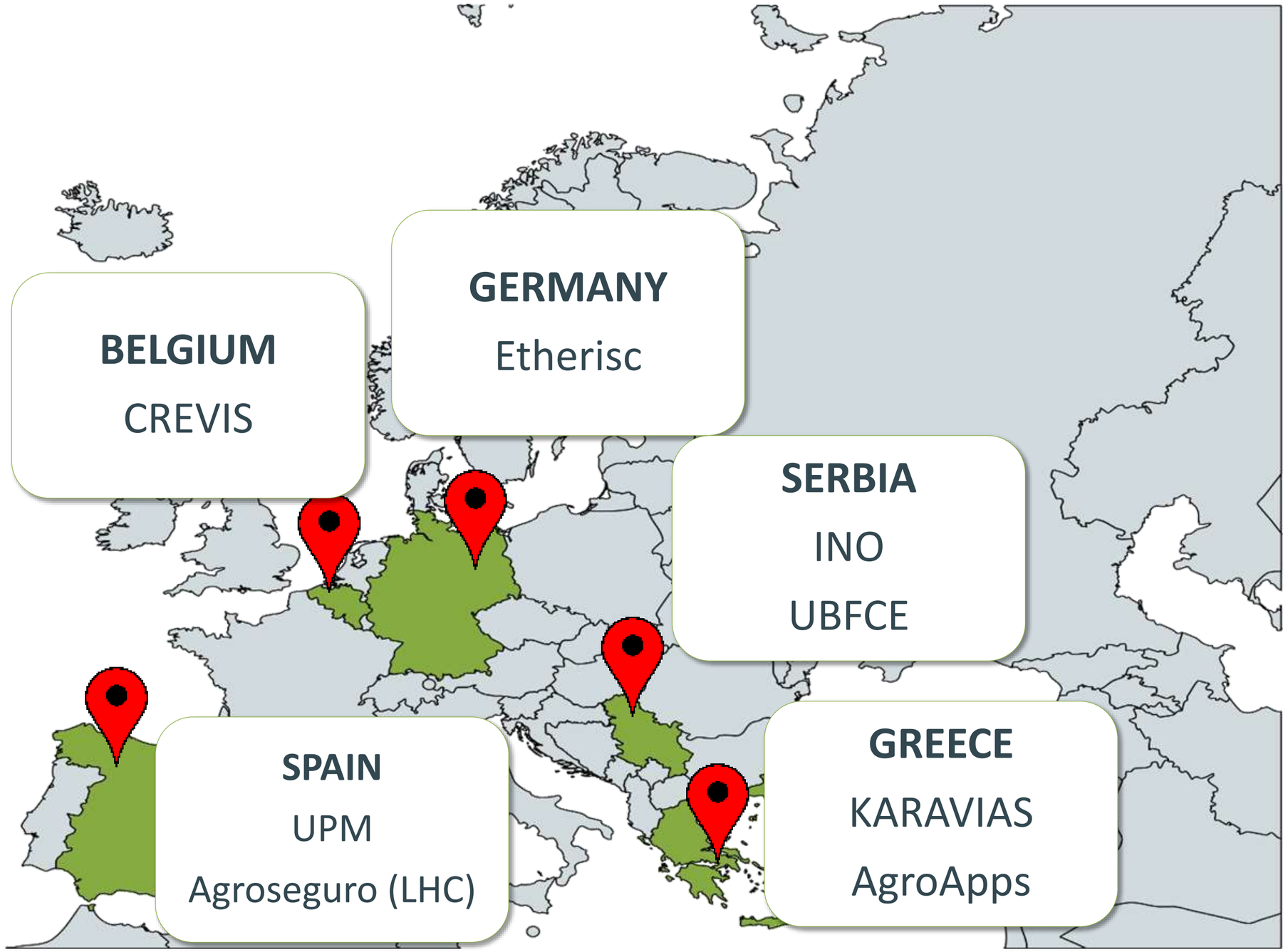
Insurance Companies

To alleviate the effect of weather uncertainty, providing **weather forecast**.

To automate the time-consuming **AgI operations**, reduce the **expense ratio for insurance programs** and ensure **transparency** and **accuracy**.

Working together…

BEACON Consortium Partners



Project Start Date: 01/01/2019

Kick-off Meeting: 4-5/2/2019

Duration: 37 months

No. of WPs: 7

Budget: 1,733,415.63 €

Project Officer: Ms. Iulia Simion

Our Lighthouse Customers

agroseguro

achmea

GENERALI

ΕΛΓΑ

GENILLARD & CO
INSURANCE FACTORY

AON

B3i

HDFC ERGO
GENERAL INSURANCE

MICRO

SOCODEVI

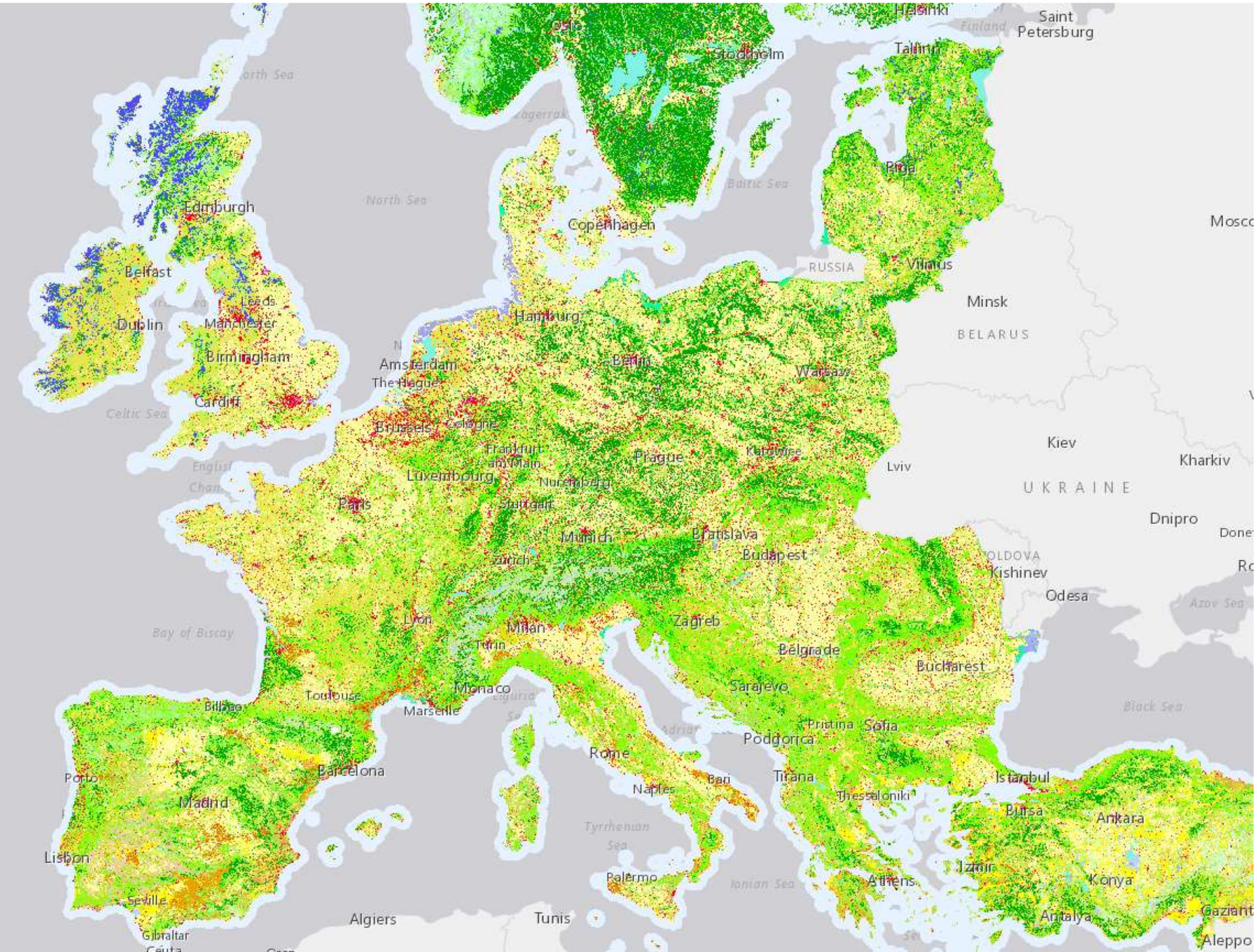
azsığorta

triglav

asua

✓ Leveraging more “Lighthouse Customers”…

CORINE Land Cover (CLC)



opernicus
Europe's eyes on Earth

Land Monitoring Service

Why Land Cover Monitoring

- Multi-functionality of land – link to other sectors
  → urban and landscape planning, water, soil, biodiversity, climate change, air quality, natural hazards etc.
- Monitoring, assessment and reporting
  (continuous observation of environmental changes over space and time)
  → reporting obligations, indicators etc.
- Decision support, policy effectiveness
  → need for action

CORINE Land Cover CONCEPT

- Start in the 1980s
- Mapping campaigns: CLC90, CLC2000, CLC2006, CLC2018
- CLC data products: CLC map for the reference year, CLC Changes between 2 reference years
- 44 land cover classes (3rd nomenclature level)
- Mapping scale: 1:100.000
- Minimum Mapping Unit: 25ha (for CLC map), 5ha (for Change map)
- Mapping minimum width: 100 m
- Methodology: visual interpretation of satellite imagery

CORINE Land Cover CONCEPT

- Standardized, harmonized and quality checked for Europe
- Produced by: EEA / EIONET (NRC Land Cover)
- Now part of Copernicus Land Monitoring Service
- Free and open access
- Widely used
- The current de facto standard for land monitoring in Europe

CORINE Land Cover EVOLUTION

	CLC1990	CLC2000	CLC2006	CLC2012	CLC2018
Satellite data used dominantly	Landsat-4/5 TM single date (in a few cases Landsat MSS)	Landsat-7 ETM single date	SPOT-4 and / or IRS LISS III dual date	IRS, SPOT-4/5 and RapidEye	Sentinel-2 and Landsat-8 for gap filling
Time consistency	1986-1998	2000 +/- 1 year	2006+/- 1 year	2011-2012	2017-2018
Geometric accuracy satellite images	≤ 50 m	≤ 25 m	≤ 25 m	≤ 25 m	≤ 10 m (Sentinel-2)
CLC mapping MMU	25 ha	25 ha	25 ha	25 ha	25 ha
CLC mapping minimum width	100 m	100 m	100 m	100 m	100 m
Geometric accuracy CLC data	100 m	better than 100 m	better than 100 m	better than 100 m	better than 100 m
Thematic accuracy	≥ 85% (probably not achieved)	≥ 85% (achieved [13]	≥ 85%	≥ 85% (probably achieved)	≥ 85%
Change mapping	–	boundary displacement min. 100 m; change area for existing polygons ≥ 5 ha; isolated changes ≥ 25 ha	boundary displacement min. 100 m; all changes > 5 ha must be mapped	boundary displacement min. 100 m; all changes > 5 ha must be mapped	boundary displacement min. 100 m; all changes > 5 ha must be mapped
Production time	13 years	5 years	4 years	3 years	1,5 years
Documentat-ion	incomplete metadata	standard metadata	standard metadata	standard metadata	standard metadata
Access to the data	unclear dissemination policy	disseminat-ion policy agreed from the start	free access for all kind of users	free access for all kind of users	free access for all kind of users
Number of European countries involved[2]	22 (28)	32 (39)	38 (39)	39	not yet known

CORINE Land Cover ISSUES

A number of deficiencies and limitations restrict wider exploitation at the Member State level and below.

- MMU of CLC (25 ha) is too coarse to capture fine spatial details.
- Mixed thematic classes with broad definitions difficult to interpret.
- Insufficient thematic details or attribution.
- Many changes smaller 5 ha of the CLC change layer.
- 6-yearly update too slow for community policy needs.
- Dynamic landscape features, which are highly relevant to policy, may be missed or underestimated.
- Different MMU for status and change layer cause difficulties in statistical applications.

CORINE Land Cover TOWARDS 2ND GENERATION

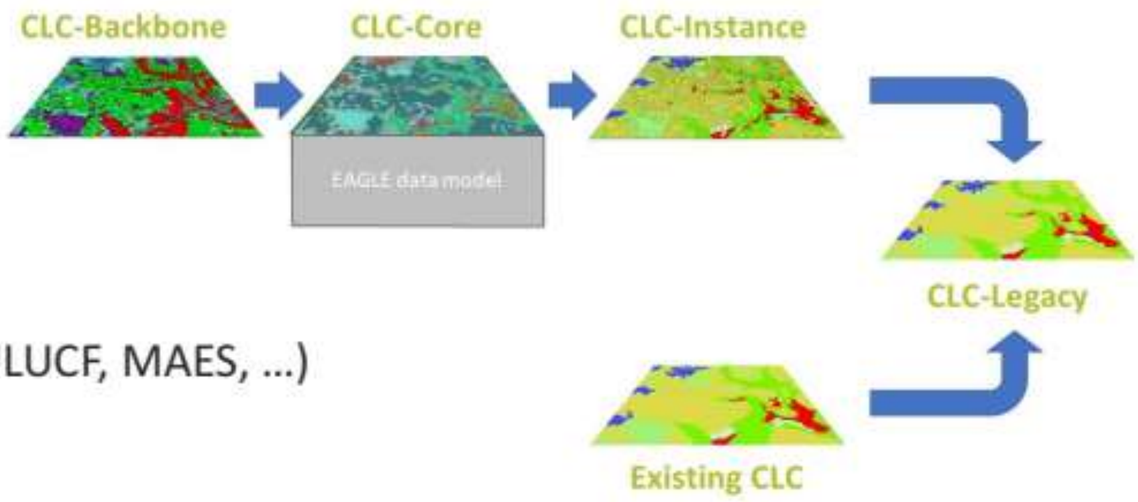
Summary of requirements review

- MMU 0.5 to 5 ha, 0.5 ha for LULUCF
- Change layer MMU = status layer MMU
- Revised thematic content (more classes, increased characterisation)
- 3 year to yearly update cycle
- Pan-European coverage (EEA-39)

CLC+ is the suite of products which have been developed under the CLC 2nd Generation approach.

The CLC+ product suite consists of

- CLC-Backbone
- CLC-Core
- CLC-Instances
  - CLC-Legacy
  - CLC-1ha
  - Many more … (LULUCF, MAES, …)



CONCLUSIONS

- 3 DIFFERENT PROJECTS, BUT A COMMON RESULT - GENERATING VALUE-ADDED INFORMATION TO IMPROVE LAND MANAGEMENT

- DATA COLLECTION (EO, IN SITU, ..) AND PROCESSING TECHNOLOGIES (CLOUD COMPUTING, MACHINE LEARNING,..) – NEW OPPORTUNITIES

- COPERNICUS SENTINEL DATA – A GAME CHANGER IN LAND MONITORING

Thank you for your attention!