Cyprus Earth Observation for Public Sector

CEOPS

ESA Contract No. 4000146291/24/NL/MH/fx

Final Presentation for Public release

CEOPS
Cyprus Earth Observation for Public Sector

Outline

- **Introduction**
- **Top-Level View of Project**
  - **Partners' roles & contributions**
  - **Work Packages**
    - WP0: Management
    - WP1: Definition of Earth Observation (EO) capabilities
    - WP2: Stakeholder engagement and requirements consolidation
    - WP3: Shortlisting of potential prototype services
- **Administrative Items**
  - **Deliverables**

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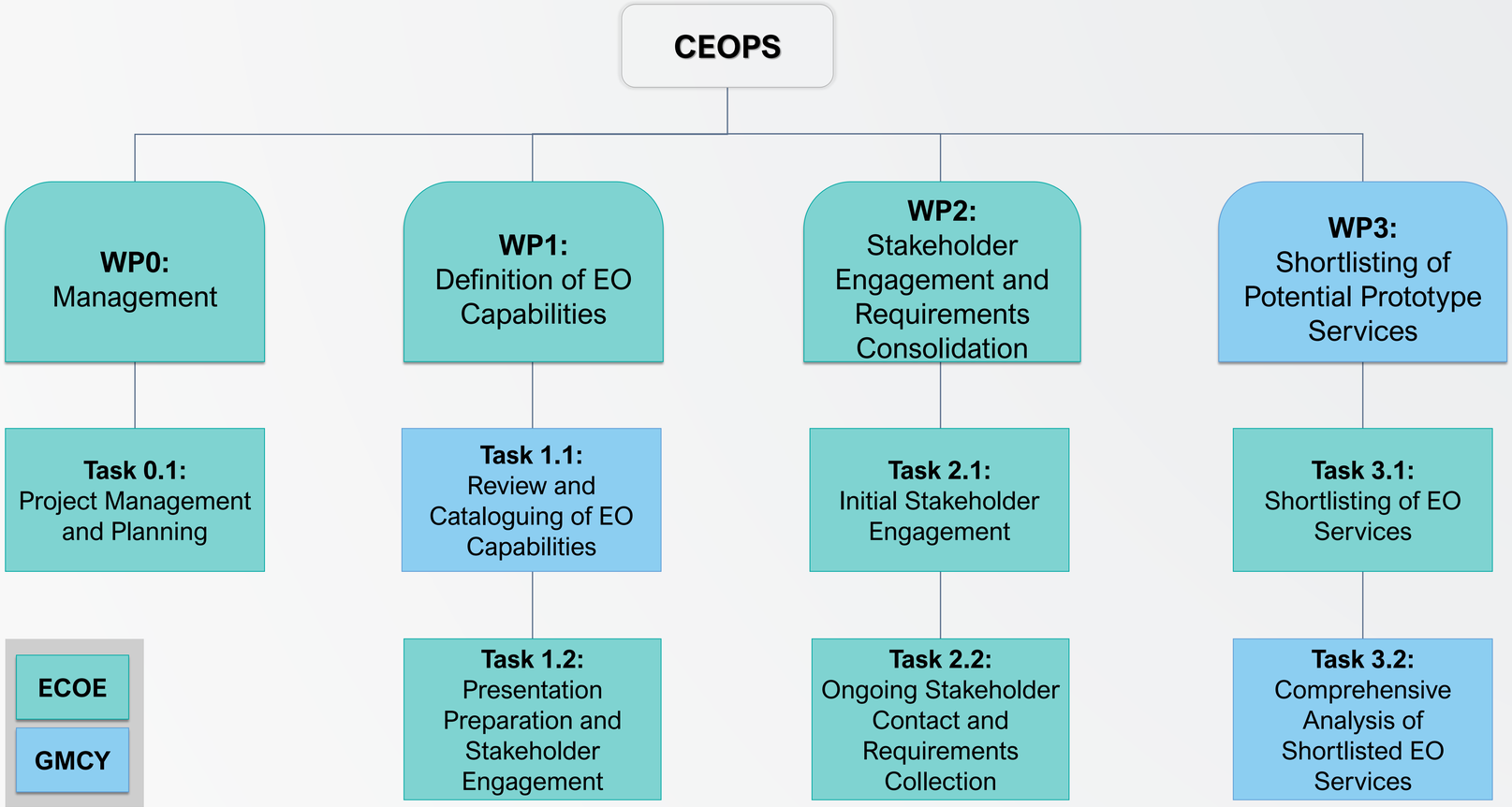
Project WBS



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ECoE Roles & Contributions

WP0 Leader - Management (M0-M8)

Activities:

- Ensure the successful attainment of project objectives, through planning, coordination, and managing and progress control of the activities
- Guarantee and promote the proper exchange of communications between partners
- Organise progress meetings and reviews
- Execute financial, administrative and contractual tasks.

WP1 Leader - Definition of EO Capabilities (M0-M2)

Task 1.2 Presentation Preparation and Stakeholder Engagement (M0-M2)

ECoE will organize a global presentation in M2 to showcase the preliminary EO services and tools catalogue.

Activities:

- Tailor the presentation based on stakeholders feedback
- Ensure relevance and engagement
- Offer detailed explanations of the EO tools, and practical applications
- Address stakeholders' questions.

Output: A structured, detailed presentation of EO tools.

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ECoE Roles & Contributions

WP2 Leader - Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.1 Initial Stakeholder Engagement (M0-M2)

ECoE will actively engage with stakeholders to introduce the EO capabilities catalogue.

Activities:

- Group stakeholders into relevant domains (Atmosphere, Marine, Land, Climate Change, Security, Emergency) based on their focus areas
- Conduct initial meetings to present the project and the preliminary catalogue, gathering feedback on stakeholder interests and additional needs.

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

ECoE will will maintain continuous engagement with stakeholders through regular follow-up meetings.

Activities:

- Gather detailed feedback on the presented tools and services
- Refine the catalogue based on this feedback
- Further understand stakeholder requirements
- Assess current operational practices, identify gaps and challenges
- Develop a wishlist of desired geospatial services.

Output: A report of user Segmentation, Operational Practices and Requirements

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ECoE Roles & Contributions

WP3 - Shortlisting of Potential Prototype Services (M5-M8)

Task 3.1 - Shortlisting of EO Services (M5-M6)

ECoE along with GMCY will begin by reviewing the detailed stakeholder requirements documented.

Activities:

- Review stakeholder requirements and map them to EO services.
- Create an initial shortlist of EO services.
- Organize digital training sessions and presentations for stakeholders.

Output: A comprehensive technical specification report for each EO service

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GMCY Roles & Contributions

Geomatics (Cyprus) Ltd

WP1 – Definition of EO Capabilities (M0-M2)

Task 1.1 - Review and Cataloguing of EO Capabilities (M0-M2)

GMCY will lead the review and cataloguing of EO services and algorithms across domains such as Atmosphere, Marine, Land, Climate Change, Security, and Emergency.

Activities:

- Conduct a comprehensive literature review and analyze public databases.
- Categorize EO tools systematically under respective domains.
- Provide detailed descriptions including:
  - Performance metrics (e.g. spatial resolution, update frequency)
  - Required datasets (EO and non-EO), customization options
  - Practical tips, costs, licensing conditions, real-world case studies
  - Utilize stakeholder feedback from WP2 to ensure the catalogue meets user needs.

Output: A structured, detailed catalogue of EO tools.

WP3 Leader - Shortlisting of Potential Prototype Services (M5-M8)

Task 3.2 - Comprehensive Analysis of Shortlisted EO Services (M6-M8)

GMCY will conduct detailed technical analysis of shortlisted EO services.

Activities:

- Analyze performance metrics (spatial resolution, coverage, update frequency, latency, accuracy).
- Identify required datasets and customization options.
- Provide information on costs, licensing, and real-world applications.
- Document the analysis to ensure clarity and accessibility for stakeholders.

Output: A comprehensive technical specification report for each EO service

Contribution

to Task 3.1 - Shortlisting of EO Services (M5-M6):

GMCY will support ECoE in:

- Reviewing stakeholder requirements and mapping them to EO services.
- Assisting in the creation of an initial shortlist of EO services.
- Organizing digital training sessions and presentations for stakeholders.

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WP0 Management (M0-M8)

Project Management

- Effective planning and coordination of project activities
- Monitoring progress and ensuring timely completion of tasks
- Facilitating clear communication between partners
- Organizing progress meetings
- Managing financial, administrative, and contractual tasks
- Keeping the project on track toward its objectives

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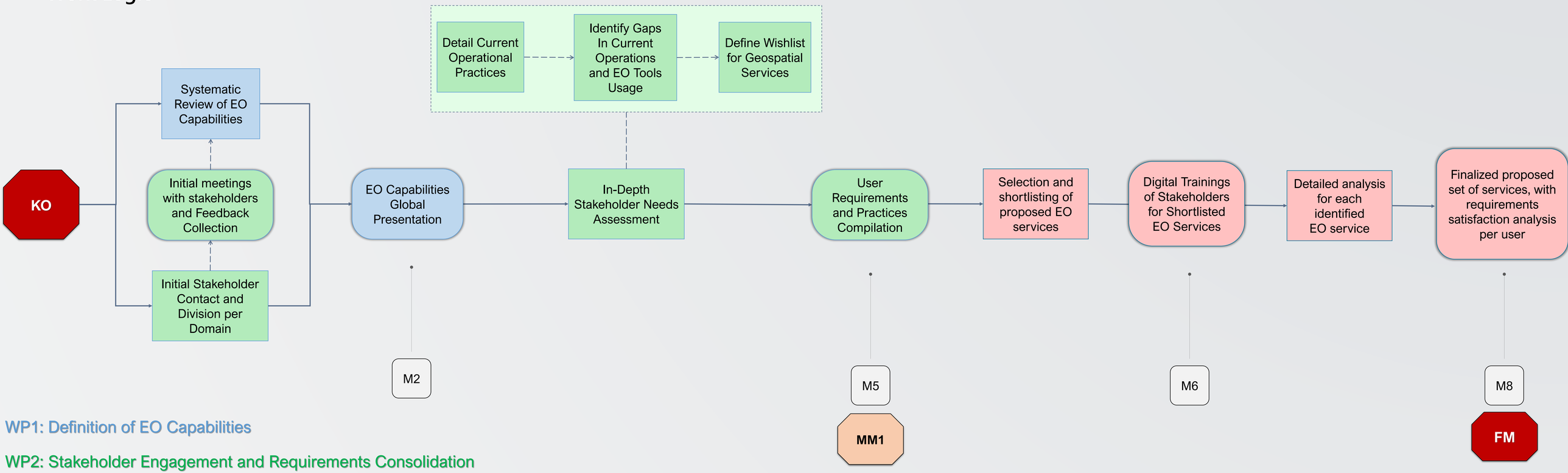
WP0 Management (M0-M8)

Work Logic



WP1: Definition of EO Capabilities

WP2: Stakeholder Engagement and Requirements Consolidation

WP3: Shortlisting of Potential Prototype Services

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WP0 Management (M0-M8)

Kick-off Meeting

- 19 November 2024 (hybrid)
- Ground floor meeting room, Service for Academic Affairs and Student Welfare, Cyprus University of Technology and online using Microsoft Teams platform
- Participants:
  - ESA Technical Officer and representatives
  - ERATOSTHENES Centre of Excellence (Prime Contractor)
  - Geomatics (Cyprus) Ltd (subcontractor)
  - Department of Electronic Communications, Deputy Ministry for Research, Innovation and Digital Policy

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WP1 Definition of EO Capabilities (M0-M2)

Geomatics (Cyprus) Ltd

Task 1.1 Review and Cataloguing of EO Capabilities

Objective

- Compile a comprehensive catalog of Earth Observation (EO) tools, platforms, and services relevant to Cypriot public sector stakeholders

Approach

- Utilize public databases and resources to identify EO tools and services
- Categorize EO services systematically to create a structured catalogue
- Incorporate stakeholder feedback from WP2 for relevance and applicability

Categorization

Atmosphere

Marine

Land

Climate Change

Security

Emergency

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WP1 Definition of EO Capabilities (M0-M2)

Task 1.1 Review and Cataloguing of EO Capabilities

Service Documentation Details

- **Product/Service Identity Card:** Summarizing key features and attributes
- **Product Functional Description:** Highlighting the purpose and applications
- **Product Processing Chain:** Explaining the workflow from data acquisition to delivery
- **Use Cases:** Providing real-world examples of applications

ID Reference System

- Unique ID per service based on thematic area initials (e.g., S1 for Security Service 1)
- Services classified into **Copernicus and Other/Commercial categories**

Atmosphere: A#	Marine: M#	Land: L#
Climate Change: CC#	Security: S#	Emergency: E#

Navigation & Accessibility

- Users can explore services using thematic categories and keywords

Outputs

- D1.1: EO Capabilities Report
- D1.1G: EO Capabilities Report (Greek version)

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WP1 Definition of EO Capabilities (M0-M2)

Task 1.2 Presentation Preparation and Stakeholder Engagement

Objective

- Present the preliminary EO services and tools catalogue to stakeholders
- Ensure relevance based on initial stakeholder feedback from initial meetings.

Approach

- Initial meetings to introduce the project, present the preliminary catalogue and gather feedback
- Addressing stakeholder questions and refining the presentations
- Finalization of the EO Capabilities presentation, based on the EO Capabilities Report (T1.1) and the initial stakeholder feedback (T2.1) and incorporate interactive tools, such as demo videos

Categorization

- Based on the **six thematic areas**: 1) Atmosphere, 2) Marine, 3) Land, 4) Climate Change, 5) Security, 6) Emergency
- Services classified into **Copernicus and Other/Commercial categories**

Outputs

- D1.2: EO Capabilities Presentation
- D1.2G: EO Capabilities Presentation (Greek version)

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WP1 Definition of EO Capabilities (M0-M2)

Task 1.2 Presentation Preparation and Stakeholder Engagement

EO Capabilities Global presentation

"CEOPS: Empowering the Public Sector through Earth Observation Technologies"

Wednesday, January 22, 2025, 9:00 to 15:00, Cyprus Scientific and Technical Chamber Conference Room, Nicosia

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WP1 Definition of EO Capabilities (M0-M2)

Task 1.2 Presentation Preparation and Stakeholder Engagement

EO Capabilities Global presentation

- Invitation (and a reminder a week before the event) sent to >150 mail addresses of stakeholders from the public sector
- >60 participants from >15 governmental Departments and Ministries
- Introductory round table discussions per thematic area to initiate the engagement
- Distribution of a short questionnaire to gather interest for in-person or online meetings
- Announcement of the workshop that will take place on March 18, 2025, during the RSCy2025

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.1 Initial Stakeholder Engagement (M0-M2)

Objective

- Gather initial stakeholder interest
- Showcase the preliminary EO services and tools catalogue

Approach

- Distribution of a press release and a short questionnaire to gather initial interest for in-person or online meetings

  Gathered information:

  1. Thematic area(s) of interest
  2. Three main use cases for which they would like to take advantage of EO capabilities (open question)
  3. Whether they are interested for in-person or online meetings
  4. Whether they would like to be trained in using EO technologies and for which thematic areas

Outcome

- 20 initial responses gathered
- 13 initial meetings conducted

Department of Fisheries and Marine Research	13 January 2025	online
Joint Rescue Coordination Centre	13 January 2025	online
Cyprus Police	14 January 2025	Physical presence
Cyprus Port and Marine Police	14 January 2025	online
National Security Authority	14 January 2025	online
Department of Agriculture	15 January 2025	online
Cyprus Scientific and Technical Chamber	15 January 2025	online
Civil Defence	16 January 2025	online
Ministry of External Affairs	16 January 2025	online
Deputy Ministry of Shipping	17 January 2025	online
Department of Environment	17 January 2025	Physical presence
Department of Meteorology	17 January 2025	Physical presence
Geological Survey Department	20 January 2025	Physical presence

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Objective

- Maintain continuous engagement with stakeholders to refine the EO capabilities catalogue according to their needs and interests

Approach

- Follow-up meetings to:
  - Collect feedback on the presented tools and services,
  - Further understanding of the stakeholders specific needs and requirements
  - Evaluate current operational practices to identify gaps and challenges
- Three 2-hours meetings conducted
- Two participatory stakeholder engagement workshops

Department of Fisheries and Marine Research	10 March 2025	Physical presence	
Department of Antiquities	12 March 2025	Physical presence	
Cyprus Port and Marine Police	31 March 2025	Physical presence	

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Two participatory stakeholder engagement workshops:

1. 18 March 2025 at Aliathon Resort in Paphos (parallel with the 11th International Conference on Remote Sensing and Geoinformatics of the Environment (RSCy2025)

- 24 participants from 8 different governmental bodies




2. 28 April 2025 at the Cyprus Scientific and Technical Chamber Conference Room in Nicosia

- 37 participants from 11 governmental bodies



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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Outcomes

- Reached out to **350 stakeholders** from the public sector.
- Engaged with **>20 departments** and agencies from **>10 ministries/organizations**.
- Developed and maintained a **comprehensive stakeholder engagement tracking tool**.
- Compiled a structured **"wishlist" of >40 geospatial products and services** based on input from end users, detailing operational needs, technical specifications, spatial/temporal requirements, and regulatory considerations for each use case.
- Grouped use cases into **five thematic domains** (Atmosphere, Land, Emergency, Maritime Safety and Marine Environment, and Safety)

Ministry / Organization	Departments / Agencies
Ministry of Agriculture, Rural Development and Environment	- Dept. of Fisheries and Marine Research - Dept. of Environment - Dept. of Meteorology - Dept. of Agriculture - Geological Survey Dept. - Dept. of Forests - Mines and Quarries Service - Cyprus Agricultural Payments Org. - Water Development Dept.
Ministry of Interior	- Civil Defence - Dept. of Lands and Surveys - Dept. of Town Planning and Housing
Ministry of Defence	- National Guard - National Security Authority - Joint Rescue Coordination Center - Defence and Security Academy
Ministry of Justice and Public Order	- Cyprus Police - Port and Marine Police - Fire Service
Ministry of Foreign Affairs	
Ministry of Finance	- Dept. of Customs and Excise
Ministry of Transport, Communications and Works	- Dept. of Public Works
Deputy Ministry of Culture	- Dept. of Antiquities
Deputy Ministry of Shipping	
District Local Government Organizations	
Cyprus Scientific and Technical Chapter	
Committee on Missing Persons in Cyprus	

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Atmosphere

Agrometeorology

- Enhancement and validation of agrometeorological forecasts

Marine and Coastal Monitoring

- Verification of wave height forecasts
- Sea surface temperature forecast evaluation

Air Quality and Dust

- Dust forecasting and regional monitoring
- Dust monitoring at mining and industrial sites

Model Evaluation and Forecast Verification

- Validation of atmospheric and environmental models
- Accuracy assessment of operational forecasts

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Land

Wildfire and Risk Management

- Identification of wildfire-prone areas based on vegetation and land management
- Urban fire vulnerability assessment
- Mapping of fire damages

Environmental Monitoring

- Land Use / Land Cover monitoring (incl. Drinking Water Protection Zones)
- Land Use Change monitoring
- Soil erosion and sealing monitoring
- Monitoring of carbon soil stocks
- Detection of herbicide application
- Detection of underground water pipe leaks

Agriculture and Vegetation

- Crop identification and classification
- Drought and pest damage assessment
- Customized land classifications
- Cultural and Urban Infrastructure

Archaeological sites erosion monitoring

- Detection of unauthorized construction/modifications
- Energy and Waste
- PV park site assessment and post-licensing monitoring
- Monitoring of waste pile areas in waste management units

Biodiversity

- Species and habitat monitoring

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Emergency

Wildfire Management

- Near real-time fire detection
- Forecast of fire spread
- Post-wildfire evacuation planning

Flood Management

- Post-flood response and management planning

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Maritime Safety and Marine Environment

Maritime Security and Surveillance

- Detection of illicit ship transfers and drifting vessels
- Surveillance of undocumented immigration via maritime routes
- Monitoring of illegal fishing activities

Cultural Heritage Protection

- Detection of antiquities smuggling at underwater archaeological sites

Environmental Protection

- Marine pollution detection and management
- Monitoring the impact of construction on the marine environment
- Coastline change and erosion monitoring

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Safety

Border and Buffer Zone Surveillance

- Monitoring of movement to and from the occupied areas
- Surveillance of activities and changes in the UN Buffer Zone
- Undocumented immigration monitoring (land routes)

Illegal Activities Detection

- Detection of illegal crop cultivation
- Detection of illegal mining activities
- General surveillance of illegal activities

Cultural Heritage Protection

- Monitoring of destruction to archaeological sites in the occupied areas of Cyprus

Population and Resource Monitoring

- Tracking of population movement and concentration
- Monitoring of legal mining sites

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WP2 Stakeholder Engagement and Requirements Consolidation (M0-M5)

Task 2.2 Ongoing Stakeholder Contact and Requirements Collection (M2-M5)

Key takeaways

- Strong interest across ministries in applying EO for monitoring, planning, compliance, and policy-making.
- Stakeholders require **customized, real-time or regularly updated spatial products** (e.g., for forecasting, monitoring, impact assessment).
- Demand for **user-friendly tools for non-experts**, such as dashboards, alerts, and simple visualizations.
- Interest in **cross-sectoral EO applications** covering atmosphere, land, marine, and security domains.
- Departments with GIS units (e.g., Dept. of Environment) more equipped to identify EO needs.
- **EO literacy and GIS capacity gaps** limit uptake in many departments; structured training needed.
- Engagement was often **individual-driven**, not institutional, affecting representativeness.
- Greater impact expected if **invitations** could be issued **via official channels** (e.g., ministry directorate).

Proposed next steps for the Cypriot ecosystem

- **Launch national EO training and awareness program** tailored to government needs.
- Appoint **EO focal points** in each ministry/department to coordinate and liaise.
- Adopt **formal engagement strategy** using official communication channels.
- Leverage **ESA collaboration** for capacity building, pilots, and data access.

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WP3 Shortlisting of Potential Prototype Services (M5-M8)

Task 3.1 Shortlisting of EO Services (M5-M6)

Digital EO Trainings (Hybrid)

10 June 2025 *(50 participants – 46 online, 4 physical presence)*

Operational applications and thematic analysis of Earth Observation data

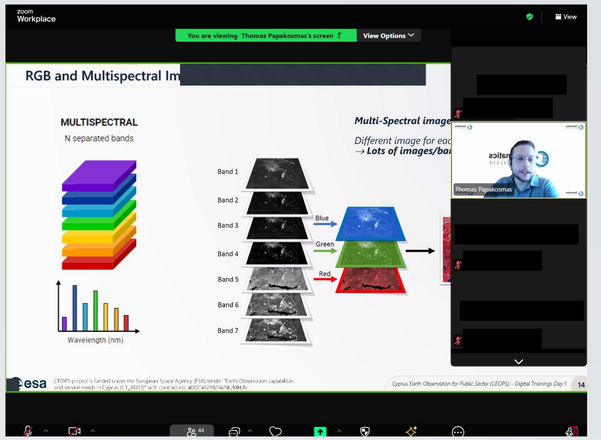
- Remote Sensing Imagery Characteristics
- Types of Remote Sensing Imagery
- Remote Sensing applications based on the stakeholders "wishlist"

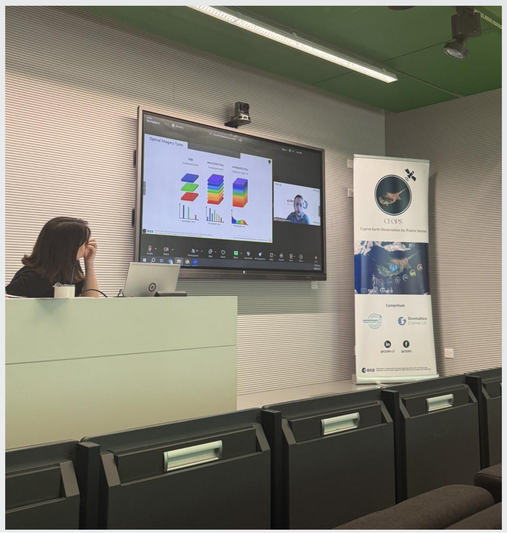
11 June 2025 *(56 participants – 54 online, 2 physical presence)*

Access, navigation and use of Earth Observation web platforms

- Access and navigation in Copernicus services
- Access and activation of Copernicus services for authorized users
- Overview of Earth Observation web platforms and tools
- Use of QGIS software for simple processing and visualization of Earth Observation data

✓ Participation from **20 different governmental bodies.**





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WP3 Shortlisting of Potential Prototype Services (M5-M8)

Task 3.1 Shortlisting of EO Services (M5-M6)

Atmosphere

- Atmosphere Data Store (ADS)
- Climate Data Store (CDS)
- EUMETSAT User portal
- NOAA Office of Satellite and Product Operations (OSPO)
- ECMWF Charts

Land

- Copernicus Land Monitoring Service
- CREODIAS
- Spottitt Biodiversity monitoring
- Airbus 3D textured model
- ICEYE Wildfire insights
- TerraScope
- AppEEARS
- Planet agriculture solutions
- EOS Data Analytics
- PlanetScope Imagery
- UP42
- Natural Capital Accounting by VITO

Emergency

- Copernicus Emergency Management Service
- SaferPlaces
- firemaps.net
- OroraTech's Fire spread prediction
- OroraTech's Wildfire Solution

Maritime Safety and Marine Environment

- Copernicus Maritime Surveillance Service
- Copernicus SESA - Crisis and Conflict Monitoring Service
- WaterInsight solutions
- SafeSeaNet
- CleanSeaNet
- Orbital EOS

Safety

- Copernicus SESA - Crisis and Conflict Monitoring Service
- OREC (SATIM)
- ICEYE's Daily Coherent Ground Track Repeat imagery
- Satellite Image Providers & Platforms: Apollo Mapping (Apollo Hunter), UP42 (Airbus), SkyWatch / EarthCache, ICEYE, Planet Labs

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WP3 Shortlisting of Potential Prototype Services (M5-M8)

Geomatics (Cyprus) Ltd

Task 3.2 Comprehensive Analysis of Shortlisted EO Services (M6-M8)

Objective

- To identify and technically specify EO tools that match the operational needs of Cypriot public sector stakeholders, based on the use cases collected in Task 2.

Workflow Summary

Input Sources:

- EO services and tools from Task 1.1 (D1.1)
- Stakeholder use cases and operational needs from Task 2

Process:

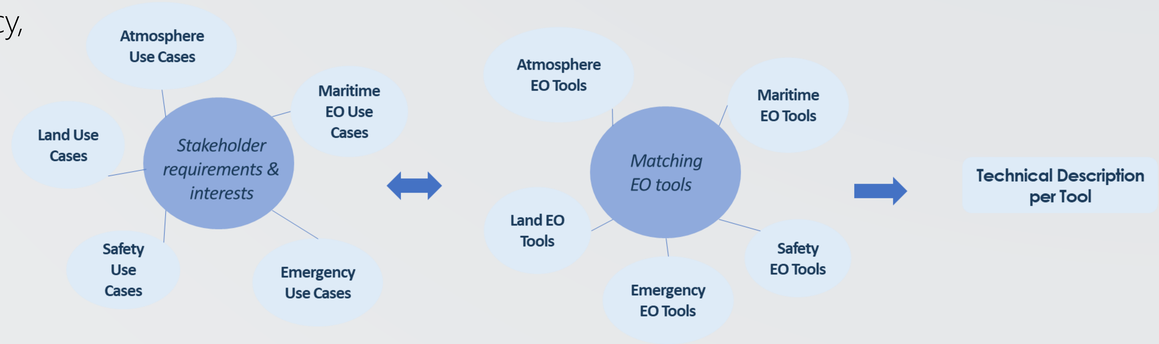
- Matched each use case with EO tools across 5 domains (Atmosphere, Land, Marine, Emergency, Security)
- Evaluated each match based on resolution, update frequency, output format, and accessibility
- Identified gaps and proposed customizations or new service concepts
- Created technical profiles for each matched tool
- Where no perfect match existed: Custom tool concepts were proposed

ID Reference System

- Pairing IDs: Use case ↔ EO Tool cross-matches referenced by D1.1 IDs (e.g., L1, A4, S4)
- Services classified into Copernicus and Other/Commercial categories

Outputs

- D3: Potential Prototype Service Specification Report



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WP3 Shortlisting of Potential Prototype Services (M5-M8)

Geomatics (Cyprus) Ltd

Task 3.2 Comprehensive Analysis of Shortlisted EO Services (M6-M8)

Evaluation of **EO tools** across key technical and operational criteria to align their capabilities with stakeholder needs in real-world **use cases** across atmosphere, land, emergency, maritime, and safety domains.

Available EO Tools & Services (Task 1) (Categorized by domain: Atmosphere, Land, Marine, Climate, Safety, Emergency)

Operational Use Cases (Task 2) (Defined based on meetings, interviews, and stakeholder events)

EO Tool Shortlisting
- Matched tools to each use case
- Evaluated spatial/temporal specs, outputs, accessibility

Technical Specification Templates
- For each shortlisted tool: specs, customization needs, access methods

Gap Analysis
- Identified cases where no tool fully met needs
- Proposed adjustments or new custom services

Cross-Referencing with D1.1
- Linked shortlisted tools with D1.1 tool inventory
- Ensured naming consistency and traceability

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WP3 Shortlisting of Potential Prototype Services (M5-M8)

Geomatics (Cyprus) Ltd

Task 3.2 Comprehensive Analysis of Shortlisted EO Services (M6-M8)

Example EO Tool: Copernicus Land Monitoring Service (CLMS)/L

Pairing Reference: Linked to D1.1 product: *CLMS Land Cover Mapping Tool*

Each use case was defined based on real stakeholder needs

Use case

1.2 Land

#	USE CASE	SPATIAL / TEMPORAL NEEDS	MATCHED EO TOOL(S)	MATCHING JUSTIFICATION	PAIRING WITH D1.1
4	**Site Assessment for PV Parks (Licensing)**	3 m / Monthly (licensing)	**CLMS,** Land Cover Monitoring Tool + Change Detection Tools (VHR, optical)	Requires customized temporal frequency + alert logic for unauthorized change.	L
5	**LULC in Drinking Water Protection Zones**	5–10 m / Bi-Annual	**CLMS,** Land Cover Mapping Tool (Sentinel-2), Web-GIS integration tool	Output can be embedded in WDD WebGIS. No tool modification needed.	L
6	**Land Use Change Monitoring**	1–2 m / Annual	**CLMS,** Change Detection Tool (Optical + VHR-based)	Needs VHR access and targeted classification (urban/agriculture/burn).	L
7	**Customized Land Classification**	1–3 m / Annual	**CLMS,** Land Classification Tool (Custom legend definition)	Fully supported via training classifiers with local class definitions.	L

Selected Tool

2.2.1 Tool 1: **Copernicus Land Monitoring Service (CLMS)/ L**

TOOL/SERVICE NAME	CLMS POLICY PRODUCT
PROVIDER	European Commission (EC), implemented by the European Environment Agency (EEA) and European Space Agency (ESA)
CATEGORY	Land
PRIMARY PURPOSE	Environmental monitoring, sustainable resource management, agricultural management, land-use planning
EO DATA INPUTS	EO data (Sentinel-2, Sentinel-1, Landsat), in-situ data, thematic datasets
PROCESSING ALGORITHMS / MODELS	Classification algorithms, Change detection algorithms, Time series classification
OUTPUT INTERPRETATION	• Land cover maps (raster, vector format) • Maps with soil moisture levels (raster/ time-series) • Results of vegetation indices implementation (Geotiff or time-series) • Water surface monitoring status (raster, vector format) • Urbanization trends (using indices or percentage maps visualization)
UPDATE FREQUENCY	Daily to yearly, depending on product type.
SPATIAL RESOLUTION	10m to 1km, depending on product type
PERFORMANCE METRICS	RMSD, Bias, STD, R etc
ACCESS MODE & LICENSING	Web portal at https://land.copernicus.eu/en, no login required
DELIVERY WORKFLOW	Accessed via web portal.
USE IN PRACTICE	Used by local authorities to assess spatial planning, climate change, water sources monitoring, environmental assessment.

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WP3 Shortlisting of Potential Prototype Services (M5-M8)

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Task 3.2 Comprehensive Analysis of Shortlisted EO Services (M6-M8)

Example EO Tool: Copernicus Land Monitoring Service (CLMS)/L

Pairing Reference: Linked to D1.1 product: *CLMS Land Cover Mapping Tool*

Each use case was defined based on real stakeholder needs

Use case

1.2 Land

#	USE CASE	SPATIAL / TEMPORAL NEEDS	MATCHED EO TOOL(S)	MATCHING JUSTIFICATION	PAIRING WITH D1.1
4	**Site Assessment for PV Parks (Licensing)**	3 m / Monthly (licensing)	**CLMS,** Land Cover Monitoring Tool + Change Detection Tools (VHR, optical)	Requires customized temporal frequency + alert logic for unauthorized change.	L
5	**LULC in Drinking Water Protection Zones**	5–10 m / Bi-Annual	**CLMS,** Land Cover Mapping Tool (Sentinel-2), Web-GIS integration tool	Output can be embedded in WDD WebGIS. No tool modification needed.	L
6	**Land Use Change Monitoring**	1–2 m / Annual	**CLMS,** Change Detection Tool (Optical + VHR-based)	Needs VHR access and targeted classification (urban/agriculture/burn).	L
7	**Customized Land Classification**	1–3 m / Annual	**CLMS,** Land Classification Tool (Custom legend definition)	Fully supported via training classifiers with local class definitions.	L

Customization need

CUSTOMIZATION NEEDS	LAND USE CASE 6
STAKEHOLDER NEEDS	**Department of Lands and Surveys (DLS) need annual monitoring of land use changes using very high-resolution imagery (1–2 m) and assessment of the impact of changes on land/property value**
GAP VS EXISTING TOOL	Current available resolution (~10 m to ~1km) too coarse in contrast to current needs. Need for a higher resolution (~1-2 m). The temporal need (annually) is covered by existing tools.
CUSTOMIZATION OPTIONS	The results will be processed in GIS platform.
DATA INTEGRATION NEEDS	Needs VHR access and targeted classification (urban/agriculture/burn).
UI/UX ADJUSTMENTS	-

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Finalized proposed set of services, with requirements satisfaction analysis per user

Fully satisfied use cases → covered by existing Copernicus & commercial tools

Partially satisfied use cases → require integration of datasets, VHR imagery, or model calibration

Uncovered gaps → addressed through proposed **prototype/custom services**

Prototype Services Identified

- Fine-scale dust monitoring (mining sites)
- Underground water leak detection
- Cultural heritage site monitoring
- Illegal construction & land use change

Fully satisfied Use Case Example

EO Tool:

TOOL/SERVICE NAME	CMEMS POLICY PRODUCT
PROVIDER	ESA Copernicus, operated by Mercator Ocean International
CATEGORY	Marine Environment
PRIMARY PURPOSE	Provides information on the state of the Blue (physical), White (sea ice) and Green (biogeochemical) ocean, on a global and regional scale.
EO DATA INPUTS	Satellite observations (Sentinel missions, other EO satellites), in-situ data, numerical models
PROCESSING ALGORITHMS / MODELS	HYCOM, CICE, ECOSMO II etc
OUTPUT INTERPRETATION	• Sea surface temperature • Salinity • sea ice • ocean currents • chlorophyll-a • primary productivity • waves • and more
UPDATE FREQUENCY	Near-real time, historical and predictive data (10 days ahead) depending on product type.
SPATIAL RESOLUTION	From 10m (Sentinel imagery) to kms (global observations), depending on product type
PERFORMANCE METRICS	RMSD, Bias, correlation, variance, scatter index etc
ACCESS MODE & LICENSING	Web portal at https://marine.copernicus.eu/, no login required
DELIVERY WORKFLOW	Distributed via Copernicus Marine portal
USE IN PRACTICE	Used by local authorities and private sector users to acquire accurate and timely ocean and marine data.
SUPPORT & CONTACT	CMEMS help center

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Prototype Services Identified

- Fine-scale dust monitoring (mining sites)
- Underground water leak detection
- Cultural heritage site monitoring
- Illegal construction & land use change

Compliance with Use Case:

COMPLIANCE WITH USE CASE	ATMOSPHERE USE CASE 1
STAKEHOLDER NEEDS	**Department of Meteorology (DM) Wave height and sea surface temperature at coastal resolutions (100–500 m nearshore, 1 km offshore), 2–4x daily.**
GAP VS EXISTING TOOL	**Minimal – CMEMS addresses the key parameters directly, including temporal and spatial needs.**
CUSTOMIZATION OPTIONS	High – products can be filtered by region, variable, depth, and time window via the Copernicus portal.
DATA INTEGRATION NEEDS	Direct integration with weather forecasting systems using NetCDF or GRIB formats.
UI/UX ADJUSTMENTS	Portal is user-friendly, but local platform integration might benefit from API-based automation and customized visual dashboards.

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Finalized proposed set of services, with requirements satisfaction analysis per user

Custom Service Example

Custom Tool

TOOL/SERVICE NAME	CUSTOM DUST MONITORING TOOL
PROVIDER	To be developed (possibly by EO research partner)
CATEGORY	Land
PRIMARY PURPOSE	High-resolution dust emission detection at active mining sites
EO DATA INPUTS	PlanetScope (<3 m), Sentinel-2 (10 m), Sentinel-1
PROCESSING ALGORITHMS / MODELS	Bare Coal Index (BCI), Object-Based Image Analysis (OBIA), ML classifiers
OUTPUT INTERPRETATION	Dust plume alerts, daily maps, emission density metrics
UPDATE FREQUENCY	Ad hoc (per acquisition) or daily
SPATIAL RESOLUTION	3 m horizontal, 10–15 m vertical detection band
PERFORMANCE METRICS	Detection accuracy, false positive rate
ACCESS MODE & LICENSING	Restricted – dependent on data provider agreements
DELIVERY WORKFLOW	Self-service access
USE IN PRACTICE	Intended to alert MQS inspectors when dust levels exceed safety thresholds
SUPPORT & CONTACT	Technical lead within EO project team

Compliance with Use Case

COMPLIANCE WITH USE CASE	LAND USE CASE 1
STAKEHOLDER NEEDS	**Mines and Quarries Service (MQS) requires ad hoc, sub-5 m dust detection over work areas.**
GAP VS EXISTING TOOL	No existing tool provides <10 m resolution dust forecasts or event detection.
CUSTOMIZATION OPTIONS	Develop pipeline using VHR data + custom dust indices; optionally integrate SAR for plume extent.
DATA INTEGRATION NEEDS	Incorporate wind direction and humidity data for improved detection accuracy.
UI/UX ADJUSTMENTS	Simple web-based dashboard for visualization and download of maps/reports.

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Task 3.2 Comprehensive Analysis of Shortlisted EO Services (M6-M8)

Mapping EO Tools to Stakeholder Needs

The shortlisted EO tools were assessed against stakeholder-defined use cases across five domains - Atmosphere, Land, Emergency, Marine Environment and Safety, and Security.

Each tool's performance was categorized as:

✅ **Fully Satisfied** – Covered by **existing Copernicus or commercial tools**

🟧 **Partially Satisfied** – Requires **integration of additional datasets**, VHR imagery, or model calibration

🔴 **Uncovered Gaps** – Addressed through the **design of prototype or custom EO services**

26 EO tools were reviewed - 4 were prioritized for further adaptation within CEOPS.

Domain	EO Tool	Support Level	Proposed Updates / Gaps
Atmosphere	UV Index Forecast Platform	🟧 Partial	Integrate dust (AOD) inputs, ground sensors, improved city-level forecasting
Land	CLMS	🟧 Partial	Add <3m VHR imagery, AI/ML classifiers, alerting system
Land/Emergency	EFFIS	🟧 Partial	OBIA + deep learning, live weather integration, fire spread modeling
Maritime/Safety	Copernicus SESA	🟧 Partial	Include sub-meter imagery, AI/ML for movement & anomaly detection, secure dashboard

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Task 3.2 Comprehensive Analysis of Shortlisted EO Services (M6-M8)

Selected Tools for Prototype Development

Based on coverage, operational impact, and technical readiness, four EO tools were prioritized for targeted adaptation within the CEOPS framework.

These tools collectively address over 20 use cases, forming the foundation for prototype service design and budgeting under WP3.

Tool	Domains Covered	Proposed Enhancements
Copernicus Land Monitoring Service (CLMS)	Land, Emergency	VHR data integration, AI-based classification, alert & validation systems
EFFIS (European Forest Fire Information System)	Land, Emergency	OBIA + Deep Learning models, real-time fire spread prediction, cloud-based visualization
Copernicus SESA	Safety, Maritime	AI/ML-based movement & crop detection, SAR-optical fusion, secure dashboards
UV Index Forecast Platform	Atmosphere	AOD & dust monitoring integration, sensor-based validation, occupational alerting

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Budgeting Overview of Shortlisted EO Tools

The **budgeting analysis** complemented the technical evaluation by assessing the **economic feasibility** of proposed updates.

Indicative costs were estimated for EO data acquisition, model development, and system integration, ensuring that future services are both technically robust and financially viable.

The analysis confirmed that existing Copernicus services offer broad coverage, but additional investment in VHR data and advanced analytics is required to meet Cyprus's high-priority needs.

Tool	Example Use Case	Estimated Total Budget (€)	Key Cost Drivers
CLMS	PV monitoring, land cover classification, drought & pest detection	7,400 – 35,000	VHR imagery, model implementation
EFFIS	Fire detection & spread forecasting	12,000 – 75,800	Deep learning model + GUI development
Copernicus SESA	Movement & illegal crop detection	20,800 – 51,000	AI/ML integration, secure dashboard
UV Index Platform	Dust & air quality monitoring	≈60,000 (one-time)	Prototype AOD model development, procurement and deployment of ground sensors

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Thank you

Any questions?

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