living planet symposium | BONN 23–27 May 2022

TAKING THE PULSE OF OUR PLANET FROM SPACE

WORLDSOILS Monitoring System

ESA Contract No. 400131273/20/I-NB

Project Objectives

Develop a **pre-operational** monitoring system

- estimations of **top Soil Organic Carbon**
- exploiting space-based **EO data**
- leveraging large **soil data archives and modelling techniques**
- **cloud environment**

Engaging and bringing together **end users and EO experts** for developing soil indices relevant for monitoring the global top soils.

Project Ambition

Monitoring system prototype characteristics:

- **Yearly estimations** of top soil organic carbon.
- **Modular**; allowing its future extension to additional soil indices.
- **Spatial resolution** 100m x 100m over continental areas and 50m x 50m over three regional test sites.
- **Large time series (3 years)**
- **Confidence metrics** provision.
- **Validation** over three European regions.

On behalf of the Project Consortium

- GMV Aerospace and Defence (**GMV**) - **Prime -** Julia Yagüe, Adrián Sanz
- Catholic University of Louvain (**UCL**) – Bas van Wesemael
- German Aerospace Center (**DLR**) - Uta Heiden
- German Research Center for Geosciences (**GFZ**) - Sabine Chabrillat
- Aristotle University of Thessaloniki (**AUTh**) - Nikolaos Tziolas
- International Soil Reference and Information Centre (**ISRIC**) - Laura Poggio
- Czech University of Life Sciences (**CZU**) - Asa Gholizadeh
- Tel Aviv University (**TAU**) - **External service provider -** Eyal Ben-Dor

NCR and Steering Committee

National Reference Centres Soil

- Service Public de Wallonie – SPW (Belgium)
- Soil And Water Resources Institute, HAO - Dimitra (Greece)
- Research Institute for Soil and Water Conservation - VUMOP (Czech Republic)

Steering Committee *(policy and programmatic guidance)*

- EC DG JRC & DG DEFIS
- EEA
- GSP FAO
- EJP Soil (STEROPES - AgroParisTech)

Project Phases

Phase 1

Feasibility analysis and system requirement baseline definition.

- **Feasibility and Impact Assessment**
- **Requirement Specification**
- **Requirements baseline**

Phase 2

Design implementation, verification and testing.

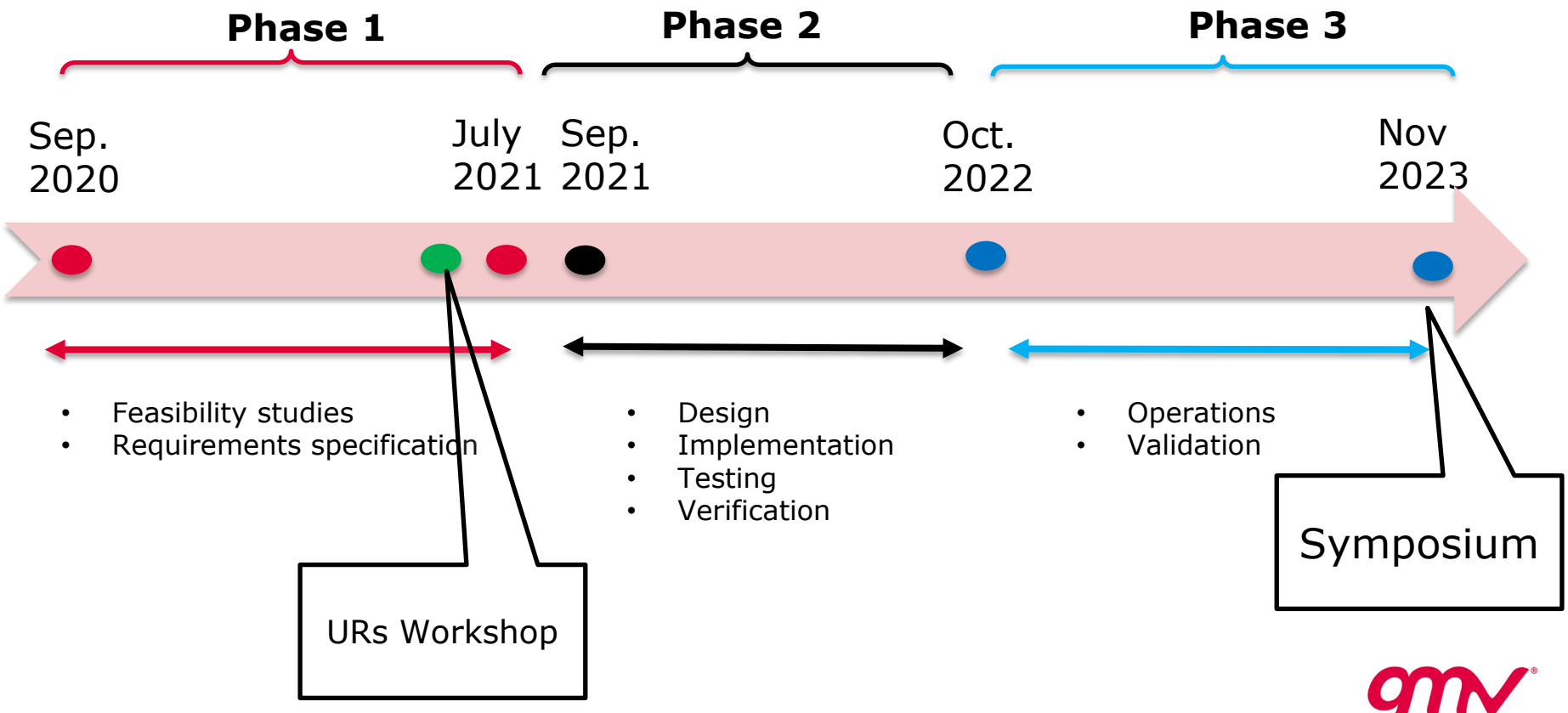
- **Detailed Design**
- **Development & testing**

Phase 3

Operation, validation and analysis.

- **Operated 1 year (SOC monitoring)**
  - Wallonie (Belgium)
  - Czech Republic
  - Central Macedonia (Greece)
- **Validation and analysis**
- **Final Symposium**

Timeline


Phase 1
Phase 2
Phase 3
Sep. 2020
July 2021
Sep. 2021
Oct. 2022
Nov 2023
• Feasibility studies
• Requirements specification
• Design
• Implementation
• Testing
• Verification
• Operations
• Validation
URs Workshop
Symposium

Work Progress (1/2)

- **Feasibility studies**
  - Development of **SOC prediction models** for bare/vegetated soils
  - Effects of applying **laboratory spectral** models to the remote sensing signal
  - Combining **prediction** and Digital Soil **Mapping**
  - Best use of **Sentinel-2** data and other Copernicus data series

  - **Scientific outcomes**→ workshop report available at https://world-soils.com/

- **User requirements** specification / consolidation /Review/ Workshop

- System **requirements** and implementation options

- **Implementation option agreed** → combination of a **local approach** for Europe (SOC predictions at the highest accuracy with confidence limits) with a **global approach** (system allowing integration of upcoming data for the rest of the world, since to-date, reference soil data is limited to Europe).

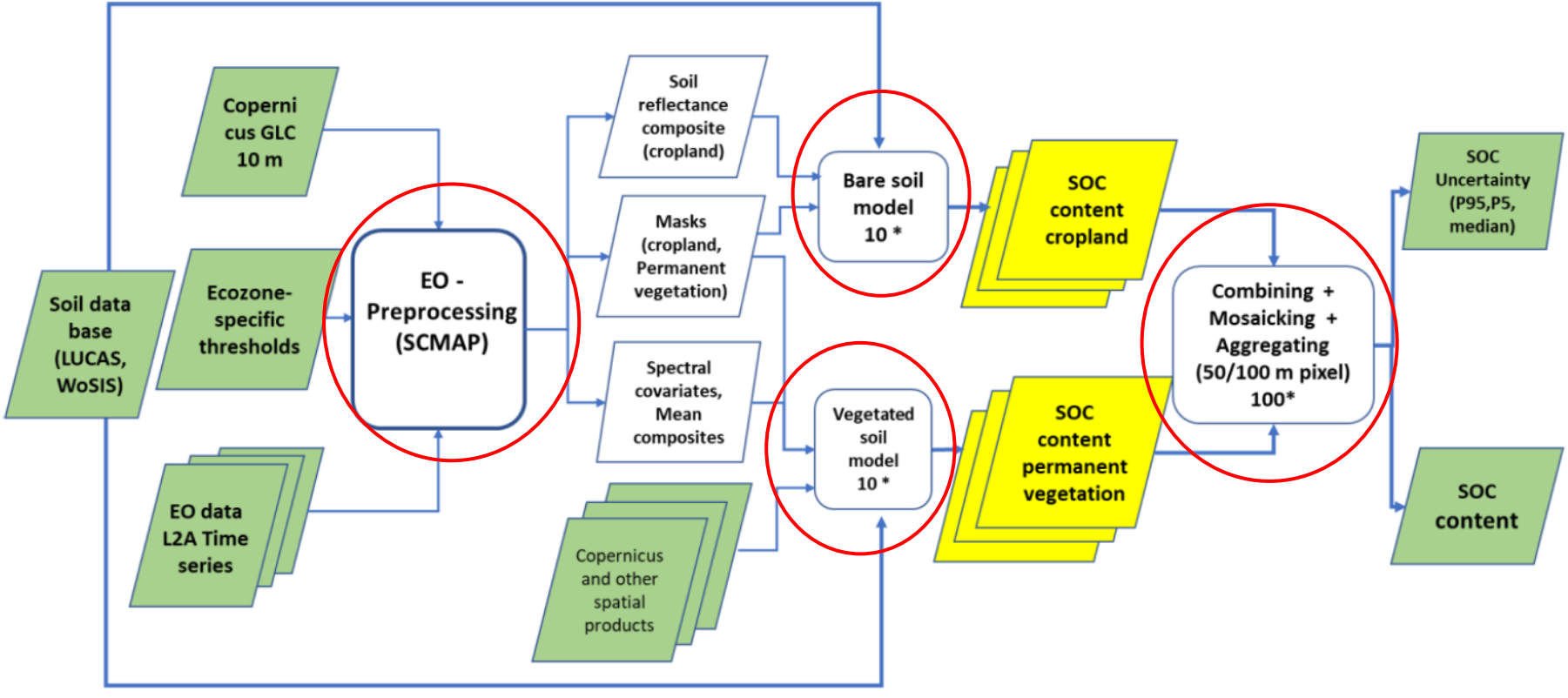
Work Progress (2/2)

- System **design**:
  - **Algorithm** Theoretical Basis,
  - **Data** Procurement,
  - Technical Specifications,
  - Implementation Plan.

- System **Implementation**:
  - Implementation of the **models** and **pre-processor**
    - Bare soil
    - Vegetated soil
    - SCMaP
    - Mosaicking
  - **GUI** –front and back end-
  - Set up of **platform** for modules deployment (DIAS MUNDI)

- **Data preparation**
  - Soil Reflectance composites (*5 years, 2018-2022) & thresholds

SOC Prediction Module



WORLDSOILS block system components. Flowchart of the SOC content prediction module. Input and output are shown in green

Way Forward

System **deployment**: June-October 2022

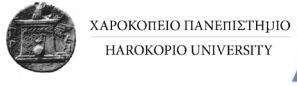
2023: one year of **operations** and **validation** with the National Reference Centres Soil

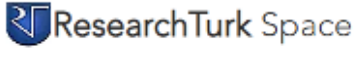
Pre-announcement of WORLDSOILS - Soil Monitoring Symposium. October 2023 in Frascati.

https://www.world-soils.com/

Stakeholders

54 Organisations, 19 Countries





remote sensing

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CITESCORE 6.6 SCOPUS

Special Issue: Remote Sensing for Soil Organic Carbon Mapping and Monitoring

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European Space Agency, ESA—ESRIN, Largo Galileo Galilei 1, I-00044 Frascati, Italy

This Special Issue welcomes manuscripts addressing: the use of optical and thermal multi- or hyperspectral imagery for SOC mapping, as well as on the challenges involved in producing coherent SOC maps. Such challenges are the compositing of the images in order to increase the coverage of satellite imagery; the transfer of spectral models from spectral libraries to the remote sensing signal; dealing with mixed pixels and improved covariates for mapping soil properties in permanently vegetated areas.

Submission Deadline: 31 July 2022

Submission link: https://www.mdpi.com/journal/remotesensing/special_issues/RS_SOC_Mapping

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Aims and Scope

Remote Sensing (ISSN 2072-4292) is a peer-reviewed, **open access** journal about the science and application of remote sensing technology, and is published semimonthly online by MDPI. The Remote Sensing Society of Japan (RSSJ) and the Japan Society of Photogrammetry and Remote Sensing (JSPRS) are affiliated with Remote Sensing, and their members receive a discount on the article processing charge.

SCIE
(IF 2020: 4.848)
High Visibility

Scopus
(CiteScore 6.6)
High Visibility

16.1 days
Submission to First Decision
(median values for papers published in this journal in the first half of 2021)

3.4 days
Acceptance to publication
(median values for papers published in this journal in the 1st half of 2021)

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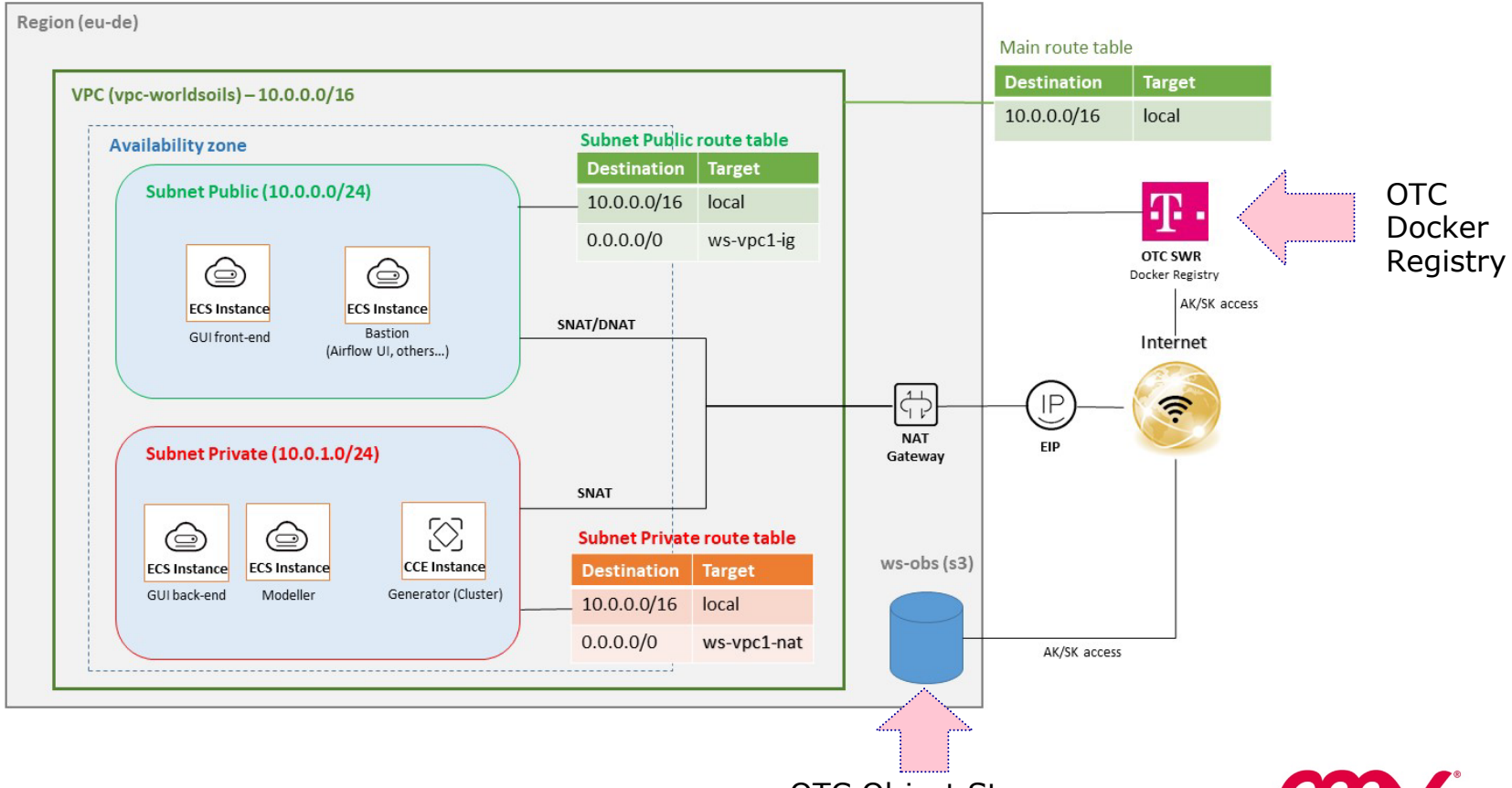
Special Issue

www.gmv.com

THANK YOU

gmv BLOG

OTC Network Configuration



Stakeholders

ORGANISATIONS

- AgroApps P.C.
- Agroscope
- BOKU university
- Cairo University
- CIRAD
- CQuest
- De Databoerin
- esalq/usp
- BGR
- Inagro
- IAR&T
- Lithuanian NPA
- Nanjing Agricultural University
- NASA Harvest
- Ohio State University
- Persistence Data Mining
- RCMRD
- Researchturk Space Co.
- Soil Capital
- Soil Service of Belgium
- State Authority for Geology Baden-Wuerttemberg
- The James Hutton Institute
- UNCCD (GEO-LDN)
- Univeristy of Valencia. CIDE
- University of Novi Sad
- Wageningen Environmental Research
- Waila AB
- EC JRC / DEFIS
- EEA
- GSP FAO
- AgroParisTech
- SPW
- HAO - Dimitra
- VUMOP

COUNTRIES

- Austria
- Belgium
- Germany
- Greece
- Lithuania
- Netherlands
- Scotland
- Spain
- Sweden
- Switzerland
- Serbia
- Egypt
- Turkey
- China
- United States
- Brazil
- Nigeria
- Zimbabwe
- Kenya

Workshop Objectives

- Involve internationally experts, end users, research and policy bodies in the consolidation of a user requirement baseline for the implementation of the WorldSoils monitoring.

- Expected Outcomes
  - Identify barriers.
  - Identify other alternatives to solve known problems applying EO for SOC prediction and DSM.
  - Identify additional requirements.
  - Reach a consensus on a consolidated requirements baseline covering most of the user needs.

- Summary Report where all contributions will be acknowledged