Web INTEractive management tool for coal Regions in transition - WINTER

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1. INTRODUCTION

Scheduled decommissioning of lignite mining in Europe requires innovative and cost-effective strategies to support **coal regions in transition**. The project **WINTER**, funded by the European Research Fund for Coal and Steel (RFCS) started in July 2022.

The main **aim** of the project is to develop a **web-interactive platform for the management of coal regions in transition** to provide guidance and facilitate stakeholder engagement, by identifying and highlighting the available information that is required to improve the current transition plans for the pilot coal transition regions. Local authorities and coal industry stakeholders will be able to utilise the developed user-friendly web-based management tool and implement it on other regions with similar concerns.

The project's **results** will contribute to the **repurposing** of closed and/or abandoned coal sites and promote the **added value** of research outputs targeted at the exploitation of new products and markets regarding the coal industry.

2. STUDY AREAS & METHODS

WINTER involves three partners from three European countries (Greece, Poland and Germany). The study areas are **Western Macedonia** in Greece, **Konin** region in Poland, and **Ruhr** area in Germany **(Fig. 1).** Western Macedonia and Konin regions are still at the initial stage of coal transition, while Ruhr area is mature in terms of transition and will be the "mirror" of the transformation strategies of Konin and Western Macedonia. In particular, there are two coal mines in Western Macedonia (Amynteo and Ptolemaida) and three in Konin region (Jóźwin, Kazimierz and Adamów), which are investigated as pilot areas. The spatiotemporal evolution was assessed by processing **Corine Land Cover (CLC)** and **Sentinel-2** satellite datasets. The image processing was implemented using the ESA's **Sentinel Application Platform (SNAP),** and the geospatial analyses were conducted utilising the ArcGIS Desktop / Pro and ArcGIS Online **(Fig. 2).**

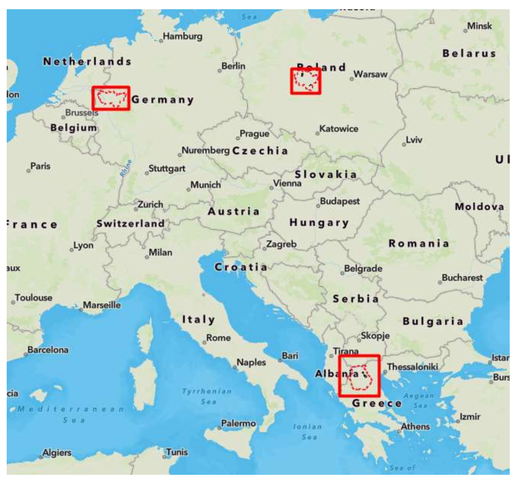

Fig. 1: *Map of the three study areas in Greece (Western Macedonia), Poland (Konin) and Germany (Ruhr).*

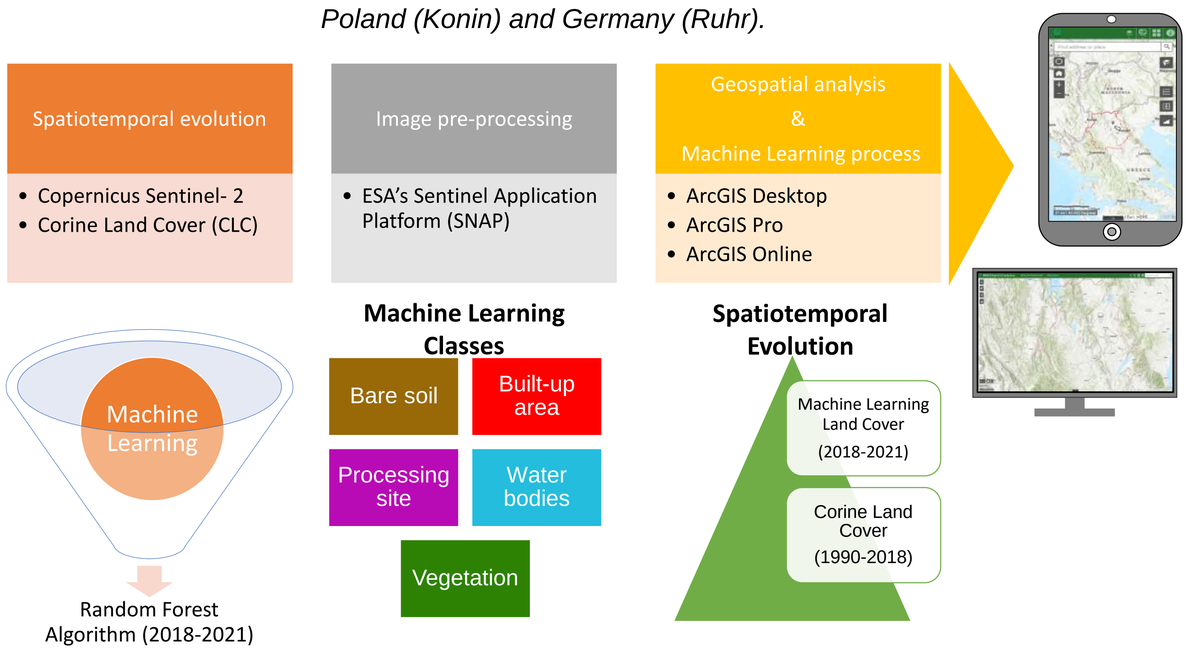

Fig. 2: Conceptual diagram of the applied methodology.

3. RESULTS

The results visualised and uploaded on a Web Interactive platform using a storytelling page and a WebGIS platform **(Fig. 3)** based on ESRI services. The platform hosts a **digital inventory** in order to help stakeholders and local authorities to find the **best practices** related with **rehabilitation and reclamation** of the proposed mining areas and information related to the **legislation** and spatiotemporal evolution of the pilot areas (Greece, Poland) through a user-friendly environment that illustrates the green transition phases.

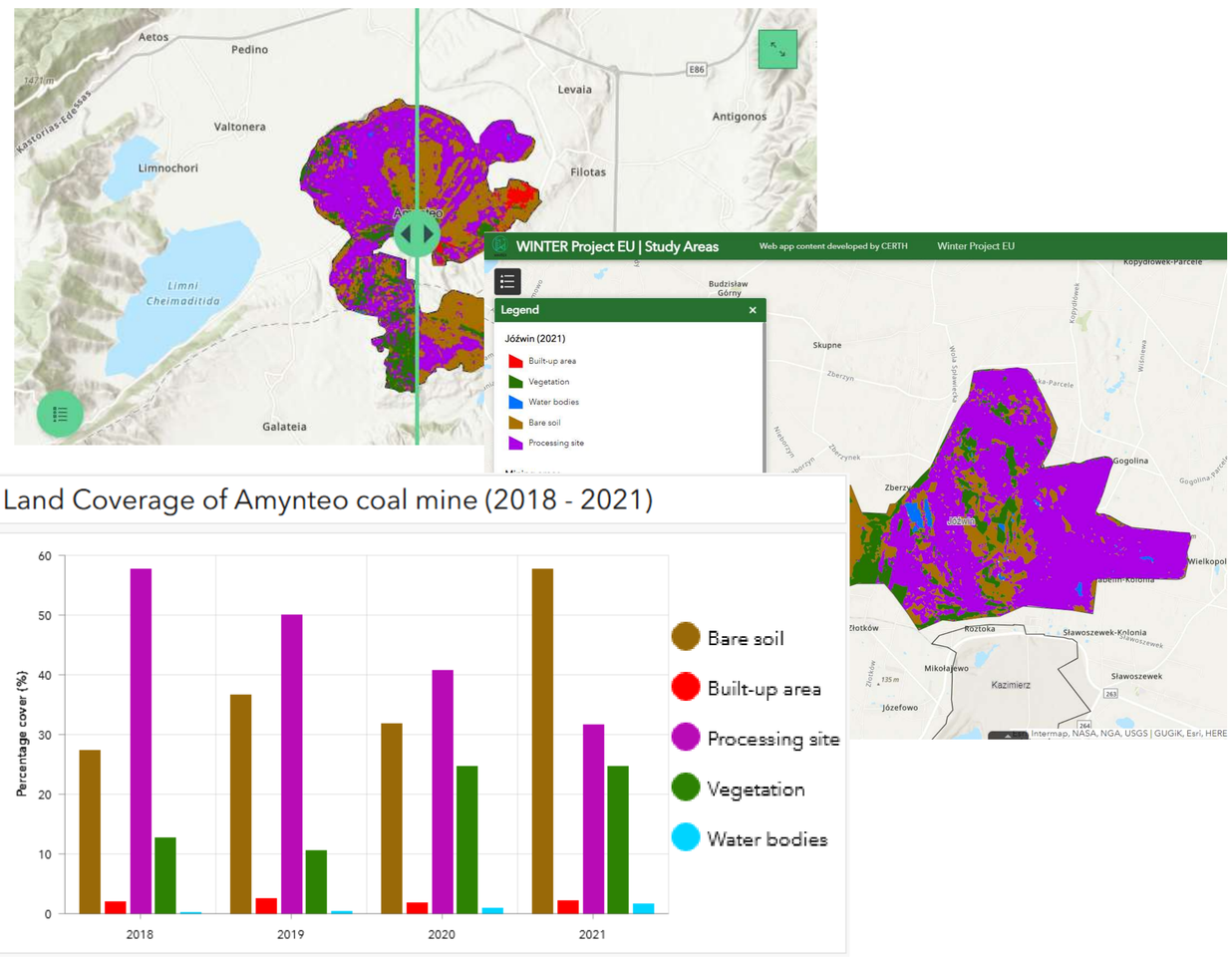

Fig. 3: *Screenshots of the Machine Learning (ML) products in the Web interactive platform. Regarding the ML classes, brown color represents the Bare soil, red the Built-up area, purple the Processing site, green the Vegetation and blue the Water bodies.*

- Regarding the Greek case study, the results of the Machine Learning (ML) classification from 2018 to 2021 showing that the Amynteo mine open-pit has the highest progress in terms of green transition. In particular, the biggest part of the processing site class was transited into Bare Soil, Water bodies and Vegetation, while the Ptolemaida mine has lower transition rates with small changes in LC classes.
- According to the results of Polish study areas from 2018 to 2021, the Kazimierz mine has achieved the highest green transition changes during the observing time period. Specifically, in Kazimierz mine the highest part of bare soil class was transited into Vegetation, while the percentage of processing site class is less than 3% of the total mine coverage. In the second place is the Adamów mine, which its green transition has an increase rate since the 2018, while the Jóźwin mine has the lowest transition trend due to the fact that is still an active industrial area.

4. FUTURE WORK

The WINTER project focuses on the implementation of a holistic approach for the management of coal mines transition challenges. In particular, the development of the interactive web management tool enabling for the dissemination of best practices with the potential to be extended and can be adapted to other regions. Furthermore, the latest ML products of 2021 will be utilised with other criteria related to geomorphology by integrating the legislation for the preliminary determination of suitable sites for the installation of **Renewable Energy Sources (RES**) such wind and photovoltaic parks. Lastly, as the project is currently in progress, gathered information and functionalities will be continuously updated and presented in the platform.

ACKNOWLEDGEMENTS

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REFERENCES

- Cope, M.P. et al. (2018) 'Developing and evaluating an ESRI story map as an educational tool', Natural Sciences Education, 47(1), p. 180008. doi:10.4195/nse2018.04.0008.
- Krassakis, P. et al. (2022) 'Geospatial Intelligence and machine learning technique for urban mapping in coastal regions of South Aegean Volcanic Arc Islands', Geomatics, 2(3), pp. 297–322. doi:10.3390/geomatics2030017.

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