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Web INTEractive management tool for coal Regions in transition

D1.2 Technical Implementation Report

Public Report

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1. EXPLANATION OF THE WORK CARRIED OUT BY THE BENEFICIARIES AND OVERVIEW OF THE PROGRESS

1.1. OBJECTIVES

WINTER will develop a web interactive platform for the management of coal regions in transition to provide guidance and facilitate stakeholder engagement. The best practices will be analysed by exchanging information and knowledge regarding the main transition challenges in each of the study areas (Western Macedonia, Ruhr area and Konin area) representing different stages of the transition process (initial stage for Western Macedonia and Konin area and mature stage for Ruhr area).

The potential users of the web management tool (coal industry and stakeholders involved in the environmental management of such sites, research organizations, energy sector, socioeconomic organizations, policy makers, , local authorities and environmental legislation consultants.) will be identified and familiarized with the platform with main goal to enhance the available information that is required for the improvement of the current transition plans for the pilot regions being at an initial stage (Western Macedonia and Konin area). The produced web management tool will be designed properly in order to be easily utilised by the local authorities and coal sector stakeholders.

WP2 *(Environmental challenges of coal regions in transition and land rehabilitation solutions)* will help coal regions in transition to face an important challenge of environmental rehabilitation and repurposing of former mining areas to new sustainable objectives. It aims at identification of the main environmental challenges regarding land reclamation in the selected coal regions (Western Macedonia, Ruhr area and Konin region), collection of existing experience of post-mining regional management and application of available land rehabilitation technologies in the best possible ways. Tracking spatiotemporal changes and building scenarios of the future uses of the post-mining areas will form a basis for sustainable planning and promoting public engagement and participation of the society. The project partners will systematize the environmental aspects of land reclamation and rehabilitation as well its legal aspects, collect and analyse geospatial data showing changes in the selected coal regions and new options for the future, evaluate various ways (scenarios) that the transition process can take. WP2 will produce results such as geospatial data, derived reports, multimedia and supplementary material that will be integrated to the Web interactive management tool of the WP4. And a social perspective of the environmental rehabilitation aspects and the existing and future environmental challenges will be covered by the WP3

WP3 *(Socioeconomic and management aspects of coal regions in transition)* aims to analyse the transition management processes in order to determine best and improper management strategies and implementation practices by identifying the actual processes, management strategies and practices that operate within these governance models and analyse their implications for post-coal governance. This includes success stories and their drivers to inform project recommendations. It also aims to investigate socioeconomic parameters of coal transition, by carrying out a systematic collection of data from the case study regions to assess the socioeconomic effects of the coal transition and to develop management strategies for the implementation and institutional structures in the 3 case studies. Final outcome will be a transition management handbook with lessons learnt, recommendations for governance, institutional structures and implementation as well as community participation.

WP4 *(Web interactive tool to address environmental and socioeconomic challenges)* aims to integrate the results of WP2 and WP3 in order to produce and visualize the guidance for the selected regions. In addition, all the results will be integrated into a web interactive platform to assist local authorities and stakeholders to deal with the transition process. The produced management tool will be designed properly in order to be easily utilized by the authorities and coal sector stakeholders as well as to be extended to other areas facing similar issues.

The proposed interdisciplinary scientific approach will be organised by Project management (**WP1**) to ensure optimum communication and exchange knowledge between the **WINTER** project

partners, additional stakeholders, mining authorities and the European Commission. As a result, Dissemination of projects results (**WP5**) will be exchanged with the political actors on EU, national and regional level and with the other stakeholders. The partners will collaborate with the Secretariat of Coal Regions in Transition and the Working Groups as well as with the different EU and (inter-)national projects.

The WINTER project is composed by five work packages. The project structure and interdependencies between the work packages are plotted in Fig. **Error! Reference source not found.** The first (**WP1:** management) and the last (**WP5:** Dissemination of project results) work packages determine the project coordination and conduce a fruitful cooperation between the beneficiaries and dissemination of the results. The more research work in the **WINTER** project is divided into three work packages, which are: **WP2**, **WP3**, **WP4.**
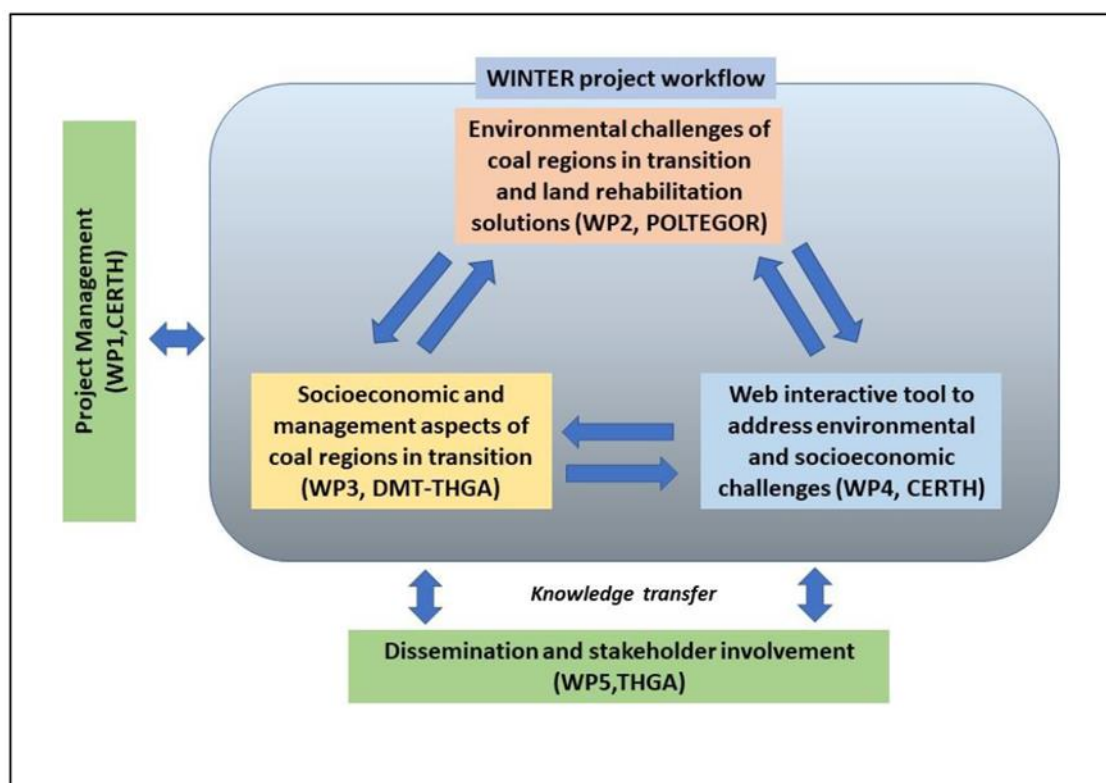

Figure 1 Interdependencies between the work packages, data provision and dissemination of project findings

This report covers the work performed during the first 12 months of the 24-month AM project. During this period, the scheduled activities were undertaken within the administrative work packages **WP1** and **WP5**, as well as the more technical work packages: **WP2 WP3** and **WP4**. The list of the project deliverables and milestones are enclosed in the Appendix.

WP1 (coordinated by CERTH) is designated to the project coordination and aims to ensure a smooth cooperation between the beneficiaries. The holistic coordination of the project led to the achievement of the proposed progress. The consortium members met on a regular basis and communicated to ensure a good synchronisation of the project activities and to address several challenges encountered during this period.

WP2 (coordinated by Poltegor) is appointed for environmental challenges of coal regions in transition and land rehabilitation solutions. Best available technologies for land rehabilitation and reclamation were described and presented taking into consideration the comparative advantage of each region. (Greece, Germany and Poland). Moreover, legislation for post-mining land reclamation was identified and analyzed. In addition, the main environmental challenges regarding land reclamation in the study areas were identified via the spatiotemporal evaluation of satellite and aerial photos. The combination of spatiotemporal evaluation of satellite and aerial

photos with spatial criteria in order to identify RE utilization options was conducted for developing RE scenario for each region in early transition stage.

WP3 (coordinated by DMT-THGA) is designated to the presentation of socioeconomic and management aspects of coal regions in transition. Analyses of management structures and processes (institutions, roles, governance, collaboration) were conducted in selected transition regions in order to determine stakeholders' status. Ideal type of management met based on proven management models within the framework of western economy. The collection of socioeconomic data was challenging due to lack of their availability at the regional level.

WP4 (coordinated by CERTH) is appointed for the visualization of data and production of interactive material and the development of a web interactive tool to address environmental and socioeconomic challenges. The collection and standardization of geospatial data, multimedia, and supplementary materials regarding the study areas has been achieved and data were incorporated into the web-GIS platform. Furthermore, the web platform's architecture integrates both a web application and a storytelling map to present both spatial and non-spatial information effectively to the public.

WP5 (coordinated by DMT- THGA) The dissemination of results as well as related activities were generally performed as originally planned and deliverables submitted as scheduled. A project website has been developed. Dissemination efforts in the project have been already made in the context of scientific conferences, meetings and workshops.

A detailed description of the work carried out in the respective **WPs** is presented in the following chapters of this report.

1.2. EXPLANATION OF THE WORK CARRIED OUT PER WP
1.2.1. WP1: PROJECT MANAGEMENT
WP Leader: **CERTH**

Partners: **CERTH, All partners**

1.2.1.1. **Task 1.1** – Project coordination and scientific quality management

Specific objectives

The main objective of this task is to coordinate the work of all participants to ensure that the project activities are progressing as scheduled, objectives are met and budgets are consistent. The specific objectives include monitoring of progress in project activities, implementation of quality assurance measures for project outputs (deliverables and milestones) and coordination of financial reporting.

Obtained results

The progress of research activities under all on-going more technical work packages of the project (**WP2**-**WP4**) is constantly monitored and corrective actions are implemented as needed.

Scientific coordination of the project led to the achievement of the planned progress.

1.2.1.2. **Task 1.2** – Project management and internal communication

Specific objectives

The main objective of this task was an overall management of the project. Further, this task comprises activities to enforce the internal communication between the project partners. The specific objective was to organize regular meetings and online conferences between the consortium partners in order to speed up the process of decision taking, review progress against objectives and milestones and ensure the smooth progress of the project.

Obtained results

The **WINTER** project officially started on the 1ˢᵗ of July 2022. An overview of the project's scope and discussions about the study areas regarding energy transition was presented ensuring that whole consortium had a comprehensive understanding of the project.

The consortium members have regularly met and communicated to ensure good synchronisation of project activities and to discuss unexpected challenges. The employed communication strategy ensured achieving the continuous progress in the project.

1.2.1.3. **Task 1.3** – EU Communications and IPR

Specific objectives

This task supports maintenance of adequate communication and exchange of information with the European Commission and preparation of technical and financial progress reports, documenting the achievement of project milestones and objectives. Moreover, this task aims at setting the framework for protection of intellectual property rights (IPR) within the WINTER project.

Obtained results

Constant communication with the EC project Officer was maintained, and any emerging difficulties and problems were immediately discussed and solved.

1.2.2. WP2: ENVIRONMENTAL CHALLENGES OF COAL REGIONS IN TRANSITION AND LAND REHABILITATION SOLUTIONS

WP Leader: **POLTEGOR**

Partners: **POLTEGOR, CERTH, DMT-THGA**

1.2.2.1. ***Task 2.1 –*** *Best available technologies for land rehabilitation and reclamation*

Specific objectives

Within Work Package 2, the focus of this task was to develop a guide on the best available technologies (BAT) for land rehabilitation and reclamation. The main objectives of this task were as follows:

a) Highlight environmental considerations: This objective involved identifying and discussing the key environmental factors that need to be considered when undertaking land rehabilitation and reclamation projects in coal regions undergoing transition, specifically Western Macedonia, the Ruhr area, and the Konin region.

b) Present successful and unsuccessful practices: The guide aimed to showcase both successful and unsuccessful approaches to land reclamation and restoration, drawing upon case studies from the selected coal regions as well as other examples worldwide. The goal was to analyse the factors contributing to success or failure and provide practical advice on effective techniques for land rehabilitation and reclamation. The guide also aimed to promote innovation and the adoption of best practices by examining technology, techniques, and project management approaches used in different situations.

Obtained results

The guide successfully covers various topics related to land rehabilitation and reclamation, as summarized below:

1) Environmental considerations: The guide identifies and discusses the key environmental factors that should be taken into account during land rehabilitation and reclamation projects. It emphasizes the importance of environmental conditions in determining the appropriate approach for reclamation efforts.

2) Challenges and technologies for reclamation: The guide provides a comprehensive overview of the challenges associated with land reclamation and analyses the available technologies and methodologies to address these challenges.

3) Approaches and divisions in reclamation: The guide explores different approaches and subdivisions within land reclamation, offering insights into effective strategies for different contexts. This allows stakeholders and decision-makers to make informed choices during the planning and implementation of reclamation projects.

4) Successful and unsuccessful practices in post-mining areas: Using examples from the selected coal regions (Western Macedonia, the Ruhr area, and the Konin region) as well as other locations worldwide, the guide highlights best and worst practices in land rehabilitation and reclamation. It provides valuable lessons for stakeholders and decision-makers. Additionally, the guide includes fact sheets for rehabilitation sites, efficiently summarizing the key aspects of successful rehabilitation efforts at specific mining sites.

The work conducted on the BAT guide for land rehabilitation and reclamation has yielded the following conclusions thus far:

1) Regional legal aspects, environmental conditions, and decisions regarding future land use significantly influence the technologies and approaches required for successful land rehabilitation and reclamation. Therefore, careful consideration of these factors is crucial for stakeholders and decision-makers when planning and implementing such projects.

2) Based on literature analysis and rehabilitation case studies, the guide proposes a classification system for post-mining land use (Fig. 2). This system can assist stakeholders and decision-makers in understanding the available options for land use after mining activities and making informed choices accordingly.
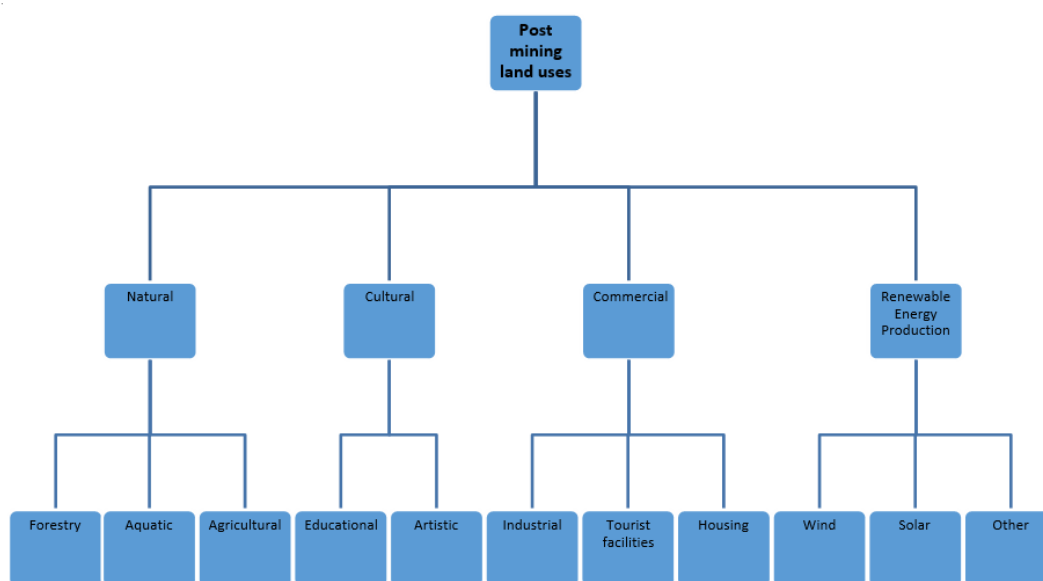

Figure 2. Suggested classification of post-mining land

3) Many successful rehabilitation projects involve a combination of technologies and applications from different post-mining land uses. Given the large-scale nature of mining sites, implementing multiple land uses is often necessary to achieve rehabilitation goals and create positive outcomes for affected communities and ecosystems.

4) The BAT guide serves as a valuable resource for identifying the best technologies available for each post-mining land use, along with examples of successful implementation in real-world settings. By providing this information, the guide supports informed decision-making and facilitates the adoption of best practices in land rehabilitation and reclamation efforts.

1.2.2.2. **Task 2.2** – Identification and analyse legislation for post-mining land reclamation

Specific objectives

The primary objective of this task was to conduct a detailed examination and analysis of the legal aspects pertaining to land rehabilitation and reclamation in Germany, Poland, Greece, and the European Union. This effort resulted in the creation of the Legal Guide for Land Rehabilitation and Reclamation, which comprehensively covers the legal frameworks, regulations, and requirements at the national and EU levels. The guide serves as a valuable resource for stakeholders and decision-makers involved in land rehabilitation and reclamation projects.

Obtained results

The Legal guide for land rehabilitation and reclamation comprehensively addresses the following legal aspects:

1) Analysis of national and EU legal frameworks: The guide examines the legal frameworks governing post-mining land reclamation in Greece, Poland, and Germany, as well as at the European Union level. It also includes legal considerations related to the implementation of renewable energy systems (RES) as an innovative approach to land reclamation

2) Comparison of regulations across regions: The guide compares the legal frameworks governing land reclamation and rehabilitation projects in Greece, Poland, Germany, and the EU. This comparative analysis highlights the similarities and differences between these regulations, providing valuable insights for stakeholders and decision-makers.

3) Presentation of a legal requirements checklist: The guide presents a tabular checklist of legal requirements related to post-mining land reclamation. This checklist is designed to assist stakeholders in ensuring compliance with national and EU regulations during land reclamation projects.

4) Proposed changes to the legal framework: Based on the conducted analyses and the lessons learned from Greece, Poland, and Germany, the guide proposes potential changes to the legal framework governing post-mining land reclamation.

Reclaiming post-mining areas is a crucial process that requires a well-regulated legal framework to ensure environmental protection and responsible land restoration. The Legal Guide for Land Rehabilitation and Reclamation offers a comprehensive analysis of the legal aspects at the national level in Germany, Poland, and Greece, as well as at the EU level.

While EU law provides a common foundation for the selected countries, guiding national regulations on reclamation and renewable energy projects in post-mining areas, there is still room

for improvement and simplification. The guide emphasizes the significance of considering the variations in national laws when undertaking reclamation projects in different EU member states, ensuring adherence to relevant regulations. It also highlights the potential for renewable energy installations in post-mining areas, contributing to land restoration and sustainable energy generation.

In conclusion, the Legal Guide serves as a valuable resource for stakeholders and decision-makers involved in land reclamation and rehabilitation projects. By providing a comprehensive understanding of the legal frameworks across the EU and the selected member states, the guide facilitates compliance, promotes environmental responsibility, and supports the attainment of climate objectives and socio-economic benefits for local communities.

1.2.2.3. **Task 2.3** – Identification of the main environmental problems and land rehabilitation and reclamation solutions

- **Subtask 2.3.1** – Spatiotemporal evaluation of satellite and aerial photos to detect changes in spatial and urban planning for the selected regions

Specific objectives

The main objective of this subtask was the visualization of long-term mining surface Land Cover (LC) & Land Use (LU) changes and the evaluation of the spatiotemporal evolution of specific mining areas, using open-source data. Particularly, Corine Land Cover (CLC) datasets were collected within the boundaries of the three study areas (Greece, Poland, & Germany) for the time period 1990 – 2018. Additionally, Sentinel-2 and Google earth satellite images were gathered for the generation of Machine Learning (ML) products in order to identify and monitor the surface evolution from 2018 to 2021 in selected coal/lignite mine areas in Poland and Greece. Specifically, the ML methodology was implemented for Amynteo and Ptolemaida lignite mines in the Western Macedonia region and for Jóźwin, Kazimierz, and Adamów coal mines in the Konin region of Poland.

Obtained results

The results of this subtask visualize the spatiotemporal evolution in regional scale from 1990 to 2018 in three different countries and the transition stages from 2018 to 2021(Fig. 3) within the boundaries of specific open-pit mines in the Greek and Polish regions. The illustration is available through interactive maps and the quantification results of the ML products are based on the following five LC classes: a) Bare Soil, b) Processing site, c) Water bodies, d) Vegetation, e) Built-up area. All the derived datasets were also homogenized and integrated in the developing Web interactive platform as material of the Work Package 4.
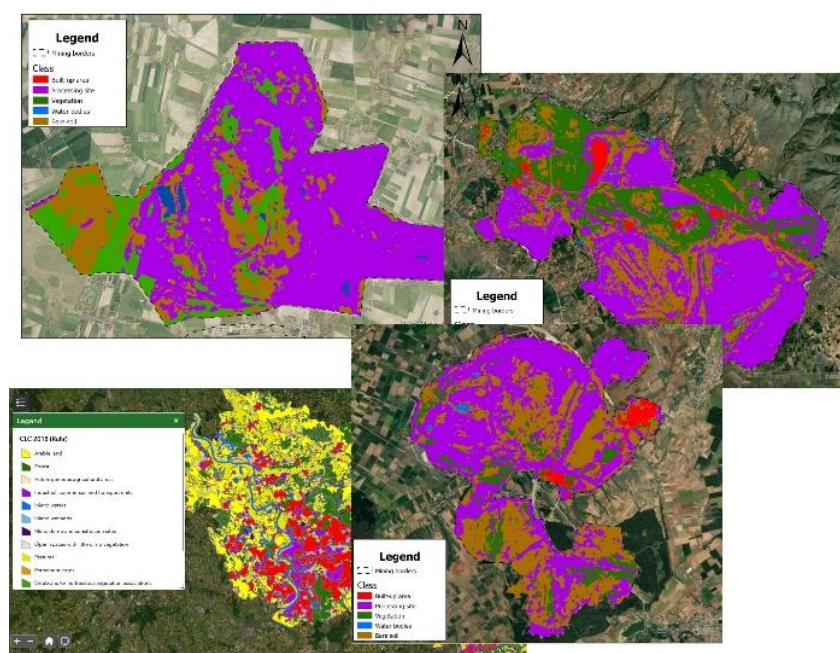
Figure 3*:* **Screenshot of the Machine Learning products and the Corine Land Cover data of the Ruhr area Western Macedonia & Konin region***.*

Based on the ML results, the Greek region, and particularly the Amynteo mine, seems to have the most significant spatiotemporal evolution in terms of green transition classes. On the other hand, the Ptolemaida mine has less green transition changes in LC classes, validating the fact that a part of the lignite mine is still active. Furthermore, according to the results of the Polish region, the Kazimierz mine has been identified as the open-pit area with the highest change in terms of green transition, followed by the Adamów mine. Regarding the Jóźwinmine, has the lowest transition trend due to the fact that is still an active extraction area.

- **Subtask 2.3.2** – Spatiotemporal evaluation of satellite and aerial photos to identify RE utilization options

Specific objectives

The objectives of this subtask encompass two key aspects: (i) the better knowledge in context of spatial criteria regarding the different types of Renewable Energy Sources (RES) and (ii) the implementation of different scenario in an effort to identify preliminary suitable regions for RES implementation within the boundaries of the selected open-pit mines. This will support spatial planning, development analysis, and decision-making processes. ML products from the previous subtask (2.3.1) were utilized as high-detailed basemap consists of LC classes, in order to be combined with other elevation, morphological, climatological and literature data for the identification of areas suitable for RES installation in Greek and Polish regions.

Obtained results

This subtask is currently in progress.

1.2.3. WP3: SOCIOECONOMIC AND MANAGEMENT ASPECTS OF COAL REGIONS IN TRANSITION
WP Leader: **DMT-THGA**

Partners: ***POLTEGOR***, **CERTH**

1.2.3.1. **Task 3.1** – Analyses of management structures and processes (institutions, roles, governance, collaboration) in selected transition regions

Specific objectives

As part of the task performance, stakeholders' structures were surveyed in the three case regions that are directly or indirectly linked to the coal phase-out and subsequent transition processes. These stakeholder analyses were backed up by additional information on legal, institutional frameworks with regard to local, regional, and national governance conditions. In addition to the qualitative input, a quantitative evaluation was carried out on the basis of expert knowledge from the participating research institutes to determine the stakeholder status of individual stakeholders. This resulted from the interplay of influence and interest in the context of the coal transition. Finally, the contents were presented in a structured data collection protocol in order to consider connections as well as weightings of actors and stakeholders on different governance levels.

This approach has proven to be suitable for understanding and representing the very different case regions and their environment in order to achieve the goal of Task 3.1, which was to develop a report on an ideal-type governance and management structure for coal transition regions. Due to the manifold differences, not only between the different characteristics of the hard coal and lignite regions, but also due to the legal conditions of the respective countries, it was necessary to derive general statements in several respects. The claim of the ideal type and the transferability to other regions were thus a challenge that was often overlooked by questions of detail. Nevertheless, on the basis of an existing research work by Jürgen Brüggemann, a comparative view between regional development and management structures could be derived in order to meet the ideal type. The consideration was based on proven management models within western economies.

Obtained results

The results obtained are based on the assumption that there are generally three groups to be considered with diverging interests - the public sector, investors or companies and citizens. These interests must be coordinated and the citizens have to be involved to a certain degree ("Good Governance") with a view to successful regional development. A regional, strategic management, for example in the form of a Public-Private-Partnership (PPP), is suitable to implement a land development of former coal sites and associated areas whilst reconciling public and economic interests (a. a. landownership). A regional perspective results from the comparison of the vertical distribution of actors in the three case regions. Corresponding, a regional level could be identified as a commonality with regard to coal phase-out processes. The aforementioned strategic management activates affected actors within the framework of relevant work steps towards a certain product. The product, as well as the steps towards it, are not conclusively outlined and can vary depending on the national context, but it could be a regional master plan for coal transition, leading to a guided regional development. Such an ideal typical process structure resulting in a regional master plan can be found in the report.

A successful transformation of a coal phase-out region may only be possible if the relevant actors in the region work together and involve other stakeholders and the population at an early stage. The development of a web tool can prove to be a valuable communication application in such coordination processes. For this purpose, the platform to be developed must also be oriented towards potential participation and communication formats in order to tap optimisation potential.

It should not be neglected that in the future the administration and maintenance could be in the hands of one of the identified actors or a possible PPP or other regional form of cooperation.

1.2.3.2. **Task 3.2 –** Socioeconomic analyses

Specific objectives

At the beginning of this task, it became apparent that socio-economic data for the three case regions was available in very different qualities or not at all. The reasons for this are manifold. For example, for the Ruhr region the statistics office of the Ruhr Regional Association is compiling and collecting information of sufficient quality for the administrative boundaries of the region since many decades. The sub-region of the Wielkopolska Voivodeship, the Konin region or Eastern Wielkopolska, is a fictitious and non-administrative border demarcation. It is derived from the municipal boundaries of municipalities affected by opencast lignite mining activities. Thus, precise statistical surveys will probably only be possible with surveys conducted within the framework of the Just Transition Programme. However, despite the Just Transitions Plan, the data situation in Western Macedonia appears to be patchy. Research work is laborious, as data of varying quality and scale is distributed among different regional, national or even European institutions.

Obtained results

On the basis of data availability, also with regard to the formation of time series and their further transferability, a non-exhaustive catalogue was forwarded to all project partners in order to ascertain which data are available and in which quality. As described in the specific objectives, however, obstacles became apparent at an early stage. With regard to the desired and preferably comparative evaluation of the socio-economic data, further steps probably have to be taken in order to generate adequate and reliable results. Thus, the variable data availability is also an early result that may justify impulses and follow-up research in the field of survey and statistics.

More research and communication among project partners need to be done in order to address these challenges and getting acceptable and accurate findings for the project's comparative examination of socioeconomic aspects.

1.2.3.3. **Task 3.3 –** Media analysis for social representations of coal transitions

Specific objectives

Conducting a media analysis of the scope of three case regions of different countries is a task that immediately encountered obstacles that were difficult to overcome. Thereby, the mere execution in different languages is not a problem with an international team. Instead, the main problem is access to licensed media across national borders. Another major hurdle is structured access to content from various relevant media platforms. For this reason, a lot of time was spent talking to clipping services. However, it turned out that only a few service providers came into consideration due to the international requirements of the project. These, in turn, were not feasible within the existing budget. However, during the processing time of Task 3.3, a free tool from the University of Leipzig was identified that enables adequate analysis for the WINTER project. The natural language processing (ASV) institute, under the direction of Prof. Dr. Gerhard Heyer, has undertaken data crawling over the past few years and has made the available data sets in German, Polish and Greek accessible to the project partners so that they can be analysed using the institute's publicly accessible methods.

Obtained results

It can already be supported that the pricing of clipping services should be taken into account in future projects with media analyses. Ultimately, the question of licences is an unavoidable one in

this field, which usually involves a not inconsiderable cost. Thus, tendering procedures for clipping services or others can also have an impact on the timing of research projects, which must be addressed in the timeline. This task is currently in progress.

1.2.3.4. **Task 3.4** – Social acceptance for best practices solutions for transition process

Specific objectives

In principle, Task 3.4 has not yet been started, but first analyses have been started in the course of the media analysis. The feasibility of a sentiment analysis within the framework of the media analysis was also discussed, which should give a first indication of social acceptance for best practices solutions in the sense of the WINTER project.

1.2.4. WP4: WEB INTERACTIVE TOOL TO ADDRESS ENVIRONMENTAL AND SOCIOECONOMIC CHALLENGES

WP Leader: **CERTH**

Partners: **POLTEGOR, DMT-THGA**

*1.2.4.1. **Task 4.1** – Visualization of data and production of interactive material*

Specific objectives

The primary objective of this task is the collection and standardization of geospatial data, derived reports, multimedia, and supplementary materials from the selected case studies. Some of the aforementioned materials have been collected and incorporated into the web-GIS platform currently under development. The uploaded geospatial data has been processed within ESRI's ecosystem, which includes ArcGIS Desktop, ArcGIS Pro, and ArcGIS Online. In addition, other descriptive (non-geospatial data) and multimedia material are being gathered from previous tasks and deliverables, such as 2.1 and 2.3.1. Furthermore, all the outcomes are being added in the online interactive platform, which will serve as a resource to support local authorities and stakeholders in managing the transition process.

Obtained results

So far, the results of this task are thematic maps, layers, descriptive texts and other multimedia data. Specifically, the geospatial data such as shape files/ feature classes (ESRI Standard) are being homogenized in common reference system, as well as the statistical analysis tables into EXCEL format. It should be mentioned that all the geospatial data were initially projected in to ETRS89 - European Terrestrial Reference System. However, Web_mercator (auxiliary sphere) coordinate reference system, has been implemented in order to be easily uploaded in the web interactive platform in Task 4.2.

The geospatial data contain the following categories:

- the geographical boundaries of three regions (Western Macedonia, Konin, Ruhr)

- the examined lignite/coal mine boundaries (Amynteo, Ptolemaida, Adamów, Kazimierz, Jóźwin)

- the Corine Land Cover (Western Macedonia, Konin, Ruhr) from 1990 to 2018

- the Land Cover layers produced by the Machine Learning algorithm in subtask 2.3.1 (Amynteo, Ptolemaida, Adamów, Kazimierz, Jóźwin)

- Locations of the reclaimed sites in Ruhr area using story-telling map

This task is in progress and will be continuously updated with new materials derived from ongoing tasks and work packages. Additionally, next period will be updated with results from the preliminary RES suitability analyses from subtask 2.3.2.

1.2.4.2. **Task 4.2 –** *Development of a demo interactive platform for the study areas*

Specific objectives

Main objective of this task is the creation of the web platform based on the collected homogenized datasets mainly from Task 4.1. As mentioned before, the architecture of the web platform combines web app and story-telling map in order to illustrate spatial and non-spatial content for the target audience. Particularly, the platform hosts a Storytelling page (Fig 4.) that represents texts, images, tabs related to the content of the WINTER project and its Work Packages using interactive slides, swipe app, maps, charts in an attempt to better understand the region under examination through transition progress related to environmental and socioeconomic challenges. The swipe map and the diagram on the right side of the figure presents the Land Cover changes of the Amynteo mine (Western Macedonia, Greece) during the time period of 2018-2021. Additionally, the swipe image depicts the land cover changes before and after the reclamation in Duesenberg (Ruhr, Germany).

Figure 4. **Screenshots of storytelling page with descriptive text for the three regions containing socioeconomic information and interactive widows such as swipe maps, images and diagrams.**

The user-friendly interface of the WebGIS platform (Fig. 5) offers to the users and stakeholders the ability to interact with the geospatial datasets by utilizing the tools and the widgets of the platform. At this stage, participants are able to understand and interact with the spatiotemporal evolution of the study areas from 1990 to 2021. The platform also includes some widgets that give the ability to the user to compare between two different periods in order to better understand and quantify the evolution of the landscape creating interactive graphs. In addition, they are some other microapps where the user can request a screening report by selecting specific geographic boundaries. The results are also available in report format so the user can download directly in their laptop or phone/tablet. Over the next period, the platform and story map will be integrated with more data and content such as the outcomes of the preliminary analysis for the installation of RES technologies within the boundaries of the lignite/coal mines.
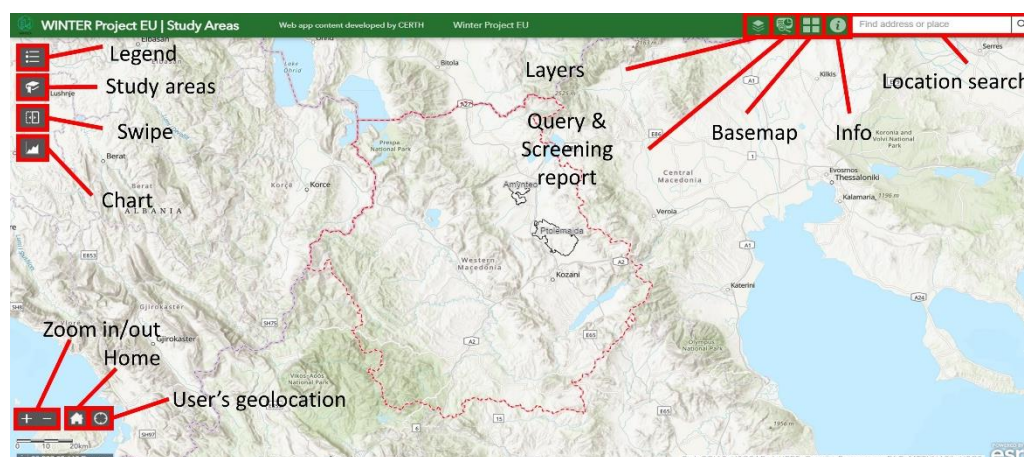
Figure 5. Screenshot of the WebGIS platform widgets and functionalities.

Obtained results

More analytically at the current stage, the platform features the following widgets and functionalities:

- **Digital maps:** Interactive layers that illustrate the LC types of study areas based on CLC and ML Land Cover classes. The user can find additional information about the features by clicking on them in order to display a pop-up table of useful attributes.

- **Charts:** Interactive chart pies (Fig 6.) that display the LC class coverage (in Km^2) of each study area regarding the CLC or the ML products.
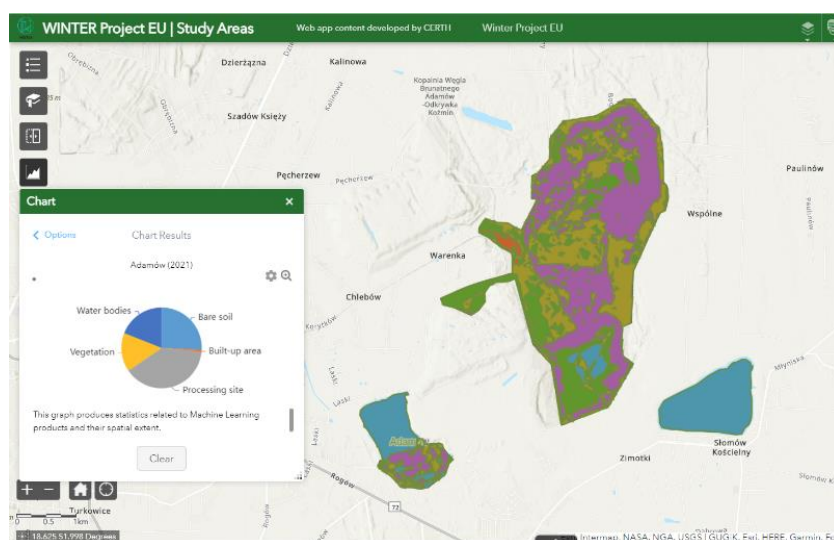
Figure 6 Screenshots of the interactive "charts" widget. Generation of interactive chart pies illustrating the LC coverage in the selected area (e.g. Machine Learning products of the Adamów mine in 2021).

- **Queries:** Predefined queries (Fig. 7) that work as spatial filters to isolate specific land cover classes regarding the selection of the user.
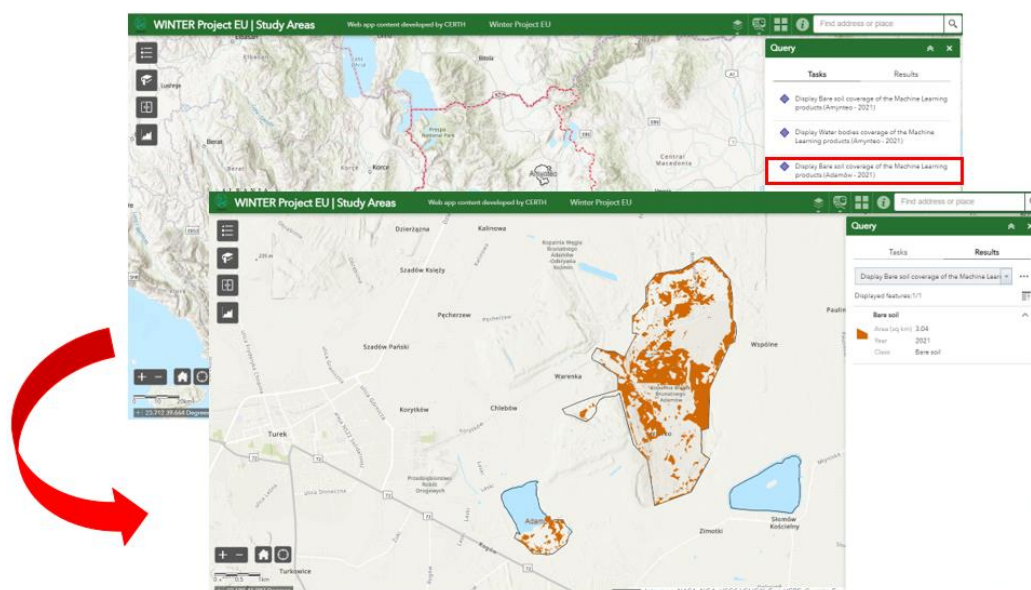
Figure 7. Screenshot of "Query" widget. The user has selected to display the areas that are identified as Bare Soil in Adamów coal mine.

- **Screening Report:** A spatial analysis widget (Fig 8.) that can be utilized to display information regarding the Land Cover spatiotemporal evolution (in Km^2) of specific area from the 1990 to 2021. The area must be within the boundaries of the study areas and can be defined by the user by creating a buffer zone around a placemark or by drawing shapes to determine the area of interest.
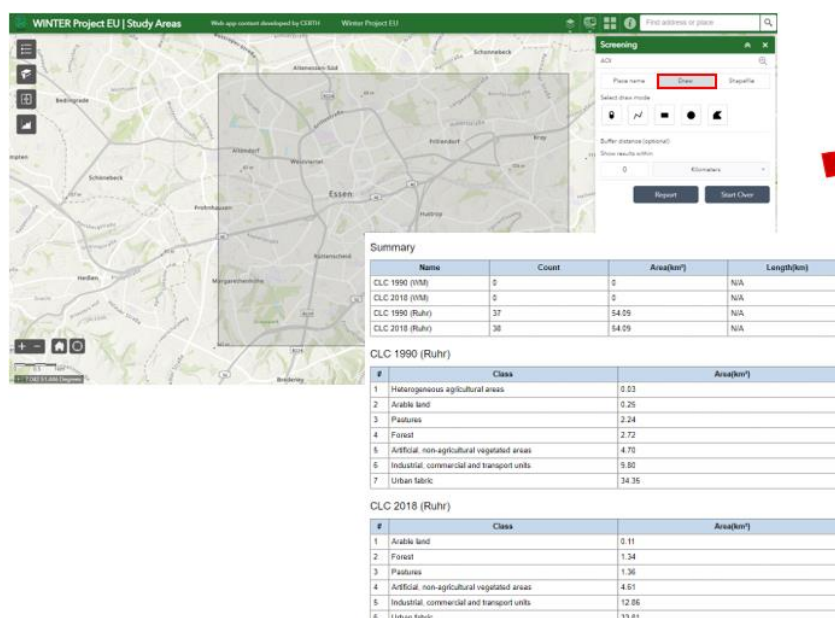
Figure 8. Screenshot of the "screening reports" example. The user defines a specific area using the Draw tool. The exported table represents the LC & LU area coverage quantifications for the specific years of 1990 and 2018, based on the processed Corine Land Cover datasets.

- **Basemap:** The users can select from a big variety of existing basemaps that can assist them to better understand the environment in the area of interest.

- **Swipe:** An interactive widget (Fig. 9) that the user can observe the differences / changes between the Land Cover types of two specific years (e.g. 2018 & 2021).
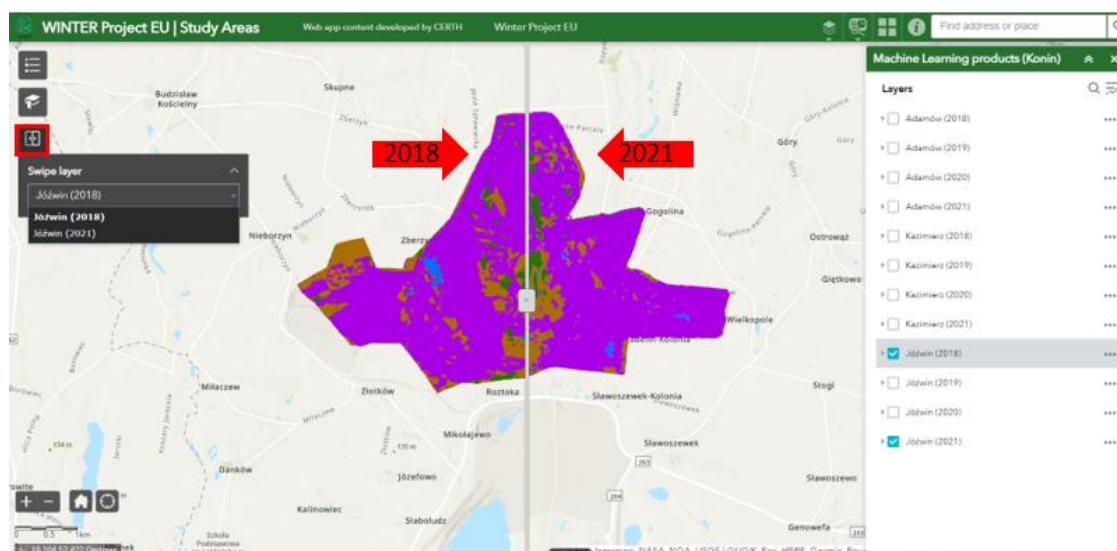
Figure 9. Screenshot of the "swipe" widget. The users can observe the differences between the LC changes for the selected years of 2018 (left) and 2021 (right) in Jóźwin mine based on Machine Learning products.

- **"Study areas" Bookmarks:** A useful tool that helps the user to zoom-in directly to the area of interest (Western Macedonia region, Ruhr area & Konin region).

- **User's Geolocation:** The users can determine their current physical location by using their phone's GPS receiver or their network address in order to mark their position in the Web interactive map platform.

The platform tries to highlight the existing material and reports of the Work Packages/Tasks, in order to present them more illustratively and ensure they are accessible through personal computers (desktops & laptops), tablets or smartphones publicly. The integration of the generated data and the ongoing development of the platform will continuously update until the end of the project following the implementation of the Work Packages/Tasks content such as WP2 & WP3.

1.2.5. WP5: DISSEMINATION AND STAKEHOLDER INVOLVEMENT
WP Leader: **DMT-THGA**

*Partners: **CERTH, POLTEGOR***

*1.2.5.1. **Task 5.2** – Communication and dissemination actions*

Specific objectives

The specific objectives of Task 5.2 are the dissemination and communication measures that are implemented throughout the duration of the project: the project website, conference presentations, articles and peer-reviewed papers, social media, participation in forums and initiatives and synergies with other projects. These measures, directed to different types of audiences/stakeholders aim to raise awareness on Just Transition in general, and the project's results in particular.

Obtained results

The project website implementation and social media has been completed according to the GA in M3 (September 2022). The project website (https://winter-project.eu/) was built, as well as social media pages for the project, all managed and updated by CERTH:

- LinkedIn: https://www.linkedin.com/in/winter-project-eu-813433244/,

- Facebook: https://www.facebook.com/winter.project.eu,

- Twitter: https://twitter.com/WINTERProjectEU

In addition, all important stakeholders were identified and many of them were contacted, so as to raise awareness about the project, such as research organisations, energy sector stakeholders, socioeconomic organisations, policy makers, local authorities and environmental legislation consultants.

Finally, a total of 5 events related to Transition were attended by CERTH, where mainly local and regional stakeholders were made aware of the project and its premise:

a. the 16th International Congress of the Geological Society of Greece (GSG), in Patras, Greece (17-19 October 2022),

b. seminar and meeting for the "Climate change adaptation of the Western Macedonia Region" in Kozani, Greece (Western Macedonia Region, 19-21 October 2022),

c. "Local Government and Just Transition" meeting in Kozani, Greece (Western Macedonia Region, 3 November 2022),

d. "Mineral Resources and Environment" online meeting, (University of Western Macedonia, 11 January 2023) and

e. "Info day for the Just Transition Development of Western Macedonia" in Kozani, Greece (Just Transition Development Authority, 26 January 2023).

These actions also helped with reaching the stakeholders that were interviewed in Task 3.1, as they had been contacted during relevant events.

Other dissemination activities include in Germany and Poland include:

- The 11th International Brown Coal Mining Congress, held in Bełchatów from April 17-19, 2023 (https://kwbbelchatow.pgegiek.pl/Kongres), featured a presentation on the WINTER project. The project was not only showcased through a dedicated session at the conference but was also included as an article titled "Project WINTER – Web INTEractive management tool for coal Regions in transition – aims and assumptions" in the conference materials.

- An article about the project can be found in the journal "Węgiel Brunatny" 2023, nr 1/122 – (https://ppwb.org.pl/Static/upload/File/wegiel_brunatny_122.pdf) on pages 30-33.

- Information about the project is availabe on the Poltegor Institute website https://www.igo.wroc.pl/projekty/projekty-unijne/winter/ and on its social media (facebook, linkedin).

- Also the project will be presented in conference at the "13th International Symposium on Digital Earth" in Athens Greece (11-14 July 2023) in Harokopio University.

Finally, WINTER has achieved an MoU with a Horizon 2020 project, RAMONES (Horizon 2020 FET Proactive Programme, GA No. 101017808). WINTER and RAMONES are both in the domain

of Environmental Sciences, Geographic Information System (GIS) Technologies, Machine Learning, Geosciences, and related research topics. RAMONES offers a radical vision of science-enabled, cutting-edge solutions in both instrumentation and robotic sensing platforms towards a step change of Radioactivity Monitoring in Ocean Ecosystems.

WINTER has a strong and active web presence. as well as in transition-related events, promoting its results effectively. This work will be crucial for reaching stakeholders for the training workshops of Task 5.1 and the final conference.

2. DISSEMINATION OF RESULTS

Among the objectives of WINTER are the presentation of the best practices on all aspects of Just Transition between transition regions through the produced guides and the visualization of all the gathered information via the web-interactive platform. The guides, as well as the platform aim to reach relevant stakeholders via dissemination of the material on the project website and the social media pages, as well as training workshops and the final conference (which are not part of the present report). The aspects of transition that have been covered through guides are best available technologies for land rehabilitation and reclamation, the legal framework of post-mining land reclamation and management structures and processes and stakeholder analysis. At the same time, the development of the web-interactive platform is well under way, including spatiotemporal analysis of the study areas and the information gathered in the deliverables mentioned above.

The aim of the project website and the social media pages is to disseminate and communicate all the above-mentioned results to a wider online audience. Results are shared as soon as the deliverables have been submitted. The deliverables are uploaded on the website, and social media posts lead to the "Deliverables" page of the website so that the texts are accessible more easily. Updates in the platform are also given on a regular basis, with links to the platform so as to increase visibility. Project meetings and internal meetings that relate to the development of the platform are also being shared. The online audience has been carefully built so that it includes people of all ages from as many European countries as possible, in order to increase visibility. Additionally, the content of the posts is being carefully prepared so that it is visually appealing. The website, platform and social media pages are interconnected to increase visibility and traffic. For that reason, there at least one post each week.

Visitor and engagement analytics are powerful tools for the monitoring of the online dissemination platforms of the project. Since the social media pages' lead to the website and the web interactive platform it is very important to be aware which social media platforms are more effective, and how to make improvements. It is important to note that social media posts help increasing website traffic considerably.

The project's LinkedIn profile (Fig.10) is the most popular of the social media pages, with the most audience engagement so far, since the LinkedIn platform facilitates post visibility more effectively. It also helps reaching a wider audience (501 followers so far) and this is reflected in the post analytics (Fig. 10). Fig. 11 shows WINTER's Facebook page (153 followers so far) and analytics (most popular posts and audience demographics) and Figure 12 shows the Twitter page and analytics. Social media analytics show that *posts increase visibility, engagement and traffic*.
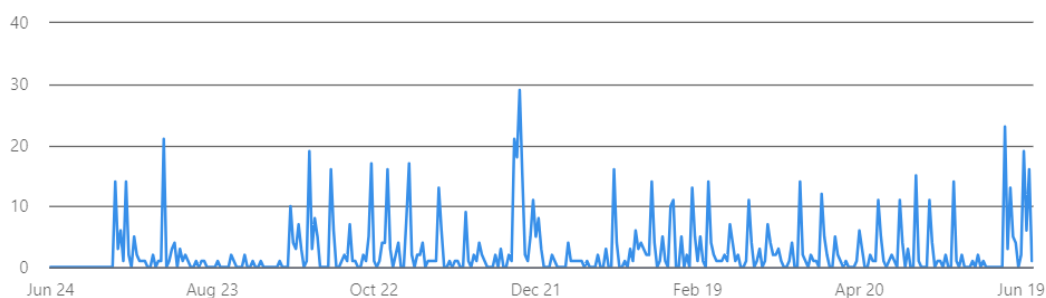
Figure 10. WINTER LinkedIn page and analytics (July 2022 – June 2023).

Age and gender
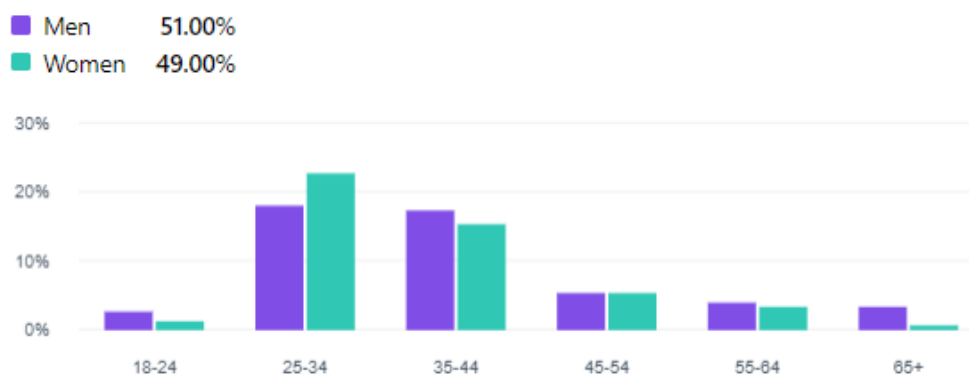
Figure 11. WINTER's Facebook page and audience demographics.

Figure 12. WINTER's Twitter page.

LIST OF FIGURES

APPENDICES

LIST OF DELIVERABLES

Deliverable	Name	WP	Lead	Type Level
D1.1	Comprehensive overview of the project	1	CERTH	R - PU
D1.2	Technical Implementation Report	1	CERTH	R - PU
D2.1	BAT guide for land rehabilitation and reclamation	2	Poltegor	R - PU
D2.2	Legal guide for land rehabilitation and reclamation	2	Poltegor	R - PU
D2.3	Report on spatiotemporal evaluation and transition scenarios for the coal mining regions	2	Poltegor	R - PU
D3.1	Report of an ideal-type governance and management structures for transition regions	3	DMT - THGA	R - PU
D3.2	Database of socioeconomic parameters	3	DMT - THGA	R - PU
D3.3	Report on the media analyses	3	DMT - THGA	R - PU
D3.4	Report on the social acceptance and community participation	3	DMT - THGA	R - PU
D3.5	Transition management handbook	3	DMT- THGA	R- PU
D4.1	Production of interactive material (maps, graphs, text, figures etc.)	4	CERTH	OTHER- PU
D4.2	Web interactive platform	4	CERTH	DEC- PU
D5.1	Documentation of training workshops	5	Poltegor	R-PU
D5.2	Project webpage	5	CERTH	DEC-PU
D5.3	A set of three presentations at relevant European conferences	5	DMT - THGA	OTHER- PU
D5.4	Final conference to show WINTER's developments and results	5	CERTH	OTHER- PU

LIST OF MILESTONES

No	Name	WP	Leader	Means of verification
1	Kick-off meeting	1	CERTH	Kick-off meeting of WINTER project
2	Progress meeting 6th month	1	CERTH	Submission of deliverable D1.1
3	Mid-term Progress meeting	1	CERTH	Submission of deliverable D1.2
4	Progress meeting 18th month	1	CERTH	The meeting will take place
5	Closing meeting	1	CERTH	Final reporting
6	Input material (geospatial data, reports, multimedia and supplementary material) for Web interactive management tool	2	Poltegor	Submission of D2.1, D2.2 and D2.3
7	Structure of database of socioeconomic parameters	3	DMT - THGA	Preparation of D3.2
8	Ideal-type governance and transition structure	3	DMT - THGA	Submission of deliverable D3.1
9	Transition management handbook	3	DMT - THGA	Submission of deliverable D3.5
10	Collection and homogenization of geospatial data for the web interactive platform	4	CERTH	Preparation of activities described in D4.1 will be discussed in mid-term progress meeting
11	Data visualization	4	CERTH	Submission of deliverable D4.1
12	Data integration in the web interactive platform	4	CERTH	Launch of web interactive platform
13	Training workshops in the three areas	5	Poltegor	Submission of deliverable D5.1
14	Project web site	5	CERTH	Launch of web page (D5.2)
15	Final conference	5	CERTH	Organization of final conference (D5.4)