Post-Mining Multi-Hazards evaluation for land-planning

PoMHaz

WP2: Post-mining hazards and multi hazards identification and assessment methodology

Deliverable D2.1: Data base of hazards related to closed and abandoned coalmines and lignite in Europe

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1 Content

2 Acronyms

D2.1   Deliverable 2.1
CERTH   Centre for Research and Technology Hellas
Ineris   INSTITUT NATIONAL DE L ENVIRONNEMENT INDUSTRIEL ET DES RISQUES
M2.1   Milestone 2.1

3 Executive Summary

The current document is the technical report of Task 2.1, supporting and supplementing the knowledge base created for D2.1. The primary objective of this task was to create a comprehensive knowledge database for the coal mining communities, explicitly focusing on post-mining hazard occurrences. The primary deliverable is an Excel spreadsheet with a knowledge base document describing the hazards affecting abandoned coal mines across Europe. Partners representing each country (France, Germany, Greece, and Poland) have been in contact with various national and regional organizations. They gathered pertinent data, representative examples, and information on hazard management related to abandoned coal and lignite mines.

Section 4.1 provides the database's creation development, while section 4.2 outlines the families categorizing post-mining hazards. Section 4.3 establishes the guidelines governing the utilization of the final knowledge database. Additionally, these guidelines are available as an additional sheet within the Excel file.

4 Background

The deliverable is related to WP2, Post-mining hazards and multi hazards identification and assessment methodology, and more precisely Task 2.1. The aims of the work done is to establish a knowledge base including a shared library between the coal mining communities of post-mining occurrences.

The creation of the data base of the mining hazard is presented the following section of the deliverable. The main deliverable is a knowledge base document describing the different hazards that can affect active and abandoned coalmines in Europe. Part of the data and the collected information in Task 2.1 will constitute an input for WP2 (Risk assessment) and WP3 (GIS development and implementation).

4.1 Creation of database

This section provides insight into how the knowledge database was structured based on partners' research and interactions. Furthermore, it presents the initial assumptions and decisions regarding the database's format, context, content, and any modifications and additions made along the milestone M1 acceptance. This section explains the database's development and current structure.

During the consortium's first meeting (8 December 2022), a crucial question arose regarding the database structure and its final format; the database format aimed to ensure universal accessibility for all project partners while maintaining user-friendliness and comprehensibility. Following discussion and with guidance from CERTH (Task leader), the decision was made to create the database using a Microsoft Excel spreadsheet. This structure is preferred for this database as it is practically accessible and easy to use for research and industry and is ideal due to the relatively small size of the database.

The database design was outlined as follows: The first column of the spreadsheet would illustrate a list of identified hazards; the first row would contain the required fields delineated in the project proposal with any necessary modifications. The primary objective was to establish a seamless correspondence between each required field (row-based) and every hazard (column-based). Furthermore, the discussion encompassed the

potential enhancement of required fields and the addition of post-mining hazards. An early augmentation to the hazard column was introduced, specifically including "tailings dams," an object not initially featured in the proposed list.

Additionally, upon the suggestion of Ineris, it was decided to categorize the identified hazards into four main families that are detailed below, as illustrated in column A of the database. Moreover, another piece of information that needed to be added was to mention in which type of mine each hazard can happen (Column C). After the first meeting, partners provided further feedback and made necessary data entries or edits within the spreadsheet cells.

Furthermore, all partners provided feedback on the structure and content of the database, which had been under development for the past two months. Subsequently, a final version of the core structure was collectively defined. Notably, partners modified several descriptions that diverged from the previous versions. These changes encompassed subsidence-related issues, spoil-based environmental pollution, and hydrological issues, specifically water disturbances in underground mines. After a thorough discussion, all partners agreed to retain these alterations.

The three last columns were introduced to facilitate the database update and comparisons among European countries regarding terminology and definitions. Partners provided feedback for each hazard, including its name, the type of mines it occurs in, and whether the proposed description aligns with their national standards (Columns K, L, and M). In conclusion, all partners unanimously endorsed the current database version, marking the completion of milestone M2.1 (Present and discuss the structure of the data base of the hazards).

Before completing the database, partners provided feedback on the national standards and a few additional suggestions for changes, which were approved regarding the new database content. Finally, it was decided to include a report alongside the Excel knowledge database file. The current technical report signifies the completion of D2.1 based on these decisions.

All meetings were conducted virtually, and all partners associated with Task 2.1 actively participated. They offered suggestions, proposed topics for discussion, and were readily available to assist whenever their input was requested.

4.2   Post-mining hazards families

Four significant families of post-mining hazards were identified to be used for hazard identification. These were ground movement, environmental pollution, hydrological issues/water disturbances, and gas/fire.

<u>Ground movement family</u> concerns hazards that appear due to mining-induced movements or movements of the ground due to changes in stresses, deformation and failure of underground structures or sudden collapse and surface deformation.

<u>The environmental pollution family</u> describes hazards that affect surface and groundwater supplies due to heavy metals and conservative pollutants. Moreover, it includes the case where spoil materials (including sulphide minerals) are placed on the surface, or a failure of the tailings dam in combination with physical weathering causes environmental pollution.

<u>Hydrological issues/water disturbances family</u> describes the hazards due to aquifer rise back (after the halt of mining operations) or the artificial flooding of pit-lakes causing consequences in the post-mining areas.

Finally, the gas/fire family is related to the hazards that can affect the surrounding areas by releasing high-energy radiation or endogenic fires caused by physical-chemical reactions.

Another way to group hazards is through the related mine type. This categorization is done in column C of the Excel file (database) by incorporating four families of mine types. These groups are:

Surface Mines: Surface mines are mining areas that extract coal or lignite from the Earth's surface, often through open-pit or strip mining methods.

Underground Mines: Underground mines are mining areas that access and extract coal or lignite from beneath the Earth's surface, typically through tunnels, shafts, or other subsurface passages.

Pit Lakes: Pit lakes are water bodies that form in abandoned open-pit mines as a result of natural groundwater filling or artificial flooding. They can serve various ecological and recreational purposes.

Waste Embankments: Waste embankments are engineered structures used to contain and manage the by-products and waste materials produced during mining activities, providing a means of safe disposal and environmental protection.

4.3   Guidelines on using the database

This section provides comprehensive guidelines on the final knowledge database in Excel format; it has also been included as the first page of the Excel-based knowledge base. This guidance will encompass key assumptions and instructions regarding the description of columns, lines, cells, and other essential elements within the database. The aim is to ensure that users can navigate and make the most of this valuable resource easily and clearly, facilitating access to crucial information.

Row 1: the first row of the file describes the information gathered for all hazards. These fields are essential for describing, understanding, evaluating the impact, and devising responses to each hazard.

Column A: the four categories of the identified hazards are ground movement, environmental pollution, hydrological issues/water disturbances, and gas/fire.

Column B "Name of hazard": the provided list includes all post-mining hazards identified by the partners, and it serves as the basis for multi-hazard identification and analysis.

Column C "Mine type": the four types used are surface mine, underground mine, waste embankments, and pit-lake. This column illustrates the type of the post-mining area where each hazard has the potential to occur.

Column D "Description": communicates vital information on hazards' based on a format-free description.

Column E "Description of effects and consequences": details the societal, financial, environmental, and any other consequences arising from the occurrence of a hazard.

Column F "Illustration and examples concerning each coalmine hazard": references specific instances where each hazard has occurred in a post-mining area.

Column G "Description of mechanisms leading to the phenomenon occurrence": describes the conditions that can lead (and have been reported to lead in the past) to a hazard occurrence.

Column H "Main variables and factors influencing phenomenon predisposition and/or occurrence and intensity": lists the primary causal factors that increase the likelihood of each hazard occurring or tend to promote their occurrence.

Column I "Main variables and factors influencing phenomenon mapping and monitoring": lists the main variables that can affect the monitoring process of a post-mining area.

Column J "Additional information and comments": includes any supplementary valuable information that did not belong to any of the existing required fields.

Column K "What is the name or term in each country?": the input for this column was obtained from national data concerning post-mining hazards. This information aims to validate the identification of hazards and highlight disparities in terminology across different countries.

Column L "Does it exist at a national level – in what type of mines it occurs?": the input for this column was obtained from national data concerning post-mining hazards. This column provides information about post-mining hazards that may occur in each respective country and specifies the types of abandoned mines in which they can happen.

Column M "Is the given phenomenon description different from the relative national description? If yes, provide the national description": the input for this column was obtained from national data concerning post-mining hazards. This column illustrates descriptions of each hazard at a national level. Any variations from the descriptions provided in the database are highlighted.

5 References

Project minutes, 8th of December 2022, "E-Meeting for Task 1.1: Knowledge base and library of post-mining hazard".

Project minutes, 1st of February 2023, "Minutes of e-meeting for milestone M1.1: Present and discuss the structure of the data base of hazards".

Project minutes, 3rd of April 2023, "Minutes of the Progress Meeting".