

D.3.1.2: Performance report on historical studies

15 May 2023

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[SPAQuE, OVAM]

Version Final



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1 INTRODUCTION

This performance report on historical studies is written in the frame of the NWE REGENERATIS project. In Deliverable 1.1.3 of the project, a new guideline was delivered to conduct historical studies. This guideline is an important aspect of the REGENERATIS methodology, as it emphasizes which historical information is crucial to collect if you want to assess the resource recovery potential of a Past-Metallurgical Site or Deposit (PMSD). For example, when conducting a historical study, you gather valuable information on past industrial activities. However, current historical studies merely focus on the human exposure and environmental risks of potential contaminations, in the frame of site remediation. Hence, the data that is gathered during the traditional historical studies do not support the assessment of economic and technical potential in terms of the valorisation of material deposits that are present on the site. Therefore, we drafted a new historical study guideline that is more oriented on the identification of resource recovery potential. This guideline contains new elements, but the traditional approach is still included.

Of course, we needed to apply this guideline on our own pilot sites, to assess the method that was developed and detect possible bottlenecks, difficulties or shortcomings. With these results, we updated the first draft of the historical study guideline and the desk dataset. In this report, we describe and clarify this process. Furthermore, we give an overview of the advantages and disadvantages of using the guideline and the desk dataset that we developed in the project.

2 THE TWO VERSIONS OF HISTORICAL GUIDELINES AND DATASETS

2.1 FIRST VERSION OF HISTORICAL GUIDELINES AND DATASETS

The guidelines proposed by NWE-REGENERATIS for a new methodology to conduct historical studies are based on the benchmark of historical guidelines across NWE. All the parameters were selected in consultation with NWE-REGENERATIS project partners and experts to ensure a well-rounded approach to meet the exact target. These guidelines provide valuable insights to set up PMSD conceptual site model, sampling plan for further investigation on site, and revalorization potential.

The methodology consists of six main steps as follows:

- Step 1 - Site identification;
- Step 2 - Legal and administrative procedures;
- Step 3 - Site documentation review;
- Step 4 - Deposits investigation;
- Step 5 - Previous investigation campaigns;
- Step 6 - Site visit.

These six steps are further divided into more than 130 different parameters to identify all the past, current and future aspects of the site in detail. With these parameters an Excel spreadsheet was created that the users may download for free from the website of the NWE-REGENERATIS project. This Excel sheet was developed to assess the information quickly and briefly, however, the Word document (with 6 steps of guidelines) provides the same information in detail.

In the guideline, each parameter is described, and indications are given to future users, in order to simplify the understanding and to avoid errors. The biggest advantage of this approach is that it identifies whether the site is a PMSD site or not. This identification helps to implement the NWE-REGENERATIS methodology on site and paves the way toward a circular economy by extracting and revalorizing the secondary raw materials by providing the site for other valuable projects.

In addition to the existing parameters across NWE to conduct historical studies, NWE-REGENERATIS project includes other important parameters for economic exploitation of the site before launching an urban mining project which is the important step of these guidelines and datasets named as “Step 4 – Deposits investigation”. This step focused on main parameters for economic exploitation of the site and allows the launching of an urban mining project.

The key parameters related to the deposits are important for the estimation of economic potential for the valorisation of raw materials located on-site and could be divided into three types, based on the previous metallurgical production processes applied in the past: inputs parameters in the processes, outputs parameters and the description of deposits. These elements are detailed hereafter.

2.1.1 List of inputs

This parameter includes the list of elements, products, chemicals, and materials used in the production process. If minerals were used in the processes, any information regarding their origin, the geological conditions of the deposits (for primary ores) or their industrial preparation (for co-products), and their chemical and mineralogical composition should be indicated. It would help to discover the characteristics of deposits/residues of the final product that was making on site and would help to have a first idea for their valorisation.

2.1.2 List of outputs

Any products, coproducts and waste that were generated on site during and after the production process should be indicated under this parameter. If some outputs were valuable or of some economic interest, it should be mentioned whether the outputs were already recycled inside or outside the site. This parameter helps to identify all types of deposits present on site and helps to identify their potential for valorisation (can be valorised or not) if yes, what kind of revenues can be acquired.

2.1.3 Description of deposits

This parameter helps to explore further the deposits' characteristics. In the case of metal deposits, it will be interesting to check the ore grades, concentration, homogeneity, and the overall economic viability of these metals. However, the investigation regarding the deposits will be case-specific as the composition of deposits on site can evolve depending on the period of production. However, the aim would be the same and in order to have a complete review, the following checklist would help to identify:

- Waste deposit location (estimation): The area where the deposits were dumped on site, if there has been any change or movement over time, all previous locations must be provided (for example by maps, aerial photography, and historical written records).
- Origin of the deposited material: A classification of the source of the deposit e.g., raw materials, end products, wastes, etc.
- Exploitation/production period: The time length of active production of the deposit and information about the production technology.
- Estimated volume: Total volume of the deposits expected to be on site.
- Estimated area: Total space in hectares, occupied by the heap of the deposit.
- Estimated average thickness: The average height of the deposit heap on site.

- Estimated average height (above natural ground)
- Estimated average depth (below natural ground)
- Estimated metal content (per metal): The estimated average metal concentration on site.
- Expected main chemical and mineralogical composition: The mineral and chemical characteristics of the deposits on the site.
- Estimated homogeneity: The physical characteristics of the deposits, if there are different deposits mixed up (heterogeneous) or the same set of deposits (homogenous).
- Ease of access to each deposit: All physical means to access the deposits. For example, access roads.

2.2 FINAL VERSION OF HISTORICAL GUIDELINES AND DATASETS

The first version of these guidelines with 6 main steps was applied by the NWE-REGENERATIS partners on the pilot and additional sites of the project to identify the benefits and bottlenecks. Each partner (responsible) developed the complete historical study of the dedicated site (Word document and datasets). While writing these historical studies each partner recorded his feedback based on his experience and facilities and difficulties encountered. Based on this feedback some parameters were modified and the final version of the guidelines and dataset was created. The next point will explain all the modifications that were made and approved by the partners.

3 SUMMARY OF CHANGES APPROVED BY RELEVANT PARTNERS – PRIORITIZATION OF DIFFERENT SECTIONS (DATASETS AND GUIDELINES)

Firstly, the structure of the datasets was changed, and parameters were added step by step (from 1 to 6 according to the guidelines). This made it more user-friendly and coherent as the parameters of the dataset were aligned with the structure of the guidelines so that when you want to find information in detail, the user can go directly to that step and parameter number and vice versa. This results in an 'empty' tab for step 2 in the dataset. The necessary legal and administrative procedures are highlighted in the dataset, but no input is necessary over there.

Furthermore, in the desk dataset the column "sources" was removed as this is an aspect that is more important in the historical study report.

After that, based on the partners' feedback some important parameters were added. In addition, the names of some parameters were changed for more clarification.

In step 1 site identification, the location of the site where the project is to take place is the main thing to first note. Part of this information will include the GPS coordinates of the site, maps, and any other document that will allow a precise location of the site. It is also important to consider the nature of the activities carried out on the site. For sites that have an indexed database, the reference number of the site must be included. Therefore, we also added the site address, so one that who is not familiar with the location of the site, can find it. We have precised that the corporate name refers to the owner of the site and the regional code to the NUTS code.

Within step 3 site documentation review, an overview of all documents that could be interesting for the historical study of the site was added. For the description of the deposits present on site, the parameters "origin of the waste" and "composition of the main types of waste" were added.

In step 4 deposits investigation, as the aim of these historical guidelines is to allow for making use of past metallurgical sites and deposits, a detailed description of the deposits on site will need to be carried out. Therefore, we have added more important parameters related to the description of deposits. For example, in the case of metal deposits, it will be interesting to check the ore grades, concentration, homogeneity, and overall economic viability of these metals. However, the investigation regarding the deposits will be case-specific as the composition of deposits on site can evolve depending on the period of production. The aim is still the same and in order to have a complete review. In this step, we have also added the parameters related to the geophysical investigation to analyze the site characteristics in terms of deposits' location, volume, and depth.

For step 6 site visit, as the objective of the site visit is to be able to have a closer view of the site (past activities and current situation) and also to observe what has been gathered already to confirm all the maps, archived documents, photos, *etc.* It was observed that there is a need to add the parameters related to geophysics to see if the geophysical investigation campaign can be run on-site or not. Therefore, the parameters were added in the final version of the guidelines and datasets.

After all of these modifications, the final version of the guidelines and datasets was applied to one of the pilot sites of the project (DUFERCO-La Louvière) to assess the progress, effectiveness, and efficiency of the new modifications and feasibility of this methodology. The positive results were recorded which were enough to finalize the last version of the guidelines.

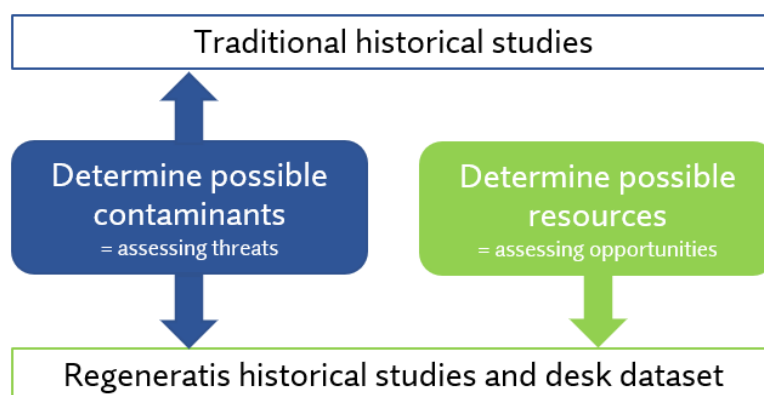
4 CURRENT STATUS/EXPECTATIONS – BENEFITS FOR STAKEHOLDERS

4.1 ASSESSING THREATS AND OPPORTUNITIES

The big advantage of the new guideline and the desk dataset is that it enables stakeholders or site owners to compile the right information that can be used for multiple purposes. Based on the information that will be gathered by using these instruments, the site owner can:

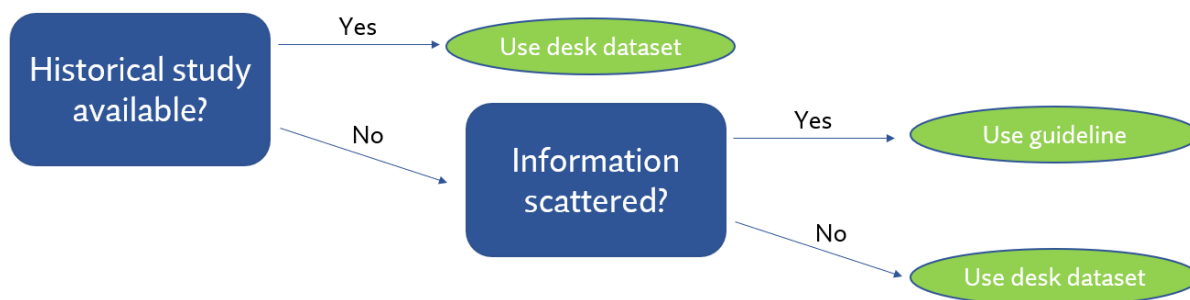
- Determine possible **contaminants**, which is of great importance for assessing human and ecological risks and for drafting a remediation plan (= assessing the **threats** of the PMSD).
- Determine possible metal **resources**, which is of great importance for assessing the valorisation potential on-site and for drafting an excavation plan (= assessing the **opportunities** of the PMSD).

Historical information is crucial for preparing soil investigations that aim to describe soil contamination. However, we should shift our focus broader than only contamination: we should not only assess the threats.



4.2 TWO DIFFERENT INSTRUMENTS

The project decided to develop two different instruments: a comprehensive guideline as well as a more to-the-point dataset. The choice to deliver two different outputs enables the site owner or stakeholders to conduct the historical study in the way they prefer, or they could use the short decision scheme in Figure 1.



For some cases the historical information will be very scattered, as no effort has been made yet to gather information. In that case, the stakeholder will probably need to invest more time and effort in gathering all useful information and it would be most valuable to go through the whole guideline. If there is already some structured information available, summarised in a document or report, it could be more interesting to use the desk dataset. When filling out the desk dataset based on a traditional historical study for example, it will go very fast, and you will discover quickly which information is not present in the study that is necessary for the estimation of the resource recovery potential.

For example, for the La Campine site there was already a whole historical study available, conducted according to the traditional guidelines, in view of site remediation. There was already a lot of information present, that could be quickly transferred to the desk dataset by reading it through. The elements that were not present yet were indeed more linked to the resource potential (estimated metal content, main chemical and mineralogical composition of the deposit, final product specifications, ...). So, in this case, you start with gathering easily accessible information, and after that, you start searching for information on the essential elements that were not yet included in the initial report. In that way, the desk data set enables you to get a good overview of the missing information.

5 LESSONS LEARNED AND RECOMMENDATIONS

5.1 THE DESK DATASET

- The Excel doesn't need to be a fixed format; it is a type of checklist that you can use in the format that you prefer (Word, Excel, online, OneNote, or the format that can be preferable to utilize the information),
- In case of a large number of parameters, the Excel can be split into different tabs based on the nature of the parameters,
- Try to be as concise as possible when you are filling in the desk dataset. Try to only include the essential information and don't lose yourself in details.

5.2 THE HISTORICAL GUIDELINES

The structural division and order of historical guidelines' steps (1) Step 1 - Site identification; (2) Step 2 - Legal and administrative procedures; (3) Step 3 - Site documentation review; (4) Step 4 - Deposits investigation; (5) Step 5 - Previous investigation campaigns; (6) Step 6 - Site visit could be changed/modified according to the site and waste's characteristics, national and regional priorities and legislations, and other affecting factors. For example, the legal and administrative part should be designed according to regional or national regulations. In future it would also be helpful to add a short description of each parameter as a definition for more clarity. Parameters related to the economic viability of the site can also be separated at the end of the historical studies which would help the private/public investors and relevant stakeholders to assess the site's economic potential quickly.

6 CONCLUSION

NWE-REGENERATIS' innovative approach to the historical studies of contaminated sites with a metallurgical past paves the way for the transition to a resource-efficient and low-carbon circular economy by recovering valuable secondary raw materials from PMSDs through urban mining. The historical information related to a site is essential in the decision-making process and gives support and facilitates the launching and implementation of urban mining projects in NWE.

For the preliminary investigation of a site focusing on the aspect of material recovery, the NWE-REGENERATIS project developed the 6 steps guideline related to how to conduct historical

studies oriented towards the identification of potential valuable raw materials from PMSDs considering the actual focus on the identification of potential sources of pollution of the historical studies across NWE. This could serve as a common approach to assessing the economic potential of a site prior to starting an urban mining project on it. Each step of this methodology contains different parameters to study the site from different perspectives, which provides more reliable information about a site from the beginning to the end of activities. These parameters can be case-specific, depending on the type of site and its activities. These parameters can be case-specific, depending on the type of site and its activities. In the NWE-REGENERATIS project, this new methodology helps to identify whether the site is PMSD or not before launching an urban mining project in an efficient manner.

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