

**Deliverable code:** EITRM109305

**Deliverable number:** D6.2

**Deliverable name:** A report about description of the project website

**Deliverable description:** Details about the new public INCO-Piles website

**Related Task:** T6.2

**Deliverable realized by:** Alma Mater Studiorum – Università di Bologna (UNIBO): F. Tinti, S. Kasmaeeyazdi

**With the collaboration of:** the whole Partnership

## INCO-Piles 2020

International consortium to recover CRMs from stockpiles/tailings targeting RIS

### Report of the INCO-Piles website

Website online: May 2020 (M5)

First Deliverable draft: June 2020 (M6)

Deliverable update: December 2020 (M12)

The INCO-Piles 2020 website is available at the following link: <https://site.unibo.it/inco-piles-2020/en>. The website has been created inside the University of Bologna Platform “Websites on demand”. The main objective of the website is to assure the dissemination of the project results and initiatives. Therefore, the INCO-Piles 2020 website provides:

- An overview on the project and its objectives, with special attention to case studies and round tables. Moreover, specific sections are devoted to the partners’ presentation, to EIT Raw Materials and RIS Strategy and to reference contacts, in order to allow interested people getting more information about the consortium.
- The outputs and results.
- Social media link to follow and share the project activities.

The website logo was object of discussion among Consortium Partners.

Alternatives presented are listed below in Figures from 1 to 5.



Figure 1. Original INCO-Piles logo



Figure 2. Alternative 1



Figure 3. Alternative 2



Figure 4. Alternative 3



Figure 5. Alternative 4

After internal discussion, *Alternative 4* was chosen as official logo of INCO-Piles Project, to be inserted in the Project website and in social media and to be included inside INCO-Piles templates (word, powerpoint).

The technical specificity of the *Alternative 4*, is:

“By the new disposition of the truck and the symbol of mining engineering, it has been possible to balance the important elements of the logo. Now, the elements are besides each other, so they are easily and immediately perceived as elements belonging to the same group”.

A second version, specific for social media (Twitter, LinkedIn) is presented below, too.



Figure 6. Second version of Alternative 4

Once decided the logo, it was inserted inside the Project Website.

The website development has followed the guidelines of «Communication guidelines for Partners» by EIT RM and was checked and validated by Project Officer late May 2020. At the top of each web page, the horizontal navigation bar is presented. The main structure of the website is:

1. Home Page
2. Project
3. Partners
4. Case studies
5. Round Tables
6. Outputs
7. Events
8. EIT RawMaterials
9. Contacts

Heading shows the Project Logo, the EIT RawMaterials logo and the EU flag (Figure 7).



Figure 7. Heading

Footing provides links to the social media of the Project: Twitter and LinkedIn (Figure 8).



Figure 8. Footing

## 1. Home Page

The home page has the following content (Figure 9):

- ✓ Logo of the Project (improved with respect to original version).
- ✓ Slide show.
- ✓ Financing body and link to the EIT RM website.
- ✓ Partners divided by type.
- ✓ Support of EIT RawMaterials evidenced

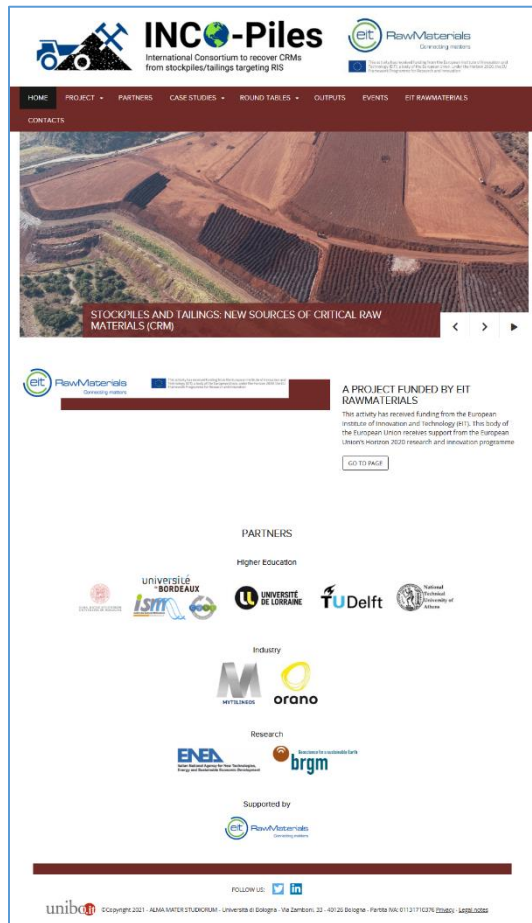


Figure 9. Home page

In the Slideshow, collection of stockpiles and tailings is presented. Currently there are:

- Bauxite tailings of Greece (2 photos, courtesy of Partner Mytilineos);
- Uranium tailings of Niger (1 photo, courtesy of Partner Orano)
- Gypsum tailings in Emilia Romagna (1 photo, made by Coordinator University of Bologna)

Other tailings of interest are under evaluation for the insertion.

Additional information presented in the slide show are:

- Map of target zones (ESEE and MED) addressed by the INCO-Piles Project.
- Focus on sustainable mining and processing, with link to the EIT Raw Materials webpage.

## 2. Project:

The “Project” page (<https://site.unibo.it/inco-piles-2020/en/project>) provides the administrative information about INCO-Piles 2020 Project (Figure 10). Moreover, it refers to the three following subcategories:

- Project objectives
- Project structure
- Description of Regional Innovation Scheme (with focus on INCO-Piles target areas)

Project objectives provide information on the main targets and general scope of the Project.

Project structure reports a simplified scheme of the Project, with evidence of work packages (WPs), semesters timing and links among activities.

Finally, a dedicated page to the explanation of Regional Innovation Scheme, and how INCO-Piles Project interrelates with it, is presented.

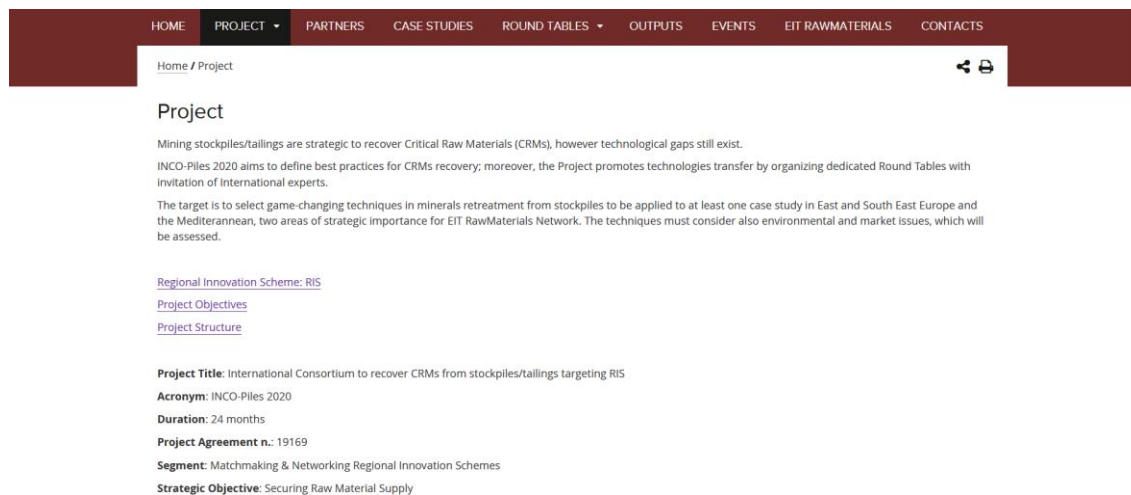


Figure 10. Project description webpage.

## 3. Partners:

The Partners page (<https://site.unibo.it/inco-piles-2020/en/partners>) presents the list of all Partners participating in INCO-Piles 2020, divided by the three categories: Higher Education, Industry and Research (Figure 11). By clicking on the partner’s logo, it is possible, through a hyperlink, to reach the working group webpage. Support of EIT RawMaterials is evidenced

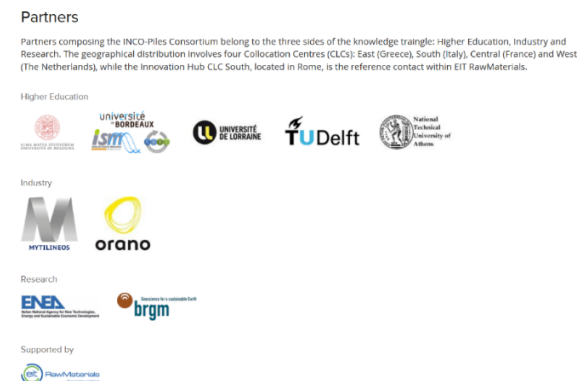


Figure 11. Partners’ list webpage.

#### 4. Case Studies:

This section (<https://site.unibo.it/inco-piles-2020/en/case-studies>) presents the information on the selected case studies, results of technical activities from WP 3, concluded in December 2020. The section is partially filled and will be completed by the end of February (Figure 12). Currently, information about the Bauxite case study from Italy is present (Figure 13).

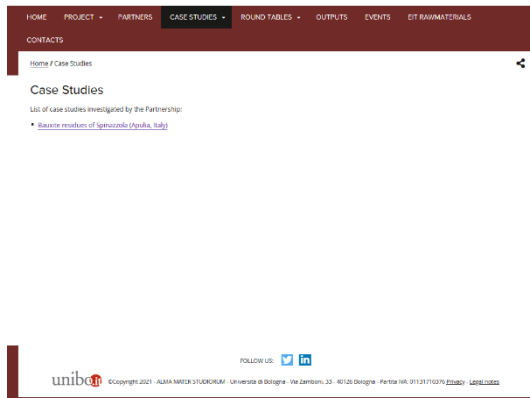


Figure 12. Case studies webpage.

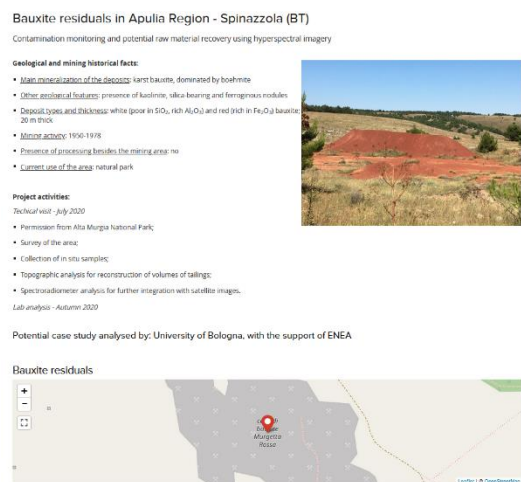


Figure 13. Apulia bauxite Case study webpage.

#### 5. Round Tables:

This section (<https://site.unibo.it/inco-piles-2020/en/round-tables>) is divided between Round Table 1 and Round Table 2 (Figure 14). The picture of the main page is courtesy of the Partner University of Bordeaux and it represents a preceding Round Table organized, in the framework of IRTC Project, so to highlight the link among EIT RM Projects. Main public information about the Round Table 1, held in December 2020, are presented in the website (Figure 15).

## Round Tables

Throughout the project, two round tables will be organized aiming to support defining best practices and promote technologies transfer with international experts:

[Round Table 1 | 2020](#)

[Round Table 2 | 2021](#)



IRTC round table, EcoBalance Conference, Tokyo 2018 - <https://irtc.info/>

Figure 14. Round Tables webpage.

### Round Table 1 - Challenges on the recovery of CRM from tailings

INCO-Piles round table with 10 experts from more than 23 countries successfully done!  
Hot discussions on sampling, characterization, excavating, processing, environmental and circular economy panels, and hard talks even in chat!

Thanks to all of you who attended our first INCO-Piles round table! It was an interesting day full of discussions about the challenges on the recovery of Critical Raw Materials from mine wastes with the global experts on the field.

We had remarkable keynote speakers and hosted 3 different panels about:

- A: challenges in sampling and characterization
- B: challenges in processing and extraction
- C: economic and environmental challenges

The main take-away messages:

**Education:** we need new skills to increase Social License to Operate and remove legal barriers.

**Economy:** we must consider the benefits of economic evaluations vs reduction of environmental impacts.

**RIS area:** we must move from artificial towards a highly-skilled approach and increase knowledge transfer.



#### ROUND TABLE 1 - LEAFLET

Round Table 1 - Leaflet  
[ pdf 1673kb ]

Round Table 1 | Challenges on the recovery of CRM from tailings

Location | Bologna, Italy

Date | 11<sup>th</sup> December 2020

[Application form](#)

NEW! Extended deadline for registration: 20<sup>th</sup> of October



Figure 15. Public information about achievements of Round Table 1.

## 6. Outputs:

This section (<https://site.unibo.it/inco-piles-2020/en/outputs>) is filled with project results. The public documents, deliverables and technical reports related to INCO-Piles are collected and presented here. Moreover, this page contains the abstract of all publications released by INCO-Piles Partners and made available to the external audience, as well as a short resume of the seminars held by Project Consortium experts for EIT labelled Master students (Figure 16).





## Outputs

Main Project achievements, results, reports and information about Project advancement

## Results

### Work Package 3 Results

The INCO-Piles project seeks to define best practices and technologies to recover Critical Raw Materials from mine tailings and stockpiles. An essential aspect for meeting this goal regards the understanding of the value of some mine waste deposits. The re-mining of mine tailings bears close similarity with the mining of primary ores and, as such, an essential part on a metal recovery project from mine wastes is the evaluation phase, which comprises an assessment on the presence of potential recoverable ore and assessment of the feasibility for project development. In this framework, the objective of the INCO-Piles Work Package 3 focuses on a comprehensive review of sampling characterisation and processing techniques, which can be applied to stockpiles and tailings.

- **Deliverable 3.1** Report with techniques, instruments and methods for sampling (**Responsible:** DELFT)

The goal of the Deliverable is to collect best available technologies and methods currently in use in the world mining sector for the specific application on stockpiles and tailings. Task 3.1 of WP 3 consisted of reviewing sampling methods and sample analytical techniques for the initial characterisation of the mine waste material. The review covers not only traditional methods and techniques but also novel approaches for material characterisation.

- **Deliverable 3.2** Report with techniques for evaluation of CRMs variability (**Responsible:** UNIBO)

Task 3.2 of WP3 consisted of reviewing characterization techniques for understanding presence of raw materials (with special reference to critical raw materials - CRMs) inside the mining wastes (both stockpiles and tailings). The review covers different aspects, such as EU legislation in mining wastes management, environmental characterization of historical mining areas for pollution detection, grade characterization for recovery of valuable metals, innovative ways and approaches to understand the presence and value of CRMs within the entire mine life cycle. The present Deliverable concludes with comments on the current standards and suggestions about a more effective characterization for practical and economic recovery of CRMs from stockpiles and tailings.

- **Deliverable 3.3** Report with techniques for recovering and processing CRMs (**Responsible:** UL)

This Deliverable aims to summarize best practices and novelties in field of mineral (re-)processing as well as to address the processing challenges associated with retreatment of tailings and stockpiles and extraction of CRMs. The present report is structured in a following manner: firstly, for each CRM concerned, the existing and emerging recovery technologies are reviewed, including recently developed methods; secondly, main mineral processing technologies, novel and performance improving technologies suitable for the tailing and stockpile re-treatment are discussed.

## Public reports and publications

**Application of geostatistical analysis interacting with the earth observation data for recovery of raw materials from mining residuals (stockpiles and tailings): research projects at University of Bologna.**

**Authors:** Sara Kasmaee<sup>1,2</sup>, Emanuele Mandanici<sup>1</sup>, Francesco Tinti<sup>1</sup>, Stefano Bondua<sup>1</sup>, Roberto Bruno<sup>1</sup>

<sup>1</sup>Department of Civil, Chemical, Environmental and Materials Engineering, Sector Mining Engineering and Geostatistics - UNIBO, via Terracini 28, 40121 Bologna

<sup>2</sup>Department of Civil, Chemical, Environmental and Materials Engineering, Sector Geomatics - UNIBO, viale del Risorgimento 2, 40136 Bologna

**Keywords:** Earth Observation, Geostatistics, Raw Materials, Recovery

**Abstract:** The poster presents an overview of the ongoing research projects at University of Bologna - DICAM Department, applying geostatistical methods to mining stockpiles and tailings with the purpose of metal recovery. The educational program RawMatCop of EIT Raw Materials is the main supporter of the research. The work takes advantage of the use of Earth Observation (EO) data for sampling optimization in mining residuals from abandoned and active mines. Purposes are both recovery of raw materials and environmental rehabilitation of tailing dams and landfills. EO can play an important role in accounting the raw material resource of a territory, since current satellites, such as the Copernicus constellations (Sentinel), provide continuous spatial and temporal coverage of the global at no cost. Thanks to the spatial resolution, Copernicus data can improve the characterization (quantification and evaluation) of a resource, together with the assessment of the associated risks. Moreover, EO can be used for continuous monitoring of the target areas, conditioned by mining activities. On the other hand, geostatistical analysis, using in situ sampling and EO images, exploit innovative methods to improve accuracy of grade and pollution maps, thus reducing the number of samples, with evident cost reduction. Test sites are bauxite residuals, located in Mediterranean Region: Greece and Montenegro (under analysis, 2019), Sardinia and Apulia (programmed work, 2020). Finally, a new international Project, INCO-Piles, starting in early 2020 and led by the research group, has the scope to identify the most promising mining residuals of Southern Europe for recovery of critical raw materials.

Poster session, *Conference on Mining the European Anthroposphere, 20-21 Feb 2020, Bologna*

### Evaluating the correlation between ground information and satellite spectral data by geostatistical tools

**Authors:** Roberto Bruno<sup>1</sup>, Sara Kasmaee<sup>1,2</sup>, Francesco Tinti<sup>1</sup>, Emanuele Mandanici<sup>2</sup>

<sup>1</sup>Department of Civil, Chemical, Environmental and Materials Engineering, Sector Mining Engineering and Geostatistics - UNIBO, via Terracini 28, 40121 Bologna

<sup>2</sup>Department of Civil, Chemical, Environmental and Materials Engineering, Sector Geomatics - UNIBO, viale del Risorgimento 2, 40136 Bologna

**Keywords:** Satellite data, Geostatistics, Kriging of Components

**Abstract:** Satellite information opened new scenarios for planet surface mineral exploration. Hyperspectral information brought by sensors on board potentially help identifying and measuring concentrations of an element if an accurate calibration is done, based on available ground sampling. Most popular uses of satellite images refer to 2D problems and most calibrations refer to the spectral properties of the objects to be discovered and characterized (Pollard M., 2005). Before calibration, images are affected by standard preprocessing, for instance for filtering unwanted effects, and for enhancing the information considered useful. The general problem for mineral exploration and reserves characterization is the spatial distribution of the target variable, with limited and sparse in situ information. Satellite images provide auxiliary information, which can be used, when correlation is found with the target variable. In this case the expected result should improve the estimation of the representation of spatial distribution of the sampled variable. Independently of the variable at hand (grades, discovery probability, ...) and of the spatial distribution model (estimation, simulation), Geostatistics allows to tackle the central problem: finding meaningful correlations and modelling the unknown surface distribution of the interest variable by including satellite data as auxiliary information (Chiles et al., 2012; van der Meer, 1994). Three issues need attention when considering satellite images: a) the different support of direct and auxiliary information, being pixel data referred to a surface, in contrast with the punctual ground data b) the need of 3D modelling c) the space-time nature of the satellite information. The correlation study is one of the most delicate phases when using satellite images for improving the models' quality of surface distribution of a target variable. Geostatistics offers a wide variety of powerful tools for a deep study of these correlations. A short case study is reported as an example where it was identified the most correlated spatial component by a multivariate structural analysis.

Oral Presentation, *Mineral Exploration Symposium, 17-18 Sep 2020 Online Event*

### Valutazione preliminare in ottica di ciclo di vita della fattibilità di una filiera italiana del riciclaggio delle batterie elettriche per autotrazione

**Authors:** Cristian Chiavetta<sup>1</sup>, Marco La Monica<sup>1</sup>, Pier Luigi Porta<sup>1</sup>, Claudia Scagliarino<sup>2</sup>, Laura Cutaià<sup>1</sup>

<sup>1</sup>Laboratorio RISE - ENEA, via Anguillarese 301, 00123 ROMA

<sup>2</sup>CINGeo - Consorzio Interuniversitario Nazionale per l'Ingegneria delle Georisorse Corso Vittorio Emanuele II, 244 - 00186 Roma

**Keywords:** Batterie elettriche, Material Flow Analysis, Filiera del riciclaggio, Fattibilità economica, Monetizzazione impatti ambientali

**Abstract:** L'affermazione di un modello circolare di produzione e consumo delle risorse necessita di interventi sull'attuale modello economico lineare a livello di prodotto-processo, catena del valore, settore produttivo oltre che a livello territoriale, tenendo conto delle interazioni tra i diversi sistemi produttivi. Il Laboratorio RISE di ENEA ha applicato in diversi contesti un approccio per la valutazione della fattibilità di sistemi di urban mining tramite un'analisi di scenario di medio-lungo periodo per la quantificazione dei flussi di materie prime seconde producibili ed una contestuale analisi della sostenibilità economico-ambientale. In questo articolo si propone la descrizione dell'applicazione di tale approccio metodologico alla valorizzazione delle batterie elettriche di trazione, includendo alcune considerazioni preliminari sulla monetizzazione delle externalità ambientali, valutate tramite la metodologia del Life Cycle Assessment (LCA).

Oral Presentation, *14° convegno della Rete Italiana LCA 9-11 dicembre, Cortina D'Ampezzo*

## Seminars

### Metals grade mapping: application to mining residues (tailings and stockpiles)

**Lecturer:** PhD Sara Kasmaee

Mining Engineer, expert in geostatistical applications

**Keywords:** Bauxite residues, Geostatistical approaches, Metals variability, Copernicus data

**Short summary:** The seminar presented the importance of mining residues in the raw materials sector: why do we need to re-consider the remained mining residues and what is the main necessity of reconsidering them: the main difference between mining stockpiles and tailings; the concept of metals characterization presented and possible methods to calculate the volume and tonnage of a mining residues; the methodology presented within a real case-study (the Bauxite residues from Greece) showing the theory and the practical steps of metals characterizations. Using the satellite data (Copernicus data) was highlighted and the importance of using remote sensing approaches in raw materials sector was demonstrated within the lecture.

**EIT Master Course:** Raw Materials Exploration and Sustainability - RAMES

Figure 16. Outputs webpage.



## 7. Events:

The page (<https://site.unibo.it/inco-piles-2020/en/events>) presents all the planned, ongoing and past events in the framework of the Project. Linked to each event, there is the possibility to add the registration form (complete with privacy policy issue). At the end of December 2020, the INCO-Piles Project meetings and the First Round Table of the Project are showed as past Project events (Figure 17).

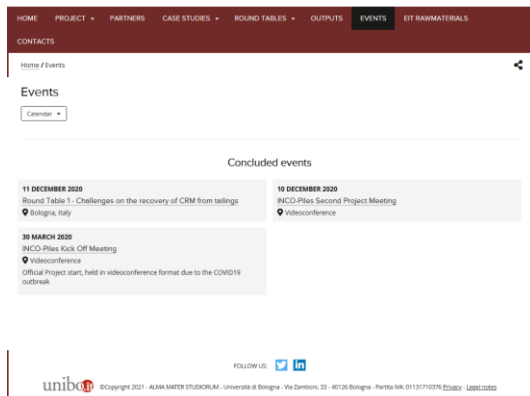


Figure 17. Events page, with evidence of past events.

## 8. EIT RawMaterials:

The webpage is dedicated to EIT RawMaterials (<https://site.unibo.it/inco-piles-2020/en/eit-raw-materials>). Specifically, the links to the EIT RawMaterials hub of interest for INCO-Piles are presented: the Innovation HUB South (venue of the Project Officer), the Regional Centre HUB Greece (managed by NTUA Project Partner) and Regional Centr HUB Southern Italy (managed by ENEA Project Partner (Figure 18).

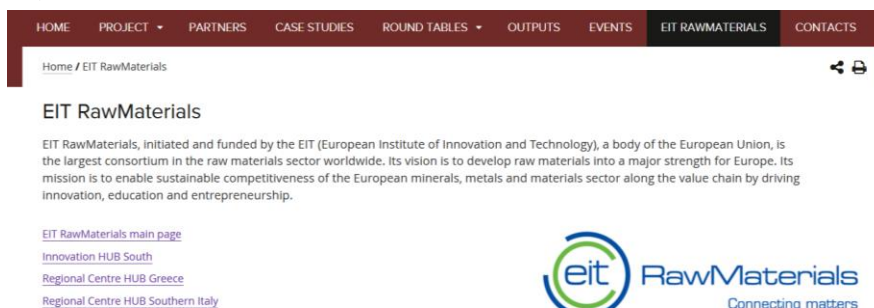


Figure 18. EIT RawMaterials dedicated webpage.

## 9. Contacts:

The Contacts page (<https://site.unibo.it/inco-piles-2020/en/contacts>) has been implemented with the aim to provide to the public audience the contact point where looking for information about the project. Moreover, the exact location and address of the Mining Engineering and Geostatistics Offices of University of Bologna, responsible of WP6 Communication and Dissemination, is provided with OpenStreetMap (Figure 19)

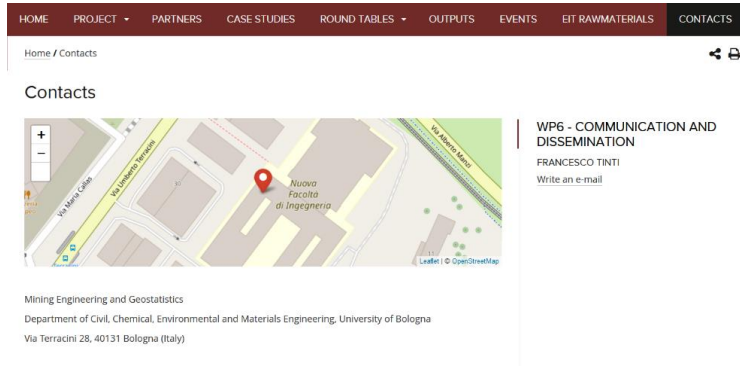


Figure 19. Contacts webpage.

### Optimization for mobile devices

The website is optimized for mobile devices (smartphones and tablets), thanks to the operational capabilities of “Websites on demand” platform. The Project logo has been rearranged for mobile devices, so to make the subscript readable.

### Web analytics

Updated statistics of website access are available. In the period 1<sup>st</sup> May-31<sup>th</sup> December 2020, the following statistics data are reported:

- 770 visits to website:
  - 65% direct access;
  - 6% from related websites;
  - 3% from social networks;
    - 56% from Twitter;
    - 36% from LinkedIn;
  - 25% from research engines;
    - 89% from desktop;
    - 11% from smartphone;
- 2468 openings of webpages;
- 1791 openings of single webpages.

The geographical coverage of the access is presented in Figure 20.

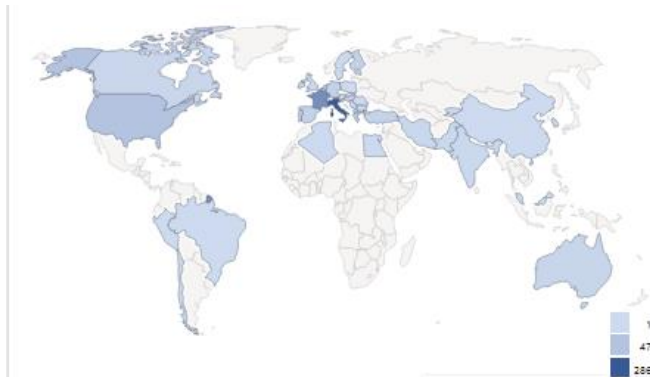


Figure 20. Geographical origin of access in the reference period (1<sup>st</sup> May-31<sup>th</sup> December 2020)

### Improvements and further steps

The following activities and improvements are expected in next 6-months period:

- Continuous update of Case Studies, Outputs, Events and Round Tables Sections, with specific attention to the results of WP2 (Round Tables Organization), WP3 (Sampling, Characterization and Processing Review), WP4 (Demonstration and Validation on Pilot Site) and WP5 (Market and Environmental Scenarios);
- Increase the visibility and number of access to the website, through targeted actions for involvement of experts of stockpiles and tailings and stakeholders in Mediterranean Area, Balkan Countries and Resources Rich Emerging Economies.