



A SUSTAINABLE ECOSYSTEM FOR THE INNOVATIVE RESOURCE RECOVERY AND COMPLEX ORE EXTRACTION

D9.3 XTRACT Outreach, Dissemination, Standardisation and Communication Activities v1

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Lead Beneficiary	ACCELI
Status	Final
Version	1.0
Due Date	31/05/2025
Delivery Date	31/05/2024
Dissemination Level	PU
Project	XTRACT – 101138432
Work Package	WP9 – Market shaping, scale-up business models and socio-economic impact & XTRACT outreach and awareness generation v1
Reviewer(s)	LAMMC – Dr. Dorotėja Vaitiekūnaitė, NTUA/AMDC – Athanassios Mavrikos

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 Funded by the European Union	XTRACT has received funding from European Union's Horizon Europe Research & Innovation Programme under Grant Agreement N°101138432. Content reflects only the authors' view and European Commission is not responsible for any use that may be made of the information it contains.

Version	Date	Partner	Description
0.1	01/04/2025	ACCELI	Initial draft structure created, including TOC and section templates.
0.2	08/04/2025	ACCELI	Initial draft preparation.
0.3	25/04/2025	ACCELI, MUON, USAL, TUBAF, TUC, NTUA/AMDC, GEOS, SAXORE, BJÖRKDAL, LNEG	Full draft completed excluding standardisation section.
0.4	09/05/2025	ACCELI, LTU	Standardisation section added; full draft ready for internal review.
0.5	23/05/2025	LAMMC, NTUA/AMDC, ACCELI	Revised draft incorporating internal review feedback.
1.0	31/05/2025	TUBAF	Final version submitted to the EC.

Executive Summary

This deliverable, **D9.3 “Outreach, Dissemination, Standardisation and Communication Activities v1”**, offers an insight into the communication, dissemination, awareness and standardisation activities of the XTRACT project developed in the first 18 months of the project from December 2023 to May 2025.

D9.3 provides an overview of the way in which the targeted activities have been developed during this reporting period. Key tasks include the creation and maintenance of the project's website, social media, creation of focussed marketing materials (digital and printed) as well as attendance at relevant events, and the release of newsletters and publications to further promote awareness, synergies, and community engagement. These initiatives were organised with the involvement of partners with the intention to increase visibility.

A significant part of this deliverable is also centred on **standardisation**, which is acknowledged to be critical to ensure sustainable take-up and overall footprint of XTRACT innovations. This comprises an analysis of the European standardisation landscape, with a focus on its impact on the mining sector, the selection of standards, and XTRACT's link to standardisation bodies such as ISO and EASA. Methodologies employed for this mapping are described, and early responses from pertinent organisations are documented. The section ends with a summary of next steps, in terms of possible contributions to policy and future liaison with standards bodies.

Second, the deliverable describes how the **XTRACT Stakeholder Community** has been set up. A secure stakeholder database has been put in place to monitor outreach and manage contacts in a GDPR compliant manner. A special page on the project site provides visibility to potential stakeholders and explains the advantages of participating in the community.

Finally, it discusses cooperation between the project partners and gives an update on certain related **Key Performance Indicators (KPIs)**. It also provides the direction for future outreach and engagement efforts and is intended to pave the way for expanded impact and continuing relevancy aligned with stakeholder needs and policy evolution.

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Terms and Abbreviations

CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
CORDIS	Community Research and Development Information Service
D	Deliverable
DoA	Description of Action
EASA	European Union Aviation Safety Agency
EC	European Commission
EEA	European Economic Area
EU	European Union
GA	Grant Agreement
GDPR	General Data Protection Regulation
HE	Horizon Europe
IPR	Intellectual Property Rights
IEC	International Electrotechnical Commission
ISO	International Standards Organisation
KPI	Key Performance Indicator
M	Month
NGO	Non-Governmental Organisation
NSO	National Standardisation Organisation
OEM	Original Equipment Manufacturer
OGC	Open Geospatial Consortium
PM	Project Manager / Person-Month (depending on context)
RTO	Research and Technology Organisation
SYGMA	System for Grant Management
T	Task

UAV	Unmanned Aerial Vehicle
UN	United Nations
UNFC	United Nations Framework Classification for Resources
UNRMS	United Nations Resource Management System
V	Version
WP	Work Package
Zenodo	Open-access repository developed under the European OpenAIRE program

1. INTRODUCTION

This report on the XTRACT Outreach, Dissemination, Standardisation and Communication Activities is a key deliverable of the XTRACT project. This report serves as a foundational document for the project, providing a comprehensive overview of all activities undertaken thus far in the realm of dissemination, communication, standardisation and stakeholder engagement. As the first report of its kind, it sets the groundwork for future efforts and shows the progress made in these crucial areas.

D9.3 “XTRACT Outreach, Dissemination, Standardisation and Communication Activities v1” describes the results accomplished in the first 18 months of the XTRACT project regarding Work Package 9. It outlines the implementation of the dissemination and communication strategy described in D9.2 “Dissemination and Communication Plan and Strategy” and assesses the outputs against the key performance indicators (KPIs) defined in the Grant Agreement and the project's DoA.

The actions undertaken aim to promote visibility and recognition of XTRACT's aims, methods and first outcomes through coordinated communication, branding, interest groups management and knowledge transfer activities. The progress reported here aligns well with the working approach outlined in D9.2, based on the principles of Inform, Explain, and Engage (ref. D9.2, Section 2.1). It is the basis for creating greater impact, reach and trust, as described in Article 17 of the Grant Agreement.

Dissemination efforts are led by Acceligence Ltd. (ACCELLI) and coordinated in close collaboration with all partners, ensuring horizontal integration across work packages and national ecosystems. The approach prioritises multi-layered stakeholder targeting and continuous refinement of tools and messages, in accordance with the project's evolving needs and external dynamics.

Throughout this document, cross-references to D9.2 are made, where applicable, to illustrate the evolution from strategy to implementation, while providing updated insights and evidence of performance from XTRACT's digital and physical outreach activities.

The intended audience for this deliverable includes project partners, stakeholders, policymakers, industry representatives, research institutions and anyone interested in the dissemination, communication and standardisation aspects of the XTRACT project. By providing a comprehensive overview of all activities performed until now, this report establishes a strong foundation for the project, ensuring that the general public is well-informed about the project's advancements, contributing to increased transparency and effective collaboration.

2. BRANDING AND VISUAL IDENTITY

Establishing a strong and cohesive visual identity was one of the earliest priorities for XTRACT, forming the backbone of all external communications and project visibility. As defined in D9.2 – XTRACT Communication and Dissemination Strategy (Section 5), the project's branding strategy was aimed at ensuring clarity, recognisability, and professionalism across all dissemination and communication materials. This approach aligns with the commitments stated in the Grant Agreement to create high-quality, recognisable dissemination assets for diverse audiences.

Significant progress was made in establishing a cohesive visual identity that represents XTRACT's mission and activities. This included designing the final logo in multiple formats, developing logo variants and usage guidelines, creating digital media profile images and headers and crafting a consistent colour palette and font selection. These guidelines ensured that all project materials adhered to a consistent visual identity which has been consistently applied across all media and promotional materials – digital and printed, serving both functional and symbolic purposes. Additionally, a communication kit was developed, comprising:

- A project brochure summarising the aims and objectives of XTRACT.
- Two roll-up banners for use at conferences and events.
- A general presentation template to maintain consistent messaging when presenting the project.

To facilitate seamless access and use of project resources, a centralised content repository has been established. All XTRACT dissemination material is available to consortium partners through this repository ([Communication Kit](#)) and is also accessible to the public via the project website [here](#).

The sections below summarise the core components developed and deployed during the first 18 months of the project.

2.1. LOGO AND BRAND DESIGN

The XTRACT logo, shown in Figure 1: XTRACT Logo, was designed to reflect the project's themes of innovation, sustainability, and technological advancement in the mining and resource recovery sectors. It exists in full colour, black-and-white, and inverse/negative versions, each with specified use cases. The final design was delivered in multiple formats, including landscape and square layouts, suitable for use across web, print and presentation materials, as described in D9.2 (Section 5.1.1).



Figure 1: XTRACT Logo

Design choices, such as the colour palette (earth and mineral tones) and typeface, were made to convey professionalism and thematic relevance. The logo is accompanied by usage guidelines detailing clear space, placement, and integration across materials (see D9.2, Section 5.1).

The logo should always appear intact and complete. The logo may not appear in any colour other than the original and the monochromes black and white. Neither should be stretched, rotated or redesigned in any way. All consortium members follow the Brand Guidelines in their communication efforts, ensuring consistent visual impact and project recognition across channels.

All logo files and guidelines are publicly available in the [Branding Pack](#) section of the project website.

2.2. PRINTED MATERIALS & DESIGN CONSISTENCY

To promote visual coherence across all dissemination tools, a comprehensive Communication Kit was created. This included:

- A [project brochure](#) in A5 format (*Figure 2*) introducing the project's vision, partners, structure, and expected impact and it is provided in editable formats for local translation and distribution. As the Pilot Use Cases progress and results become available, we anticipate updating the initial version. This will further enhance the leaflet's effectiveness in conveying the project's progress and achievements.

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PROJECT FACTS

Funding Programme: Horizon Europe
Topic: HORIZON-CL4-2023-RESILIENCE-01-02
Duration: 36 Months | Starting from 1 December 2023
Total Funding/EU contribution: 4,995,636 €

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CONSORTIUM

ABOUT XTRACT

XTRACT is a 3-year Horizon Europe funded project which brings together 14 partners from 9 European countries. XTRACT aims to introduce innovative solutions for assessing stockpiles and tailings, alleviating resource pressure, and significantly contributing to EU Climate Neutrality Goals with substantial emission reduction. The project also focuses on low-TRL green technologies, like bioleaching and phytoremediation, tailored for mining waste piles, offering sustainable solutions for waste remediation and precious metal recovery. XTRACT is not just a project; it's a bold step towards a greener and more sustainable future in the mining industry.

OBJECTIVES

- Automate mineral prospecting and extraction in challenging conditions.
- Introduce "precision mining" for selective recovery of metals from low-grade minerals and mine wastes.
- Scale and deploy remote sensing for systematic monitoring of "hard-to-access" mining sites.
- Enhance an open standards-based digital repository for sustainable mining transformation.
- Evaluate mine sites and waste disposals, demonstrating the feasibility of green technological solutions.
- Organise uptake, replication, and upscaling of XTRACT innovations.
- Plan and facilitate the exploitation of project results.
- Communicate and disseminate scientific and technical results, fostering knowledge transfer and market development.

TECHNOLOGIES

- Difficult Mineral Contexts Classification
- Reconfigurable UAV System
- Electrolysis & Processability Index
- Blowhole Detector System for Waste Mapping
- Ground & Air-borne analysis
- Real Time Ore Grade Assessment
- Drilling Performance Optimisation
- Surface & Underground Mine Mapping
- Sustainable Assessment: LCA, Carbon Footprinting and Circularity Indicators
- Phytoremediation & Phytoremediation Solutions
- Eco-Friendly Bioleaching
- Novel Membrane Filtration Technology
- Novel Airborne Geophysical/Electromagnetic System

PILOTS

- Pilot 2: Björkdal, SWEDEN
- Pilot 1: Polsterhäuser, GERMANY
- Pilot 3: São Domingos, PORTUGAL
- Pilot 4: Laverton, GREECE

Figure 2: XTRACT 1st Leaflet

- Two **roll-up banners** (as shown in *Figure 3* and *Figure 4*) for use at external event (conferences, exhibitions) and consortium meetings. These roll-up banners provide a concise overview of the project's highlights at a glance. The purpose is to captivate the audience's attention and promote the project through a combination of informative text and visually appealing elements.



A Sustainable Ecosystem for the Innovative Resource Recovery and Complex Ore Extraction

XTRACT

ABOUT XTRACT
XTRACT introduces the novel concept of the Zero Emission Mine of the Future, developing and validating innovative microinvasive technologies for sustainable and decarbonized extraction. XTRACT will provide low-TRL green technologies of phytoremediation and phytoremediation, particularly appropriate for mining waste piles and abandoned sites that represent a solution for mine waste remediation but also for the extraction and recovery of various precious metals.

PROJECT FACTS
Funding Programme: Horizon Europe
Duration: 36 months
Start Date: December 1st, 2023
Total cost: 4,995,636€
XTRACT Coordinator: Technische Universität Bergakademie Freiberg (TUBAF)

TECHNOLOGIES

- Advanced Multimodal Techniques in Classification of Difficult Mineral Contexts.
- New borehole detector system for density-mapping of waste rock stockpiles and tailings heaps, including software tools.
- Real-Time Ore Grade Assessment from Drill Monitoring.
- Sustainability Assessment Framework based on Applied LCA, Carbon Footprinting and Circularity Indicators.
- Novel Bioteaching Eco-Friendly Technology for the Recovery of Strategic and Critical Metals.
- Novel Membrane Filtration Technology for Higher Metal Recovery, Water and Waste-Water Treatment.
- Novel Airborne Geophysical-Electromagnetic System.
- Reconfigurable UAV System.
- Surface and Underground Mine Mapping System.
- Ground and Air-borne remote sensing and analysis system for Tailings Content Assessment.
- Drilling Performance Optimization System.
- Electrodialysis and Processability Index.

PILOTS
 Pilot 1: Tellerhäuser, Germany
 Pilot 2: Björkdal, Sweden
 Pilot 3: São Domingos, Portugal
 Pilot 4: Lavrion, Greece

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 TUBAF, UNIPARALLEL, MUON solutions, UNIVERSIDAD DE SALAMANCA, ACCIQUENCE, brgm, LNEG, GEOS, and others.

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Figure 3: XTRACT Banner – 1st Version



XTRACT

A Sustainable Ecosystem for the Innovative Resource Recovery and Complex Ore Extraction

The XTRACT project introduces the novel concept of the Zero Emission Mine of the Future, developing and validating innovative microinvasive technologies for sustainable and decarbonised extraction

TECHNOLOGIES

- Mineral Classification Mastery
- Revolutionary Waste Management
- Ore Grade Assessment in Real-Time through Drill Monitoring
- Sustainable Practices in Focus
- Eco-Friendly Metal Recovery
- Efficient Membrane Filtration
- Airborne Geophysical-Electromagnetic System
- XTRACT Reconfigurable UAV System
- Comprehensive Mine Mapping
- Tailings Content Assessment
- Optimised Drilling Performance
- Electrodialysis and Processability Index
- Novel Phytoextraction and Phytoremediation Solutions

PROJECT FACTS

Funding Programme: Horizon Europe
Duration: 36 months
Start Date: December 1st, 2023
Total cost: 4995.636€
XTRACT Coordinator: Technische Universität Bergakademie Freiberg (TUBAF)

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PILOTS

- Pilot 1 Tellerhäuser Germany
- Pilot 2 Björkdal Sweden
- Pilot 3 São Domingos Portugal
- Pilot 4 Lavrion Greece

CONSORTIUM

TUBAF, BRGM, UNIPARALLEL, LNEG, MUON SOLUTIONS, UNIVERSIDAD DE SALAMANCA, ADCELSER, UNIVERSITÄT SACHSEN BERGHAU, GEOS, INSTITUTO TECNOLÓGICO DE CANTABRIA, INSTITUTO TECNOLÓGICO DE CANTABRIA, INSTITUTO TECNOLÓGICO DE CANTABRIA

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Figure 4: XTRACT Banner – Enhanced Version

The designer, a professional in the field, played a key role in creating high-quality, visually appealing materials. Design consistency was ensured across all assets through the use of fixed brand elements, as described in D9.2, Section 5.2. Relevant posts on social media were done to announce the availability of these materials which are available for download on the project's website ([link](#)) and are updated as needed.

The brochure has been widely used at events and exhibitions, including the [Green Horizon Summit 2024](#), the [Almodôvar School Open Science Day](#), the [1st Automation, Robotics & Drones Expo in Athens](#) and the Conference of Metallurgists in Canada. Similarly, the XTRACT roll-up banner has accompanied partners during scientific conferences, open days and dissemination sessions, helping to draw attention to the project and support informal interactions.

Moreover, printed materials were displayed in participating institutions, with project briefings given to visiting groups, including students and research communities. These activities have reached an estimated 20 participants per session, broadening awareness and support for XTRACT's mission.

2.3. XTRACT OVERVIEW PRESENTATION

An official XTRACT project presentation (as shown in *Figure 5*) was developed and shared with all partners (ref. D9.2, Section 5.2.3). The slides provide a standardised overview of the project's scope, work packages, partners and anticipated outcomes. It will be updated to ensure alignment with key project messages. The current version is accessible via the internal repository.

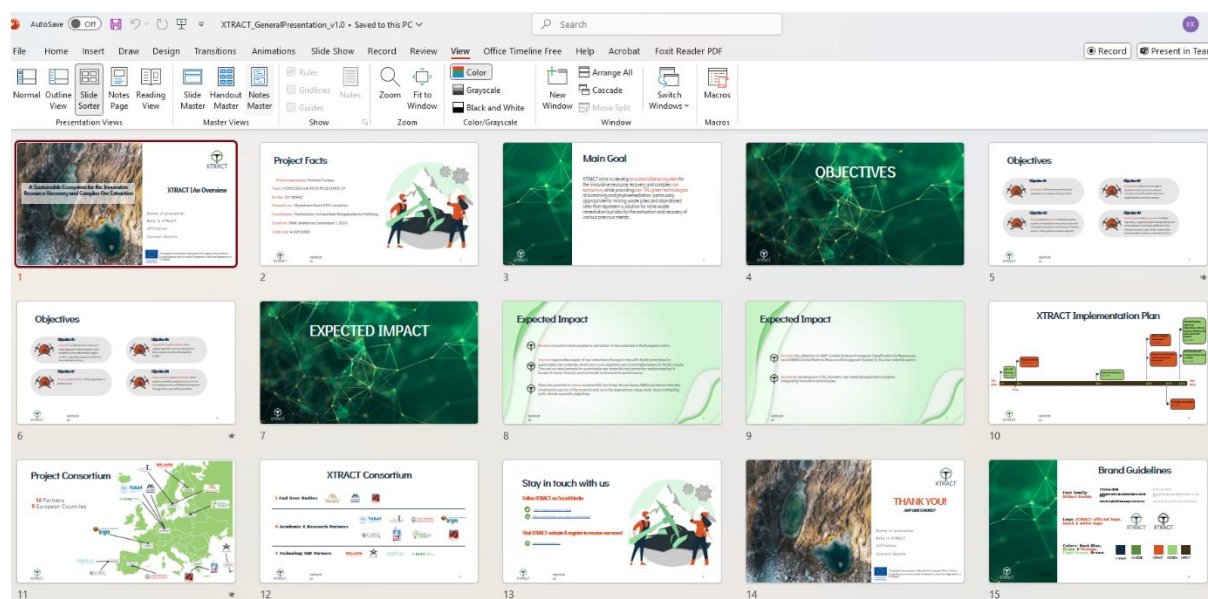


Figure 5: XTRACT Overview Presentation

The XTRACT Overview Presentation has been used at various conferences and meetings, including academic and industry-specific fora such as Agrovizija in Lithuania, the [Green Horizon Summit 2024](#), the [“Managing Ecosystems for a Sustainable Tomorrow”](#) seminar, the [CERESiS Project Final Event](#) and the EURECA-PRO Colloquium, reinforcing a unified and professional representation of the project and is available for download on the [Branding-Pack](#) page of the XTRACT website. It was also used in Partner meetings with institutional stakeholders (e.g., LTU, AMDC/NTUA).

2.4. PROJECT TEMPLATES

XTRACT Templates have been developed to ensure uniformity of reports, deliverables and presentations. All partners of the consortium received these templates to ensure that communication and dissemination efforts would proceed smoothly. They are continuously updated and have been adopted across all work packages, reinforcing visual coherence and professional presentation across the consortium's outputs. Specifically, the template package includes:

- Deliverable template and Review Report Template (see **Annex 1**)
- Agenda template for meetings (see **Annex 4**)
- Minutes template for meetings (see **Annex 2**)
- PowerPoint template for internal and external presentations (see **Annex 3**)
- Press release and newsletter templates for media outreach

These resources have been made accessible via the XTRACT Repository ([link](#)), ensuring that all partners can retrieve and apply them as needed.

3. PERFORMANCE OF COMMUNICATION CHANNELS

Effective use of digital channels has been instrumental in amplifying XTRACT's visibility and fostering stakeholder engagement. In line with the digital communication strategy outlined in D9.2 (Section 3) and the DoA, the project has deployed a layered communication approach, combining a dynamic web presence, social media activity, media engagement and newsletters. These channels have provided consistent outreach to the research, industry and civil society communities.

3.1. WEBSITE PERFORMANCE

The project website (<https://xtract-project.eu/>) was developed and launched very early in the project by the XTRACT Communications Manager (ACCELI) in Month 1. It serves as the central hub for all communication and dissemination activities. Designed in alignment with the project's brand guidelines, the website presents a professional, visually coherent platform that reflects XTRACT's identity and emphasizes its connection to the European Union. Separate sections have been made accessible to the wider public, containing non-confidential and stakeholder-relevant information about the project's objectives, progress, partners and outputs.

Between Month 1 and Month 18, the website has been continuously expanded and updated to reflect project milestones, events, project meetings and communication campaigns.

One significant addition was the launch of the "Addressing the Challenge of Sustainable Mining" campaign in November 2024. This campaign featured an analytic blog post aimed at raising awareness about the critical challenges facing sustainable mining today and showcasing XTRACT's innovative approaches to addressing them. The article is publicly available at this [link](#), contributing to outreach efforts by offering informative, high-quality content targeted at both professional and public audiences.

Another important development was the integration of the [XTRACT Stakeholder Registration Form](#) into the website. This form was introduced to simplify and streamline the process for stakeholders to express their interest in the project and join the XTRACT stakeholder community.

The benefits of the online form include:

- Facilitating easier registration and data collection

- Expanding the reach of stakeholder engagement
- Enabling more efficient tracking and management of community growth

Consortium partners have been encouraged to promote the form within their networks, further supporting the project's community-building objectives.

In addition to standard project information, the XTRACT website offers several features designed to facilitate Open Access to results, transparency and engagement with stakeholders.

A dedicated [Zenodo repository](#) has been created for XTRACT to ensure that scientific outputs, public deliverables and relevant datasets are accessible in accordance with Horizon Europe Open Access guidelines. A Zenodo button is available on the website's homepage, providing direct access to the repository. This facilitates easy navigation for stakeholders, researchers and the general public who are interested in reviewing and reusing the project's outputs, thus supporting the project's commitment to open science and wider dissemination.

The website also hosts a [Public Deliverables](#) section where all approved non-confidential deliverables are uploaded progressively as they become available. This section ensures transparency and allows external stakeholders to monitor the project's scientific and technical progress. Public deliverables are formatted following the project's communication and branding guidelines to ensure consistency and accessibility.

Furthermore, a dynamic [News Hub](#) section has been established to provide regular updates on project activities, event participation, clustering announcements and press releases. News articles are posted frequently, highlighting milestones and engagement activities and are cross promoted through XTRACT's social media channels to maximise reach.

These additional features collectively enhance the website's role not only as an information portal but also as an active dissemination tool, aligned with the project's broader objectives to increase visibility, foster knowledge sharing and support stakeholder interaction.

Website Analytics Monitoring

In order to systematically monitor the performance and audience engagement of the XTRACT website, the project team linked the site to the **Google Analytics** platform. Google Analytics is a widely used web analytics service provided by Google that enables detailed tracking and reporting of website traffic and user behaviour.

Through [Google Analytics](#), XTRACT is able to gather valuable data insights, including:

- How visitors interact with the website, such as session duration, bounce rate and navigation behaviour.
- The demographics of the visitors (where available), including location, device type and language preferences.
- The main traffic sources leading users to the site (e.g., direct traffic, social media referrals, organic search).
- The most popular pages and content categories visited, allowing the team to identify topics of highest interest.

Monitoring these parameters helps the consortium assess the effectiveness of communication efforts, understand the needs and interests of the audience and continuously improve the website's structure and content. It also provides a data-driven foundation for optimising future outreach strategies and enhancing the user experience.

Specifically, the parameters monitored through Google Analytics include:

- Average engagement time per session
- Engaged sessions per user
- User distribution per country
- Page views per individual page

Insights gained have already informed content development, such as increasing emphasis on stakeholder engagement activities and enhancing clustering-related information.

Going forward, regular reviews of website analytics will support ongoing efforts to refine and target XTRACT's digital communication strategy more effectively, in line with the dissemination and communication goals set out in D9.2 and the DoA.

Website Performance

The XTRACT website has demonstrated strong performance in its first 17 months:

- 2,000 unique users accessed the website, significantly exceeding the initial KPI target of 300 visitors for the first year.
- The average engagement time was approximately 54 seconds per active user, indicating that visitors typically engaged meaningfully with the site content.
- The total event count (including clicks, scrolls, downloads, and other interactions) reached 19,000, demonstrating consistent interaction and navigation activity across the website.

Figure 6 presents a snapshot of the report, summarising key performance data for the XTRACT website during its first 17 months, including metrics such as new users, engagement time and total event count.

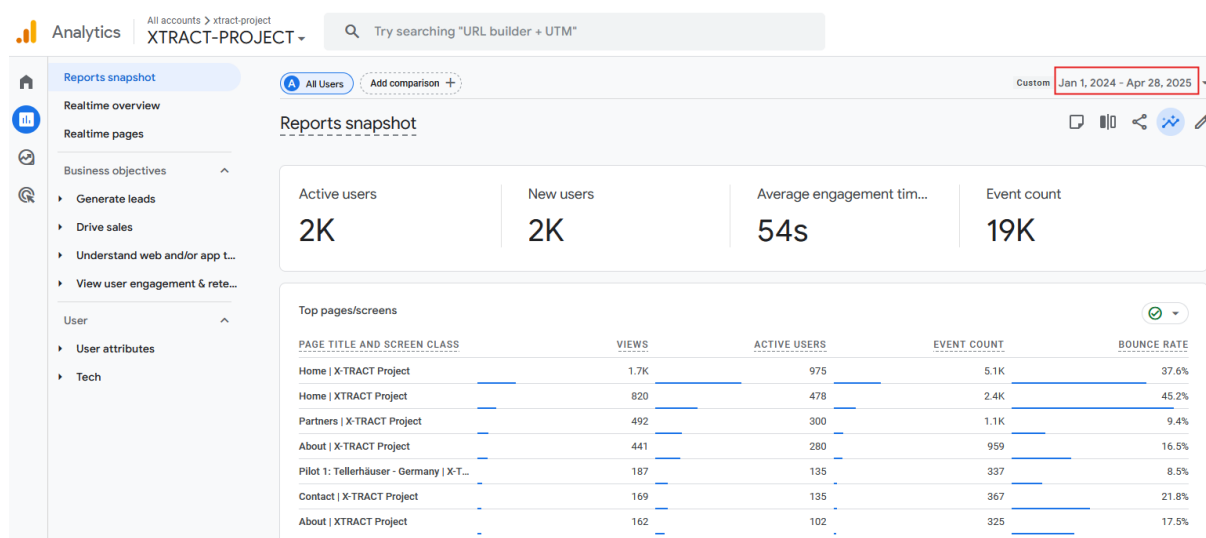


Figure 6: XTRACT Website Performance Overview

Dissemination efforts, including regular news updates, social media cross-promotion and the publication of campaign material, have been effective in driving engagement and growing the site's audience organically.

The website will continue to be expanded with scientific publications, stakeholder activities, clustering updates, and promotion of XTRACT results, maintaining its role as a dynamic and engaging communication tool.

3.2. DIGITAL MEDIA ENGAGEMENT

The substantial dissemination of the XTRACT project is achieved through a carefully planned and managed social media strategy. The official social media accounts of the Project are available on [LinkedIn](#), [X](#) and [YouTube](#) and serve as key platforms for sharing updates and engaging with the public. ACCELI holds the responsibility of regularly updating these social media accounts, ensuring that postings about partner accomplishments and other relevant public information are shared in a timely manner. To maximize the project's reach, ACCELI actively encourages all project partners with social media accounts to follow, react and share coherent content, while consistently tagging and mentioning the XTRACT profile. This collaborative effort strengthens the project's online presence and facilitates wider audience engagement.

3.2.1. LinkedIn

A project-specific LinkedIn Company page was created at the beginning of the project and is available at <https://www.linkedin.com/company/xtract-project>. So far, the LinkedIn page of XTRACT has 461 followers. A screenshot of the projects LinkedIn page is shown in *Figure 7*.

This page acts as a central hub for sharing all major project updates and announcements, ensuring that the XTRACT audience remains well-informed and engaged.

One notable advantage of having a Company LinkedIn page is that it offers additional tools for measuring the overall performance of the activities. These tools enable in-depth data analysis, tracking organic campaign results and providing valuable insights. As shown in *Figure 8*, the XTRACT project's official LinkedIn page has demonstrated strong engagement over the past year (4/27/2024 – 4/26/2025), with 36,261 impressions and 1,245 reactions.

By leveraging the capabilities of LinkedIn, ACCELI aims to maximize the visibility and impact of the project within the professional community and beyond.

The first posts focused on introducing the consortium's core partners to our LinkedIn community. News such as the launch of the first Press Release, the creation of the XTRACT leaflet and rollup banners, the launch of the website and participation in events were also posted on LinkedIn to enhance awareness about the project. Additionally, a dedicated "Meet the Team" social media campaign was launched to highlight individual contributions and humanize the project, further engaging the audience.

As part of the communication and dissemination activities for the XTRACT project, a total of 33 posts were published on the official LinkedIn page between 27 April 2024 and 26 April 2025. *Table 1* presents key performance metrics collected from LinkedIn Analytics, including impressions, clicks, click-through rate (CTR) and likes for each post. These metrics provide insight into the engagement and reach achieved through the project's online presence during this period. Due to LinkedIn's data retention policy, analytics are only available for the most recent 12 months. As a result, performance metrics for posts published before 27 April 2024 are not available.

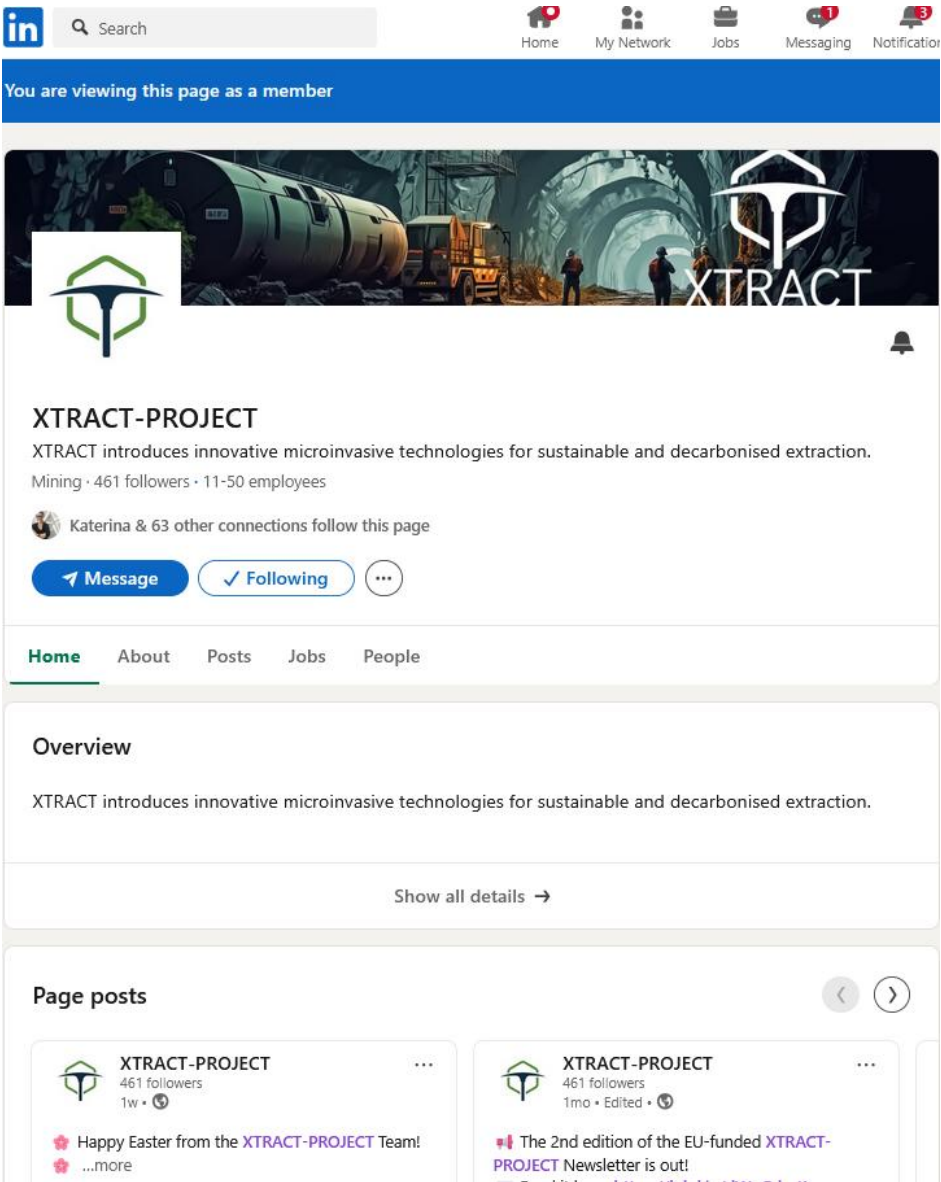


Figure 7: XTRACT LinkedIn page

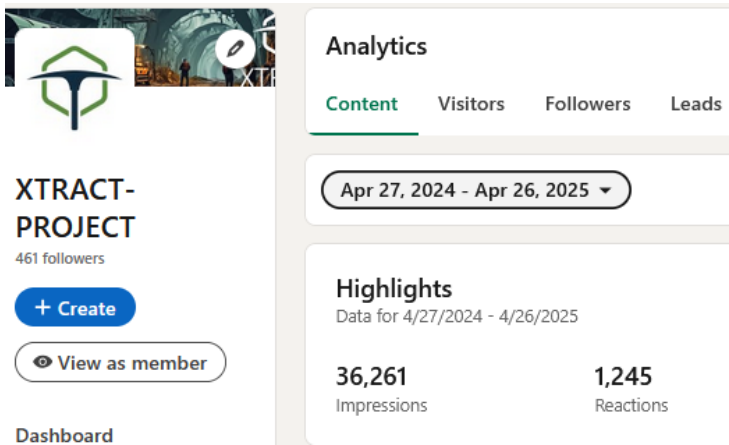


Figure 8: Analytics Overview for XTRACT Project (Data for 27/4/2024 – 26/4/2025)

Table 1: Overview of LinkedIn Posts

Post link	Impressions	Clicks	Click through rate	Likes
https://www.linkedin.com/feed/update/urn:li:activity:7318204017375875073	360	16	0,044444446	21
https://www.linkedin.com/feed/update/urn:li:activity:7309950299174047745	826	16	0,019370461	42
https://www.linkedin.com/feed/update/urn:li:activity:7305591155092590592	256	13	0,05078125	19
https://www.linkedin.com/feed/update/urn:li:activity:7303383191615135745	1123	26	0,023152271	40
https://www.linkedin.com/feed/update/urn:li:activity:7295417374843793409	1583	116	0,073278584	46
https://www.linkedin.com/feed/update/urn:li:activity:7289662839730925568	571	15	0,026269702	27
https://www.linkedin.com/feed/update/urn:li:activity:7284973567128014852	279	14	0,050179213	17
https://www.linkedin.com/feed/update/urn:li:activity:7275477316787408897	1207	16	0,013256007	35
https://www.linkedin.com/feed/update/urn:li:activity:7274450726548893696	630	272	0,431746036	17
https://www.linkedin.com/feed/update/urn:li:activity:7274382388523094016	1031	23	0,022308439	31
https://www.linkedin.com/feed/update/urn:li:activity:7272210150902423553	1297	37	0,028527372	48
https://www.linkedin.com/feed/update/urn:li:activity:7270378675546542080	941	30	0,031880978	36

https://www.linkedin.com/feed/update/urn:li:activity:7270061137499410432	1007	157	0,155908644	46
https://www.linkedin.com/feed/update/urn:li:activity:7268383761229041664	273	143	0,523809552	16
https://www.linkedin.com/feed/update/urn:li:activity:7262882551965372420	768	19	0,024739584	30
https://www.linkedin.com/feed/update/urn:li:activity:7259991467543183360	521	10	0,019193858	23
https://www.linkedin.com/feed/update/urn:li:activity:7254165856845254657	1083	39	0,036011081	41
https://www.linkedin.com/feed/update/urn:li:activity:7250465133460606976	1135	33	0,029074891	25
https://www.linkedin.com/feed/update/urn:li:activity:7241813498853249024	760	14	0,018421052	35
https://www.linkedin.com/feed/update/urn:li:activity:7236725794406862849	777	20	0,025740026	21
https://www.linkedin.com/feed/update/urn:li:activity:7227343309470392320	768	28	0,036458332	27
https://www.linkedin.com/feed/update/urn:li:activity:7226892163366678528	407	23	0,056511056	12
https://www.linkedin.com/feed/update/urn:li:activity:7214270603933982720	496	21	0,04233871	18
https://www.linkedin.com/feed/update/urn:li:activity:7212076003148328960	4725	877	0,185608461	86
https://www.linkedin.com/feed/update/urn:li:activity:7211769735372312576	2632	809	0,307370812	39

https://www.linkedin.com/feed/update/urn:li:activity:7211397316304392193	2065	533	0,258111387	61
https://www.linkedin.com/feed/update/urn:li:activity:7211327213776855042	2980	1822	0,611409426	65
https://www.linkedin.com/feed/update/urn:li:activity:7209549026281590785	913	28	0,030668126	23
https://www.linkedin.com/feed/update/urn:li:activity:7205856158778109952	1001	37	0,036963038	29
https://www.linkedin.com/feed/update/urn:li:activity:7205005318076928000	650	46	0,070769228	18
https://www.linkedin.com/feed/update/urn:li:activity:7198650649725571072	615	26	0,042276423	21
https://www.linkedin.com/feed/update/urn:li:activity:7195895212588584960	434	11	0,025345622	14
https://www.linkedin.com/feed/update/urn:li:activity:7190744964119617537	650	39	0,059999999	25

3.2.2. X (Twitter)

A social media account for the project on X (formerly Twitter) was created in November 2023 under the handle @xtract_project. A screenshot of the project's X account is shown in *Figure 9*.

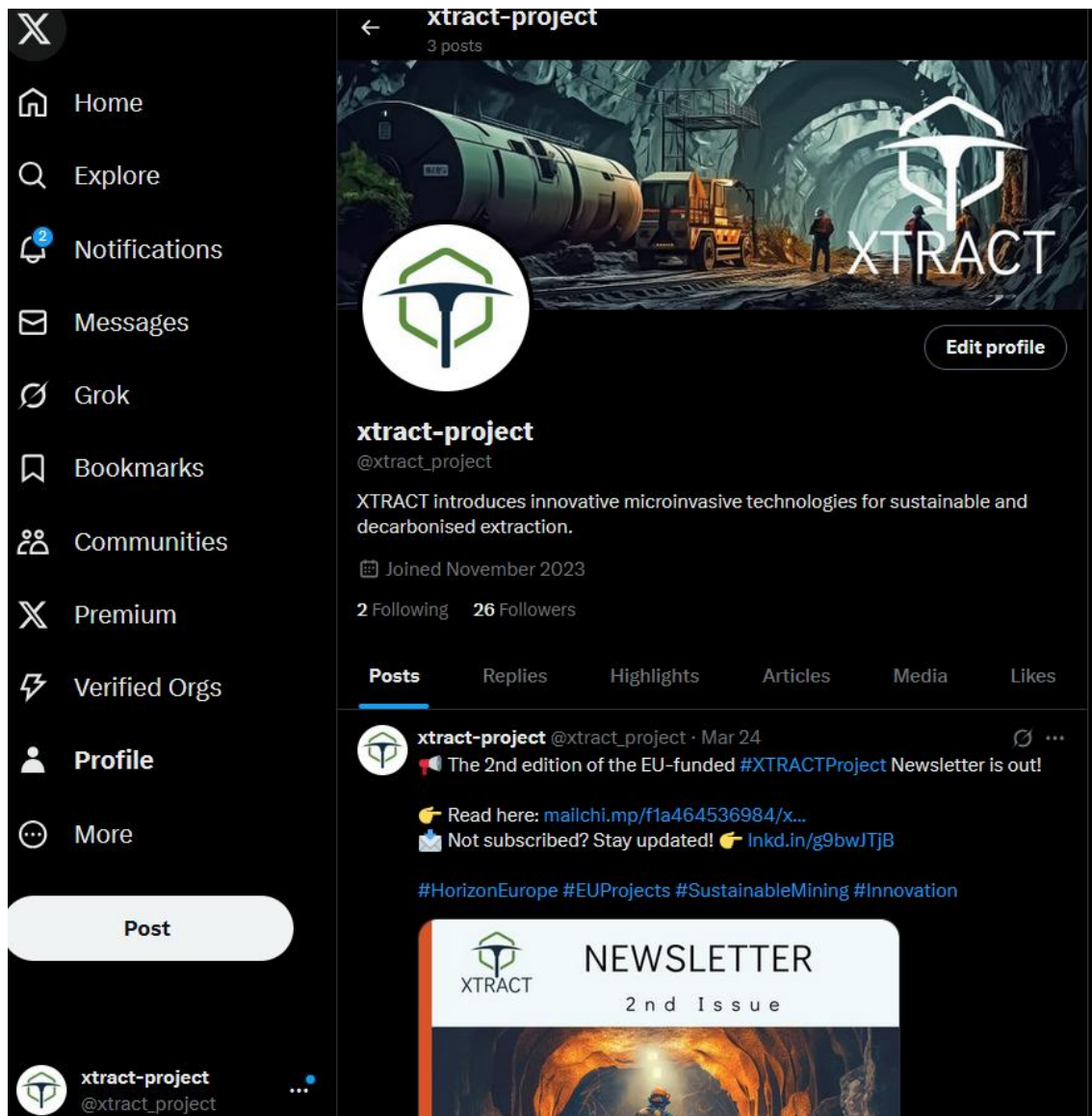


Figure 9: Screenshot of the official XTRACT project account on X

The platform was initially used as a real-time communication channel to raise awareness about the project, share key updates and engage with stakeholders in the mining and raw materials sectors. However, due to significant changes to the platform's interface, audience engagement trends and shifting user preferences since its rebranding, X is no longer considered the most effective channel for reaching the target audiences of the XTRACT project. As a result, activity on the account has been limited, with dissemination efforts prioritised on more suitable platforms such as LinkedIn.

3.2.3. YouTube

A YouTube channel for the XTRACT project was created to host and disseminate audiovisual content that visually communicates the project's objectives, fieldwork and results. The official channel is accessible at <https://www.youtube.com/@xtract-project> and a screenshot is shown in *Figure 10*.

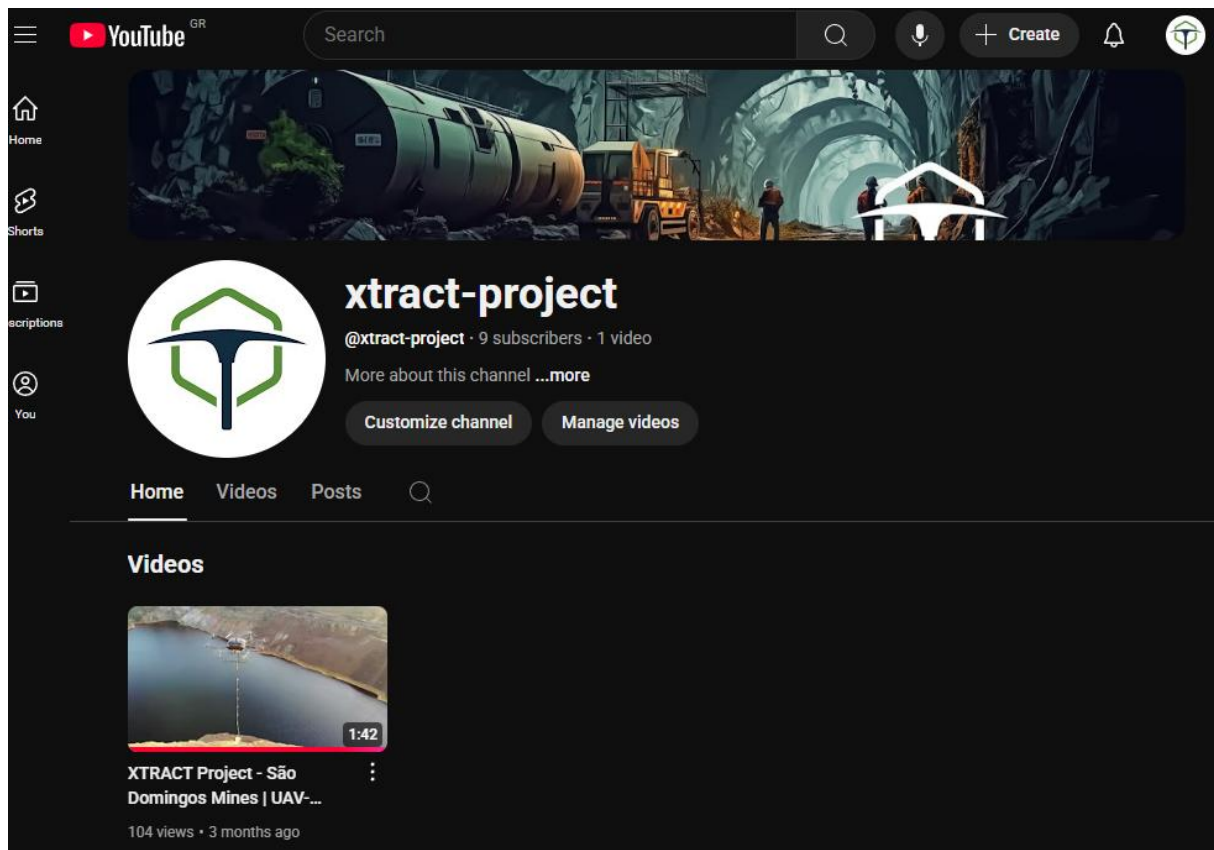


Figure 10: Screenshot of the official XTRACT YouTube channel (@xtract_project)

Currently, the channel features a demonstration video titled "[XTRACT Project – São Domingos Mines | UAV-assisted aeromagnetics solution demo \(November 2024\)](#)", which premiered on January 13, 2025. This video presents a field operation conducted over the historic São Domingos mine, showcasing the UAV-based aeromagnetics and multispectral imaging solution developed under the project. The demonstration illustrates how the CERBERUS UAV was used to detect subtle magnetic variations and map subsoil metal content with high precision.

Further video content is under preparation, including a video introducing the project and its key partners. All videos will be widely promoted across all XTRACT communication channels to ensure broad visibility and engagement.

3.3. E-NEWSLETTERS

The XTRACT project aims to enhance communication and stakeholder engagement through biannual e-newsletters. These newsletters provide updates on the project's progress, highlight significant news and showcase ongoing activities. The XTRACT newsletters are addressed to a specific target audience, including partners, consortium members, third parties and other interested parties.

The newsletter sign-up is visible via the website's homepage (see *Figure 11*). Furthermore, according to the social media strategy, there are specific posts with a call to action to subscribe in the XTRACT Newsletters mailing list. So far, the XTRACT mailing list already counts 90 members.

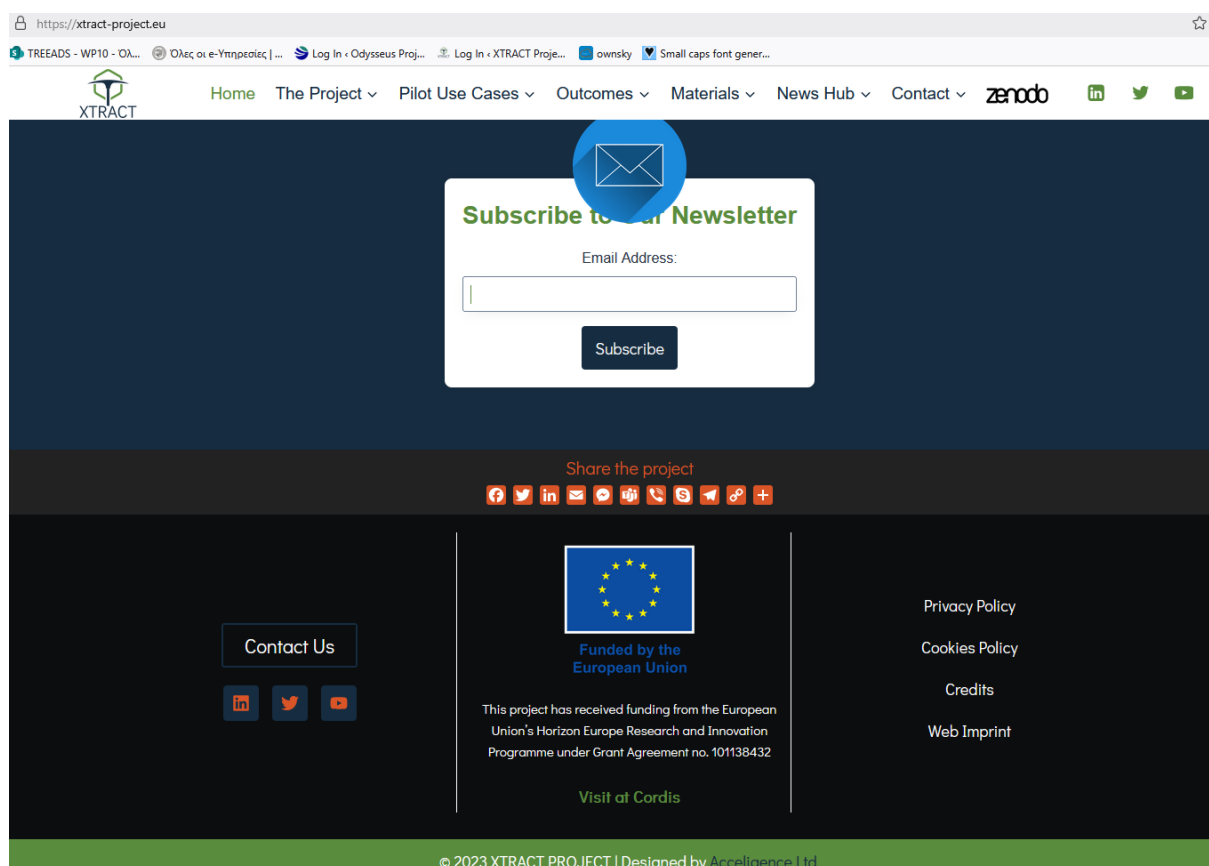


Figure 11: Newsletter sign-up section visible on the XTRACT project homepage

To create successful Newsletter campaigns, there is a need to use an email marketing platform. The XTRACT's Communications Manager uses the [Mailchimp platform](#). Mailchimp is a polished, professional platform designed for campaigns creation. The actual newsletter editing takes place in a clean web app.

Upon issuing every e-Newsletter, we can monitor the relative analytics such as open-rate, total clicks, most clicked buttons or images and total opens. These metrics are available via the reporting analytics tool of the platform used. These data are being used with regards to the creation of more effective campaigns (See below – *Figure 12*).

XTRACT Project – 2nd Newsletter Edition			
Regular email	Sent	xtract-project	42.6% 16.7%
Last edited Mon, Mar 24, 08:41 AM by xtract project	Mon, Mar 24, 08:41 AM	56 recipients	Opens Clicks
Audience: xtract-project 46 recipients			
XTRACT Project e-newsletter - 1st Issue			
Regular email	Sent	xtract-project	58.1% 16.3%
Last edited Thu, Jun 20, 2024, 08:38 AM by xtract project	Thu, Jun 20, 2024, 08:38 AM	46 recipients	Opens Clicks

Figure 12: Mailchimp Analytics showing e-newsletter open rates and clicks

The **first newsletter**, issued in June 2024, can be found [here](#). It introduces the project, its Pilot use cases, and partners, while detailing significant milestones and events. The **second newsletter**, available [here](#), focuses on project progress and the development of synergies between partners, with updates on ongoing activities.

Both newsletters are available on the XTRACT website under the respective category (see *Figure 13*), serving as a regular communication channel to keep stakeholders and the public informed about the project's latest achievements and plans.

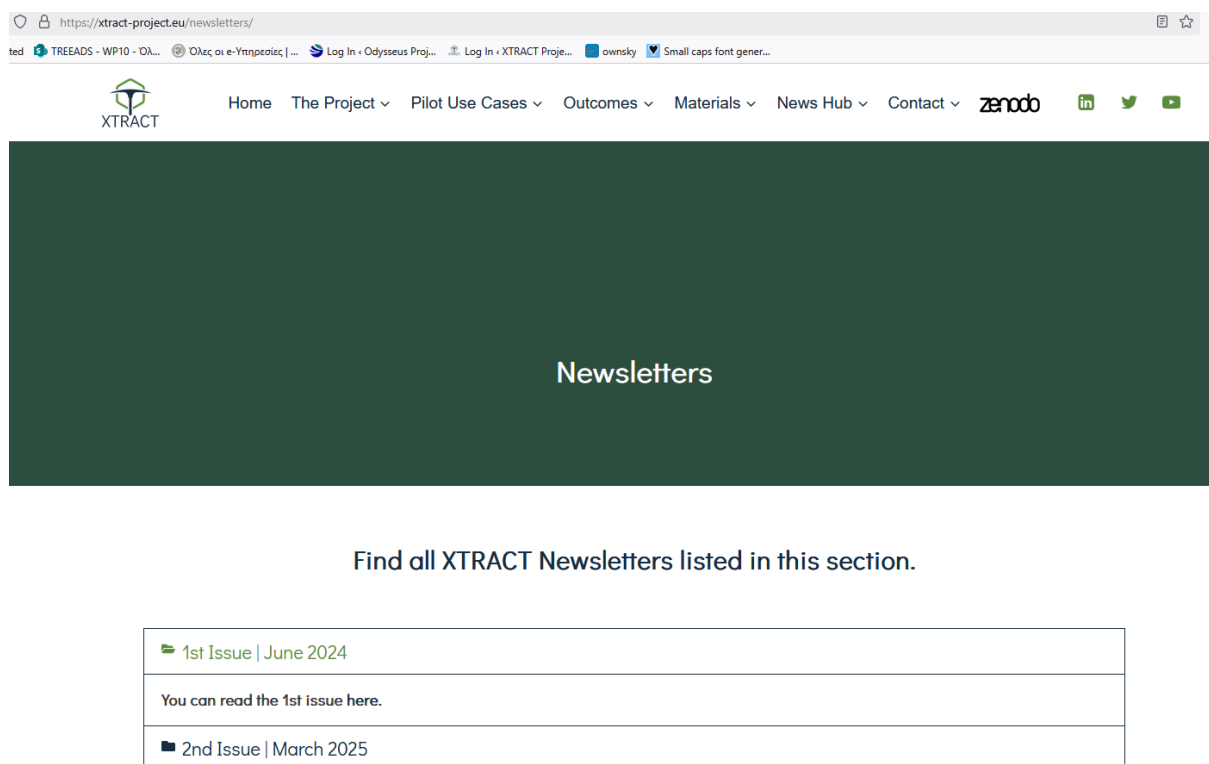


Figure 13: XTRACT Project Newsletters section on the website

3.4. OTHER MEDIA COVERAGE & PRESS RELEASES

XTRACT expanded its digital reach through podcasts, discussing project developments and insights into sustainable mining and resource recovery. These podcasts served as a platform to engage a broader audience, including civil society, industry partners, and academics, offering insights into innovative extraction and remediation practices.

(<https://www.ondaceroavila.es/PodcastAvila?c=x8xdmjc&p=avilaonda>,
<https://open.spotify.com/episode/0O54gTZrIRI33gsj2119Mb?si=d0d53cffe41a4f1b>)

The Project Coordinator collaborated with the regional media in order to release articles explaining the project to the general public. Articles in Sächsische Zeitung and Freie Presse highlighted XTRACT's innovative mining approaches. <https://www.saechsische.de/lokales/mittelsachsen/freiberg/sachsen-erfindet-im-erzgebirge-den-bergbau-neu-PKSVF4LRRXEAFW43WSLLOLIJHY.html>,
<https://www.freiepresse.de/erzgebirge/schwarzenberg/forscher-der-tu-freiberg-tuefteln-am-bergbau-der-zukunft-im-erzgebirge-soll-eine-pilotanlage-entstehen-artikel13610181>)

The project overview on the Indigo Research Group's website provided additional exposure to industry partners. (<https://www.indigo.tuc.gr/research/xtract/>)

A press release of the XTRACT project was published and was widely publicised through all partners' social media channels and the project's platforms (available on the website [here](#)). This press release

was shared with project partners, and guidelines were included to help them tailor the content for their respective audiences.

A second version was published on ACCELI's website (see *Figure 14*), further amplifying the project's launch and scope.

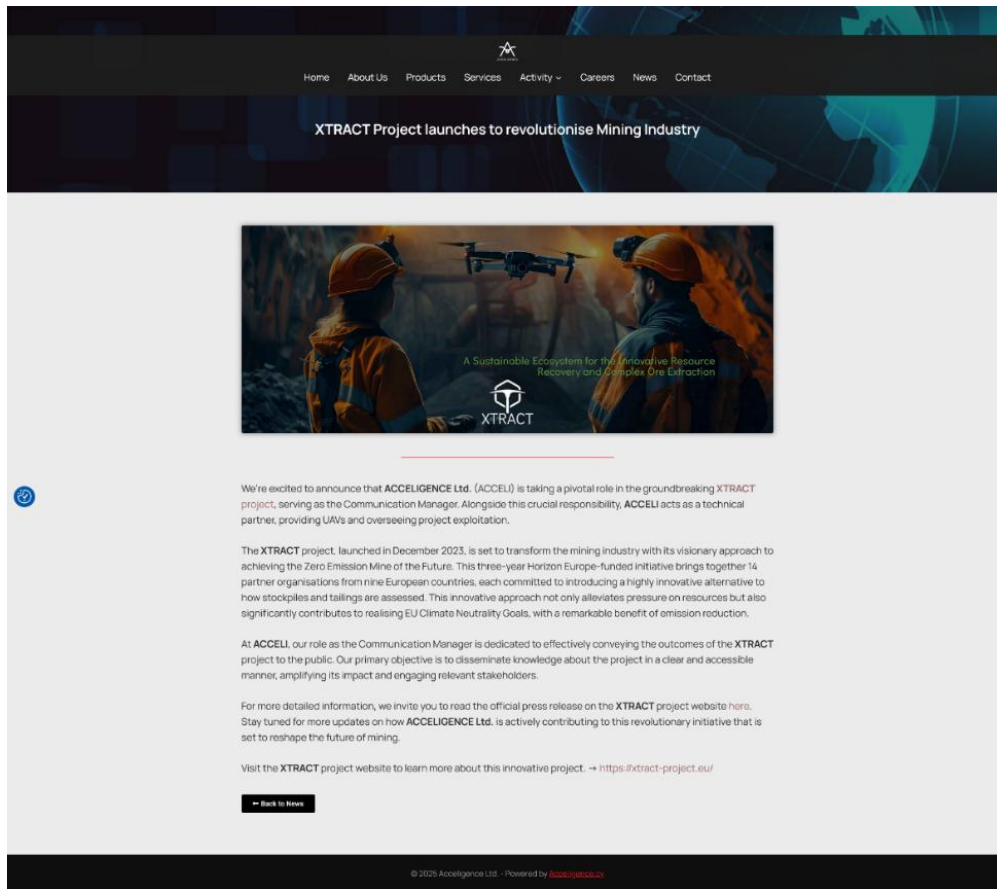


Figure 14: Press release published on ACCELI's website

In addition to the general press release, TUBAF launched a German version for national and regional media (see *Figure 15*), ensuring broader regional outreach.

Kooperatives Symphonie-Orchester
Fakultäten & Einrichtungen
Direktlinks
EN

Auf dem Weg zum emissionsfreien Bergbau: Metalle gewinnen mit Mikroorganismen

Startseite / News

• TUBAF entwickelt innovativen Prozess für Biolaugung von Kupfer, Indium und Zink

In einem Bioreaktor unter Tage arbeiten Mikroorganismen und verwandeln Erze oder Reststoffe aus dem Bergbau in die Wertmetalle Kupfer, Indium und Zink. Innovative Membranfilter filtern anschließend die Wertmetalle aus dem entstehenden Prozesswasser. In einer Pilotanlage eines aktuellen Bergbauvorhabens bei Pöhla in Sachsen will ein Team der TU Bergakademie Freiberg beide Prozesse zu einem innovativen Verfahren zusammenbringen. Die umweltschonende Lösung könnte es ermöglichen, Metalle bei niedrigen Temperaturen und direkt in einem Bergwerk durch die sogenannte Biolaugung zu gewinnen.

Im Labor haben die Forschenden die beiden innovativen Prozesse schon erprobt, nun können sie den umweltschonenden Prozess dank einer Förderung der Europäischen Union in einer Pilotanlage in größerem Maßstab testen: „Bei niedrigem pH-Wert bringen wir die Mikroorganismen in einem Bioreaktor dazu, die Metalle aus unlöslichen Sulfiden, hier zum Beispiel in den Mineralen Sphalerit und Chalkopyrit, in Lösung zu bringen. Kupfer, Indium und Zink können dann mittels verschiedener hydrometallurgischer Verfahren aus der Lösung gewonnen werden – und das bei geringem Energieeinsatz und ohne die für pyrometallurgische Prozesse typischen schädlichen Abgase“, erklärt Professorin Sabrina Hedrich, die das internationale Forschungsprojekt „XTRACT“ koordiniert.

Projektmitarbeiter Dr. Roland Haseneder ergänzt: „Durch ein hybrides Membranentrennverfahren werden anschließend die Mikroorganismen abgetrennt und die Wertmetalle durch selektive Filtereinheiten nach Ladung und Größe „sortiert“. Dies erfolgt vorzugsweise durch direkte Verschaltung mit der Biolaugung vor Ort“.

Forschende im Bergwerk bei Pöhla, einem der Standorte für die Pilotanlage. Foto: TU Bergakademie Freiberg

Forschende im Bergwerk bei Pöhla, einem der Standorte für die Pilotanlage.

Aus Armerzen umweltschonend Metalle gewinnen

Das Verfahren eignet sich damit besonders für Erze oder Reststoffe aus dem Bergbau, in denen nur geringe Konzentrationen der Metalle enthalten sind – sogenannte Armerze. „Allein durch die Umsetzung mit den Mikroorganismen können die Metalle ohne externe Energie in eine lösliche Form überführt und so einer Aufbereitung zugeführt werden. Hinzu kommt, dass die Gewinnung der Metalle aus Armerzen sehr komplex ist. Die biohydrometallurgischen Verfahren haben sich hier nicht nur als umweltschonend, sondern auch als besonders geeignet herausgestellt“, so Hedrich.

Neben dem Bergbauprojekt im sächsischen Pöhla kommen diese Armerze auch in weiteren Bergwerken in Europa vor. Gemeinsam mit den Partnern wird das Verfahren künftig auch im Bergwerk Björkdal (Schweden) und zum Recycling von Bergbaurückständen in São Domingos (Portugal) und Lavrion (Griechenland) erprobt.

Über das Forschungsprojekt „XTRACT“

Ziel von XTRACT ist das emissionsfreie Bergwerk der Zukunft mit innovativen mikroinvasiven Technologien für einen nachhaltigen und kohlenstoffarmen Abbau. Damit trägt das Forschungsprojekt dazu bei, primäre Ressourcen zu schonen und Technologien für die Verwirklichung der EU-Klimaneutralitätsziele breitzustellen. Die im Projekt entwickelten Verfahren sind sowohl für Armerze als auch für Halden und Altlasten geeignet und bieten sich damit nicht nur für die Gewinnung und Rückgewinnung verschiedener Edelmetalle, sondern auch für die Sanierung von Bergbaufällen als Lösung an. Mit insgesamt 5 Millionen Euro werden im Forschungsprogramm Horizon Europe der EU für die bis Dezember 2026 14 Partnerorganisationen aus 9 Ländern (Deutschland, Schweden, Finnland, Litauen, Spanien, Griechenland, Frankreich, Portugal, Zypern) gefördert.

- TU Bergakademie Freiberg Institut für Biowissenschaften sowie Institut für Thermische Verfahrenstechnik, Umwelt- und Naturstoffverfahrenstechnik
- Lulea Tekniska Universitet (LTU)
- Muon Solutions Oy (MUON)
- Universidad de Salamanca (USAL)
- ACCELIGENCE LTD (ACCELIG)
- Bureau de recherches géologiques et minières (BRGM)
- Unparallel Innovation Lda (UNP)
- Laboratorio Nacional de Energia e Geologia Lp. (LNEG)
- Polytechnio Kritis (TUC) Lietuvos Agrarinii ir Miskų Mokslų Centras (LAMMC)
- Lietuvos Agrarinii ir Miskų Mokslų Centras (LAMMC)
- Saxore Bergbau GmbH (SAXORE)
- Etairia Axiopoiiseos Kai Diacheiriseos Tis Periousias Tou Ethnikou Metsoviou Polytechniou (NTUA/AMDC)
- G.E.O.S. Ingenieurgesellschaft mbH (GEOS)

Figure 15: TUBAF's German version of the press release

Furthermore, the University of Salamanca (USAL) focused their dissemination efforts on the XTRACT project's kick-off meeting, using the geospatial platform that they will be leading as the central theme. This coverage in Spanish was aimed at reaching the local community and broader Spanish-speaking audience (see Figure 16).

La Universidad de Salamanca lidera el desarrollo de una plataforma geoespacial inédita en Europa que revolucionará la industria minera

El Grupo de Investigación TIDOP con sede en la EPS de Ávila dirige la iniciativa que será validada en 9 países diferentes y está enmarcada en el proyecto europeo "XTRACT" de 5 millones de euros.

09/10/2024 | Comunicación Universidad de Salamanca / María Suárez

La industria minera se enfrenta a una presión cada vez mayor para reducir las emisiones, ya que las explotaciones mineras subterráneas emiten aproximadamente un 50% más de gases de efecto invernadero que las explotaciones a cielo abierto. La demanda de metales y minerales críticos, cruciales para la transición de Europa, exige un cambio de paradigma en las prácticas mineras. La minería europea no solo debe ser eficiente en el uso de los recursos, sino también compatible con el medio ambiente, segura y económicamente viable para cumplir las estrictas normas medioambientales.

En este contexto, la Universidad de Salamanca, a través de su Grupo de Investigación Reconocido TIDOP ubicado en la Escuela Politécnica Superior de Ávila, lidera el desarrollo de una "plataforma geoespacial inédita en Europa para revolucionar la industria minera, que será validada en nueve países diferentes y se enmarca en el proyecto europeo "XTRACT", de 5 millones de euros", explica el director del GRI, Diego González Aguilera, a Comunicación USAL.

El proyecto "XTRACT", puesto en marcha en diciembre de 2023, está llamado a revolucionar la industria minera con su enfoque pionero para lograr uno de los objetivos clave de Europa: lograr la autosuficiencia en materias primas esenciales para la transición ecológica y digital y avanzar hacia la ruta de Cero emisiones. Para esta ambiciosa iniciativa de tres años de duración, financiada por Horizonte Europa y que reúne a 14 organizaciones asociadas de 9 países europeos "la experiencia de la USAL será clave", subraya el investigador.

Minería de precisión e inteligencia artificial

El proyecto plantea cuatro importantes innovaciones como, la automatización de la prospección y extracción de minerales en un contexto minero complejo; la introducción del novedoso concepto de "minería de precisión" para la recuperación selectiva de metales valiosos a partir de minerales de baja ley y residuos mineros; el despliegue de sistemas de drones de última generación e inteligencia artificial que permitan la vigilancia sistemática y a distancia de yacimientos mineros y depósitos de residuos de difícil acceso; y por último, la evaluación y validación en diferentes emplazamientos mineros en Alemania, Suecia, Portugal y Grecia y la eliminación de residuos, así como la demostración de las diferentes soluciones tecnológicas.

Por otra parte, la plataforma "XTRACT" que desarrollará el grupo TIDOP de la USAL va más allá de ser un completo sistema computacional avanzado basado en Inteligencia Artificial para ayudar en la gestión minera, ya que "proporcionará funcionalidades en toda la cadena de valor: extracción, procesamiento y restauración", destaca.

Además, la nueva herramienta geoespacial se alimentará de diferentes tipos de imágenes e información de sensores IoT, avanzando en un verdadero gemelo digital de la explotación minera. Por último, cabe destacar que la Universidad de Salamanca desarrollará y aplicará métodos geofísicos basados en drones que supondrán toda una innovación en la industria minera.

GRI TIDOP de la Universidad de Salamanca

Creado en el año 2005, el Grupo de Investigación Reconocido TIDOP (Tecnología de la Información para la Digitalización Inteligente de Objetos y Movimientos), pertenece al Departamento de Ingeniería Cartográfica y del Terreno de la Universidad de Salamanca y reúne sus esfuerzos en torno a 3 pilares fundamentales: la industria geoespacial, las energías renovables y el análisis de estructuras y materiales.

TIDOP se caracteriza por poseer una composición multidisciplinar, con miembros especializados en diferentes campos: geoinformática, computación, ingeniería industrial, ingeniería civil y arquitectura. Una de las principales fortalezas del grupo es su amplia transferencia de tecnología con más de 12 patentes y 32 publicaciones científicas, precedido tanto a nivel internacional como nacional en numerosas ocasiones, en uso de los grupos de investigación con mayor producción científica de la Universidad de Salamanca.

Como resultado, TIDOP trabaja en numerosos proyectos en colaboración con compañías líderes en el sector industrial dentro de los campos de la ingeniería aeroespacial, energía, seguridad y transporte e infraestructuras, entre otros.

MÁS INFORMACIÓN:

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Teléfono	920 353 500
Web	https://xtract-project.eu/

COMUNICACIÓN EN:

IMÁGENES RELACIONADAS

TAGS:

Universidad de Salamanca | Grupo TIDOP | plataforma geoespacial | industria minera | Proyecto europeo XTRACT | EPS de Ávila | Horizonte Europa | transición ecológica | sostenibilidad | IA | gemelo digital | minería de precisión | tecnología | drones | industria

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- La Universidad de Salamanca concede los premios María de Maeztu ...
- El rector Juan Manuel Corchado recibe a los deportistas de la Un...

Figure 16: USAL's Spanish press release on XTRACT's kick-off meeting

3.5. PUBLICATIONS

Scientific dissemination through publications is a key objective of the XTRACT project, ensuring that the research findings and technological developments are widely accessible to the academic and professional community. These activities reinforce the visibility and technical credibility of the XTRACT project, support the advancement of its innovative concepts, and promote collaboration with related research initiatives. All scientific outputs adhere to the Horizon Open Access Mandate and will be

uploaded to the [Zenodo](#) platform under the dedicated XTRACT community, ensuring long-term accessibility and traceability.

As part of the overall dissemination strategy, a list of relevant peer-reviewed journals was curated to support the scientific dissemination of project results. This preparatory work laid the foundation for targeted publication efforts by research partners. Journal selection was guided by relevance to the fields of sustainable mining, resource recovery, and critical raw materials.

The following section presents both the achieved and planned publications across the consortium during the first 18 months of the project.

3.5.1. Achieved Publications

During 2024, TU Bergakademie Freiberg (TUBAF) successfully issued three scientific publications related to microbial biotechnologies for metal extraction, a core focus within XTRACT. These include two Open Access journal articles and one book. The Open Access articles address the process optimization of an in-situ bioleaching section combined with membrane filtration, and the enrichment of dissolved metal(loid)s and microbial organic matter in a historic mine drainage system. These are:

- Götze, K.; Hedrich, S.; Braeuer, A.S.; Haseneder, R. *Process Optimization of an In-Situ Bioleaching Section with Associated Membrane Filtration in a Field Test Laboratory*. Minerals 2024, 14, 308. <https://doi.org/10.3390/min14030308>
- Sanchez, A.; Haas, K.; Jackisch, C.; Hedrich, S.; Lau, M. *Enrichment of dissolved metal(loid)s and microbial organic matter during transit of a historic mine drainage system*. Water Research 2024, Volume 266. <https://doi.org/10.1016/j.watres.2024.122336>

In addition, the book *Biological Metal Recovery from Wastewaters*, authored by Hedrich, S. and Wiche, O., was published by Springer Cham in 2024. <https://doi.org/10.1007/978-3-031-73765-7>

3.5.2. Planned Publications

The consortium has outlined a robust plan for further dissemination through scientific publications in high-impact, peer-reviewed and Open Access journals.

TU Bergakademie Freiberg (TUBAF) intends to publish three more papers in highly ranked peer-reviewed journals as Open Access articles. One potential paper in 2026 on the design and commission of the iron-oxidizing bioreactor to produce lixiviant for the in-situ bioleaching, in a biotechnology and engineering journal. The paper aligns with an ongoing master thesis which will be published at TUBAF in September 2025. Another paper on the bioleaching of the mine wastes from the São Domingos site (Pilot 3) regarding metal recovery and environmental protection. This paper will also be linked to another ongoing master thesis which will be published at TUBAF in September 2025. The results of the design and commission of the iron-oxidizing bioreactor and in situ bioleaching plant (Pilot 1) and the bioleaching of the São Domingos mine wastes will also be presented at the International Biohydrometallurgy Symposium in Orléans 2026 and two further raw materials and biotechnology focused conferences in 2025 and 2026. The International Biohydrometallurgy Symposium topics will also be subject to peer-reviewed extended abstracts and articles published in a Journal special issue. Furthermore, TUBAF intends to generate an Open Access paper on membrane technology from the DECHEMA meeting presentation in early 2026.

The Technical University of Crete (TUC) plans to submit scientific papers focused on the Life Cycle Assessment (LCA) and Social Life Cycle Assessment (SLCA) of the project's technologies. Additionally, a second TUC team involved in phytoremediation research will work on phytoremediation-related publications once more experimental data are collected from the pilot research activities. At the moment, a review paper is under preparation on the phytoremediation potential of abandoned mine

sites and is expected to be submitted by May 2025. These contributions will be complemented by joint publications co-authored with NTUA/AMDC and LAMMC, focused on the phytoremediation and phytomining applications demonstrated at Pilot 4.

NTUA/AMDC and LAMMC are collaborating with TUC on the preparation of two scientific papers for Open Access journals, presenting the results of phytoremediation and phytomining applications in Pilot 4.

The University of Salamanca (USAL) is preparing at least three white papers to document and disseminate the methodologies and results related to the implementation of InSAR, LiDAR-SLAM, and GPR technologies within the project. These papers will be submitted during the implementation period and will prioritize Open Access journals to maximize outreach.

Additionally, LNEG is preparing two abstracts for submission to MedGu 2025 (<https://2025.medgu.org/index.php?p=welcoming>), aiming to present findings related to the XTRACT project. LNEG is also exploring further dissemination opportunities after October 2025.

Finally, MUON is planning the submission of an open-access scientific paper focused on the muographic studies of the São Domingos pilot.

These coordinated efforts underscore the XTRACT consortium's commitment to advancing scientific knowledge and ensuring broad dissemination of its results in line with open science principles.

4. DISSEMINATION & STAKEHOLDER ENGAGEMENT

Dissemination encourages the circulation of knowledge and results to the ones that can make the best use of them, and it enables the value of results to be potentially wider than the original focus. Undoubtedly, it is an essential element of all good research practice and a vital part of the project plan as it strengthens and promotes the profile of the project. Its main focus is the results of the project, and it aims to ensure that these results are available for audiences that may take an interest in the potential use of them. In XTRACT, dissemination and stakeholder engagement activities are guided by the strategy defined in D9.2 and have been evolving in alignment with the project's progress. Efforts during the first 18 months have focused on establishing tools and channels, building awareness and identifying and contacting relevant stakeholders. Emphasis has been placed on ensuring consistent messaging and fostering collaboration with external actors who can contribute to or benefit from the project.

4.1. COLLABORATION AMONG PARTNERS

Collaboration among partners in the XTRACT project has progressively strengthened over time, particularly in the areas of dissemination, communication and stakeholder engagement. While initial coordination was limited, partner interaction has improved notably as the project evolved, with further developments expected in the coming months and to be reported in the next version of this deliverable.

Regular WP9 meetings, bilateral exchanges and discussions held during consortium meetings have facilitated the sharing of updates, the alignment of upcoming events and the gradual synchronisation of dissemination efforts across work packages. Since September 2024, dedicated monthly WP9 meetings have been established to further support this coordination. These meetings provide a space for partners to present their activities, propose ideas, and discuss the next steps collaboratively. To date, meetings have been held in September, October, January, March and April, with minutes recorded and circulated by the Communications Manager to ensure transparency and keep the entire consortium informed.

Examples of emerging collaboration include the provision of content for social media posts, co-development of the project's first video, and early-stage coordination for upcoming webinars. The Communications Manager also informs partners about external opportunities – such as synergies with other projects – encouraging participation when relevant connections are made by individual partners.

This growing spirit of cooperation is expected to lead to stronger joint activities, improved visibility for project results and broader outreach impact as the project continues to mature.

4.2. EVENTS – SUMMARY OF KEY ACTIVITIES

An overview of the consortium's participation in external events up to Month 17 is presented below. These events provided valuable networking opportunities, fostering connections that lay a solid foundation for future collaborations and stakeholder engagement.

To support this effort, every four months ACCELI encourages partners to actively participate in relevant events. By curating a list of strategic opportunities, ACCELI aims to maximise the project's visibility across key sectors and ensure sustained engagement within diverse professional communities. Forthcoming actions are outlined in Deliverable D9.2, Section 3.4.

Below is a brief description of all attendances, followed by *Table 2: Overview of XTRACT Representation at Key Events*. For those events where partners contributed materials, corresponding blog entries have been published in the [Events section](#) of the project website.

Early engagements at the Green Horizon Summit 2024, Almodôvar School Open Science Day, the CERESIS Project Final Event and the RESPECT Project's Critical Raw Materials Act: Dream or Reality? provided opportunities for project representatives to introduce XTRACT's mission and objectives to diverse audiences. Project representatives introduced XTRACT's mission at the 1st Automation, Robotics & Drones Expo in Athens (April 2024), sharing project insights with industry professionals and distributing 100 leaflets.

In addition, XTRACT was represented at the Conference of Metallurgists in Canada in August 2024, where a poster presentation showcased the project's scope, highlighting various work packages. Moreover, the project was represented at the EURECA-PRO 18th Freiberg Colloquium, where findings relevant to sustainable mining practices were shared through presentations, helping to strengthen XTRACT's reputation in both academic and industrial circles.

Furthermore, at the event "Agrovizija – meet the future of agriculture" held in Akademija, Lithuania, from June 19-21, 2024, an oral presentation and open discussion on "Innovative and sustainable technologies. How to utilize them in forestry?" were conducted. The material was presented verbally, engaging civil society members and sparking discussions on sustainable forestry.

The XTRACT muography pilot study was introduced through a poster presentation at the GeoDays conference (11–13 March 2025, Oulu, Finland) and the project was also promoted at various other events, including FinnMateria (Jyväskylä, Finland, 6–7 November 2024) and G-EXPO (Tokyo, Japan, 29–31 January 2025). Additionally, a keynote presentation featuring XTRACT-related topics was delivered at the XII Annual Meeting of red INVECA e.V. on 18 October 2024 in Freiberg, Germany.

Table 2: Overview of XTRACT Representation at Key Events

Event	Location	Description
Green Horizon Summit 2024	Lithuania	Link

Almodôvar School Open Science Day	Portugal	Link
CERESiS Project Final Event	Greece	Link
RESPECT Project: Critical Raw Materials Act – Dream or Reality?	Remotely	Link
1st Automation, Robotics & Drones Expo	Greece	Link
Agrovizija – Meet the Future of Agriculture	Lithuania	The phytoremediation/phytomining concept was presented. Relevance to the society, economy and environment were discussed. Possible adaptations to smaller operations were mentioned.
“Managing Ecosystems for a Sustainable Tomorrow” Seminar	Lithuania	Link
XII Annual Meeting of Red INVECA e.V. - Renewable Energy, Sustainability, and Social Impact	Germany	Link
GeoDays Conference	Finland	Link
FinnMateria	Finland	Project promotion and networking / Link
G-EXPO	Japan	Project promotion and networking
EURECA-PRO 18th Freiberg Colloquium	Germany	Paper: "Investigating Phytoremediation Parameters for Recovery of Industrial Sites Contaminated with Heavy Metals" / Link
63rd Annual Conference of Metallurgists (COM)	Canada	Poster presentation
MINE.IO Project Workshop: Sustainable Mining Practices in the Future	Sweden	Virtual participation/ Link

All events are recorded in the official project registry, with supporting materials stored in the dedicated folder titled [Dissemination Records](#), accessible to partners. These records serve as proof of participation and visibility efforts. These records are also reported to the European Commission via the SYGMA platform by the Project Manager, in accordance with Horizon Europe reporting requirements.

4.3 CLUSTERING WITH OTHER PROJECTS

Clustering with related EU-funded projects is a key part of XTRACT’s dissemination and impact strategy, as set out in both the DoA and D9.2 (Section 3.5). These collaborations aim to support shared learning, increase project visibility and strengthen policy and community engagement in the raw materials and sustainable mining ecosystem.

During the first 18 months of the project, XTRACT has established initial synergies with several Horizon Europe initiatives, which are publicly presented on the project website’s [Synergies page](#). These include:

- **START** – The START Project (Sustainable Energy Harvesting Systems Based on Innovative Mine Waste Recycling) is an EU-funded initiative under the Horizon Europe Programme. It aims to create sustainable, tellurium-free thermoelectric systems for harvesting waste heat, using secondary raw materials sourced from mining waste within the European Union. By collecting and repurposing waste sulphides from deactivated mine dumps and tailings, START offers an innovative solution to reduce resource dependency, align with the European Green Deal objectives, and promote a circular economy. The project’s primary goal is to develop sustainable and economically viable thermoelectric technologies for applications in heavy industry, maritime sectors and as power sources for off-grid sensors and IoT devices. (<https://www.start-heproject.com/>)
- **BLOOM** – The BLOOM Project is a Horizon Europe initiative with a €7.5M budget uniting 15 partners across 4 European countries, as well as Canada and Brazil. The project is focused on facilitating the exploitation of primary critical raw materials (CRMs, minerals and metals only) for the EU to strengthen EU supply chains by increasing efficiency in the extraction and processing of minerals with a smart and modular solids analysis system consisting of an online MLA (Mineral Liberation Analysis) with a sensor based on LIBS (Laser-Induced Breakdown Spectroscopy) technology, which enables the integration of advanced control loops at different stages of processing on mining sites, based on Machine Learning and Artificial Intelligence techniques, or data-driven extraction operations based on accurate mineralogy information from the site. (<https://bloomproject.eu/>)
- **REPTIS** Project – Responsible Extraction and Processing of Titanium and other Primary Raw Materials for Sourcing EU Industrial Value Chains and Strategic Sectors and other Primary Raw Materials (<https://www.reptis.eu/>)
- **MINE.IO**, a Holistic Digital Mine 4.0 Ecosystem, is a €14M, 42-month project bringing together 25 partners focused on industrialization, informatization, and sustainable development of the mining sector. It aims to provide solutions that will build a novel mining digital ecosystem and a systemic structure for the implementation of Industry 4.0 in mining industrial environments. MINE.IO solution will embrace the whole mining system value chain from resources’ exploration, extraction, and processing to waste management and post-mining activities, with seven pilot use cases in Germany, Poland, Greece, Finland and Portugal. (<https://mineio-horizon.eu/>)
- **Materials for Batteries Cluster Hub**, a network connecting research institutions, industry leaders, and innovation stakeholders. This membership provides XTRACT with opportunities to engage in collaborative projects and knowledge exchange within the sector.

These synergies represent a strong starting point and have already helped position XTRACT within a wider EU network. While joint activities have not yet been implemented, communication channels have been opened with project coordinators and dissemination leads. Shared opportunities – such as participation in thematic sessions, joint visibility actions, and stakeholder-targeted communication – are being actively explored and will be pursued in the second half of the project.

In parallel, informal exchanges have taken place with related projects, including **CERESiS**, **RAWMINA**, and **RESPECT**, particularly during events and stakeholder-facing forums. These connections have contributed to mutual awareness.

Beyond these established collaborations, several XTRACT partners are already engaged in a wide range of Horizon Europe and EIT RawMaterials projects. While not yet formalised within the XTRACT framework, these ongoing involvements offer future opportunities for technical dialogue, communication exchange and outreach coordination:

- **MUON Systems** contributes to **AGEMERA** and **REMHub**, advancing muon imaging for mineral exploration
- **NTUA/AMDC** is involved in the **Restart** project on circular economy innovation
- **GEOS** is active in **METALLICO** and **RAWMINA**, focusing on battery raw materials production
- **TUBAF** is linked with **RAWMINA**, **HARMONY**, **ZEROSTEEL**, **ReLiFe**, and education programmes such as **SINReM** and **SINReM-TREND**, incorporating XTRACT insights into teaching and thesis development

These engagements reflect the consortium's position within a broader research ecosystem and the intent to build on them more deliberately during the second half of the project. While clustering remains a developing area for XTRACT, the foundations are in place for deeper collaboration, particularly through aligned messaging, co-presence at EU events and joint contributions to stakeholder engagement efforts.

4.4 STAKEHOLDER COMMUNITY

One of the primary objectives of the XTRACT project is to actively engage and collaborate with a wide range of stakeholders to ensure the successful implementation and uptake of project outcomes. To achieve this, XTRACT initiated a structured stakeholder mapping and engagement process to identify key actors, their roles, and the value they may bring or receive from project outcomes.

4.4.1 Stakeholder Groups and Strategic Engagement Areas

To further enhance the efficiency and inclusiveness of stakeholder engagement, the XTRACT project adopts a comprehensive stakeholder grouping framework, as originally defined in the Grant Agreement (Section 3.2.1.1). This framework has served as a valuable reference for structuring outreach and targeting communication efforts. By identifying and engaging stakeholders based on their functional roles and expected contributions, the project ensures that dissemination, exploitation and community-building actions are appropriately directed and impactful.

Stakeholders are classified into five key groups, each representing a distinct area of influence in relation to the project's goals: Enablers, Providers, Utilisers, End Users, and Facilitators. These categories allow the consortium to plan and monitor engagement strategies in a structured and strategic manner, ensuring that the project reaches a diverse yet relevant audience across the value chain.

Table 3 provides an overview of these stakeholder groups, describing their typical actors, specific relevance to the XTRACT project, and the type of engagement or impact expected from their participation. The categorisation remains dynamic and will be updated as the XTRACT Stakeholder Community evolves further.

Table 3: Stakeholder Groups, Relevance, and Engagement Examples in XTRACT

Stakeholder Group	Description & Example Actors	Relevance to XTRACT	Engagement Focus & Expected Contribution
Enabler <i>Framework Instigators</i>	Public authorities and policy-making bodies such as regional governments, local authority agencies, EU and international institutions.	Facilitate systemic improvements by supporting regulatory alignment, identifying bottlenecks, and promoting sustainable regional development.	Provide policy insight and validation; support replication through alignment with local and EU frameworks; enable access to public sector opportunities.
Provider <i>Knowledge Ecosystem</i>	Universities, research and technology organisations (RTOs), innovation hubs, and domain-specific experts.	Drive innovation through research contributions, capacity building, and technology transfer.	Collaborate in knowledge sharing, capacity-building activities, and testing of XTRACT methodologies and technologies.
Utiliser <i>Value Partners</i>	SMEs, ICT developers, mining industry actors, consultancy firms, and industry associations.	Act as direct adopters and multipliers of the project's technological outputs, bringing field expertise and practical feedback.	Participate in pilot activities and technical workshops; contribute to product and process validation; co-develop use cases.
End User <i>Point of Delivery & Uptake</i>	Citizens, communities affected by mining activity, local and regional authorities, NGOs and civil society groups.	Represent the societal interface of the project; provide real-life validation and adoption scenarios.	Engage through co-creation processes, feedback loops, and scenario testing; drive user-centred innovation and public acceptance.
Facilitator <i>Financial Provisions</i>	Investors, venture capital firms, public and private finance institutions, and funding platforms.	Ensure long-term sustainability and scalability of project outcomes through funding support and business validation.	Collaborate in exploring viable business models; support exploitation planning and replication financing strategies.

This mapping has also guided the composition of the **Advisory Board**, currently being finalised, to ensure coverage across all strategic stakeholder categories.

4.3.1 Engagement Strategy for Community Development

The XTRACT consortium has already taken significant steps to establish and grow the project's Stakeholder Community. A structured and coordinated invitation process has been launched, inviting identified stakeholders to engage with the project and support its mission.

An official invitation template, accompanied by a Letter of Support (LoS) and a stakeholder profile form, was shared with all partners. Each partner was requested to disseminate these materials within their professional networks, targeting relevant stakeholder groups across sectors. The process was

supported by clear instructions, including guidance on how to submit the completed documents to the XTRACT Project Coordinator and Project Manager, as well as how to track outreach activities while remaining compliant with GDPR.

To maximise outreach and improve accessibility, partners were also encouraged to translate the materials into their native languages, a practice initiated by TUBAF with a German version. This inclusive approach enhances engagement and ensures cultural and linguistic diversity within the XTRACT Stakeholder Community.

Stakeholders who join the community are invited to contribute their expertise, provide feedback, participate in workshops and demonstrations and follow the project's progress through its digital channels (e.g., LinkedIn, official website). Their involvement will help shape the project's direction and increase its relevance to real-world needs.

This outreach activity is ongoing, and the XTRACT consortium will continue expanding and nurturing this network, aiming to create a vibrant and collaborative environment for dialogue, knowledge exchange and mutual learning throughout the project's lifetime.

4.3.2 Stakeholder Database

To ensure effective and coordinated outreach, the XTRACT consortium has established a structured Stakeholder Database. This internal tool supports the identification, invitation, and engagement of key stakeholders across all relevant sectors. The database enables tracking of outreach progress, avoids duplication of efforts among partners, and facilitates a unified strategy for building the XTRACT Stakeholder Community.

Due to the sensitivity of personal data and in compliance with GDPR, the Stakeholder Database does not include personal information in publicly shared documents or deliverables. Instead, personal details such as names, roles, and contact information are stored securely and accessed only by the authorised members of the coordination and project management team.

Each partner has been invited to contribute to the Stakeholder Database which includes the following fields:

- Responsible Partner for Invitation
- Potential External Partner
- User Community
- Invitation Sent
- Letter of Support (LoS) Received
- Project Relevance
- Contact Name
- Function
- Email Address

All partners have been instructed to update this database regularly, particularly after sending invitations or receiving Letters of Support (LoS). This process ensures that stakeholder engagement activities remain transparent, coordinated and traceable throughout the project's lifecycle.

Several partners have already contributed significant entries to the Stakeholder Database by identifying, contacting and inviting relevant external entities aligned with the XTRACT project's objectives.

NTUA/AMDC has identified and contacted several stakeholders relevant to [Pilot 4](#). Formal invitations and Letters of Support have been sent to the following stakeholders: the “Industrial Educational Museum” (Lavriion, Public Authorities & Policy Makers), the “Scientific Society of Lavriion” (Lavriion, Public Authorities & Policy Makers), the “Municipality of Lavriion” (Lavriion, Public Authorities & Policy Makers), the ESG, Sustainability and Climate Change Services department of PwC Greece (Industry) and the EIT RawMaterials Hub – RIS Hub Greece (RTO).

In the Freiberg region, TUBAF, in collaboration with G.E.O.S. and SAXORE, has identified and contacted relevant stakeholders, that are potentially interested in the technologies and targets of the XTRACT project. TUBAF successfully connected with the Saxon State Office for Environment, Agriculture and Geology, the German Mineral Resources Agency (DERA) and the Geo Competence Centre Freiberg. SAXORE made contact to Zinnwald Lithium PLC (European SME producing battery-grade lithium hydroxide) and two representatives of the visitor mine ([Pilot 1](#)) and of the local municipality of Breitenbrunn.

In addition, SAXORE and G.E.O.S. are currently awaiting responses from Wismut GmbH (Company), the Saxon State Ministry for Economy, Labour and Transport and the Geological Survey of Finland (GTK).

In parallel with these efforts, and in line with the approach described in Section 4 of Deliverable D9.2, a dedicated Stakeholder Community section was launched on the XTRACT website (<https://xtract-project.eu/stakeh-comm/>), offering visibility to stakeholders and outlining the benefits of joining. New entries are added to the database securely and on a regular basis by the Project Manager (TUBAF).

The Stakeholder Database will continue to evolve as new entities are identified and engaged throughout the project. This living tool plays a key role in supporting community-building activities and fostering long-term collaboration with external actors.

4.4 DISSEMINATION KPIS

The specific KPIs for WP9 are presented in *Table 4*.

Table 4: Dissemination & Communication KPIs

Expected performance	Year 1	Year 2	Year 3 & beyond	Current Status
Website – number of visitors (unique, returning)	300	400	800	1500+
Social media (LinkedIn, Twitter, YouTube) – total number of followers	400	500	600	495
Social Media Campaigns – total number	1	≥2	≥2	2
No of project videos – total number	≥ 0	≥ 1	≥ 1	-
Video views on YouTube	0	>150	≥250	-
Communications kit: brochures and posters	≥2	≥ 2 (Updated)	≥ 2 (Updated)	3
Printed material distributed	100	300	500	140

No of e-Newsletter – total number	2	≥ 2	≥ 2	1st Issue (June 2024) 2nd Issue (March 2025)
No of peer reviewed publications	≥ 2	≥ 7	≥ 10	3
No of XTRACT Workshop/ Webinars	1	≥ 1	≥ 2	Planning two webinars within 2025
No of End Users attending XTRACT Webinars	40	≥ 60	≥ 80	-
No of presentations, conference events and discussions	≥ 8	≥ 10	≥ 20	16
No of Awareness Campaigns	≥ 2	≥ 2	≥ 2	2
No of projects contacted	≥ 5	≥ 10	≥ 10	10
No of liaison activities performed	≥ 3	≥ 8	≥ 10	5
No of Standardisation bodies reached	≥ 2	≥ 2	≥ 2	2

5. STANDARDISATION AND EMPOWERING EUROPEAN MINING

5.1. INTRODUCTION

5.1.1. Purpose and Scope

This section outlines the initial activities of T9.6 Standardisation and Empowering European Mining for the period of M1-M18. This task is two-folded; firstly, it requires the identification of relevant existing standards to implement as part of the XTRACT Platform and secondly it requires the XTRACT consortium to leverage on its results and findings to produce contributions to ongoing and future pre-normative activities of suitable standardisation bodies helping in the empowering of European Mining sector.

During the first reporting period of the project's implementation, the activities of this task focused on the first requirement. More specifically during the first reporting period the following has been achieved:

- (a) Defined the standardisation approach;
- (b) Identified the existing standards that are relevant to the innovations within XTRACT;
- (c) Initiated communication and collaboration with relevant standardisation bodies;
- (d) Brainstormed and planned the next steps/actions specific to standardisation, including the potential contribution to the relevant standardisation bodies and developments from the results of the project.

This section is related with the innovative solutions of XTRACT as well as with the IPR strategy of the project which is defined in D9.1 Market Shaping, Open Fair Repository, Scale-up Business Models and Socio-Economic Impact v1. It is worth noting that this task is also directly correlated with the activities and outcomes of the technical work packages of XTRACT.

The consortium partners used their knowledge and know-how in their relevant field of expertise and industry to ensure that the outcomes of the XTRACT project are compliant with the existing and emerging standards applicable.

5.1.2. Structure of the Section

This section has the following structure:

- Section 5.1 presents an introduction to this section and its scope.
- Section 5.2 provides an overview of the standardisation system.
- Section 5.3 provides the methodological approach that has been followed.
- Section 5.4 lists the relevant standards that have been identified and are applicable to XTRACT.
- Section 5.5 provides reports on the initial communication and collaboration, which has begun with the relevant standardisation bodies.
- Section 5.6 presents the envisaged next steps and conclusions.

5.2. OVERVIEW OF THE STANDARDISATION SYSTEM

According to the European Union (EU), regulations are binding legal acts that apply directly and in their entirety across all EU Member States. As part of the EU's secondary law, regulations derive their authority from the principles and objectives established in the EU treaties (primary law).

In contrast, standards are voluntary technical specifications that define requirements for products, production processes, services, and test methods. Developed by industry and market actors, standards adhere to fundamental principles such as consensus, openness, transparency and non-discrimination. They play a crucial role in ensuring interoperability and safety, reducing costs and facilitating companies' integration into the value chain and trade. Standards further provide people and organisations with a basis for mutual understanding and are used as tools to facilitate communication, measurement, commerce and manufacturing.

Standardisation is an effective way to ensure that the results of XTRACT are transferred to the real market. In the scope of XTRACT, the consortium partners should ensure compliance with existing regulations and standards relevant to the XTRACT technologies and mining.

5.2.1. Standards in Mining Innovations/Technologies

Listed below are examples of standardisation bodies that issue standards which are generally applicable and relevant to technologies/innovations used in mining industry.

5.2.1.1. International Standard Organisations (ISO)

ISO develops worldwide applicable, market-driven standards, in a multi-stakeholder environment which ensures that a wide range of technical views are represented, including those relating to social and economic interests. While not subjected to a specific jurisdiction, international standards have an important contribution to facilitating international trade that has been recognized by the World Trade Organisation (WTO). The organisations cited below follow the Code of Good Practice for the Preparation, Adoption and Application of Standards of the WTO Agreement on Technical Barriers to Trade.

5.2.1.2. European Standardisation Organisations

The European Standardisation system plays a major role in the EU Single Market, enabling the free circulation of goods among 28 countries. The European Standardisation system relies on a single standard model. European standards are identically adopted by all their National Members and any national conflicting standard is withdrawn. European standards facilitate compliance with EU harmonization legislation, hence the entry and free circulation of goods in the EU Single Market, based on a set of requirements equally applicable in all Member States of the European Union.

European Standardisation Organisations work closely with their international level counterparts, in order to avoid duplication of efforts and promote global relevance of standards. For example, 31 % of CEN (European Committee for Standardisation) standards are identical to ISO standards and 72 % of CENELEC (European Committee for Electrotechnical Standardisation) standards are identical to IEC standards.

5.2.1.3. National Standardisation Organisations (NSO)

The NSO are the organisations officially recognized at national level as being able to represent all Standardisation interests in their country. They are responsible for developing national standards in their countries and they are the members of ISO, CEN and CENELEC. National stakeholders interested in Standardisation activities are able to take part in the process at European or International level through their national Standardisation organisations.

The legal status of national Standardisation organisations varies from one country to another. The most typical status is a private non-profit organisation whose members are national business associations and companies, but sometimes the NSO is a part of the public administration.

5.2.1.4. Other Relevant Standards

Specific technologies must adhere to regulations issued by relevant international/regional bodies. For example, the use of Unmanned Aerial Vehicle (UAV) is regulated by authorities that oversee aviation safety. In the EU, it is done by the EASA (EU Aviation Safety Agency), means that the manufacturing of UAV in the EU must adhere to EASA regulations. Other examples include Open Geospatial Consortium (OGC) that standardizes geospatial content & location-based services, General Data Protection Regulation (GDPR) that regulates information privacy within the EU and the EEA, and various United Nations (UN) frameworks.

5.3. METHODOLOGICAL APPROACH

The identification of relevant existing standards was carried out by the completion of a survey by all XTRACT partners. The survey was distributed via SurveyMonkey and by filing the questionnaire, the consortium partners created the basis for the Standardisation and identified future possible directions.

The survey in summary requested from the respondents to:

- Provide details of the respondent (name, email address, organisation).
- Mention innovations/technologies within XTRACT that the respondent's organisation is working on.
- List the existing standards that are relevant to the innovations/technologies that the respondent's organisation is working on within XTRACT and their level of alignment.
- Provide insight as to whether the partners believe that there is potential for Standardisation by using the results of XTRACT.
- Provide information as to their intentions and interest to participate in the development of existing standards and the way to achieve this.

A copy of the template survey is attached to this deliverable as **Annex 5**.

All survey responses are further analysed below.

5.4. IDENTIFIED RELEVANT STANDARDS TO XTRACT INNOVATIONS/TECHNOLOGIES

The following standards listed in *Table 5* have been identified based on the survey and will be followed by the consortium partners throughout the project:

Table 5: Summary of Relevant Existing Standards to XTRACT

Standard	XTRACT Innovation/ Technology
ISO/TC 20 is a technical committee of the International Organisation for Standardisation.	Reconfigured UAV system for mapping and survey
ISO 14044 (closed loop strategy of recycling materials without affecting initial properties) ISO 14040/14044 – this standard specifies the requirements and guidelines for conducting the life cycle inventory analysis, impact assessment, and interpretation of results phases of an LCA ISO 14044 for SLCA	Hyperaccumulator based phytoextraction and phytoremediation
NF EN ISO 11885, NF EN ISO 10304, NF EN ISO 15923-1, NF EN ISO 17294-2, NF EN 1484, NF EN ISO 17-025	Bioleaching
EASA – Standards of the European Union Aviation Safety Agency regulations in Open Category A1/A3 for the drone classification	Reconfigured UAV system for mapping and survey
Commission Delegated Regulation (EU) 2019/945 and Commission Implementing Regulation (EU) 2019/947 which entered into force on 01/07/2020. Regulation 2019/947 which focuses on the operation of UAS applied from 01/07/2020.	Reconfigured UAV system for mapping and survey
OGC Specific data formats for imagery, point clouds	Airborne geophysical-electromagnetic system
GDPR	All technologies and innovations that may as a result collect personal/sensitive information of people.
UN	Miniatured X-Ray fluorescence system, analytics technology

Other (Metso)	New bioleaching concept, optimized membrane filtration technology
Two main standards which are relevant are UNFC-UNRMS and DCAT.	XTRACT Knowledge Repository

It is clear that ISO standards are relevant to many XTRACT innovations/technologies, whilst each of the other identified standards is relevant to one XTRACT innovation/technology, as shown in *Table 5*.

The survey results are further summarised below:

Figure 17 below presents the potential for Standardisation as provided by the partners in the survey. Reasons for no possibility for standardisation were that some technologies were very new or not mature enough and there is not yet an established industry for them.

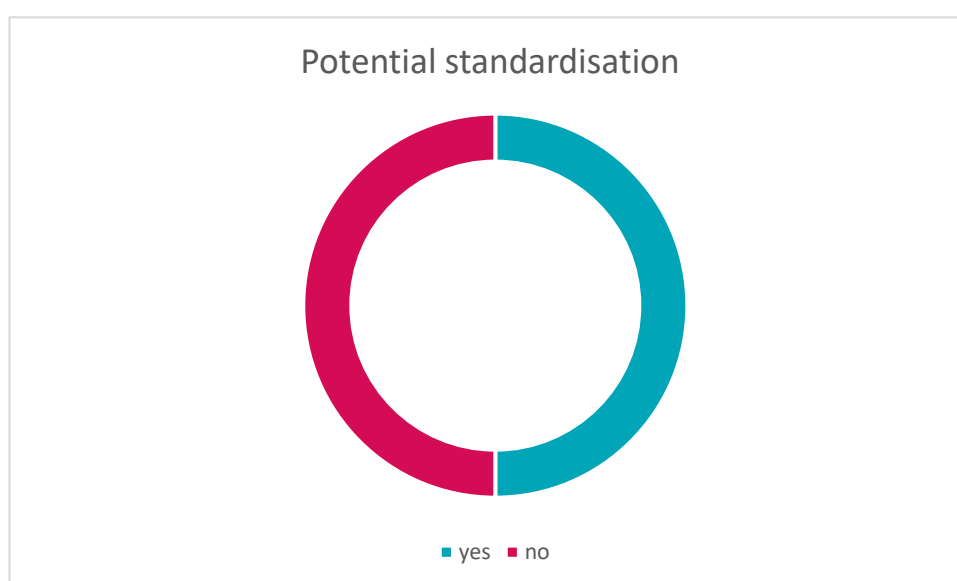


Figure 17: Potential for Standardisation

Figure 18 presents the level of alignment between the partners' innovations/technologies with their relevant standards.

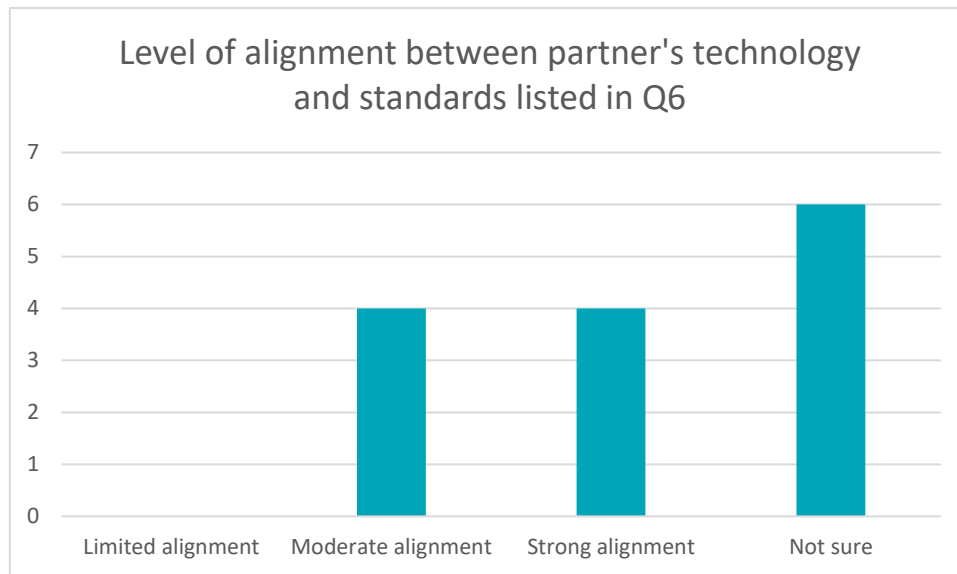


Figure 18: Level of Alignment

Figure 19 presents the number of partners that have identified potential gaps in the existing standards. The gaps that have been identified will be examined further in the second reporting period of the project. Additional gaps may be identified as the project progresses.

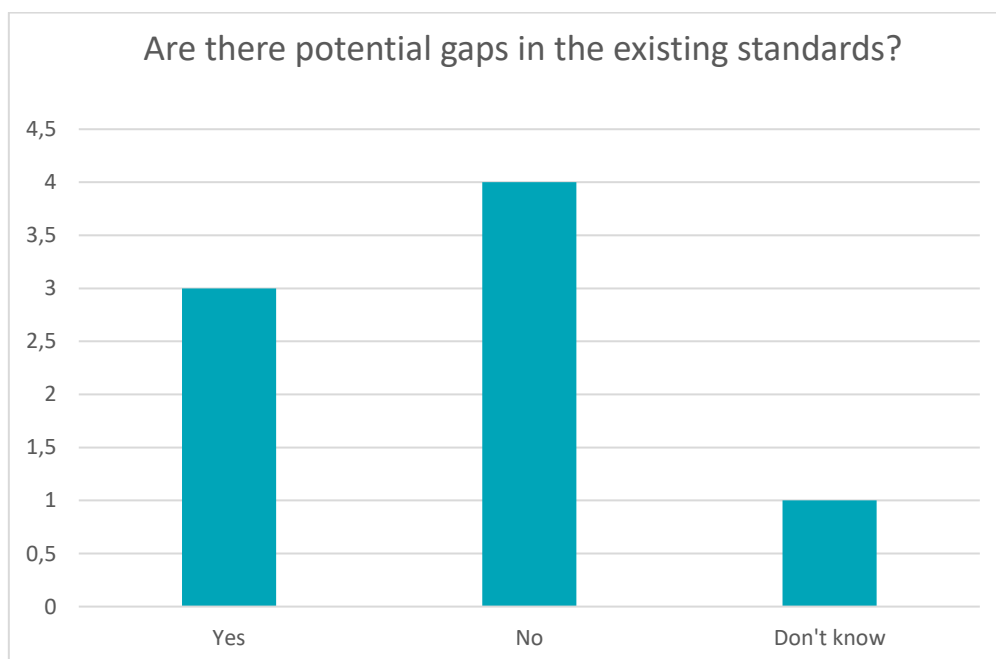


Figure 19: Potential Gaps in the Existing Standards

Furthermore, the majority of the partners stated that even though they are highly interested in participating the development/update of existing standards relevant to XTRACT, they are currently not engaged in such activities. During the second reporting period, and as the project progresses the partners will be in a better position to do so. This activity will be one of the main focuses of this task during the second reporting period of the project. The consortium partners are currently considering carrying workshops, conducting surveys, interviews and contacting regulation and standardisation bodies to take this forward.

In order to evaluate the progress of XTRACT's standardisation strategies, the consortium partners stated that they will ensure to collect feedback from end users/stakeholders relevant to their innovations and follow up with regular progress reports.

The following are some more highlights/main results for specific technologies/innovations detailing the mapping of XTRACT innovations/technologies and their relevant standards.

5.4.1.1. New Bioleaching Concept, Optimized Membrane Filtration Technology (developing partner: TUBAF)

The relevant standard, with moderate alignment, is the one from the Original Equipment Manufacturer (OEM) Metso, which is one of the largest OEM in mineral processing.

<https://www.metso.com/portfolio/biox-process/>

5.4.1.2. Ground and Airborne Remote Sensing for Tailing Content Assessment (developing partner: MUON)

There are no existing relevant standards. This is because the innovation/technology is very new.

5.4.1.3. Airborne Geophysical-Electromagnetic System (developing partner: USAL)

The relevant standard, with strong alignment, is Open Geospatial Consortium (OGC) for specific data format for imagery and point clouds.

5.4.1.4. Reconfigured UAV for Mapping and Survey for Underground Mining Exploration (developing partner: ACCELI)

Several relevant standards, with strong alignment, are identified, which are:

- ISO/TC 20, ISO standard for construction and operation of aircraft and space vehicles, <https://www.iso.org/committee/46484.html> .
- EASA open category A1/A3, EASA's regulations for drones, <https://www.easa.europa.eu/en/domains/drones-air-mobility/operating-drone/open-category-low-risk-civil-drones>
- EU regulation 2019/947, which outlines rules and procedures for the operation of unmanned aircraft, https://eur-lex.europa.eu/eli/reg_impl/2019/947/oj/eng
- GDPR

5.4.1.5. New Bioleaching Concept (developing partner: BRGM)

Several relevant ISO standards, with moderate alignment, for water quality are identified, which are ISO 11885, ISO 10304, ISO 15923-1, and ISO 17294-2. Another relevant ISO standard is ISO 17025 for testing and calibration laboratories.

5.4.1.6. Miniatured X-Ray Fluorescence System, Analytics Technology (developing partner: UNP)

Relevant standards, with strong alignment, are the UN Framework Classification for Resources (UNFC), which is a universal system for classifying and reporting minerals, energy, and other resources, and the UN Resource Management System (UNRMS), which is a comprehensive framework that integrates sustainability into global resource management practices.

5.4.1.7. Hyperaccumulator-based Phytoextraction and Phytoremediation (developing partner: TUC)

Two relevant ISO standards, with strong alignment, for environmental management – life cycle assessment are identified, which are ISO 14040 and ISO 14044.

5.5. LIAISON WITH RELEVANT STANDARDISATION BODIES

Based on the identified relevant standards, the consortium as a first step contacted two standardisation bodies, ISO and EASA, to assess the Standardisation of the reconfigurable Unmanned Aerial system that is being developed to map and scan areas in a mine that are difficult to access such as abandoned mining sites, remote tailing storages and old underground mine workings. The communication was commenced to ensure that (i) XTRACT reconfigurable Unmanned Aerial system is compliant with the existing standards and (ii) to consider whether any gaps are identified for which XTRACT can contribute.

These bodies have responded and a summary of the initial communication is summarized below.

5.5.1. Response from ISO

The representatives of ISO advised that XTRACT partners who are involved in the development of this technology should ensure that they contact their national Standardisation body who is a member of ISO to advise further.

5.5.2. Response from EASA

EASA was provided with information on the use of the XTRACT reconfigurable Unmanned Aerial system i.e., used inside an underground mine. The XTRACT consortium requested clarification on whether the applicable EU regulations still apply for a flight in a closed space. EASA clarified that the EU Regulations are not applicable for flights in an indoor area/closed area. For such flights, the partners should ensure that they are in compliance with all national and safety requirements of the country and sites the flight is executed.

5.5.3. Next Steps

In the next reporting period, the intention is to take these discussions further:

- to ensure that XTRACT activities are in line with all existing standards,
- contact more standardisation bodies relevant to other technologies/innovations of XTRACT,
- consider how XTRACT results can be leveraged to contribute to existing standards.

5.6. NEXT STEPS AND CONCLUSION

5.6.1. Policy Making Related Activities

Led by LTU, and with contributions from all partners and the project coordinator TUBAF, a number of activities have been envisaged to support and advance standardisation within the mining and raw materials industry. These activities include:

- Stakeholder meetings with policymakers, relevant authorities and stakeholders to serve as platforms for direct engagement, allowing findings to be presented and discussed.
- Collaboration with other EU projects which leveraged to disseminate findings more broadly. Engaging in such platforms allows XTRACT insights and results to reach a wider audience of policymakers and authorities across the mining sector.
- Insights will be shared online making them accessible to the broader audience is through social media and project website. This helps to reach policymakers and authorities who are active online and consume information digitally.

- Articles to be published in journals or through other channels that may reach policy makers and industry professionals to ensure that recommendations reach the intended audience. Such publications can provide a more in-depth look at the XTRACT findings and recommendations to policy, regulations, standards and practice.

Finally, XTRACT will focus on the planning of an effective communication awareness campaign, the organisation of project webinars targeting stakeholders in raw material and mining management and European initiatives to spread the word about XTRACT's activities.

5.6.2. Conclusions

This section provides the most significant activities and findings concerning the standardisation task 9.6 for the period of M1-M18 and provides an overview of relevant existing standards for XTRACT innovations/technologies. Significant work was put to analyse the existing standards and evaluate the elements of innovation correlated with the activities of XTRACT.

Contribution to Standardisation is very important and will be focused on this exercise during the second reporting period of the project. More specifically, the next steps will focus on enabling the XTRACT consortium to leverage on its results and findings to produce contributions to ongoing and future pre-normative activities of suitable standardisation bodies helping in the empowering of European Mining sector. The contents to be proposed will be consequent with the IPR strategy of the project.

The communication that has already been established with ISO and EASA provides a starting point for such contribution to Standardisation in the relevant industry. Furthermore, during the second reporting period, the consortium partners will need contribute to the standardisation activities in order to promote the solutions of XTRACT and increase the overall visibility of the project.

6. FUTURE ACTIONS

Building on the foundational efforts of the first reporting period, the second half of the XTRACT project will prioritise more targeted, collaborative and impact-driven dissemination and communication activities. Emphasis will be placed on addressing areas that are currently underperforming or require strategic refinement, in line with both the DoA and the evolving needs of the project.

Key actions planned for the upcoming period include:

- **Stakeholder engagement & Webinars:** Several stakeholder-focused webinars are planned to facilitate knowledge exchange and promote deeper connections with key audiences. The stakeholder database will be expanded and updated and tailored communication materials will be developed to better support partner outreach.
- **Scientific publications:** Priority will be given to the preparation and publication of scientific papers in open-access journals and papers that reflect XTRACT's research and innovation outcomes.
- **Boosting social media content quality:** Social media activity will be ramped up with more structured content planning and partner contributions. A renewed effort will be made to reach the M36 targets in terms of engagement levels.
- **Disseminating updated print and multimedia materials:** Revised versions of the brochure and banner will be prepared to reflect recent developments. A short project video – featuring partner contributions and pilot site footage – is also planned for late 2025 to support visibility during the final project year.

- **Pursuing new synergies and cross-project visibility:** Building on early collaborations, the consortium will explore additional liaisons with relevant Horizon Europe projects. Participation in joint sessions and technical panels will be encouraged and coordinated across WPs.
- **Ensuring more balanced partner engagement:** Specific actions will be taken to encourage more active involvement from partners in communication activities, including clearer internal deadlines and support materials. Monthly WP9 meetings will continue to serve as the coordination hub.

The aim of these activities is to enlarge project interventions and make sure that its results are more widely understood in the scientific, industrial and societal communities. Adjustments to the strategy will continue to be made as needed, based on performance metrics and feedback.

7. CONCLUSIONS

During the first 18 months of the XTRACT project, dissemination and communication activities have progressed steadily, albeit with a number of areas still requiring focused attention and improvement. While the strategy outlined in D9.2 has provided a strong foundation - particularly in terms of branding, visual identity and the establishment of core tools – the pace of implementation has varied across actions and partner contributions.

The project’s digital presence has been successfully established, and key communication channels are now active and delivering measurable visibility. Early participation in events and the development of clustering links have contributed positively to positioning XTRACT within the Horizon Europe community. However, not all planned activities have yet materialised to the extent originally foreseen.

Efforts have been made to align dissemination and communication actions with the commitments set out in the Grant Agreement. Nonetheless, certain activities – such as deeper engagement with end users, regular multi-language media content and partner-level amplification – require further work to reach their full potential.

Monitoring of KPIs has been helpful in identifying both progress and gaps. While website traffic, social media growth and early event presence have exceeded expectations, stakeholder database activation and webinar/workshop organisation are flagged for reinforced effort in the next period. Moving forward, the consortium will prioritise:

- More consistent partner engagement in dissemination;
- Strengthening ties with external stakeholders through webinars;
- And ensuring that scientific publications begin to reflect the project’s outputs.

The next reporting period, culminating in **D9.3 – Outreach, Dissemination, Standardisation and Communication Activities v2** (M36, November 2026), will aim to document not only quantitative progress, but also demonstrate how initial lessons have been addressed through adaptive strategies and targeted actions. The consortium remains committed to increasing the reach, quality and impact of its dissemination efforts in the second half of the project.

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ANNEX 1: INTERNAL REVIEW REPORT TEMPLATE FOR DX.X



A SUSTAINABLE ECOSYSTEM FOR THE INNOVATIVE RESOURCE RECOVERY AND COMPLEX ORE EXTRACTION

XTRACT REVIEW REPORT TEMPLATE FOR DX.X: TITLE

Work package	WPx: Name of WP
Task	Task x.x: Name of task
Authors	(Name of Reviewer)
Dissemination level	Confidential (CO)
Status	Draft
Document date	
Version number	x.x



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PROCESS USED IN XTRACT FOR DELIVERABLES' REVIEW

The XTRACT Consortium uses the internal Deliverable Review process to assure quality, consistency, and high standard for the documented project results.

The Review is done by the assigned review team in accordance with the Project Quality plan. The author of the deliverable has the final responsibility to collect the comments and suggestions from the assigned reviewers and integrate the final changes to the deliverable document that will be officially submitted to the EC by the Coordinator.

Reviewers:

Mr/Ms/Dr... XXX – XX/ COMPANY

Overall Review Result

Deliverable is:

☐ Fully accepted	☐ Accepted with reservation	☐ Rejected unless modified as suggested	☐ Fully rejected
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SUGGESTED ACTIONS TO THE AUTHORS

1. The following adjustments should be made
2. Specify missing chapters / subjects
3. Necessary adjustments to the deliverable's content and essence
4. Further relevant required improvements



REVIEWERS' COMMENTS

COMMENTS OF REVIEWER AND AUTHOR'S RESPONSES

These refer to any issue not covered by the particular topics below, including general contents thoroughness, correspondence of the reported work to the project's and the WP's objectives as described in the Description of Action and its correspondence to the general HORIZON-RIA programme objectives.

TOPIC A: RELEVANCE

Is this deliverable relevant to XTRACT and to the particular WP activities it covers?

Reviewer comments

Click or tap here to enter text.

Author response

Click or tap here to enter text.

TOPIC B: METHODOLOGICAL FRAMEWORK SOUNDNESS

Please comment on the soundness of the methodology followed and how it is explained. Are the results arbitrary or based upon a clear methodology, involving users' tests, expert opinions, etc.?

Reviewer comments

Click or tap here to enter text.



Author response Click or tap here to enter text.
TOPIC C: QUALITY OF ACHIEVEMENTS
<i>Please comment on the essence of the results. Are they of high value? Are they what one should expect when reading this deliverable?</i> Reviewer comments Click or tap here to enter text. Author response Click or tap here to enter text.
TOPIC D: QUALITY OF PRESENTATION OF ACHIEVEMENTS
<i>Please comment on the results presentation. "Are the results adequately explained and commented or just mentioned? Is there a link between methodology and results?"</i> Reviewer comments Click or tap here to enter text. Author response Click or tap here to enter text.



TOPIC E: DELIVERABLE LAYOUT / SPELLING / FORMAT

Please comment on the deliverables' layout. "Does it include all necessary chapters; is it readable, in comprehensive language, etc.?"

Reviewer comments

Click or tap here to enter text.

Author response

Click or tap here to enter text.



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ANNEX 2: XTRACT MEETING MINUTES TEMPLATE



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XTRACT (NO, TYPE) MEETING MINUTES

Type of the meeting	WPx meeting, GA meeting, XX phone call...etc.
Date/ Place	
Authors	Main author -Company, Contributor-Company, Contributor -Company, Contributor -Company ,...
Status	Draft
Document date	28/04/2025
Version number	x.x



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REVISION CHART – STYLING HEADING 1

Revision Chart Version	Date	Main author	Summary of changes
0.1	00/00/0000		Draft outline
0.2	00/00/0000		
0.3	00/00/0000		
0.4	00/00/0000		
Etc..	00/00/0000		(delete unused lines)
1.0	00/00/0000		Final version



Meeting Minutes

PARTICIPATION LIST					
Organisation	Name	Day 1	Day 2	Day...	Signature



Meeting Minutes

MEETING AGENDA		
Time	Topic	Presenter



OVERALL MINUTES

AGENDA TOPIC - SELECT STYLE HEADING 2

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AGENDA TOPIC - SELECT STYLE HEADING 2

HEADING 3

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Names of level two titles in this section are only suggestions and can be modified if required.

HEADING 4 (NO NUMBERING)

Body text

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ACTION POINTS, DECISIONS AND NOTES, HEADING 1

Nº	WP	What	When	Responsible	Status



ANNEX 1: TRAVEL INFORMATION

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HEADING 3 (NO NUMBERING)

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ANNEX SUBTITLE (NO NUMBERING)

Body text

Body text

HEADING 3

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ANNEX 2: TITLE OF ANNEX, ANNEX HEADING

ANNEX SUBTITLE (NO NUMBERING)

Body text

Body text

ANNEX 3: XTRACT POWERPOINT TEMPLATE

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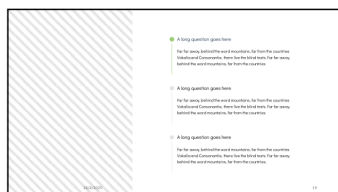
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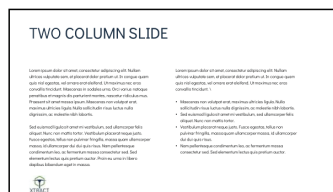
D9.3 – XTRACT Outreach, Dissemination, Standardisation and Communication Activities v1



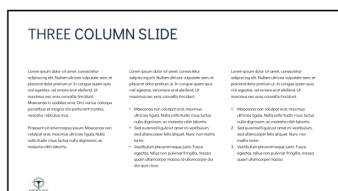
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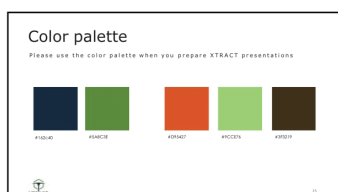
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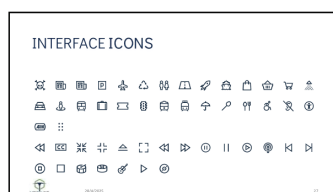
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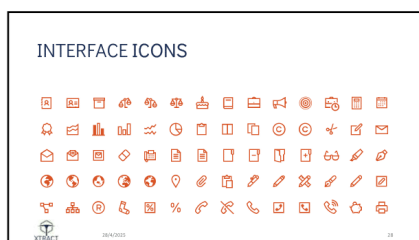
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ANNEX 4: XTRACT AGENDA TEMPLATE FOR MEETINGS



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XTRACT (NO, TYPE) MEETING AGENDA

Date of the meeting	
Place	
Hosting partners	(Name, Organisation) (main contact point and contact details)
Status	Draft
Travel information	(link to Repository)
Document date	28/04/2025
Version number	x.x



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PARTICIPATION LIST – STYLING HEADING 1

No	Name of participant	Organisation		Country

(link to Repository)



MEETING AGENDA

DAY 1 – SECTION_HEADER

Time	Topic	Presenter

DAY 2 – SECTION_HEADER

Time	Topic	Presenter



ANNEX 1: TRAVEL INFORMATION

ANNEX SUBTITLE (NO NUMBERING)

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ANNEX SUBTITLE (NO NUMBERING)

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ANNEX 5: STANDARDISING AND EMPOWERING EUROPEAN MINING SECTOR - SURVEY TEMPLATE

Standardizing and Empowering European mining sector

This survey was developed for the XTRACT project as a baseline for the development of the XTRACT standardization strategy. The purpose with the survey is to identify the relevant existing standard(s) related to the XTRACT Platform. Results of this survey will enable the XTRACT consortium to produce contributions to the ongoing and future pre-normative activities of suitable standardization authorities with the goal of empowering the European mining sector.

All partners shall participate in this survey. The results will be reported in D9.3. Please submit your answers before 30 November 2024.

For any further clarification, please contact Dr. Adrianus Halim from LTU,  or Ms. Christiana Themistocleous from Accelience, .

1. Please provide your personal details

First name

Last name

2. Please provide your contact details

Email address

3. Which organization are you working with?

☐ TUBAF

☐ LNEG

☐ LTU

☐ TUC

☐ MUON

☐ LAMMC

☐ USAL

☐ Björkdal mine

☐ ACCELI

☐ SAXORE

☐ BRGM

☐ NTUA/AMDC

☐ UNP

☐ GEOS

4. State innovations/technologies within XTRACT that your company deals with.

5. Please state whether your company believes that the answer in Question 4 have potential for standardization or not.

☐ yes

☐ no

If no, please specify why

6. Please provide a list of existing standards in the industry (e.g. ISO, EN, ASTM) related to your company's innovations/technologies, together with a brief description of how it has supported your company in achieving its goals. Please define the type of the standard, i.e. technical or operational.

7. What is the level of alignment between your company's innovations/technologies with the standards listed in question 6?

☐ Limited alignment

☐ Moderate alignment

☐ Strong alignment

☐ Not sure

8. Have you identified any potential gaps in the existing standards and are these gaps relevant to XTRACT? If yes, please describe them and explain how they affect your company's business.

9. Some countries may have their own authorities who create national standards specifically for their sectors or industries, in addition to the global & regional ones like ISO, EN, and ASTM. If this is the case in your country, please provide name of the standardization authorities, website address that contains the standard, and name any technical committee associated with that standardization authority if it exists.

Authority	
Website	
Technical Committee	
Authority	
Website	
Technical Committee	
Authority	
Website	
Technical Committee	
Authority	
Website	
Technical Committee	
Authority	
Website	
Technical Committee	

10. This is a follow up of Question 8 and 9. Have you participated or are you participating in the development/update of the existing standard(s) relevant to the XTRACT and the one(s) answered in Question 9 (if there is any) as a member of a working group or a committee?

☐ Yes

☐ No

If yes, please explain:

11. If you answer "Yes" in Question 10, have you monitored/contributed or are you monitoring/contributing the development of the standards (the existing one(s) and the one(s) answered in Question 9) in the way other than participating in a working group or a committee?

- ☐ Yes
- ☐ No

If yes, please explain:

12. If you answer "No" to Question 10, are you interested to contribute to the development of the standards in the future?

- ☐ Yes
- ☐ No

If yes, please explain:

13. Please provide your experience and involvement in ongoing projects (European and National) related to the domains covered by XTRACT. Provide a short description and outcome of the relevant standardization activities performed in the projects.

14. Regardless whether you have been involved or not in developing or updating any standard, let's imagine that you are involved in such as process. In this case, what is the best way to involve the end users of your company's products

- ☐ Conducting a survey
- ☐ Conducting an interview
- ☐ Doing workshops
- ☐ Other (please specify)

15. How should we evaluate the progress of XTRACT's standardization strategy?

- ☐ Regular progress reports
- ☐ Feedback from end users/stakeholders

Other (please specify)



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The Members of the XTRACT Consortium:

Short Name	Country	Short Name	Country
TUBAF	Germany	LNEG	Portugal
LTU	Sweden	TUC	Greece
MUON	Finland	LAMMC	Lithuania
USAL	Spain	BJÖRKDAL	Sweden
ACCELI	Cyprus	SAXORE	Germany
BRGM	France	NTUA/AMDC	Greece
UNP	Portugal	GEOS	Germany