Maximise H2 Enrichment in Direct Reduction Shaft Furnaces

Development of Website and Project Branding Toolkit

Deliverable 4.1

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1. Introduction

1.1. Purpose and scope of the present document

Dissemination and communication play an extremely important role in the success of any project, so there is the need to define a clear plan for all the dissemination and communication activities to be carried out along the lifetime of the project.

This document (D4.1 Development of Website and Project Branding Toolkit) describes the project website (https://www.estep.eu/clean-steel-partnership/list-of-csp-projects/maxh2dr) and other online media. The objective of the website is to promote the project and its activities and outcomes by offering tailored information to a variety of audiences inside and beyond the project's community.

Moreover, the MaxH2DR presence online is also completed with the design and development of the social media channels on LinkedIn, Twitter, ResearchGate, which complemented the already launched project website.

Finally, the document also describes the initial set of communication material that was created in the first six months of the project by using the project branding toolkit, such as the document and presentation template, and other types of jointly used pieces.

1.2. Structure of the document

This report is divided into 3 different sections:

- Section 1 described the scope of the project website, target audience, website structure and various webpages previews
- Section 2 outlines other online media channels together with some guidelines
- Section 3 provides an overview of the various communication tools and material

2. Project website

2.1. Scope

For the purposes of disseminating information about the project and its results, as well as for ensuring a communication channel for key stakeholders, a website has been set up in accordance of the project branding toolkit (deliverable D4.1).

The MaxH2DR website is accessible at the following URL link: https://www.estep.eu/clean-steel-partnership/list-of-csp-projects/maxh2dr

The project website is hosted on the ESTEP website and can be found under the list of projects of the Clean Steel Partnership (CSP). By being on the ESTEP website, MaxH2DR will benefit from the already existing visibility of the ESTEP website within the steel community and beyond. Nevertheless, it has to be noted that since ESTEP is updating its own website and it will be finalized beginning of 2023, the MaxH2DR website will subsequently also be updated with its new design. The above-mentioned project URL link will then also be adapted and will ideally merge to www.maxh2dr.eu.

The MaxH2DR website is the principal source of information regarding the project, including its scope and framework, consortium, and activities, for the target audiences of MaxH2DR. It will function as a central point for distribution and interactivity, both with its own content and through links to other websites or platforms, and will also act as a central repository for MaxH2DR deliverables, documents and other material. As the project's major communication tool, the website address will be prominently displayed on all project-related communication materials. The website will, therefore, also be used for networking purposes.

The dedicated website started to function in November 2022 (M6) and will be updated throughout the duration of the whole project (M48). After the end of the project, the website will remain accessible with its content and publication, and it will as well contain the non-confidential deliverables.

2.2. Target audience

The MaxH2DR website is designed to engage both the project' stakeholders (see also deliverable D4.2) and members of the general public affected by and/or interested in the decarbonisation technology for integrated steelworks, more specifically in hydrogen enriched direct reduction and the Carbon Direct Avoidance pathway pursued in the steel industry. Therefore, the whole steel community and its value chain, academic and professional audiences (such as scientific communities, research centres, and public organisations) will be able to profit from the published content, as well as other European projects, in an effort to discover synergies and potential collaboration avenues. Journalists will discover recent information such as news, upcoming events, and press releases.

In order to increase the awareness of the project, ESTEP will share the project logo and the link to the dedicated project website to be added on the partner's websites. The partners will be invited to translate key information about the project in their respective national languages. This will also increase the reach of the target audience.

2.3. Website structure

The public area of the website presents all relevant information on the project. This includes the project overview, project objectives, partners, news and events, outcomes and contact.

Certain intermediate deliverables may be made available in the public area under the publication section, depending on the information contained. The public area will also be used for stakeholder engagement activities, for instance, the publication of links to the public consultation when this is launched.

There is also a private area generated by BFI, a shared folder, which serves as a repository for working documents and intermediate deliverables as well as facilitating exchanges between partners and other selected stakeholders.

The website will be constantly updated to ensure the timely dissemination (deliverable D4.2) of information about the project.

The website is structured as following:

- **Home page** (Fig. 1) is divided with 4 subpages: project overview, news & events, outcomes and contact
- **Project overview** (Fig.2) contains the project summary, project key facts and ambition as well as further links to other pages. It also includes 3 subpages: **objectives** of the project (Fig.3), **partners** (Fig.4) and **structure** (Fig.5). The structure page is an overview of the 5 work packages of the project.
- **News & events** (Fig.6): This page corresponds to all information that will be displayed in the media, press releases, social media, etc. as well as the past and futures events related to the project. It will also contain the project announcements made through the newsletters.
- **Outcomes** (Fig. 7): This page describes the impacts of the project and it also includes 2 subpages to the publications and deliverables of the project. The **publication** page is related to the future publication of scientific articles, project flyer, etc. The **deliverables** page will contain any intermediate deliverables and documents that can be made available for the public area. Both subpages will be regularly updated according to the progress of the results of the project.
- **Contact** (Fig.8): Contact details from the project Coordinators (SSSA & BFI) can be found on this page

Figure 1: MaxH2DR website home page

Project overview

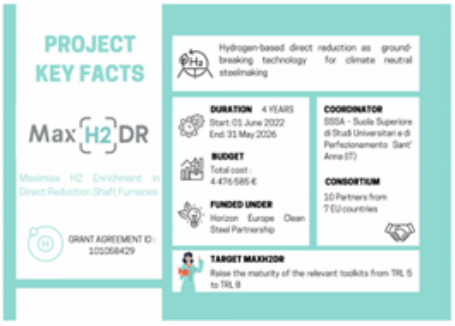
Project summary

H2-enriched direct reduction (DR) is the key decarbonisation technology for integrated steelworks mentioned in pathways of all major steel producers. Natural gas driven DR is established in industry mostly outside Europe but there are no experiences with high H2 enrichment > 80%.

H2 based reduction is no principal issue but endothermic and the influences on morphology, diffusion and effective kinetics are not known. Also properties and movement of particles in the reactor are not know and issues like sticking cannot be excluded. Probably, temperature distribution and flow of solids and gas will be clearly different. No reliable prognosis is possible yet, in particular with regard to local permeability, process stability and product quality of industrial size furnaces with higher loads on the particles and larger local differences. Many activities are initiated for first industrial demonstration of H2-enriched DR but they will not close many of these knowledge gaps.

MaxH2DR provides missing knowledge and data of reduction processes. A world-first test rig determines pellet properties at conditions of industrial H2 enriched DR furnaces and a physical demonstrator shows the linked solid and gas flow in shaft furnaces. This will be combined with digitals models including the key technology DEM-CFD to provide a hybrid demonstrator able to investigate scale-up and to optimise DR furnace design and operating point.

This sound basis will be used to optimise the process integration into existing process chains. Simulation tools will be combined to a toolkits that covers impacts of product properties on downstream processes as well as impacts on gas and energy cycles. Thus, promising process chains, sustainable and flexible, will be achieved for different steps along the road to decarbonisation. The digital toolkits will support industrial demonstration and implementation and strengthen digitisation and competitiveness of the European steel industry.



Project ambition

MaxH2DR has the ambition of achieving a set of measurable and verifiable general objectives:

- Create new knowledge combining several ground-breaking world-first innovations on H2-enriched DR
- Exploit new knowledge and data into digital toolkits for the DR furnace and its process integration
- Provide the digital basis for the planned CDA demonstrator with >80% CO2 mitigation within CSP
- Support industrial implementation of DR with fast and maximum H2 enrichment
- Raise the maturity of the relevant toolkits from TRL5 to TRL8.

Detailed information about the MaxH2DR project is available on the following links:

Objectives
Partners
Structure
News & events
Outcomes
Contact

Further links :

EU Factsheet MaxH2DR project PDF: click here
Clean Steel Partnership SRIA

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Max H2 DR

Objectives
The innovation actions of MaxH2DR are specifically directed towards *three general objectives*: (1) close the most important current knowledge gaps regarding H2-enriched DR, (2) exploit this new knowledge to develop highly innovative digital toolkits and (3) provide the digital basis for the planned CDA

Partners
*The MaxH2DR consortium consists of 10 specialised partners (1 steel producer, 3 research institutes, 5 universities and 1 technology platform) from 7 different EU countries. The MaxH2DR project is coordinated by SSSA (overall project coordination) and BFI (technical coordination). *

Structure
*Work packages (WP) *

Figure 2: Project overview

Objectives

The innovation actions of MaxH2DR are specifically directed towards three general objectives:
(1) close the most important current knowledge gaps regarding H2-enriched DR,
(2) exploit this new knowledge to develop highly innovative digital toolkits and
(3) provide the digital basis for the planned CDA demonstrator with >80% CO2 mitigation within CSP.

Max H2 DR
Maximise H2 Enrichment in Direct Reduction Shaft Furnaces

The third general objective refers to the central objective of the Clean Steel Partnership (CSP) : to demonstrate complete production chains with more than 80% CO2 mitigation. Considering the budgets and the timing of CSP and numerous already initiated demonstration activities, this objective generally has to be realised by a combination of demonstrators at different sites which need to be united with a digital toolkit to a "hybrid de-monstrator". MaxH2DR is designed for this approach, to complete already initiated demonstration activities and to provide digital toolkit as crucial enablers for CSP.

This includes the following objectives:

- closing knowledge gaps on reduction processes and kinetics in H2-enriched DR,
- providing a unique description of the physical properties of pellet/DRI during H2-enriched DR,
- demonstrating the coupled solid and gas flow in a physical DR demonstrator for the first time,
- providing the first DEM/CFD model of a H2-enriched DR furnace,
- deeply validating and fusing DR furnace models with physical demonstration to a " hybrid demonstrator"
- creating unique digital toolkits for process optimisation and process integration of H2-enriched DR units
- supplying guidelines process optimisation of H2-enriched DR furnaces and on scale-up to full industrial size,
- digitally identifying and demonstrating feasibility of steel production chains based on H2-enriched DR.

More concrete focused on the key technology H2-enriched DR in shaft furnaces, the project MaxH2DR also directly addresses three main research and innovation areas:

- Replacement of fossil carbon energy by renewable (hydro/wind/solar) electricity in iron and steelmaking.
- Development of pilots and demonstrators in the field of direct reduction of iron with hydrogen. Direct reduction of iron ore with high amounts of hydrogen is expected to be key for CO2 neutral steelmaking.
- Innovation activities focused on the process and the product properties as well as on the impact of the product properties on the downstream processes (e.g. Electric Arc Furnace). The process technology may have to be adapted to the new boundary conditions

Figure 3: Project objectives

Partners

The MaxH2DR consortium consists of 10 specialised partners (1 steel producer, 3 research institutes, 5 universities and 1 technology platform) from 7 different EU countries. The MaxH2DR project is coordinated by SSSA (overall project coordination) and BFI (technical coordination).

VDEh-Betriebsforschungsinstitut GmbH (BFI)

VDEh-Betriebsforschungsinstitut GmbH (BFI), a non-profit institute in Germany, is focused on applied research for steel industry. The staff of around 100 people is organised in 8 scientific departments and drives in close and interdisciplinary cooperation. 70% of the staff are scientists and engineers who guarantee, together with technicians and administrative staff, a high level of research quality and project performance e.g., by applying a strict quality management of research proposals and a consequent results-oriented management of projects.

Ruhr-University Bochum

Ruhr-University Bochum (RUB) is one of Germany's leading research universities. The University draws its strengths from both the diversity and the proximity of scientific and engineering disciplines on a single, coherent campus. RUB is the largest employer in Bochum (6.200) and one of the largest universities in Germany in terms of students (42.000). RUB has an in-house DEM code which is perfectly suitable for the project.

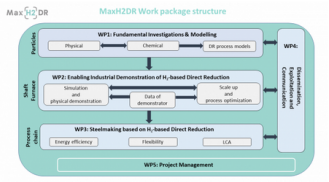
Université de Lorraine

The Université de Lorraine (UL), a big university in the West of France, trains 60,000 students and employs 7,000 people. The university is multidisciplinary and international (10,000 international students). It is also a member of several European networks, and is 43rd in the Shanghai ranking in metallurgical engineering. Institute Jean Lamour (550 people) is the laboratory committed to MaxH2DR, with its 'Process metallurgy' group. The University of Lorraine has long experience in DR modelling.

Figure 4: Project partners

Structure

Work packages (WP)



The MaxH2DR projects implements a consistent red line, starting with fundamental investigations of the basic mechanisms relevant for large scale H2-enriched DR in WP1. These findings build the base for demonstration and scale-up simulation in WP2. WP3 then integrates the results in the process chain. The technical WPs 1-3 are complemented by WPs for dissemination, exploitation, communication and management.

WP1: Fundamental investigations & modelling

WP1 is dedicated to chemical and physical investigations in order to close existing knowledge gaps with regard to the reduction processes in H2-enriched DR and the evolution of chemical and physical properties of the pellets during their descent in the furnace till the final product, DRI.

Key objectives:

- New sophisticated reduction kinetics model based on the experimental data for H2-enriched DR
- World-first test rig to measure adhesive forces of pellet bulks at industrial H2-enriched DR furnace conditions
- Include cohesion forces in DEM to describe movement of real particles in H2 enriched DR shaft furnace
- Implementation of the new kinetics sub-model into overall DR process models

WP2: Enabling industrial demonstration of H2-based direct reduction (DR)

WP2 exploits the WP1 results to demonstrate a H2-enriched DR shaft furnace: first, a physical demonstration of solid and gas flow, second, to digital demonstration, and finally a hybrid demonstrator. This fuses all results of WP1, digital demonstration and further DR demonstration and/or industrial plant data according to a specifically developed validation strategy .

Key objectives:

- Physical demonstration of linked solid and gas flow in DR shaft furnaces
- Measurements of the decent of real raw materials and its influence on the gas flow in DR shaft furnaces
- Calibration and validation of DEM/CFD model using results of physical demonstration experiments
- Conversion of the fast and flexible FEM based process model into a validated hybrid demonstrator for DR shaft furnace scale-up and optimisation
- Recommendations and guidelines to overcome scale-up problems, achieving an efficient and stable DR shaft furnace operation for high product quality
- New process designs for gas injection and charging to optimise the DR shaft furnace process for maximum H2 enrichment

WP3: Steelmaking based on H2-based direct reduction

Figure 5: Project structure

News & events

Events

June 2022

The MaxH2DR project started in June 2022. In order to raise awareness of the project and to engage relevant stakeholders, also beyond the steel industry, the project took part to EU Green Week Partner Event - CSP webinar , where ESTEP hold a webinar with focus on "The Clean Steel Partnership: a driver to net zero, from research to deployment of ground-breaking technologies for steel" on 1 June 2022. See here project presentation

The project also took part to the ESTEP Dissemination event 2022 'Beyond steel research projects', which was held by ESTEP on 22 June 2022. Presentation can be found here

October 2022

The Kick-off meetings took place on 18-19 October 2022 in Brussels.

November 2022

The MaxH2DR project will be presented at the second international conference dedicated on hydrogen "H2 for Green Steel - Hydrogen route for a green steelmaking process and applications", organised by the ESTEP Focus Group Low Carbon & Energy Efficiency on 30 November 2022 in Versailles (France).

News

The webpage will be regularly updated throughout the whole project

Follow the MaxH2DR project on LinkedIn and Twitter

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Figure 6: Project news & events

Outcomes

Impact

MaxH2DR project will result in two digital toolkits which are essential enablers for the planned CSP demonstration of a CDA process chain demonstrator with >80% CO2 mitigation. This central result, new knowledge, new test rigs and recommendations will strongly support the implementation of the key technology H2-enriched DR in European steelworks. They will also support the fast increase of the H2 content in the new industrial DR plants including the process optimisation. This head start of digital and technical levels will be essentially for the survival of the European steel industry during the inevitable decarbonisation process. Thus, the impact of MaxH2DR will be a significant mitigation of CO2 emissions in the European steel industry.

These impacts of MaxH2DR are perfectly aligned with the expectations within Horizon Europe:

- Demonstrate CDA technologies with >80% CO2 mitigation
- Efficiently and flexibly integrate RES in metallurgical processes,
- Accelerate the green and digital transition with respect to efficient and globally leading,
- Competitive and climateneutral industrial value chains

More detailed information can be found in the deliverables and publications

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Deliverables	Publications
Deliverables made throughout the whole project will be uploaded on this webpage	Publications made throughout the whole project will be uploaded on this webpage

Figure 7: Project outcomes

Contact

Project Coordinators

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Follow the MaxH2DR project on LinkedIn and Twitter

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Figure 8: Contact project coordinators

3. Other online media

3.1. Scope

With the aim of increasing the project outreach, the use of online media is key to maximise the multiplier and click-through effects. To ensure dissemination across Member States, the project consortium will rely on the existing and targeted online presence of all the partners.

The use of social media as communication and dissemination tools has proven to be very cost-efficient, responsive and easy to measure their reach to assigned target groups (deliverable D4.1). They also help increase online and offline visibility, as well as recognition from the scientific community and audiences with diverse interests. Another benefit of using social media is the ability to inform the audience on the project's progress in real time. The ultimate goal will be to improve the visibility and visits on the MaxH2DR website, establishing and maintaining engagement for the duration of the whole project.

The MaxH2DR website is already linked to the social media accounts of the project: LinkedIn (Fig.9), Twitter (Fig.10) and ResearchGate (Fig. 11), in order to increase awareness of the activities carried out and to ensure stakeholder participation. All social media accounts are intended to be updated regularly with posts relevant to the project and its activities, with a response rate on possible inquiries/comments, to ensure audience engagement and maximum number of followers/connections/likes/re-tweets.

3.2. Guidelines

As far as online media dissemination is concerned, all partners are expected to promote the project through their organisation accounts and provide material for dissemination through these channels. The MaxH2DR consortium and other interested and supportive parties may also use their own communication channels to enhance the dissemination of the MaxH2DR project among their networks. MaxH2DR will support its distribution by providing connections and relative links. However, in order to harmonise the use of online media, it is important to provide some guidance.

In general, all partners are requested to rely on the MaxH2DR's branding toolkit and logo to ensure a consistent presentation of the project across different online tools. In addition, all publications and other materials made available online will:

- display the EU emblem
- include the following text "This project has received funding from the European Union under grant agreement NUMBER — 101058429 — MaxH2DR"

The project partners are also encouraged to use, in preference, LinkedIn and Twitter and to include the project hashtag #MaxH2DR in all their posts on social media related to the project. To benefit on existing trends, the partners are also invited to use other emerging hashtags to join topic-specific conversations (such as for instance #CleanSteel, #hydrogen, etc.).

The number of connections/followers/ likes is easy to identify, however social media analytics will be of more use to the consortium, in terms of identifying the followers' country of origin, gender, occupation and interaction with the posts. These data will help evaluate, adjust and refine the MaxH2DR communication and dissemination strategy to better engage the target audience.

3.3. LinkedIn

The MaxH2DR project LinkedIn page is available via this link:
https://www.linkedin.com/company/maxh2drproject

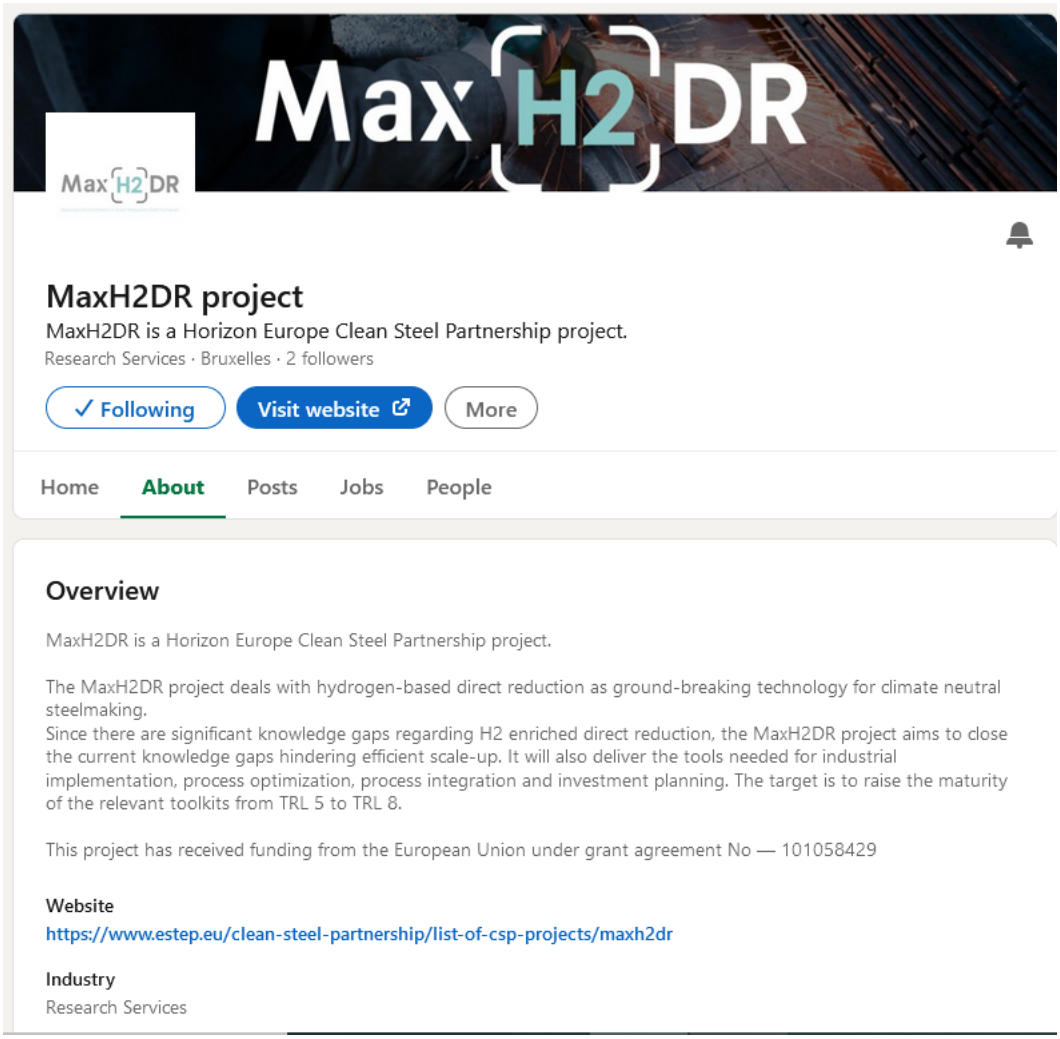


Figure 9: LinkedIn home page

3.4. Twitter

The MaxH2DR project Twitter account is accessible via this link: https://twitter.com/MaxH2DR

Figure 10: Twitter home page

3.5. ResearchGate

ResearchGate is a European commercial social networking site for scientists and researchers [2] to share papers, ask and answer questions, and find collaborators.[3] According to a 2014 study by Nature and a 2016 article in Times Higher Education, it is the largest academic social network in terms of active users[1] [2].

While reading articles does not require registration, people who wish to become site members need to have an email address at a recognized institution or to be manually confirmed as a published researcher to sign up for an account. Members of the site each have a user profile and can upload research output including papers, data, chapters, negative results, patents, research proposals, methods, presentations, and software source code. Users may also follow the activities of other users and engage in discussions with them.

Being ResearchGate very spread and widely recognised in the academic and scientific community, a group named "MaxH2DR" has been established by SSSA on the ResearchGate platform, involving all the participants to the research activities developed by the different beneficiaries, to the aim of coming into discussion with other interested researchers and increasing the visibility of publications produced in the project.

The MaxH2DR project ResearchGate account is accessible via the following link:

https://www.researchgate.net/project/GA-101058429-Maximise-H2-enrichment-in-Direct-Reduction-Shaft-Furnace-MAXH2DR

[1] Matthews, David. "Do academic social networks share academics' interests?". Times Higher Education. 2018. Retrieved 2016-04-22.
[2] Van Noorden, Richard "Online collaboration: Scientists and the social network". Nature, 2014. 512 (7513): 126–129.

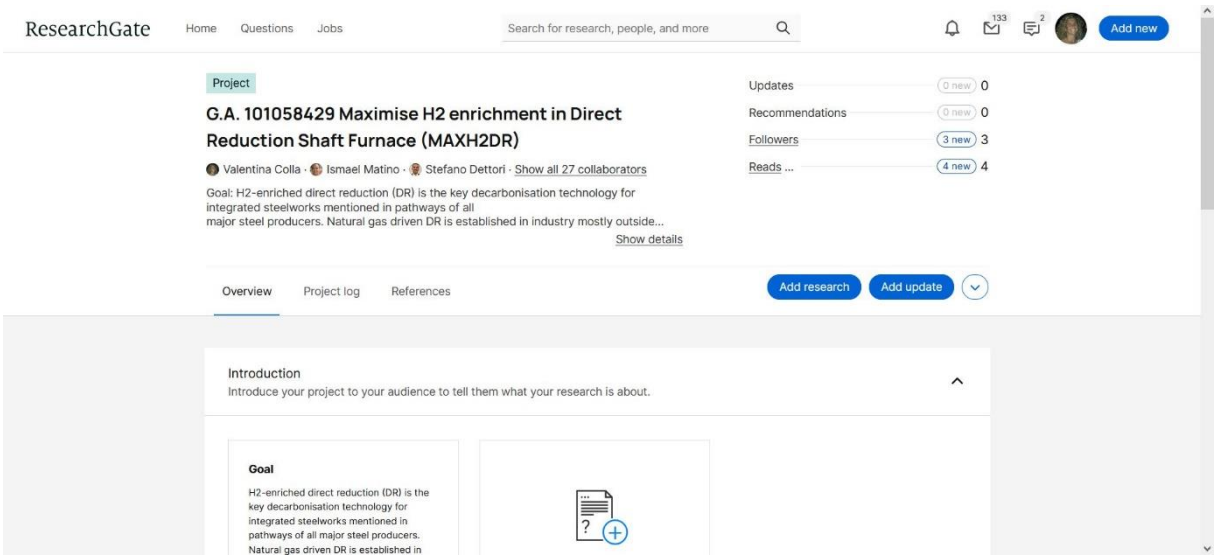


Figure 11: ResearchGate home page

4. Communication material

Using the MaxH2DR branding toolkit and design concept, an initial set of several dissemination and communication materials were already created in the first six months of the project. This is mainly the document (Fig.12) and presentation template (Fig.13), and other types of jointly used pieces such as banners and branded pictures (Fig.14). Other types of material including the newsletter template, posters, flyer, roll-up, and stickers will be further developed throughout the project.

4.1. Document Template

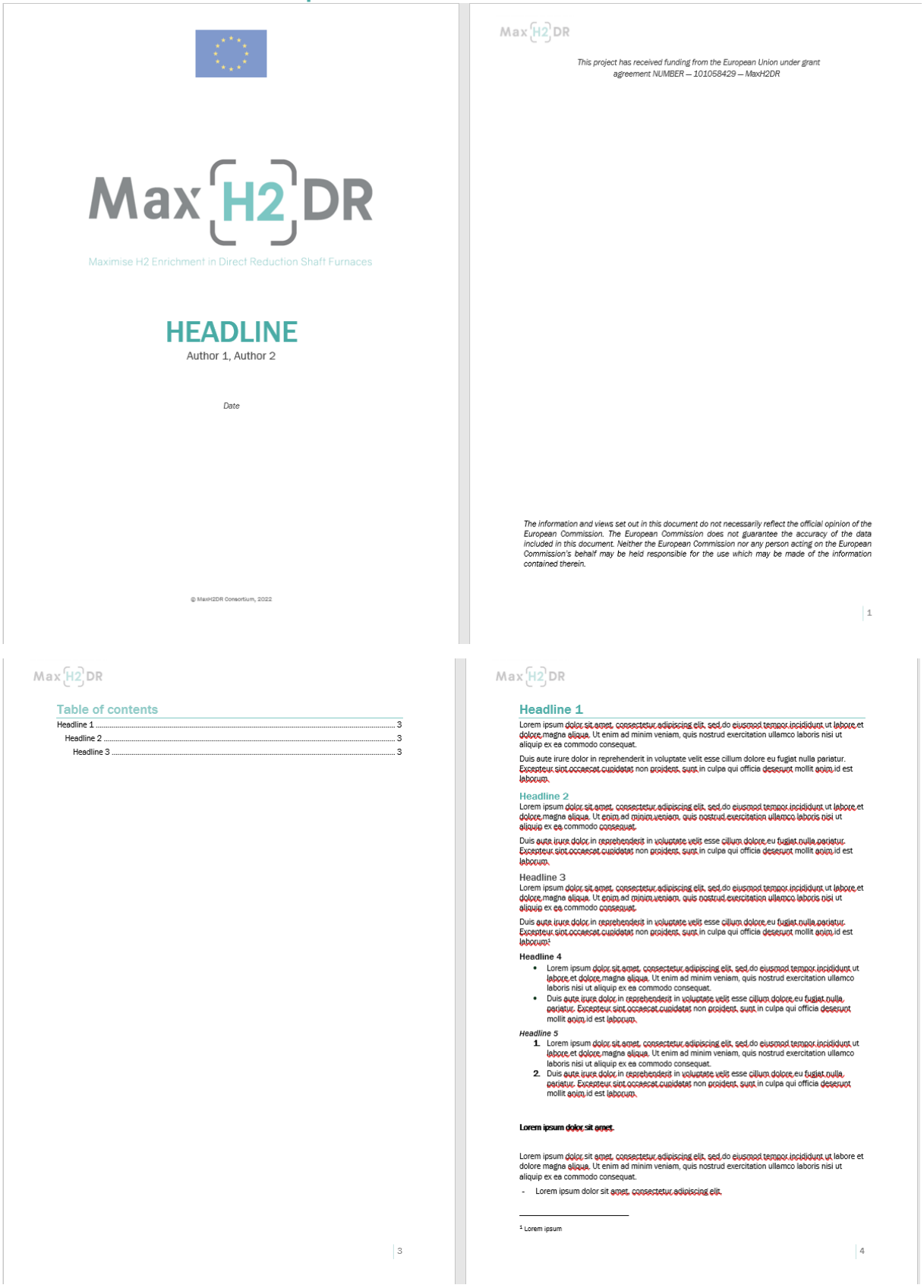
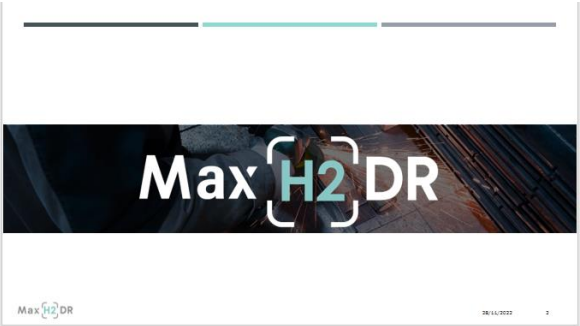


Figure 12: Word document template.

4.2. Slide Template

1



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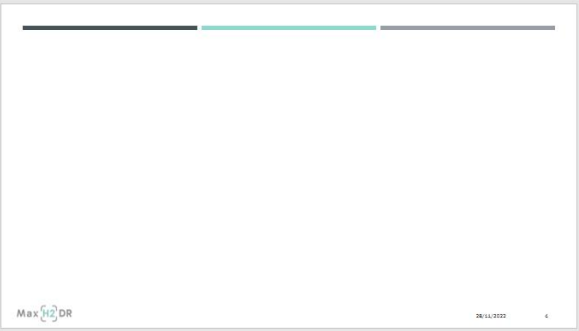

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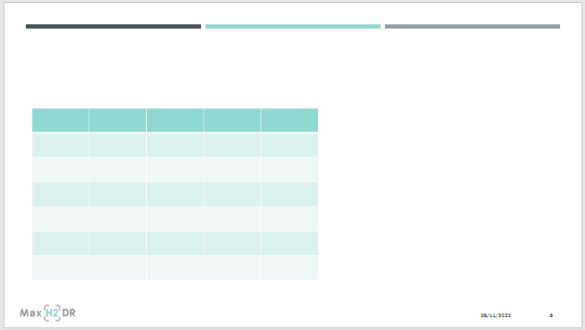

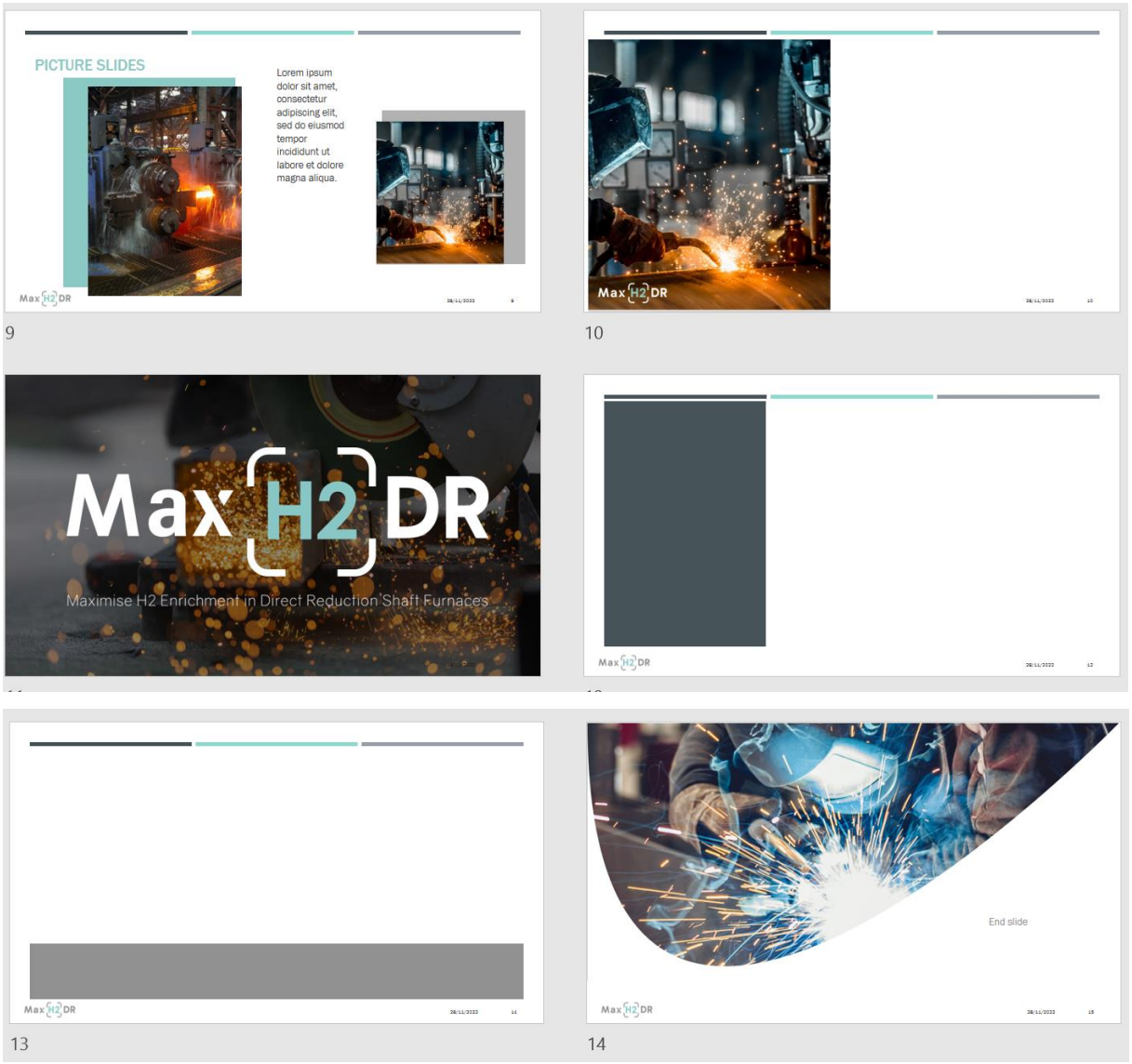

Figure 13: Powerpoint slide template

4.3. Newsletter Template

The project newsletter is a communication tool that will be used to share information about the project such as outcomes, publication of deliverables, events, etc. with the project members and their networks, stakeholders, and even beyond. The newsletter will also be utilised in order to maximise participation in events and foster engagement towards the project.

The project newsletters will be prepared and distributed by ESTEP through its in-house designed newsletter mailing system. However, as already mentioned, ESTEP is updating its website as well as the design of its newsletter which is linked to its website. Hence, since ESTEP is hosting the MaxH2DR website, the MaxH2DR newsletter template will be ready by beginning of 2023.

In order to gather the contents, the partners will be asked to provide short summaries of their work and key findings. The complete procedure is described in the dissemination strategy (see deliverable D4.2).

A PDF version of the project newsletters will also be available on the project website under the news section.

4.4. Banners and pictures

As part of the project brand identity, the use of attractive banners and pictures in the various communication tools and social medial channels is key to increase the project outreach. Further banners and branded pictures will be developed throughout the whole lifetime of the project.

Figure 14: Project banners & pictures

List of Figures

List of Acronyms and Abbreviations

Acronym	Full Name
ARIZ	Algorithm for innovative problem solving
BFI	VDEh-Betriebsforschungsinstitut GmbH
CSP	Clean Steel Partnership
DL	Deliverable Leader
DDP	Document Development Plan
ESTEP	European Steel Technology Platform
EU	European Union
IPR	Intellectual Property Rights
PCO	Project Coordinator
PNO	CIAOTECH s.r.l.
QM	Quality Manager
SSSA	Scuola Superiore Sant'Anna
TRIZ	Theory of inventive problem solving
UL	Université de Lorraine / University of Lorraine
WP	Work Package