

Pre-normative research for safety of hydrogen driven vehicles and transport through tunnels and similar confined spaces

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FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

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Summary

The present deliverable aims to analyse and to update the Dissemination, Communication and Awareness Plan (DCAP) of the HyTunnel-CS project. To perform this task, based on information collected from the partners of the project, the FHa with the support of IFA and NEN has developed a complete analysis of the first 24 months of the project.

This deliverable analyses and updates the target audiences identified in the initial version of the DCAP by introducing the firefighters schools and the Regulation, Codes and Standard (RCS) organizations. It has also adapted the main messages for the different actors, aiming to present a clear and positive vision of the project. Added to this modification, the HyTunnel-CS webpage is presented, by analysing its sections and by explaining what users may find in each of them.

Moreover, an analysis of the status of the National Networks is done, presenting the conclusion that further efforts need to be done in order to increase the National Network size. The synergies existent between HyTunnel-CS and other European or national projects is studied and possible action to boost collaboration among the projects is presented.

This deliverable also considers the current status of general actions as distribution of the newsletter, the dissemination activities and publications both performed and planned. Deviations due to COVID-19 are presented also in this report.

To achieve a wider dissemination of the HyTunnel-CS project, the connection with forums to participate is analysed, emphasizing the possibilities to participate or collaborate in the European Hydrogen Safety Panel (EHSP) or in normalization committees.

Finally, this report briefly studies which are the applicable KPIs for the dissemination strategy of the project. Even if the status of the dissemination strategy of the project is satisfactory, possible actions to improve are also presented.

Keywords

Dissemination, Communication, Awareness, Hydrogen, HyTunnel-CS, Hydrogen, Safety, website

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Nomenclature and abbreviation

CEN-CLC	<i>Comité Européen de Normalisation- Comité Européen de Normalisation Electrotechnique</i>
CTIF	<i>Comité Technique International de prévention et d'extinction du Feu</i>
D	Deliverable
DCAP	Dissemination, Communication and Awareness Plan
EHSP	European Hydrogen Safety Panel
FCH 2 JU	Fuel Cells and Hydrogen 2 Joint Undertaking
FHa	<i>Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón</i>
IFA	International Fire Academy
ISO	International Standardization Organization
JTC	Joint Technical Committee
NEN	Royal Netherlands Standardization Institute
RCS	Regulation, Codes and Standards
SAB	Stakeholders Advisory Board
TC	Technical Committee
VIN	Vehicle Information Number
WHEC	World Hydrogen Energy Conference

Definitions

Dissemination: to spread or give out something, especially news, information or ideas, widely.

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1. The HyTunnel-CS dissemination strategy (FHa, NEN, IFA)

The aim of the HyTunnel-CS project is to perform pre-normative research for safety of hydrogen driven vehicles and transport through tunnels and similar confined spaces (FCH-04-1-2018). The main ambition is to facilitate hydrogen vehicles entering underground traffic systems at risk below or the same as for fossil fuel transport.

The HyTunnel-CS dissemination strategy was presented in the D6.1 Dissemination, Communication and Awareness Plan (DCAP) [1]. The dissemination strategy evolves as far as the project is active, and an update is needed from time to time. This document presents the 2nd update of the DCAP, analysing the points to be considered and the activities carried out during the first 24 months of the project and presenting those planned until the end of the project.

The DCAP is a toolset that must be complementary to the outcomes resulting of the project developments, having the common goal of maximising the impact. Some of these tools remain stable on time as the logo of the project, but others need to be reviewed. Its main objective is to pass on the main messages to the determined audiences, especially those whose influence has been marked as “high”.

1.1 Determination of audiences

Stakeholders or interest groups are, from a broad perspective, any group or individual that may affect or be affected by the achievement of the project's objectives. For an adequate development of the same, it is possible to determine the following groups and interest, of which some fundamental criteria are exposed in terms of their management. The relevant information is summarized in the Annex I. Determination of audiences.

1.2 Communication messages about hydrogen and the HyTunnel-CS project

Below are some proposed messages for dissemination to the indicated audiences or others in the communication tasks that are carried out around the HyTunnel-CS project. These messages should be clear and appropriate as it has been remarked in previous meetings of the project.

A project as HyTunnel-CS needs to present messages in a clear way, trying to present the information in a way that can increase awareness in the end-users of the hydrogen technologies. The development of the project has shown that the most important messages are:

- The HyTunnel-CS project is carrying out critical analysis of effectiveness of conventional safety measures in tunnels and other underground transportation infrastructure.
- The HyTunnel-CS project is generating unique experimental data regarding the interaction of hydrogen with safety equipment and systems of underground transportation infrastructure using the best European hydrogen safety research facilities and real tunnels.

- The HyTunnel-CS project is creating deeper knowledge of the relevant physics to underpin advanced hydrogen safety engineering and develop innovative prevention and mitigation strategies.
- The HyTunnel-CS project is preparing harmonised recommendations for intervention strategies and tactics for first responders providing conditions for their life safety and property protection during accidents with hydrogen powered vehicles in tunnels, underground parking, etc.
- The HyTunnel-CS project is developing recommendations for inherently safer use of hydrogen vehicles in underground transportation systems. These recommendations will be shared with the RCS agents and the industry, to achieve a huge dissemination.
- The HyTunnel-CS project is producing commonly agreed, scientifically based recommendations for the update of relevant RCS and level up the safety culture of using hydrogen cars in general and especially in confined spaces.

Other important messages to communicate are, but not limited to:

- Hydrogen is a chemical element, very light and with a large amount of energy per unit mass. From the point of view of energy use, it allows to store large amounts of energy from any primary energy source.
- Hydrogen is as safe as any other industrial gas when it is handled properly by trained personnel.
- Hydrogen vehicles that are already marketed are approved and have passed all safety tests.
- The results of HyTunnel-CS go beyond the duration of the project and it is planned to establish mechanisms so that the cooperation experiences developed not only with manufacturers but also with first responders last in time.
- The HyTunnel-CS project is developing further existing and new contemporary computational fluid dynamics and finite element models, simpler engineering correlations of relevant physics models, hazard and risk assessment tools; validate them against generated experimental data for use as predictive tools for safety design.
- The HyTunnel-CS project will reduce over-conservatism thanks to the scientific work which is carried out during the project.

- The HyTunnel-CS project is supported by stakeholders as universities, manufacturers, industrial actors and regulation codes and standard actors.

1.3 Audiences reached

Analysing a first estimation presented in M18 of the estimated number of people reached by the project, it can be concluded that HyTunnel-CS consortium is disseminating efficiently the outcomes of the project. With an amount of near 3400 person reached, the project will increase the number of stakeholders reached thanks to events as the final dissemination conference (M36) and other scientific activities as the participation in conferences.

Table 1. Audiences reached by the HyTunnel-CS project

Type of audience reached in the context of all dissemination & communication activities	Estimated Number of people reached
Scientific Community: Newsletter receivers	1551
Scientific Community: Attendants to Int. Symposium on Hazards, Prevention and Mitigation of Industrial Explosions	30
Scientific Community: Attendants to the Danish Fuel Cell Day 2019	100
Industry: Attendants to the workshop regarding trains SFEM	50
Industry: Attendants to the Stakeholders Workshop	200
Industry: National networks members	53
Industry: Stakeholders Advisory Board Members	13
Policy Makers	20
General Public	1332
PRELIMINAR TOTAL	Almost 3400

2. Webpage analysis (FH_a)

With a simple and already operational approach, the HyTunnel-CS webpage (<https://hytunnel.net/>) is one of the main dissemination tools of the project. It is being maintained with contributions from all partners, who have a link in their respective web pages to HyTunnel-CS to disseminate, ensure its visibility and improve its Search Engine Optimization. The maintenance of the project webpage covers the project development time and two additional years after its finalisation. During this period, the public deliverables will be available in the webpage.

Based on the roles of the HyTunnel-CS website presented in the D6.1 [1], the webpage has been created with the section's structure presented in Figure 1:

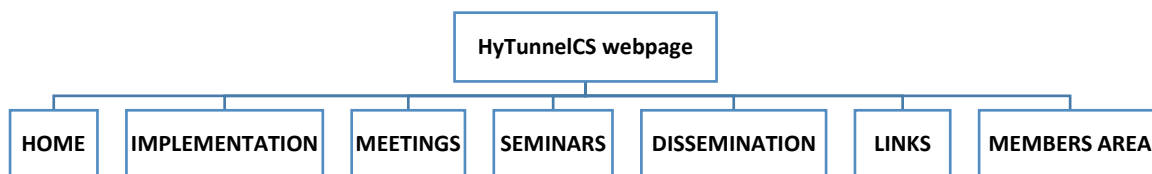


Figure 1. Webpage main structure

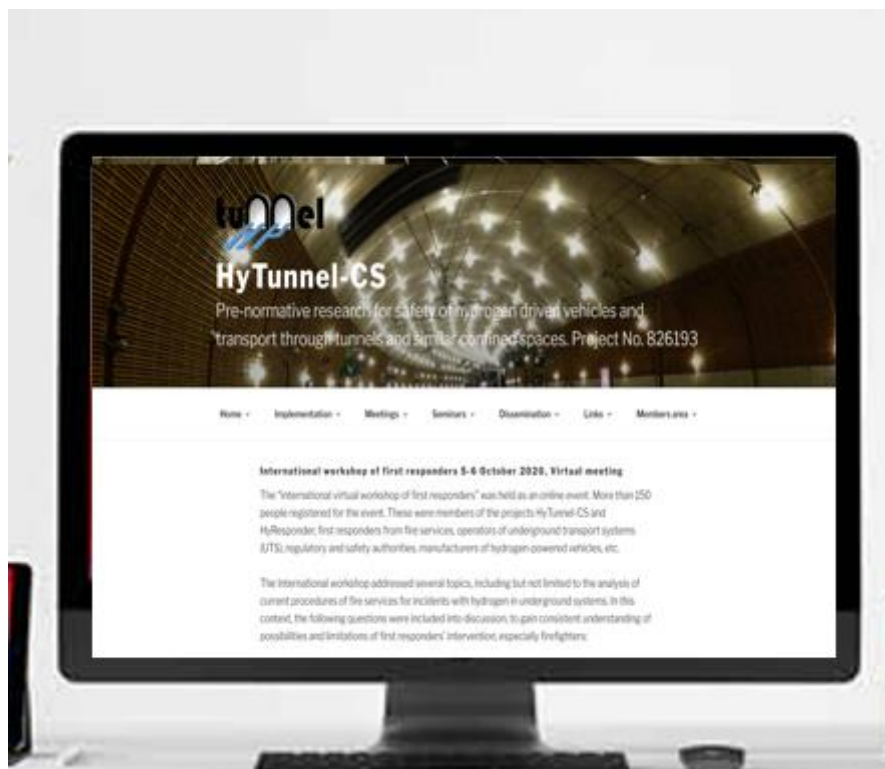


Figure 2. Webpage appearance

- **IMPLEMENTATION:** This section has detailed information about the project structure of the project, with sub-sections dedicated to each work package of the project. Additionally, this section presents the list of deliverables of the project (with links to the public ones that are already approved) and the list of project milestones.
- **MEETINGS:** This section presents the list of project meetings, with the venue and dates. In addition, for each of the meetings already held, an informative note has been created, with a summary of the meeting.
- **SEMINARS:** This section details which are the seminars planned during the project. For each of the seminars there is a sub-section with information about the event as the venue and the planned structure of the event.
- **DISSEMINATION:** In this section, the objective is to inform the webpage user about general news about tunnels and safety (News Feed section), give access to the newsletters and present the recommendations for different actors arising from the HyTunnel-CS project in the future.
- **LINKS:** This section provides a well-developed list of useful links for the user covering different topics as Hydrogen Safety, Associations, RCS, Projects, Databases, Vehicles and Fuelling Stations and Education topics.
- **MEMBERS AREA:** This section allows the HyTunnel-CS project partners and Stakeholders Advisory Board (SAB) members of the project to share data and reports in a safe way. The access to this section is only available with a user and password account.

Thanks to the use of Google Analytics, it is possible to evaluate the operation of the webpage and obtain valuable information. The use of Google Analytics was set at the beginning of M11 so the information presented only represent 12 months of the project.

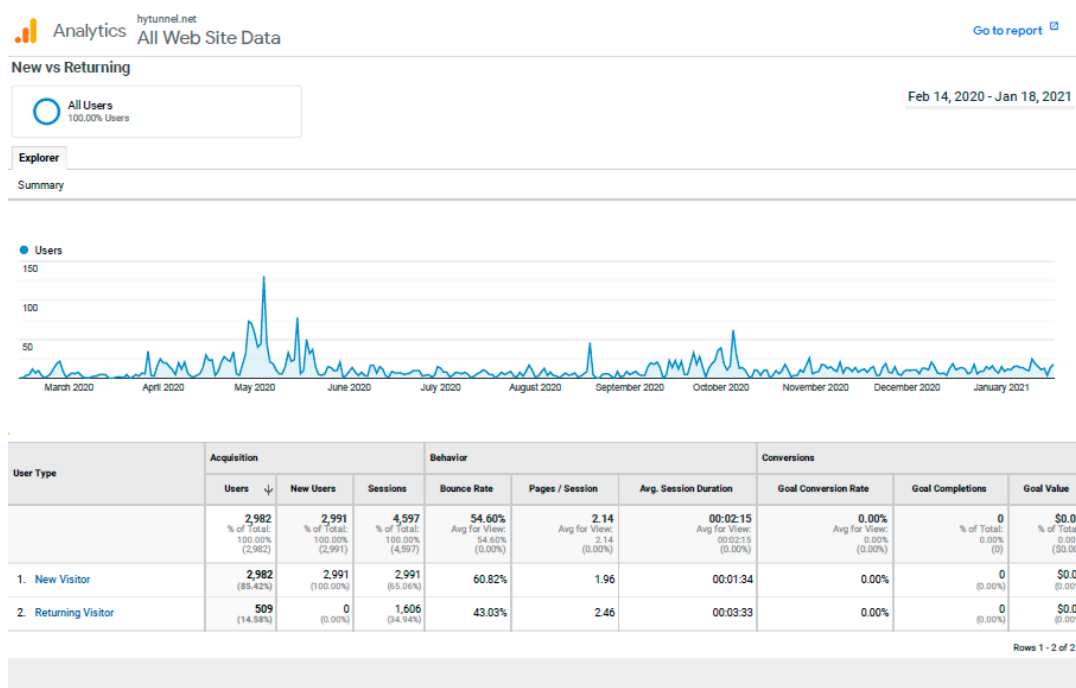


Figure 3. Analytics Dashboard

2.1 Users and unique users, captation vs fidelitation

The HyTunnel-CS Google Analytics report shows how relevant is the site for the user targeted. 4.587 sessions have been tracked along this year and 2.982 unique users. The values obtained are under the average expected for this kind of website.

It is important to attract new users and keep old ones coming back. In this case, it is positive to see how those who visit the site return. This again demonstrates that the content is relevant and is building user loyalty.

2.2 Bounce rate, page/session and average duration.

One of the rules of SEO is that Google values the engagement of users when visiting a page, understanding that the most consulted pages offer more quality to the user. As Google always wants to offer quality search results, logically pages with more engagement will have more points to be positioned at the top of the search results. The bounce rate is the percentage of single-page sessions, e.g., sessions where the user has left your site at the entry page without interacting with it.

The bounce rate figure is 43%. The average should be between 40-60%. In this case is positive, being a value below 50% considered as OK. Page/session figure is 2,14 which means the user interacts with the site, spending more than 2 minutes browsing and reading relevant content.

2.3 Users interaction, main milestone

In this case the timeline shows how the Stakeholders' Workshop celebrated in May had a stunning impact in terms of number of sessions. It means that communication and dissemination activities to promote the event were successful. Other occurrences of high number of users are near October, when the dissemination for the IFA's workshop was performed.

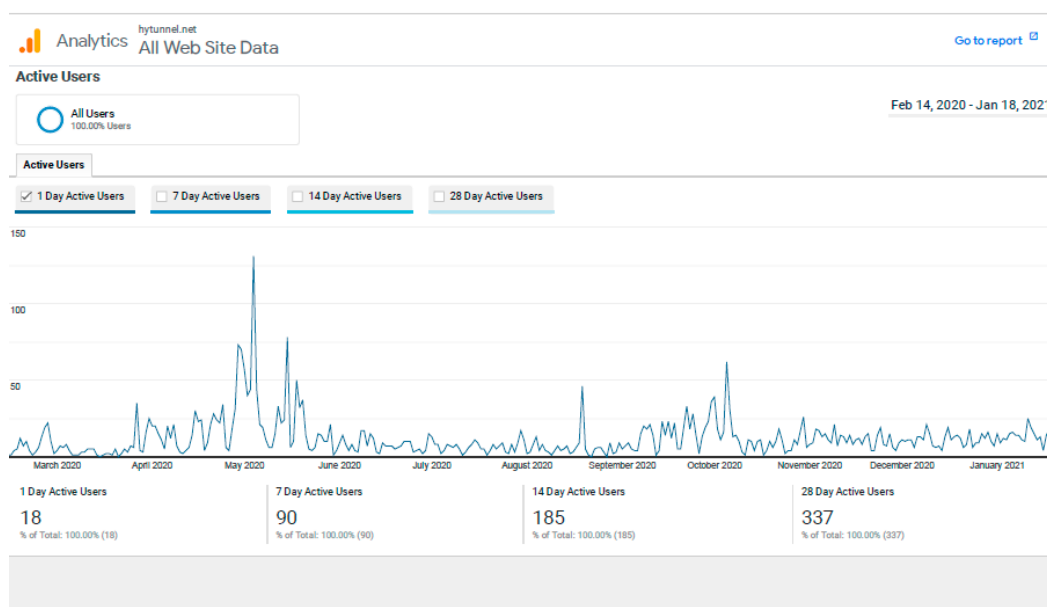


Figure 4. Analytics Dashboard

2.4 Users flow

The User Flow report is a graphical representation of the paths that users took on the website: the source from which the users arrive, the different pages they visit, and the point at which they leave your site. With the User Flow report traffic volumes from different sources has been compared and website's effectiveness has been shown. In this case, it is relevant to know that a global audience has been reached thanks to the all the consortium efforts. This audience dashboard represents where our opportunities for growth lie.

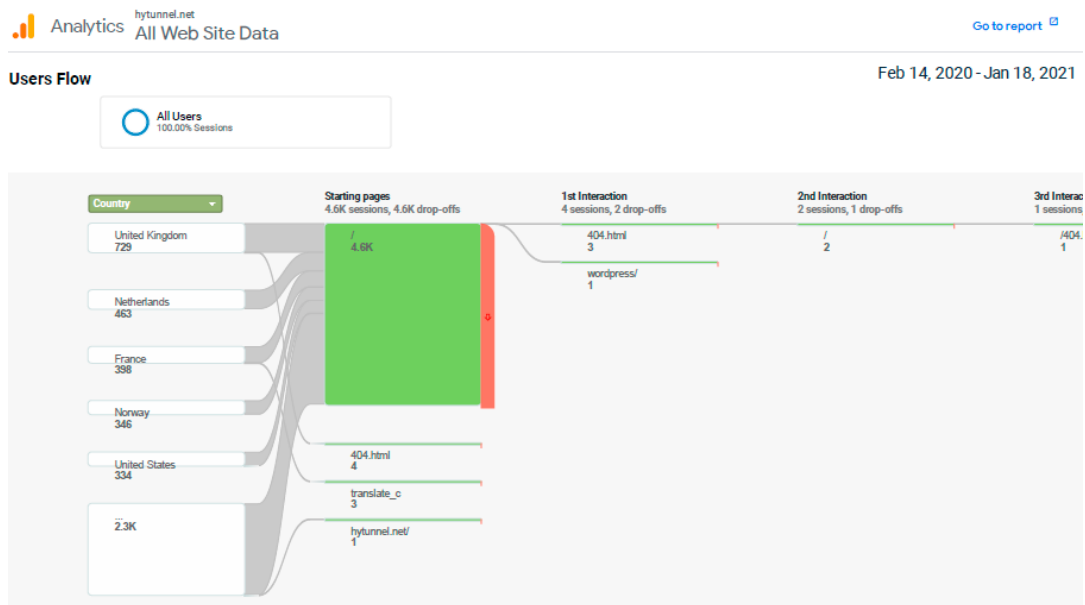


Figure 5. Analytics Dashboard

3. National networks (FHa, NEN, IFA)

The National Networks is the base for a wider dissemination of the project. There are currently 53 representative members in the database. To develop the database, several reminders have been sent out to project partners. As the Figure 6. National Networks distribution per country shows, there is a variety in the nationalities enough that should be able to disseminate effectively the information raised by the project.

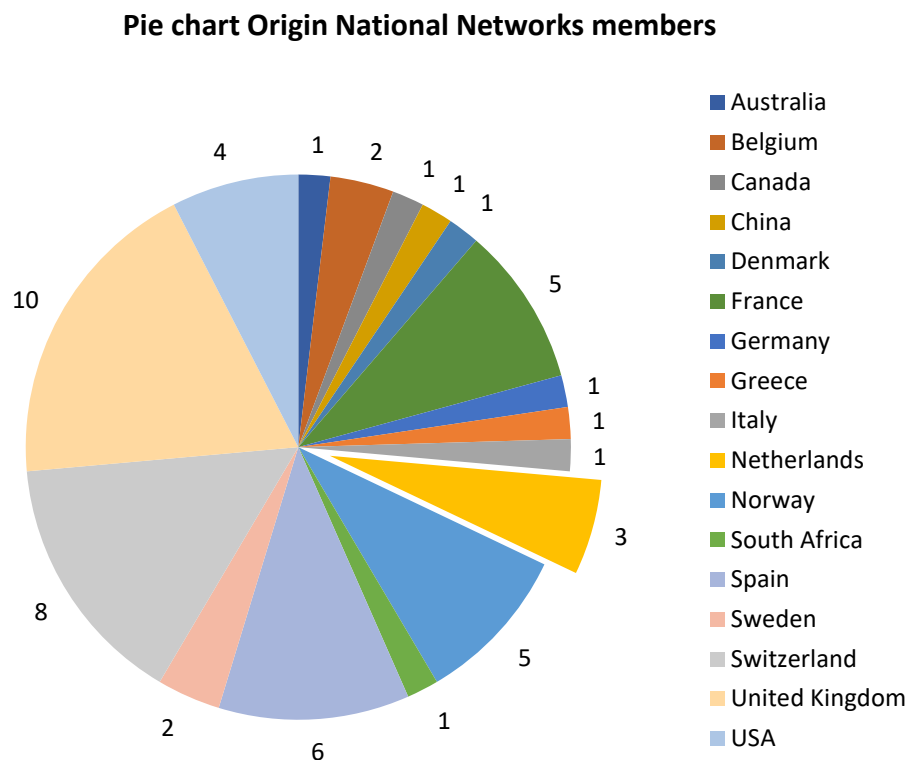


Figure 6. National Networks distribution per country

Due to the Data Protection Regulation, the process to become member of the National Network was modified. The national partner must share the document presented in the Annex I with the potential National Network member and a representative member of this entity should send the document filled to the WP6 leader (FHa) to fulfil the register.

Specific areas are covered by the National Networks members. As an example, information raised from the firefighters' perspective said that in most countries fire services are municipal organisations. Thus, the *Comité Technique International de prévention et d'extinction du Feu* CTIF will not be suitable for deep dissemination, although they would be happy and willing to do so, increasing the dissemination within relevant actors.

Most important way of dissemination with firefighters will be via the fire academies which are run by regions or federal states. Thus, HyTunnel-CS should address mainly the fire academies. They will be willing to provide specific information on hydrogen issues for first responders via their websites, which will be the potential members for the national networks.

4. Synergies with other projects (FHa)

Since HyTunnel-CS is a project of the FCH2 JU and is aligned with the different existing national initiatives in Europe in relation to hydrogen mobility, working meetings should be promoted with these entities and with relevant projects that are already underway in the European Union like, HyLaw, H2Me, etc.

The HyTunnel-CS collaborates closely with the International Association for Hydrogen Safety and the EHSP; both promoting and disseminating hydrogen safety culture, within and outside the FCH2 JU.

Members of the Stakeholders Advisory Board belonging to other projects or entities and has shown their interest in the outcomes of this project in several times (as an example, the participation of RISE Norway in the SAB was set thanks to the dissemination of the project through SH2IFT project. A researcher from that institution is also developing task in NCSR Demokritos)

Moreover, during the HyTunnel-CS project development, several projects with possible synergies have been detected. The possible synergies are presented below:

PRESLHY

Pre-normative Research for Safe Use of Liquid Hydrogen (<https://preslhy.eu/>)

PRESLHY is an FCH2 JU co-funded project (Grant Agreement No 779613) which aims to address pre-normative work for the safe use of liquid (cryogenic) hydrogen as an energy carrier, by identifying safety critical areas where knowledge gaps exist, and specific standards are needed. Those gaps will be closed by developing and validating new appropriate models and engineering correlations.

This project is coordinated by the Karlsruhe Institute of Technology from Germany and 5 out of the 9 project partners are also HyTunnel-CS members. Moreover, some project partners belong to the HyTunnel-CS SAB. It is expected thus that the outcomes of this project may be shared to the HyTunnel-CS project and all the collaboration possibilities will be promoted (participation in events or use of both communication networks).

HyResponder

European Hydrogen Train the Trainer Programme for Responders.

The aim of this FCH2 JU project (Grant Agreement No 875089) aims to develop and implement a sustainable “train the trainer” programme in hydrogen safety for first responders. This project is coordinated by the University of Ulster and it is expected that the outcomes of the HyTunnel-CS project will be used during the HyResponder project development, as long as the safety issues and work with firefighters and first responders is being already performed by the HyTunnel-CS project.

Potential communications and participation on events, added to the information shared from the HyTunnel-CS project towards HyResponders should be the actions to perform. Additionally, as it has been stated in the National Network section, the participation in this project of firefighters’ schools will be the best way to promote the results among the firefighters.

A good example of the synergies between both projects is the collaboration and participation of the HyResponder members in the workshop led by IFA in October. Moreover, based on the common coordination (UU) in both projects, the synergies will be boosted at its maximum level.

5. Newsletters (FH*a*)

Visitors to the HyTunnel-CS website can sign up for a newsletter which will give regular updates, develop HyTunnel-CS profile, and achieve wider stakeholder recognition. It uses examples from HyTunnel-CS activities, interviews with project ‘champions’, quotes from end users and will highlight HyTunnel-CS success and linked opportunities. The three newsletters sent so far have achieved good results: more than 70% open rate because the database of stakeholders and interested parties is very accurate.

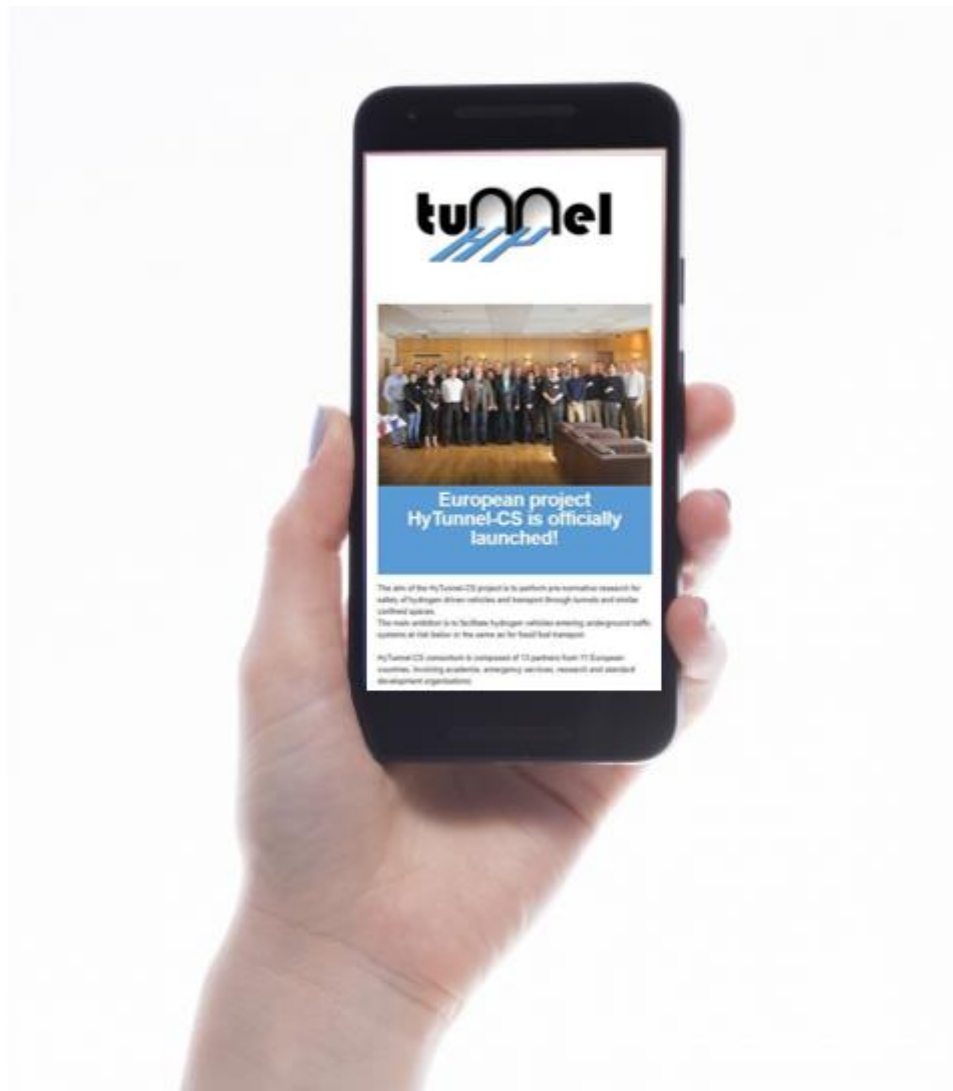


Figure 7. First newsletter sent



Figure 8. Second newsletter sent

The third newsletter was sent in September 2020 regarding the International Workshop of First Responders that took place in October 2020. This special issue of the newsletter encouraged the recipients to participate virtually in the meeting, helping to disseminate the event.



Figure 9 Third newsletter sent

According to the first version of the DCAP, the newsletter was supposed to be sent twice a year. However, after the assessment of the consortium, it has been decided that one newsletter per year is a more attainable goal and can also meet the communication objectives.

The fourth newsletter is planned to be sent at the beginning of 2021. The content to consider will be a summary of the 2020 year and the COVID situation with the main events IFA's WS/ Stakeholders WS and how COVID-19 affected the project?

Moreover, highlights of the main events coming soon will be also presented. Contribution from all partners is expected, as it has demonstrated to be the most effective way to disseminate the project.

6. Publications and dissemination activities already performed & forthcoming actions (FHa, NEN)

Since the HyTunnel-CS project has been developing for two years, the number of dissemination activities has been growing.

Being true that COVID diffculted the participation in oral events, the project has performed during the last two years a relative high number of participations in events. An extract of the participations in events is presented below these lines. It should be noted that further events are expected in the coming months, being a fact that the results of the project will be available at the end of the project.

Table 2. List of events and participation from the project partners

Conference, congress, etc.	Name of the publication	Date of issue	Place	Author(s)
The danish hydrogen- and fuel cell day 2019 (<i>den danske brint og brændselscelledag</i>)	Overview of the HyTunnel-CS project	19 October 2019	Denmark	Frank Markert (DTU)
H2FC Supergen Hydrogen Research Conference 2020	Influence of nozzle shape on hydrogen-air mixing for high pressure hydrogen jet	17-18 February 2020	University of Nottingham, UK	V. Shentsov, H. Takeda, K. Takeno, D. Makarov, V. Molkov
H2FC Supergen Hydrogen Research Conference 2020	Explosion-free in a fire composite hydrogen storage tank	17-18 February 2020	University of Nottingham, UK	V. Molkov, D. Makarov, S. Kashkarov
H2FC Supergen Hydrogen Research Conference 2020	Numerical study of instantaneous high-pressure hydrogen release in a tunnel	17-18 February 2020	University of Nottingham, UK	W. Dery, V. Shentsov, S. Kashkarov, D. Makarov, V. Molkov
World Hydrogen Energy Conference (WHEC 2020)	Breakthrough safety technology of explosion free in a fire tank for compressed gaseous hydrogen storage	July 5-9 2020	Istanbul Turkey	V. Molkov, S. Kashkarov, D. Makarov,
CISAP9	Spatial and Radiative Characteristics of Large-Scale Hydrogen Jet-Fires	20-23 September 2020	Venice Italy	Russo P., Marra F., Mazzaro M., Pilo F., Marini D., Vianello C., G. Pucci
Workshop Trains SFEM	SFEM Presentation about the requirements on hydrogen trains.	30 June 2020	Conference call	Mike Lipscomb
IA Hydrogen Safety Research priorities workshop	Progress in safety research in tunnels and confined spaces	26-30 October 2020	Conference call	D. Makarov, V. Molkov (on behalf of the project partners)
Dutch Tunnel Platform (KPT)	Presentation at the Dutch Tunnel Platform	27 January 2021	Conference call	Vladimir Molkov, Christian Brauner and Janwillem van den Berg
Girls in technology	Presentation of the HyTunnel-CS project by USN partner	3 February 2021	Conference call	Agnieszka Lach
Internal HyTunnel-CS meeting with car OEMs	Presentation of the HyTunnel-CS project	9 February 2021	Conference call	D. Makarov, A. Bernad (on behalf of the project partners)

7. Possible forums to participate (FH_a, NEN, IFA)

The participation of the HyTunnel-CS project partners in forums should be a tool to disseminate the results and good practices of the project. As an example, directly linked with firefighters where there are many wrong ideas outside the firefighter's community, the participation should promote a reliable and valuable information exchange.

Examples of these wrong ideas are:

- Many people think we would be able to do proper measurements at the scene which is impossible to do indeed.
- On the other side many people think firefighting is very dangerous which is not if you do it in a proper way.
- Swedish experts on fire protection just proposed to fill oxygen in the bottles of breathing apparatuses to enable firefighter to stay longer at the fire front. Pure oxygen would kill the firefighters.

Based on this issue related with firefighters, it might be helpful to inform scientists and engineers about the results of HyTunnel-CS regarding first response as well as the first responders alone.

From a wider dimension, this information flow may be performed thanks to the participation on safety forums. Among these possible forums, the HyTunnel-CS could be of special interest for the **EHSP**.

The EHSP, launched by the FCH2 JU in 2017, aims to promote and disseminate hydrogen safety culture within and outside of the FCH 2 JU programme. This panel is composed by a multidisciplinary pool of safety experts grouped in task forces according to their expertise. As long as the leader of the Task Force 1 and other members of the EHSP are members of the HyTunnel-CS consortium, it can be assumed that the information raised from this project will flow towards this panel.

Added to these international forums and conferences, and linked with the expected actions linked with RCS, the partner Royal Netherlands Standardization Institute (NEN) has identified the forum **CEN/CLC/JTC6 Hydrogen in energy systems**. Last efforts in this direction aim to include the CEN/JT6 as an SAB member also, to increase the alignment between the project and the normalization body. There has been made a formal decision by JTC6 to join the SAB. The membership is now at the formalizing stage, looking for the proper way to do it.

This Joint Technical Committee (JTC) of the European Committee for Standardization (CEN) deals with standardization in the field of systems, devices and connections for the production, storage, transport and distribution, measurement and use of hydrogen from renewable energy sources and other sources, in the context of the European strategy for the development and acceptance of the hydrogen market. The scope includes cross cutting items such as: terminology, Guarantee of Origin, interfaces, operational management, relevant hydrogen safety issues, training and education.

JTC6 meets biannually in March and October in Brussels. Because some of the HyTunnel-CS partners are also active members of JTC6, including NEN as secretary and HyTunnel-CS

project coordinator Prof. Vladimir Molkov of Ulster University as member, it would be relatively easy to give a presentation/input on the HyTunnel-CS Project in JTC6.

8. Workshops and events (FH_a, IFA)

HyTunnel-CS will use opportunities to deliver workshops at events to gather feedback from participants or from experts on issues. However, due to the COVID-19 pandemic situation around the globe, the initial plans have been adapted to the online way, allowing thus the realization of the events, with small delays in some situations due to organization matters.

Moreover, a close cooperation will be established with relevant national and international projects ensuring networking activities and knowledge sharing. During the first period of the HyTunnel-CS project, the 10th of September 2019, in Karlsruhe, Germany took place the “**Internal seminar on knowledge and technology exchange**” chaired by Christian Brauner from International Fire Academy (IFA) where several topics as the existing strategies, tactics and procedures, and scenarios were discussed.

The notes of the seminar are included in the D5.1 “Report on existent intervention strategies and tactics for first responders” [2]. A general conclusion based on the outcomes of the project from the firefighters’ perspective is that there is no need to organize specific workshops for hydrogen issues.



Figure 10. Special pillars for providing access to the batteries in the bottom of an electrical vehicle (TESLA M3).

Other events performed are the stakeholders’ workshop, the IFAs’ workshop. The final dissemination conference is planned for the M36.

8.1 Stakeholders Workshop

HyTunnel-CS had scheduled a Stakeholders Workshop in Rome on 4-5 May 2020. The aim of the workshop was to present the results and advances of the project to the industrial and the academic collaborators and users.

As the pandemic situation started to cross Europe in February, the workshop was held online by Google Meets. The available information about this event is already available on the project website ([Stakeholders' Workshop – HyTunnel-CS](#))

The workshop was announced on:

- HyTunnel-CS website (news section: https://hytunnel.net/?page_id=33)
- Social media. All publications include the #HyTunnelCS hashtag
- Twitter: https://twitter.com/search?q=hytunnelcs&src=typed_query
- Facebook: https://www.facebook.com/search/top/?q=%23hytunnelcs&epa=SEARCH_BOX
- LinkedIn: <https://www.linkedin.com/feed/hashtag/hytunnelcs/>
- The project's newsletter: <https://mailchi.mp/b48948a0afcc/hytunnel-cs-newsletter-2572726>
- Several emails sent to the project consortium, SAB and NN.

The workshop attracted more than 220 people from Europe, United States, Canada, and Australia registered for this event. This workshop brought together:

- tunnel authorities,
- tunnel managers and designers,
- tunnel operators and safety officers such as first responders,
- hydrogen-powered vehicles manufacturers and developers,
- hydrogen delivery transport developers and manufacturers,
- universities and research centres,
- associations (e.g., American Hydrogen Association, HySafe),
- and other participants.

In total 27 presentations were held: 3 presentations in the opening session, 22 technical presentations from the partners of the project and 2 presentations from stakeholders. It can be concluded that the workshop was an overall success, thanks to the leadership of the partners from URS.

8.2 International workshop of first responders held by IFA

The international workshop of first responders was held on 5-6 October 2020. The name of the workshop was changed to workshop of emergency services as not only first responders, but the organisations as a whole were addressed.

Originally the workshop was planned as “international workshop with participation of experts from fire services, police services and rescue services”. Due to COVID-19, the on-site event planned for May 2020 was not feasible. Instead, the workshop was held as an online event.

8.2.1 Participants of the workshop

The workshop counted 102 participants. These were actors of the projects HyTunnel-CS and HyResponder as well as members from fire services. Representatives also included operators of underground transport systems as well as regulatory and safety authorities and manufacturers of hydrogen-powered vehicles.

Originally, paramedics and police officers were to be invited to the workshop in addition to firefighters. However, it soon became apparent that these two target groups have so far shown little interest in the topic of incidents involving hydrogen-powered vehicles.

Only the issue of safety distances is likely to be of great importance to the police. After all, it will be the task of the police to evacuate people from the endangered areas. Here however the police forces will follow the recommendations and defaults of the fire services. Due to similar reasons and the importance of their involvement as first responders dealing with hydrogen-related issues, the major number of attendants were firefighters.

8.2.2 Goals

The goals of the workshop were firstly to have a better common understanding of the tasks, options, and limitations of first responders, especially firefighters. Secondly, the workshop served to identify open questions, especially from firefighters to the scientists involved in the project. Both goals were achieved by sharing knowledge on established operational firefighting tactics for underground transport systems and by solving tabletop scenarios together.

It was not the intention of the workshop to formulate conclusive, generally valid recommendations for the management of incidents involving hydrogen-powered vehicles at that stage. This will only be possible after the issues raised in the workshop have been solved.

8.2.3 Conduct of the workshop

The online workshop took place over two half days (one afternoon, one morning). The first half day focused on knowledge and experience sharing. The second half day was used to discuss basic tactical issues. Speakers were scientists from the HyTunnel-CS project and experts from fire services and fire academies.

More information is available on the HyTunnel-CS webpage [International workshop of first responders 5-6 October 2020, Virtual meeting – HyTunnel-CS](#)

8.2.4 Outcomes of the workshop

One of the main findings of the workshop was that technologies like TPRD-less tanks would significantly reduce or even eliminate many risks of hydrogen-powered vehicles. For many

participants of the workshop this was a completely new perspective for the future. This gave the impression that in some cases problems were discussed which, thanks to innovative technology, could no longer pose serious problems. At the same time, it became clear that despite these innovative security technologies, specific hazards will remain.

Regardless the prospect of significantly safer hydrogen vehicle technologies in the future, the workshop participants concluded that most incidents involving hydrogen-powered vehicles can probably be handled in a similar way to conventional powered vehicles. However, there are some special properties of hydrogen-powered vehicles that must be considered, e. g., how to detect and handle a hydrogen jet flame.

From the point of view of the fire services, it is therefore of the utmost importance for the future to ensure that the first responders receive information about the type of fuel involved as early as possible. This would be technically feasible if the Vehicle Information Number of the vehicles involved were automatically transmitted to the fire brigades by radio or could be read out by them.

8.3 Dissemination Conference

Dissemination Conference will take place in Brussels in M36 and it will be organised by FH_a. The main objectives of the conferences are:

- Presenting results and outcomes of the 3-year-action to the stakeholders, including Hydrogen Europe members, FCH₂ JU officers, European Commission representatives.
- Inviting Mass media communication to reach a wider audience and achieve a great impact.

Along the session will be presented the following topics:

- Results and advances of the project to the industrial and the academia collaborators and users.
- Feedback session to account and follow up the improvement of activities in the rest of the project.

The initial idea is to start the presentations with the recommendations developed within the project, and, after that, present the scientific foundation behind the recommendations.

The Dissemination Conference is tentatively scheduled for 17th February 2022 being hold jointly with the celebration of the project end and joint GA and SAB meeting, ideally one day after. To maximize the impact and attendance, partners will consider the opportunity to hold these two events in Brussels close to relevant events at EU level.

To maximize the impact of the Conference a full 360° Communication Plan will be developed to reach audience through different channels such us: website, press, and social media networks belonging to the consortium.

For the conference, print material might be developed such us: flyers, roll-ups, etcetera.

9. Collaboration with standardization committees (NEN, IFA)

There are several possibilities for collaboration with standardization committees to provide inputs from the project to Technical Committee's (TC):

- **CEN/CLC/JTC6 Hydrogen in energy systems, WG 3 “Hydrogen Safety”**

One of the tasks of this WG is to provide a technical report on safety in confined environments related to mobility, using relevant input from the HyTunnel-CS project. In its task, the WG has declared to follow up on the work of the HyTunnel-CS Project.

- **CEN/TC 268 - Cryogenic vessels and specific hydrogen technologies applications**

The scope of this TC lies in the field of insulated vessels (vacuum or non- vacuum) for the storage and the transport of refrigerated liquefied gases, concerning the design of the vessels and their safety accessories, gas/materials compatibility, insulation performance, and the operational requirements of the equipment and accessories.

- **CEN/TC 23 Transportable gas cylinders**

The scope of this TC lies in the field of transportable gas cylinders, their fittings, and requirements relating to their design, testing and operation.

- **ISO/TC 197 Hydrogen technologies**

The scope of this TC lies in standardization in the field of systems and devices for the production, storage, transport, measurement and use of hydrogen.

- **International Energy Agency Hydrogen Implementing Agreement (HIA), Task 37 Hydrogen Safety (2015-2021)**

The work plan and objectives of this task are designed to support the acceleration of safe implementation of hydrogen infrastructure through coordinated international collaborations and hydrogen safety knowledge dissemination.

- **United Nations Economic Commission for Europe - Global Technical Regulation #13 Hydrogen and Fuel Cell Vehicle Safety (UN ECE GTR #13 HFCVS)**

This regulation specifies safety-related performance requirements for hydrogen-fuelled vehicles and aims to minimize the risk of serious injury due to fire, burst or explosion related to the vehicle fuel system.

The above-mentioned committees have been contacted by NEN for possible collaboration or to provide them with input from the HyTunnel-CS project, to ensure the sustainable implementation of the project outcomes.

Added to these standardization committees and linked with the needs faced by the first responders, the HyTunnel-CS project should consider also the possibility of the introduction of data transmission technology for optimizing the **ISO 17840 “Road Vehicles-Information for emergency responders”**.

The most important information of all for firefighters is that there is a hydrogen incident. Since incidents with liquefied petroleum gas or natural gas are at least partially similar, information

is needed as to whether a gas-powered vehicle is involved. This information is obviously relevant. Without information about the drive type, an incident specifically correct action of the first responders will not be ensured; however, this applies not only to hydrogen-powered vehicles but also to all types of drive, for example, to pure electric vehicles, in view of the battery problem.

The CTIF Commission for Extrication & New Technology accomplished very important work that is beneficial to all relief workers worldwide¹. Here the ‘UN Decade of Action for Road Safety’ is at the centre, with as the most important goal: shortening the intervention time because of which the survival chances of the victims increase, as well as striving for optimal security for both the victims and the relief workers at the place of the incident.

The ISO 17840 standardized the information that is made available by the industry & car manufacturers for the first and second responders. The CTIF Commission for Extrication & New Technology worked on determining one structure in the Rescue Sheets and in the *Emergency Response Guides* that are drawn up by the manufacturers for new models. The rescue information is directly linked to recognizable pictograms.

Of course, in a tunnel this crucial information regarding the type of propulsion is not safely available with the current state of the art, because logos and labels on the vehicles could be unrecognizable due to crash effects or fire. Therefore, one way of implementing the standard and optimizing the availability of rescue information is the use of data transmission technology (e.g. E-call).

Based on the Vehicle Information Number (VIN), a data set about the vehicle’s properties can be sent out to a receiver as early as possible, providing the first responders with crucial information.

These technological tools are already being used in Formula 1 by *Federation Internationale de l'Automobile* ‘accidents data recorders’ & ‘telemetry’. This standardized responder device will help us to make critical and lifesaving decisions even when there is no network (3G/4G/...) available.

It is a further developed and improved version of the E-call system that works as an important information source and backbone. The information can be sent out directly to the fire engine & crew, their dispatching or even collected by the tunnel infrastructure itself and forwarded in case of emergency. In these cases, we would talk about ‘Vehicle-to-Vehicle’ or ‘Vehicle-to-Infrastructure’ communication lines. All information in case of emergencies could be available by ‘scanning’ the VIN of all vehicles at the moment they enter an underground infrastructure.

¹ CTIF is the ‘International Association of Fire and Rescue Services’ and has as its main goal supporting and stimulating the cooperation between the fire departments and other emergency services from all over the world. CTIF ensures scientific research, the publication of articles and reports, the organization of different commissions and working groups and the cooperation with other bodies than the rescue services that are also working in the field of prevention and security

10. Conclusions (FHa)

The dissemination activities of the HyTunnel CS project will be boosted from this period to the end of the project expected in February 2022. The overview of the first and second periods is positive. Analysing the indicators presented in D6.1, mostly all the tasks are in progress and in some of them there are actions indicated.

Due to the COVID situation, the HyTunnel-CS project had to move face-to-face meeting to online events. Offline events have more impact than virtual ones because the press lives in first line the project. For this reason, the HyTunnel-CS reach and impact in terms of media has been lower. It is an aim of the project trying to reach the maximum audience in the following months.

Key Performance Indicator	Status
Initial version of the Awareness, Communication and Dissemination Plan of the HyTunnel-CS project and its updates.	Ongoing
HyTunnel-CS summary execution report that reflects all the activities carried out.	To be done at the end of the project
Press releases: At least 5 press releases, corresponding the most important milestones of the project.	Discussed
Work meetings and conferences, with at least 15 publications in journals.	Work in progress
At least four specific work meetings to transfer experiences to interested entities.	Work in progress
At least 3 publications for technical journals specialized in hydrogen and fuel cells.	Work in progress
Maintenance and updating of the website with the collaboration of all project partners.	Work in progress
Development of news boards describing the project on the HyTunnel-CS website, in the partners' websites and in their physical locations (screens or panels).	Work in progress
Publication of information about the project on social media with the collaboration of all partners in its dissemination through their respective profiles.	Work in progress
Publication of leaflets and posters for local dissemination	Work in progress
Preparation of quarterly reports of social media, monitoring the increase of followers and fans in each social media, mentions and comments, interactions and quality of the same	Implemented by means of Google Analytics

Table 3. Dissemination Key Performance Indicators analysis

Discussed topics:

Press releases. At least 5 press releases, corresponding to the most important milestones of the project.

During the collection of information for this deliverable, no press releases have been released and thus no media impact has been detected. Further efforts need to be done to achieve 5 press releases.

Additionally, the status of the project meetings and events is summarized in Table 3.

No.	Meeting	Location	Dates	Status
1	Kick-off meeting	UU, Belfast, UK	27-28 Mar 2019	DONE
2	1st progress meeting (includes internal seminar on knowledge and technology exchange)	KIT, Karlsruhe, Germany	11-12 Sep 2019	DONE
3	2nd progress meeting	CEA, Grenoble, France	4-6 Feb 2020	DONE
4	Stakeholders' workshop	URS, Rome, Italy	4-5 May 2020	DONE ONLINE
5	International workshop of first responders	IFA, Balsthal, Switzerland	4-5 Oct 2020	DONE ONLINE
6	3rd progress meeting	NCSR, Athens, Greece	16-18 Sep 2020	DONE ONLINE
7	Midterm review	Brussels, Belgium	9 Nov, 2020	DONE ONLINE
8	4th progress meeting	USN, Porsgrunn, Norway	2-4 Feb 2021	DONE ONLINE
9	5th progress meeting (includes 2-day internal seminar on research conclusions for use by emergency services, M30 to M31)	HSL, Buxton, UK	14-17 Sep 2021	
10	6th progress meeting	IBZ, Brussels, Belgium	15-16 Feb 2022	
11	Dissemination conference	FCH JU, Brussels, Belgium	17 Feb 2022	

Table 4. Current status of events planned

References

- [1] Maite Imirizaldu, Miguel Zarzuela, y Mercedes Sanz, «Dissemination, Communication and awareness plan», Deliverable 6.1. HyTunnel-CS (Grant Agreement Number 826193)
- [2] Christian Baumer, Tom Van Esbroek, Donatella Cirrone, Dmitry Makarov, y Alfonso Bernad, «Report on existent strategies and tactics for first responders», Deliverable 5.1. HyTunnel-CS (Grant Agreement Number 826193)

Annex I. Determination of audiences

Target audience	Influence	Objective	Message	Possible dissemination tool or channel
Community, national and regional administration	High	Inform Raise awareness	General information about the project: beneficiaries, phases, results and achievements Benefits derived from the cooperation developed	Project events Explanatory meetings Send of materials Transfer of socio-economic and environmental benefits of the action
Beneficiaries and partners of the project	High	Accompany Support Raise awareness	Communicate the results and the progress of the project Coordinate communication Cooperation in the dissemination and distribution of tasks	Internal communication Participation in events of other partners and groups Joint meetings with other entities Project work meetings and networking among partners Participation in events, fairs and congresses
Small Medium enterprises and large companies	Medium	Inform Attract	General information about the project results and business opportunities	Sending information Meetings Demonstrative acts Technical sessions

Stakeholder Advisory Board	High	Inform Involve	Business opportunities and business transformation Cost effectiveness Security and simplicity of operations Dissemination	Meetings Workshops Generation of contents Sending material Experiment demonstrations Actions with media Introduce their feedbacks frequently
Research and educational centres	Medium	Inform	General information about the project Technological developments	Sending information Technical sessions Project presentations
Event organizers	High	Inform Involve	Business opportunities and business transformation Cost effectiveness Security and simplicity of operations Dissemination	Training Generation of contents Sending materials for your exhibition Demonstration events Actions with media and interest groups

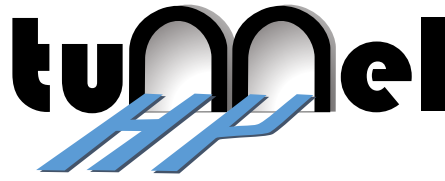
Vehicle Safety Companies	High	Inform Involve	Business opportunities and business transformation Cost effectiveness Security and simplicity of operations Dissemination	Training Generation of contents Sending materials for your exhibition Demonstration events Actions with media and interest groups
Clusters and sectorial organizations related to hydrogen	Medium	Inform	General project information	Sending information Meetings with associations and other representative projects
General and specialized media	High	Inform	General information of the project and evolution Construction of prototypes Cooperation Technological developments Associated investments Energy sustainability	Sending information periodic meetings. Participation in events Offer of contents (written and audio-visual) that are generated with the project Provision of qualified HyTunnel-CS spokespersons Participation in radio, TV and special written or online programs Driving experiences Transfer of socio-economic and environmental benefits of the action

Promoters of other related initiatives	Medium	Inform Collaborate	General project information	Meetings
			Opportunities for cooperation	Participation in events
				Forums of the sector
				Search for collaborations and support in diffusion
Economic and social agents at European level	Low	Inform	General project information	Explanatory meetings
			Business and employment opportunities	Participation in the events that are organized
			Environmental benefits and sustainability	Collaboration for dissemination in sectorial organizations
Tunnel Safety agencies or companies	High	Inform Involve	Business opportunities and business transformation	Training
			Cost effectiveness	Generation of contents
			Security and simplicity of operations	Sending materials for your exhibition
			Dissemination	Demonstration events
				Actions with media and interest groups

RCS actors	High	Inform Involve	Communicate the results and the progress of the project	<p>Invite RCS actors to join national networks HyTunnel-CS project</p> <p>HyTunnel-CS Partners to join national relevant platforms to inform about the project</p> <p>HyTunnel-CS Partners to organise national workshops at the end of the project</p> <p>HyTunnel-CS Partners to write policy papers for each recommendation on new/updated RCS (to share national and with TC's) that can also be placed e.g. on HyTunnel-CS website and websites national platforms)</p>
firefighter community	High	Inform Involve	<p>Communicate the results of the project</p> <p>Experiences exchange</p>	<p>As long as the information must flow in the proper order, contact with firefighters schools to provide the useful information</p> <p>To overcome language barriers ², and to improve the wider dissemination of the results of the project, the content must be translated to all relevant EU-languages</p>

² Fire services trust at most in experience. Let it be their own experience or experience gathered from other firefighters. With a view to the language issue change of experience will be organised on a national level or within the language areas. e.g. for German within the countries of Germany, Switzerland, Austria and partly the Netherlands. It will be very difficult to organise exchange of experience on a supranational level.

Annex II. National Network registration template



Pre-normative research for safety of hydrogen driven vehicles and transport through tunnels and similar confined spaces

Fuel Cells and Hydrogen Joint Undertaking (FCH2 JU)
Grant Agreement Number 826193

Confirmation for National Networks

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FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

Summary of National Network

The HyTunnel-CS project through this National Networks will collaborate with researchers and experts in underground traffic systems and hydrogen safety to integrate their knowledge and activities into the project and disseminate the project results more efficiently.

The members of the National Network will serve as a bridge between the work developed within the project and the non-project stakeholders who may be interested in the HyTunnel-CS findings.

National Members will not have specific obligations to the consortium, but can be very valuable in giving feedback to the project outcomes and further disseminating them.

If you have any questions or need more information, please do not hesitate to contact Alfonso Bernad (abernad@hidrogenoaragon.org).

National Network Registration

Please, if you are interested in participate as member of the HyTunnel-CS National Networks, fill the following document with your information.

COUNTRY:

PARTNER WHO HAS CONTACTED YOU:

COMPANY NAME:

SECTOR/SPECIALISATION:

CONTACT PERSON:

CONTACT MAIL:

CONTACT PHONE:

Data Protection - Privacy policy

This Privacy Policy is intended for HyTunnel-CS National Networks members. It describes how we collect, store, use and retain your personal data. It also describes how you can change the data that we hold and the ways in which your data is used.

1. Where is your data stored? The data are stored on the members area of HyTunnel-CS project website. Access to this area and your data is strictly limited to the members of HyTunnel-CS consortium and European Commission, and is controlled through password protection.
2. How do we collect data about you? The data that HyTunnel-CS holds about you is collected directly through the present form. Data include: your country, company and specialisation, name, contact email and phone number.
3. Why do we collect data about you? We collect data about you in order to: keep in touch with the project news; invite you to a range of project events including workshops, conference, etc.; update you regarding the status of HyTunnel-CS research and info that may be of interest; send you the project newsletter; contact you to ask information about your specialisation field.
4. What data do we hold? Your email address may be stored in the newsletter contact lists of the consortium members.
5. Who will we share your data with? Your data will be shared within the HyTunnel-CS consortium and European Commission.
6. How long do we retain your data? Your data will be retained for the whole duration of HyTunnel-CS project. Project partners may use your contact beyond HyTunnel-CS project to send you newsletter or other project promotional materials.
7. How can you control the way in which we use your data?
You can contact us by email to let us know how and why you want to hear from us, or if you no longer want to hear from us at all: abernad@hidrogenoaragon.org.
Please use the same contact for any complaint about the way in which your data is being gathered, stored or used.