



European Train the Trainer Programme for Responders

Fuel Cells and Hydrogen Joint Undertaking (FCH JU)
Grant Agreement Number 875089

Deliverable D1.2

Description of regional, national and international training activities for responders in accidents involving hydrogen

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FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

D1.2 HyResponder “Description of regional, national and international training activities for responders in accidents involving hydrogen”

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Summary

This document gives a snapshot of regional, national and international training activities for responders in accidents involving hydrogen. It also highlights training needs and requirements and the interest levels amongst responder training organisations in hydrogen safety specific training. A questionnaire was distributed to training organisations utilising the consortium, the SAB, and umbrella organisations including partner CTIF. The training developed within HyResponse¹ and by the US based Centre for Hydrogen Safety² remain the primary programmes, with a fragmented approach outside this to hydrogen specific training. However, the questionnaire has served multiple purposes beyond work package 1, including how to grow and shape the SAB, and inform work packages 2, 3, 4 and 5.

Keywords

Responder training, fire schools, training organisations, alternative fuels, operational training, virtual reality training, eLearning

¹ <http://www.hyresponse.eu/>

² <https://www.aiche.org/academy/courses/ela253/introduction-hydrogen-safety-first-responders>

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1. Introduction

It is key that the the training provided through HyResponder is timely, fit for purpose and extends beyond the end of the project. With this in mind the experience gained through HyResponse, and through other training organisations will be utilised in the development of the “train-the-trainer” programme. At the initial proposal stage, in addition to partner training organisations, the consortium had established partnerships with Japan and North America, and these will be further built upon over the course of HyResponder.

Whilst the original purpose of this deliverable was to assess the regional, national and international training activities for responders in accidents involving hydrogen, it has become clear that hydrogen specific training for responders beyond HyResponse³, and the US programme for First Responders⁴ is limited and fragmented. Thus this document also describes a questionnaire which has been used to gather information which will help to build a wider network of training organisations beyond the consortium, who have an interest in training for responders in hydrogen safety, and to assess their training capabilities.

The HyResponder consortium is well placed to establish a comprehensive picture of training activities in hydrogen safety across Europe and beyond. Training organisations for responders from 10 European countries are directly represented through the consortium and the SAB, with CTIF in particular providing links to further organisations through their members and SPFI to fire schools through European Fire Service Colleges’ Association (EFSCA)⁵.

Within this document, activities at ENSOSP in hydrogen safety training since the completion of the HyResponse project are noted and some information on the US training is included. This deliverable also describes the design and findings of a questionnaire of training organisations. It should be noted that this document describes a snapshot of ongoing activities and perceptions of training organisations. The questionnaire responses whilst informative, do not cover all possible training organisations throughout Europe. The findings have already been used to build the SAB and it is intended they will also be used to inform WP2 “Training materials development”, WP4 “National training programmes”, and WP5 “Dissemination and Sustainability”. It is planned that the network of responder organisations with an interest in hydrogen safety training is continuously revised throughout the project as awareness of HyResponder grows.

2. Existing training in Hydrogen Safety for First Responders

Whilst some localised training exist in hydrogen safety the key training programmes remain those developed within the European HyResponse project and that delivered by the Centre for Hydrogen Safety in the United States. It can be seen from the responses to the online questionnaire which are described later in this document that training is under development in the Netherlands and in Belgium (within a Fire school)

³ <http://www.hyresponse.eu/>

⁴ <https://www.aiche.org/academy/courses/ela253/introduction-hydrogen-safety-first-responders>

⁵ <https://www.efsca.org>

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reference is made to a facility in Italy, the key training highlighted is that provided at ENSOSP.

2.1 HyResponse training platform

A comprehensive training platform for first responders was developed within HyResponse. The training platform incorporated lectures, VR, operational training and the Emergency Response Guide and several successful training events were run within the project. Since the projects conclusion in 2016:

- The original lectures (pdf) and presentations remain available on the HyResponse Website (<http://www.hyresponse.eu/>) and are publicly available
- The original lectures have been incorporated into an online learning module through Net-tools and can be accessed within <https://elearning.fch2edu.eu/courses/course-v1:fch2edu+UU001+2019-2020/about>
- There is scope to update and expand the materials and to actively utilise the lectures
- The Operational Training Platform has been utilised to a limited extent for local organisations in France. There is scope to maximise the reach and impact of this unique facility within HyResponder.
- It can be seen from the responses to the questionnaire described later in this document that HyResponse is seen as a key source of information for respondents

2.2 US Centre for Hydrogen Safety: Introduction to Hydrogen Safety for First Responders

This web based course takes approximately 1 hour to complete. Whilst it is less comprehensive than the HyResponse materials it is very user friendly, easily accessible and provides an "awareness level" overview of hydrogen for fire, law enforcement, and emergency medical personnel. It introduces first responders to hydrogen, its basic properties, and how it compares to other familiar fuels; hydrogen use in fuel cells for transportation and stationary power; potential hazards; initial protective actions should a responder witness an incident; and incorporates supplemental resources including videos, supporting documents, and links relevant to hydrogen safety.

This course is a useful resource presented by the Center for Hydrogen Safety (<https://www.aiche.org/chs>) and there is scope for the HyResponder training to be complementary to this online training resource.

It is worth noting that unlike HyResponse, this CHS training provides a login. This is free to access but does provide a useful means of tracking usage of the materials.

3. Data collection

As described in the previous section, the key existing training packages can be identified as HyResponse and the CHS training. However, it is recognised that other activities may be ongoing at a local level, and/or there is potential to grow these and

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to maximise the reach sustainability of HyResponder. Hence a questionnaire was designed and circulated.

3.1 Questionnaire design and purpose

A questionnaire was designed to serve a number of purposes, in addition to identifying further SAB members and enhancing awareness of the HyResponder project it also served to inform deliverables across four work packages as outlined in table 1.

Table 1: Link between questionnaire outputs and deliverables

WP	Deliverable	Potential Questionnaire Input
1	D1.2 Description of regional, national, and international training activities for responders to accidents involving hydrogen	Identification (if any) of activities beyond HyResponse and the US training programme
2	D2.8 e-Platform for training materials	Understand current use of eLearning and platforms
2	All deliverable relating to training materials	Outputs clearly indicate the relevance of level, focus, language etc.
3	D3.1 Report on the formation of national training clusters	Identify stakeholders outside the consortium
5	D5.6 Establishment of pan-European network of trainers	Identify trainers and interest levels outside the consortium
5	D5.11 International e-Forum for responders	Identify contacts and engage participants from the outset
5	All materials related to dissemination	Outputs clearly indicate the need to promote the HyResponder project to responders outside the consortium
5	Sustainability of the HyResponder objectives in the longer term	The outputs will inform design of the training materials and be used to build a network, all contributing directly to the sustainability of the HyResponder outputs beyond the formal project completion

Following feedback from the consortium on outline questions an electronic questionnaire was developed using Typeform⁶. The Typeform interface and list of questions are presented in Appendix 1.

3.2 Distribution channels

The questionnaire was sent to all partners and the SAB, their contacts, CTIF members and EFSCA. Whilst an emphasis was placed on completion by responder training organisations, the questionnaire was left open for additional stakeholders to complete.

4. Analysis

4.1 Response rate, location and nature of respondents

There were 45 responses received to the survey. Whilst informative it should be noted that there were several organisations who submitted multiple responses and this represents only a snapshot of the number of e.g. fire schools. There were submissions from 38 unique organisations across 20 countries.

⁶ <https://www.typeform.com/>

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The location of the respondents is given shown in Figure 1, and it can be seen that several respondents are based in countries not involved with the HyResponder project.

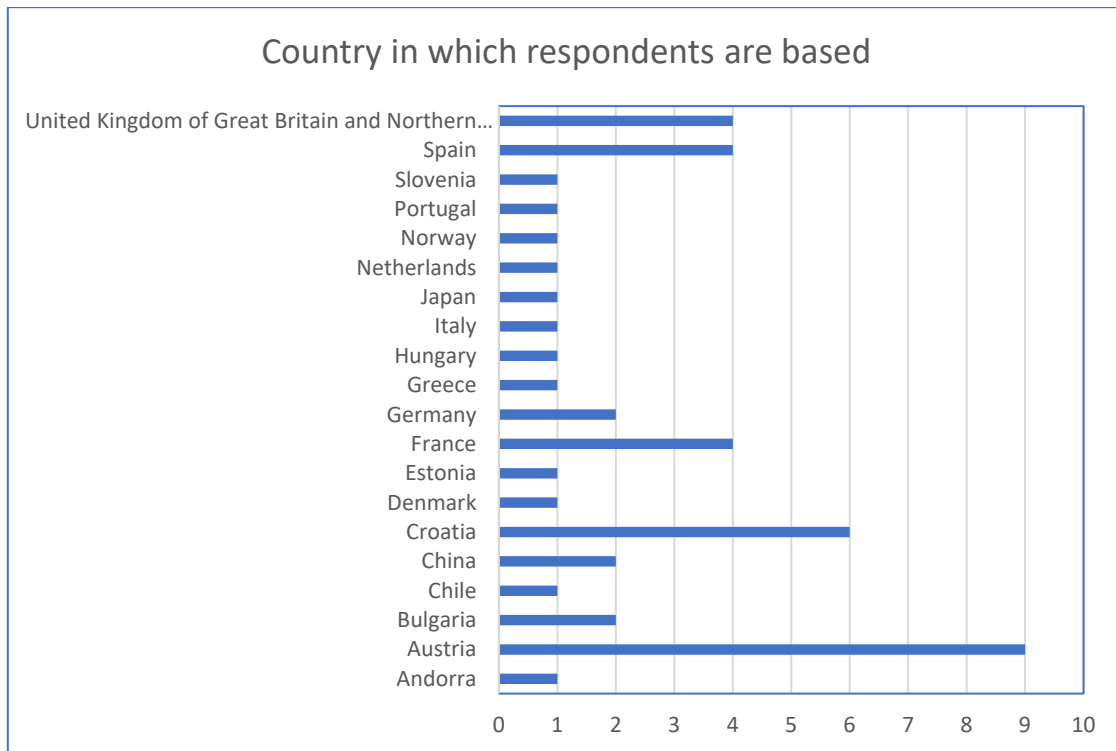


Figure 1: Location of questionnaire respondents

The majority of respondents (69%) were representatives of Fire Services with training responsibilities as shown in Figure 2 and Figure 3 respectively. It is not possible to clearly recognise the breakdown between private and public sector from the results.

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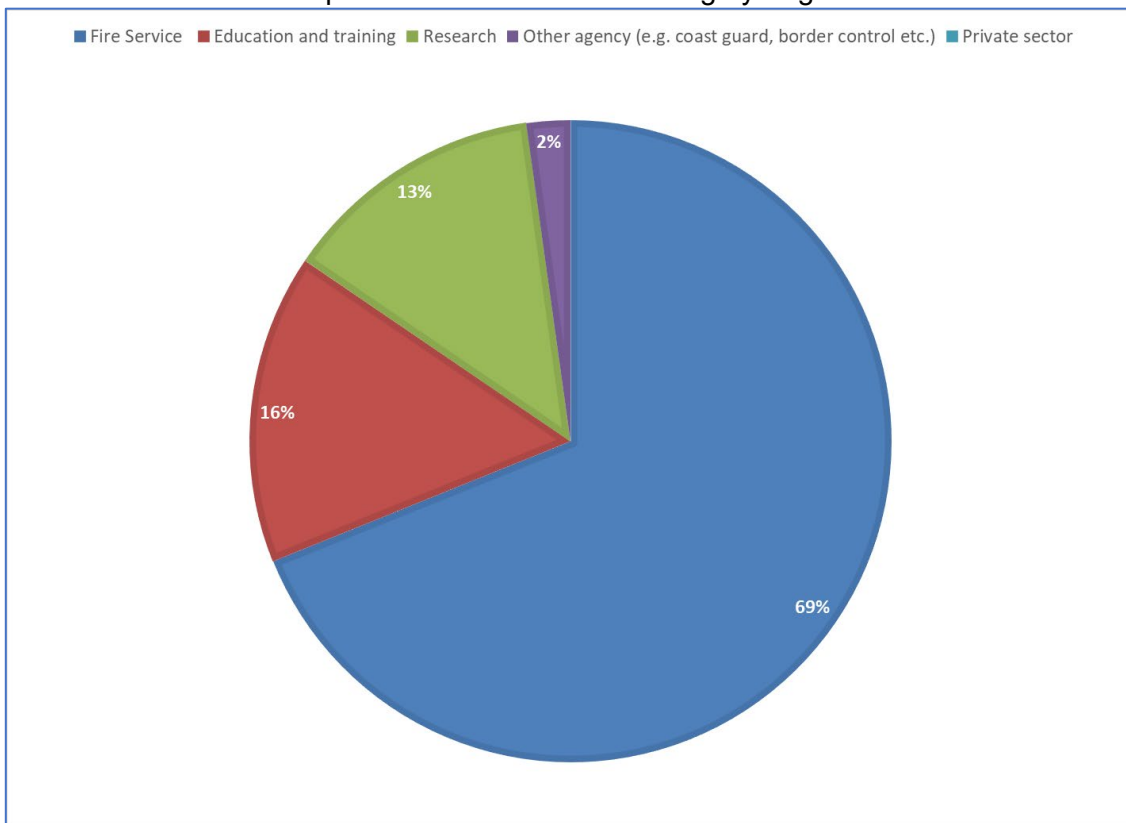


Figure 2: Sectors represented in questionnaire responses

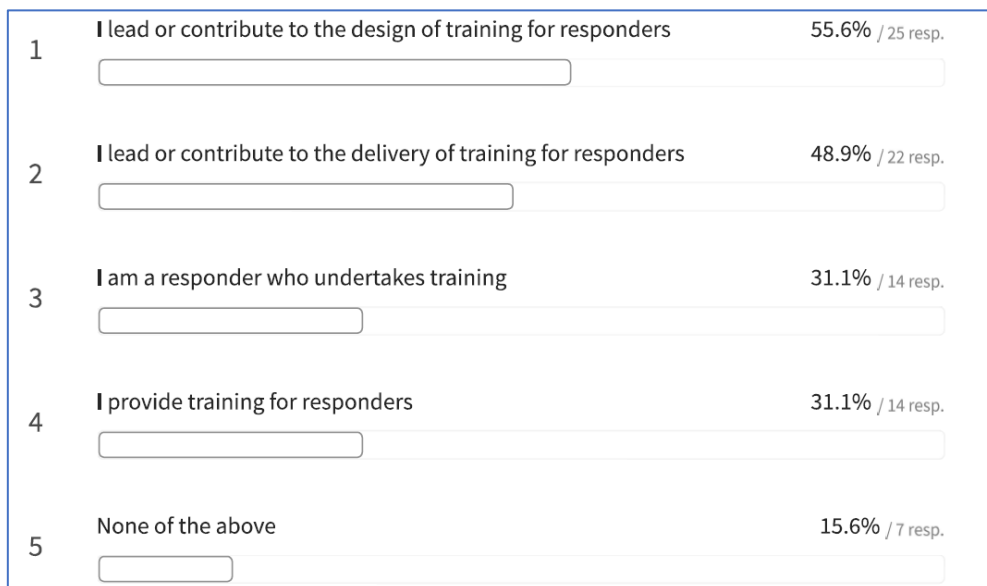


Figure 3 Training role of the respondent within their organisation

A list of the unique organisations and the corresponding countries is given in Table 2

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Table 2: Country or respondent and organisation (where stated)

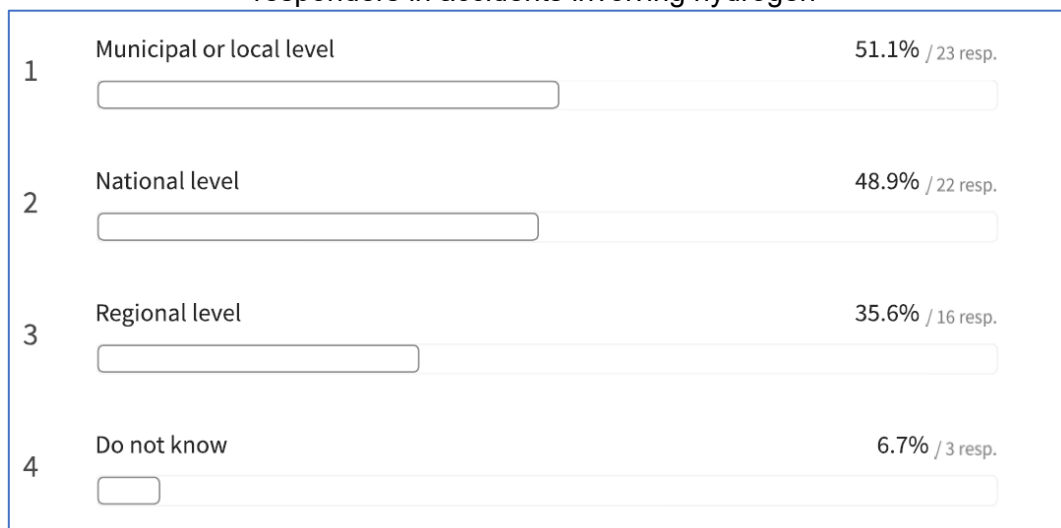
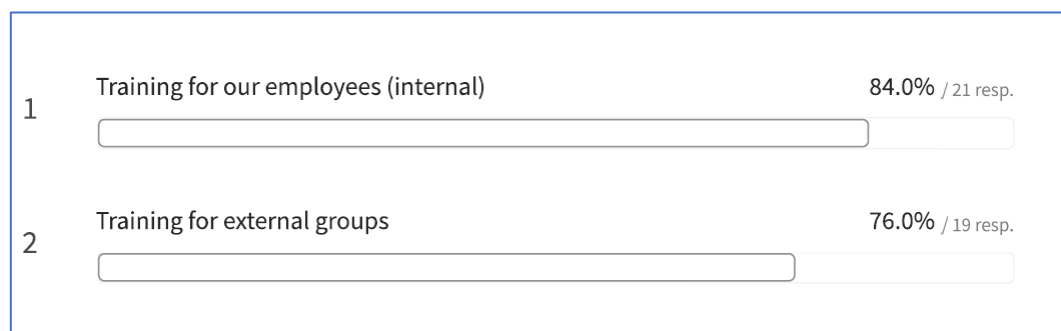
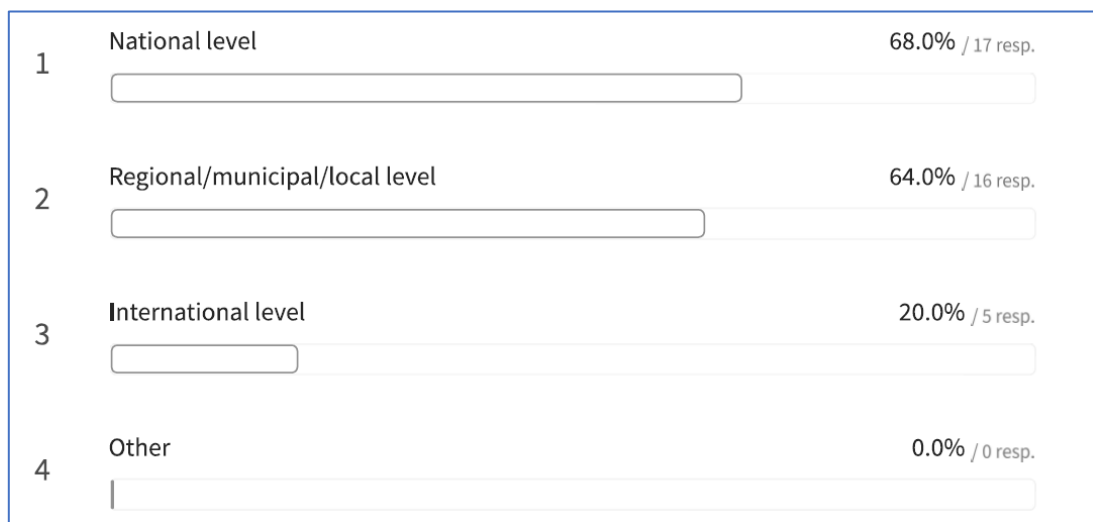
Country	Organisation	Country	Organisation
Andorra	Bombers d'Andorra	France	National French Firefighters Federation (FNSPF)
Austria	ÖBFV (Österreichischer Bundesfeuerwehrverband)	France	CEA
Austria	Landesfeuerwehrkommando Salzburg	France	Air Liquide
Austria	BTF SANDOZ KUNDL	Germany	DLR Institute of Networked Energy Systems
Austria	Berufsfeuerwehr Wien	Germany	Berufsfeuerwehr Hamburg
Austria	Berufsfeuerwehr Linz	Greece	Hellenic Fire Service
Austria	Landesfeuerwehrverband Burgenland	Hungary	Disaster Management Training Centre
Austria	LFS Tirol	Italy	Dipartimento dei vigili del fuoco
Bulgaria	Directorate General "Fire Safety and Civil Protection"	Japan	ICT
Chile	spei	Netherlands	Instituut Fysieke Veiligheid
China	Guanghua Fire department, Shanghai, China	Norway	University of South-Eastern Norway
Croatia	Public fire brigade city of Rijeka	Portugal	National Fire Service School of Portugal
Croatia	DVD Topusko	Slovenia	Fire-Fighting Association of Slovenia
Croatia	DVD HRVATSKA KOSTAJNICA	Spain	Ayuntamiento de Zaragoza
Croatia	Javna vatrogasna postrojba Nova Gradiška	Spain	University of Zaragoza
Croatia	Croatian Firefighting Association	UK	Northern Ireland Fire and Rescue Service
Denmark	Danish emergency management agency	UK	Dorset & Wiltshire FRS
Estonia	EASS (The Estonian Academy of Security Sciences)	UK	Warwickshire Fire & Rescue Service
France	SDIS85	UK	Fire Service College

4.2 Current provision of training for responders

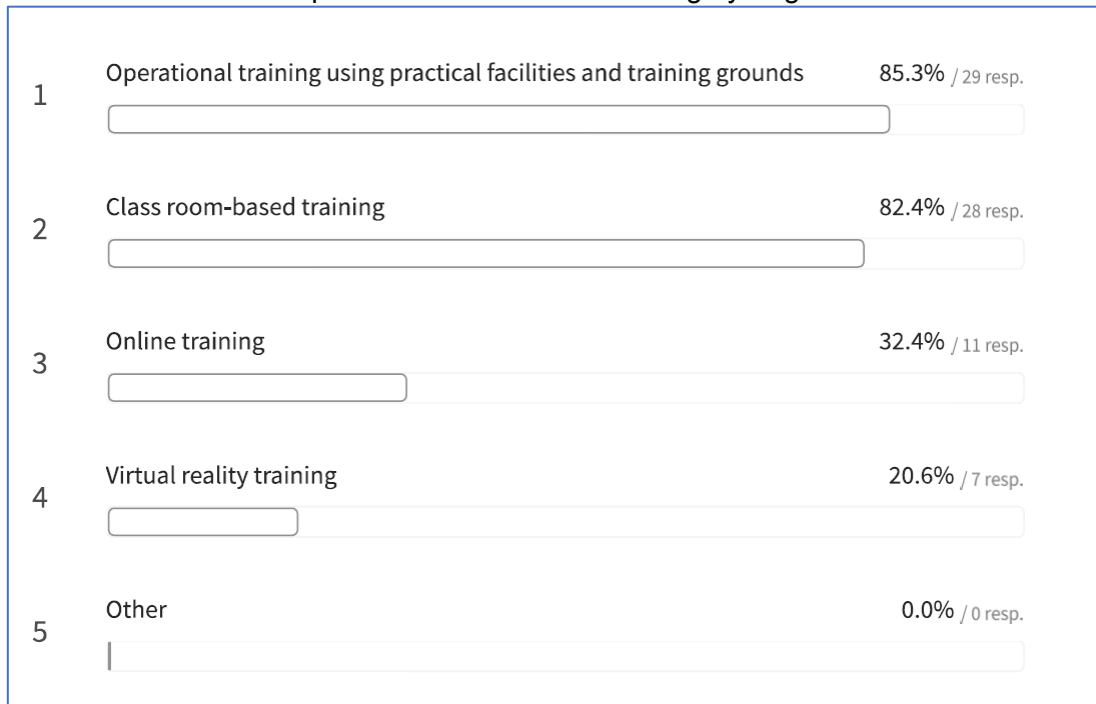
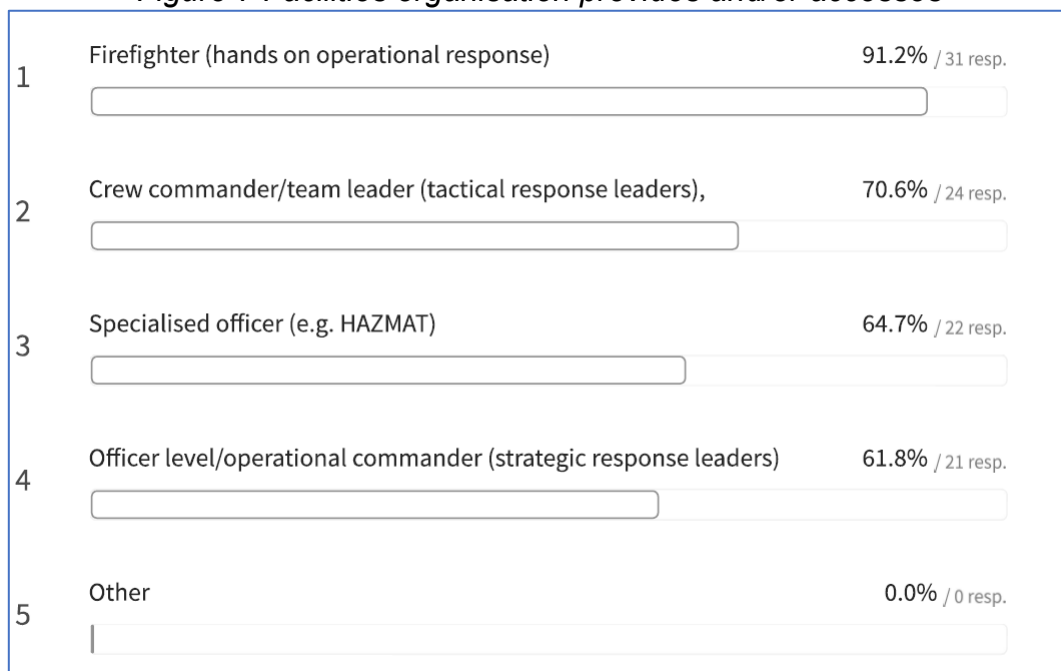
Respondents were asked at what level they currently provide training, who the accrediting body is, and the nature and capacity of their training. The information provided was useful in giving an indication of the structure of training. However, the specific capacity of e.g. classrooms varied widely, and limited data was provided on the bodies who accredit/set standards for training so this is not reported.

Variance in the level at which training is provided varies across countries as is clear from Figure 4. The majority of training organisations who responded provide training externally in addition to internally. This could be built upon with the train the trainer programme to maximise reach. It should be noted that “external groups” were not specifically explained in the questionnaire and may be open to interpretation.

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*Figure 4 How training is provided within each country**Figure 5 Type of training provided by the respondent organisation**Figure 6 Region in which organisation provides training*

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*Figure 7 Facilities organisation provides and/or accesses**Figure 8 Level of responder training provided***4.3 Current training in Alternative fuels including hydrogen**

Respondents were questioned on what training if any they access or provide in relation to alternative fuels and specifically hydrogen. Whilst over 60% (Figure 9) utilise training in battery vehicles only 25% access training in hydrogen or fuel cells, 11% mentioned “other training” without elaborating. Approximately 25% of respondents have accessed online training (Figure 10) so care will need to be taken with the ePlatform to boost

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this figure within HyResponder. With the impact of COVID-19 in 2020 it is expected that numbers accessing online training will grow significantly, and HyResponder is well placed to build on this.

Respondents were asked about their awareness of existing training related to hydrogen safety, specifically HyResponse (Figure 12) and the Net-tools eLaboratory (Figure 13). Just under half had neither heard of HyResponse nor had any awareness of training in FCH technologies for responders. Respondents were asked to provide links or notes on any training that they were aware of, out of those who replied the majority mentioned HyResponse.

These outcomes highlight the importance of designing appropriate disseminating actions for the HyResponder training programme.

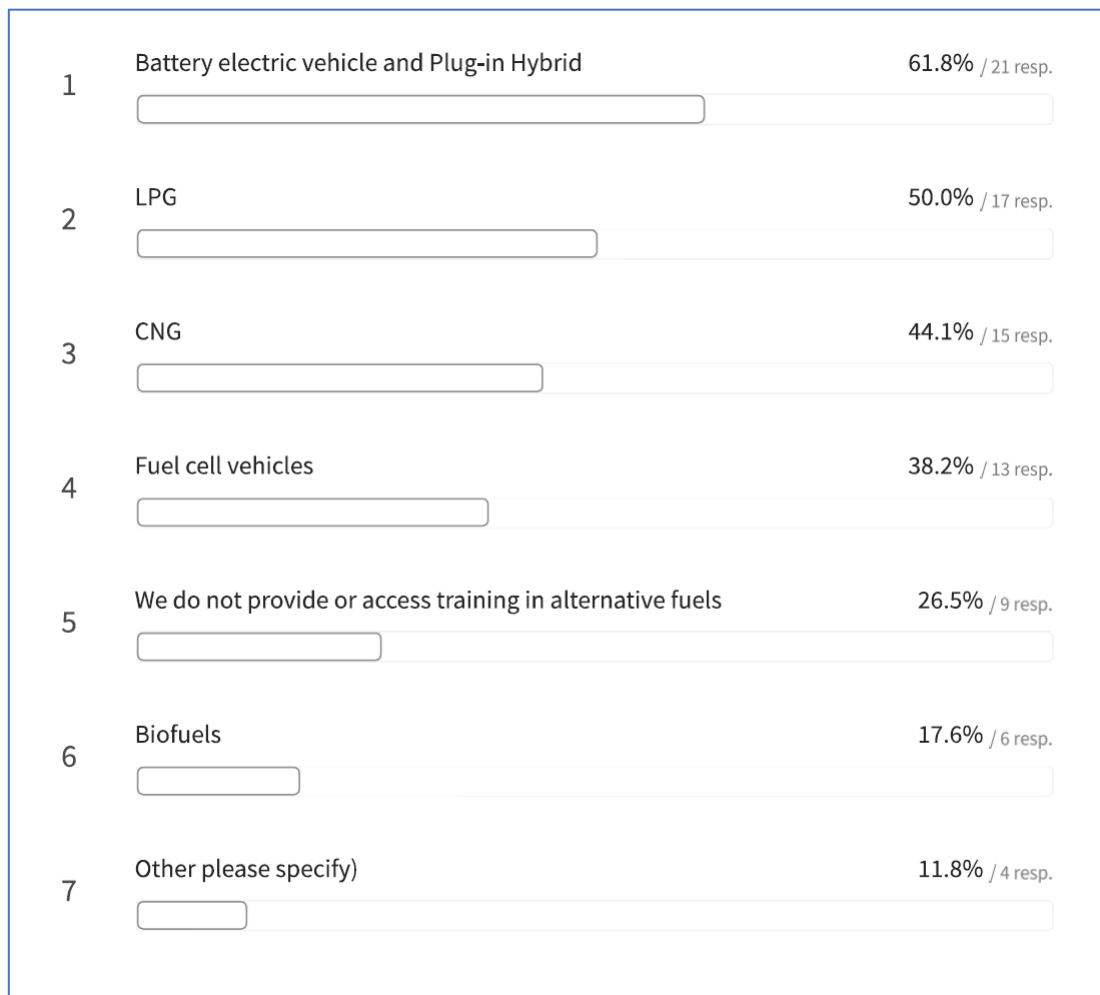


Figure 9 Training provided or accessed in alternative fuels

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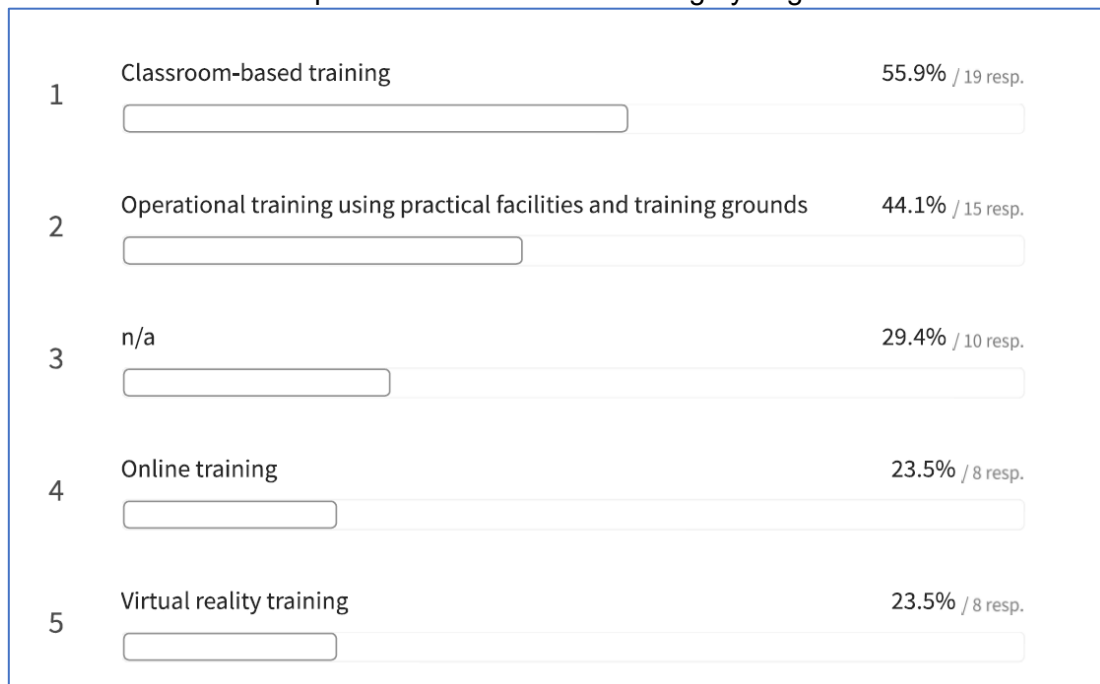


Figure 10 Nature of training in alternative fuels

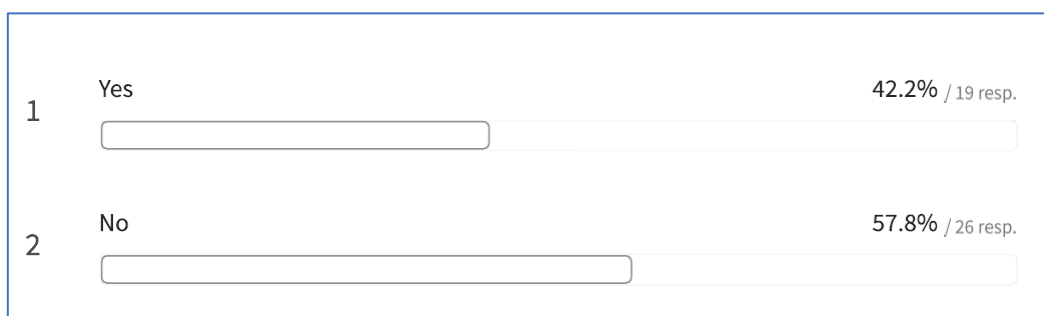


Figure 11 Awareness of training for responders in fuel cell and hydrogen technologies

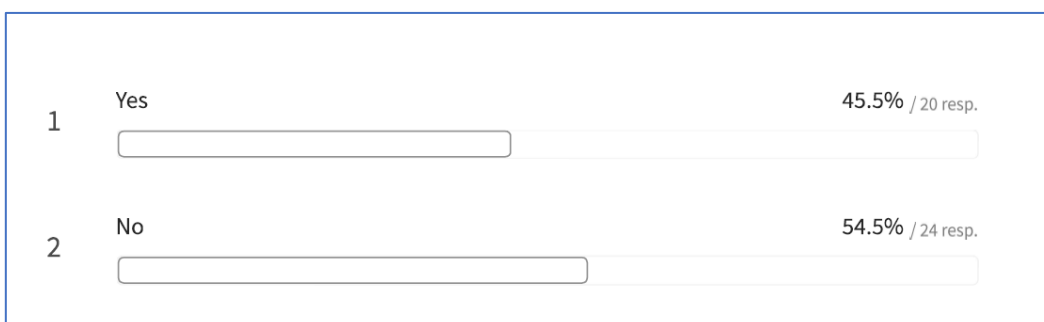


Figure 12 Awareness of HyResponse

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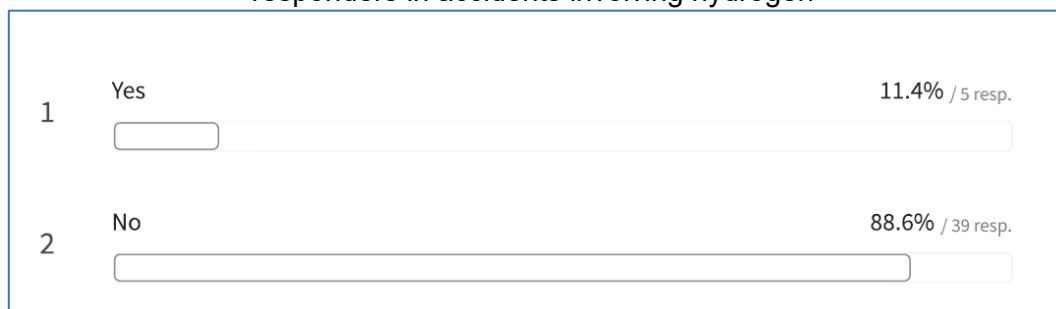


Figure 13 Awareness of the Net-tools project and/or eLaboratory

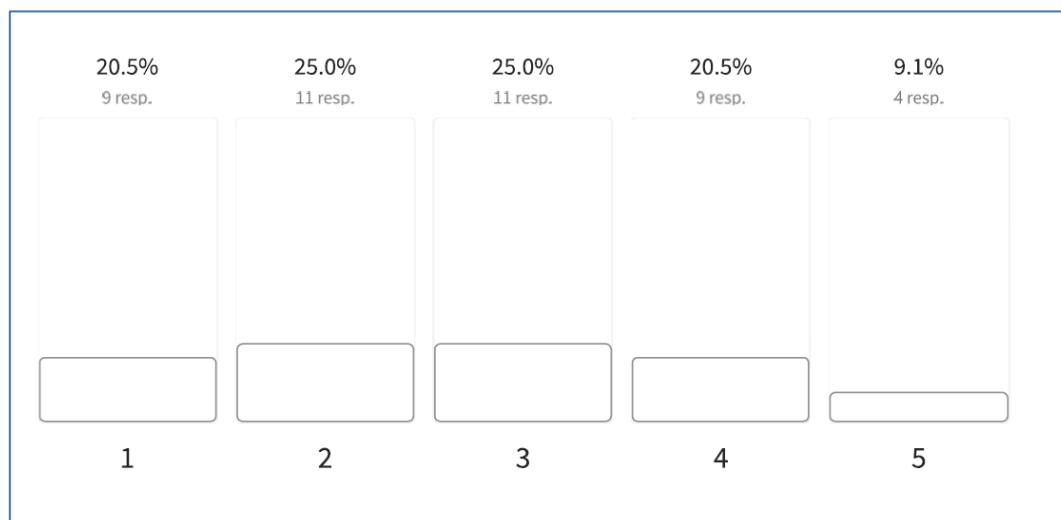


Figure 14 Rate your knowledge of FCH technologies on a scale of 1 to 5 with 5 being very knowledgeable

4.4 Perceived training needs in hydrogen safety for responders

Respondents were asked to specifically consider training in hydrogen safety for responders, in order to identify what the relative importance of different modes of training and the level of competence/awareness/understanding achieved.

A key point identified was availability of training materials in a local language with over 85% rating this of utmost importance (Figure 15). Both Operational and VR training support were seen as important with an emphasis on operational training.

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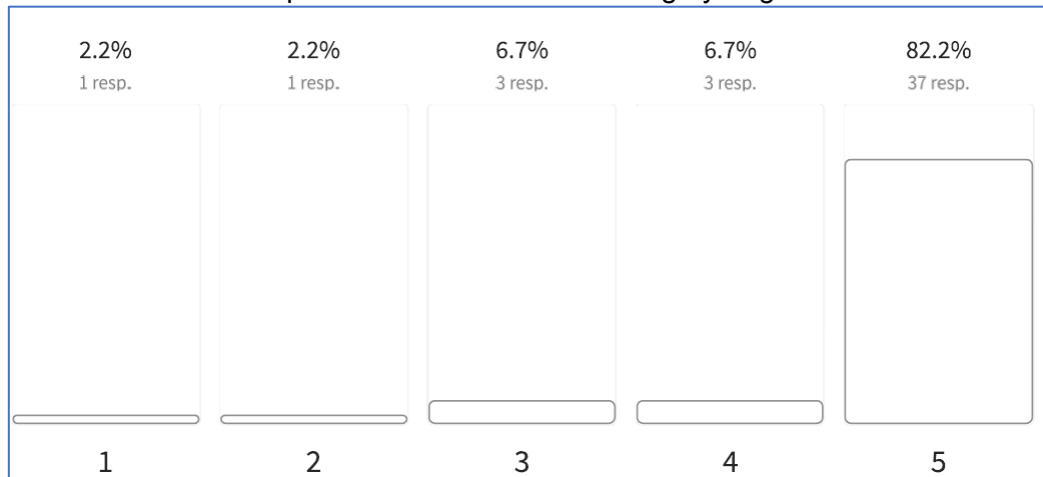


Figure 15 Rate the importance of having materials in a local language on a scale of 1 to 5 with 5 being most important

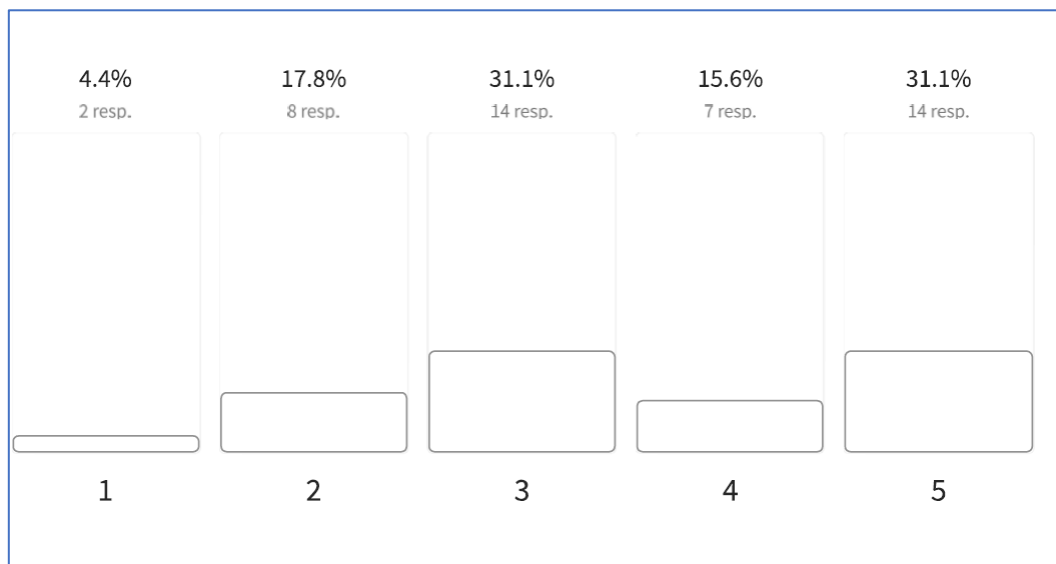


Figure 16 Rate the importance of having VR training support on a scale of 1 to 5 with 5 being most important

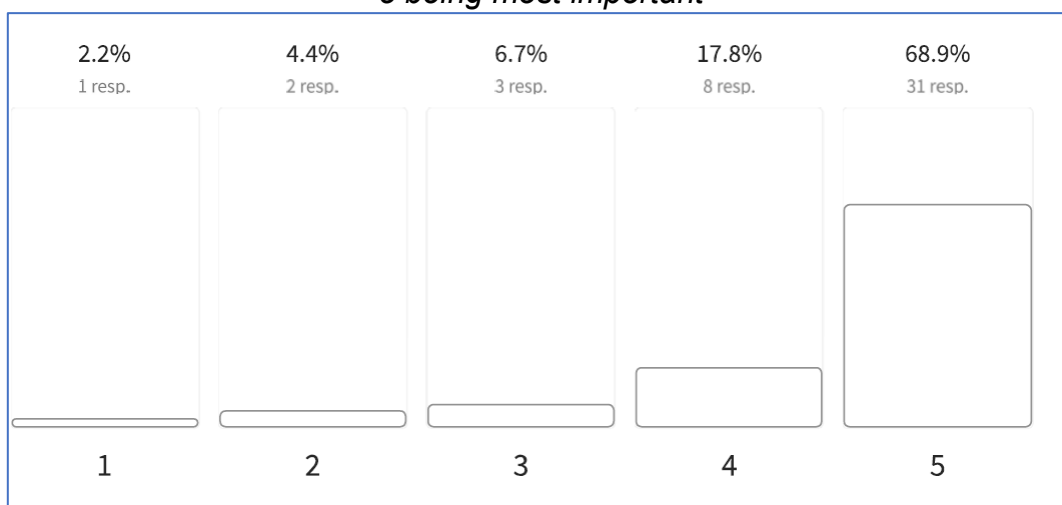


Figure 17 Rate the importance of having operational training support on a scale of 1 to 5 with 5 being most important

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Professional recognition was seen as important (Figure 18) supporting the development of clear learning descriptors and outcomes within WP2 to facilitate this recognition. Whilst both a face to face element (Figure 19) and online support (Figure 20) were favoured it can be seen from Figure 21 that support beyond the training is preferred. This can be used to inform the design of the eforum and the WP5 output.

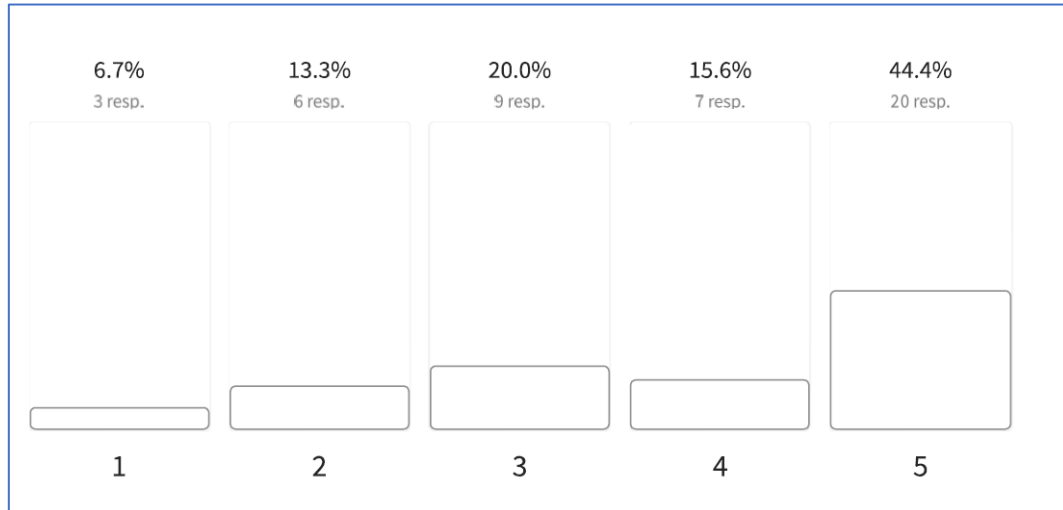


Figure 18 Rate the importance of having the training accredited or professionally recognised on a scale of 1 to 5 with 5 being most important

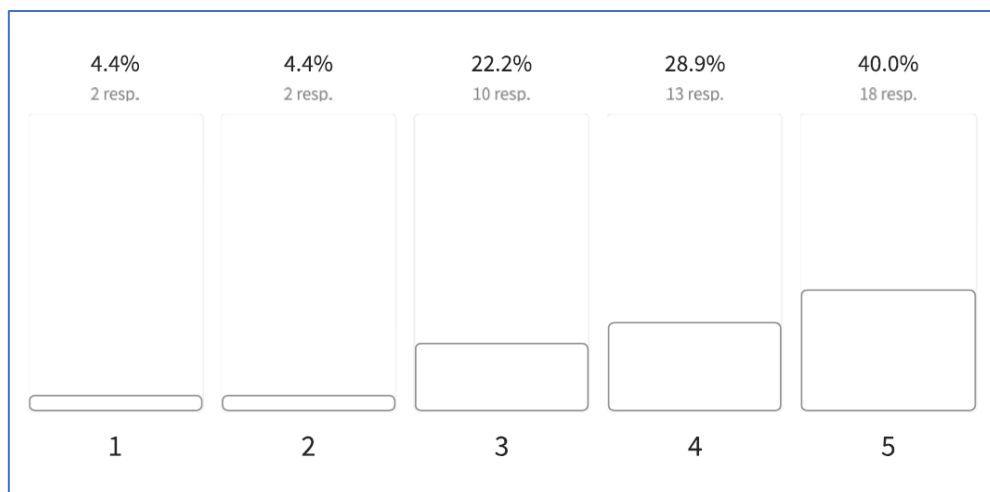


Figure 19 Rate the importance of having the training delivered face to face on a scale of 1 to 5 with 5 being most important

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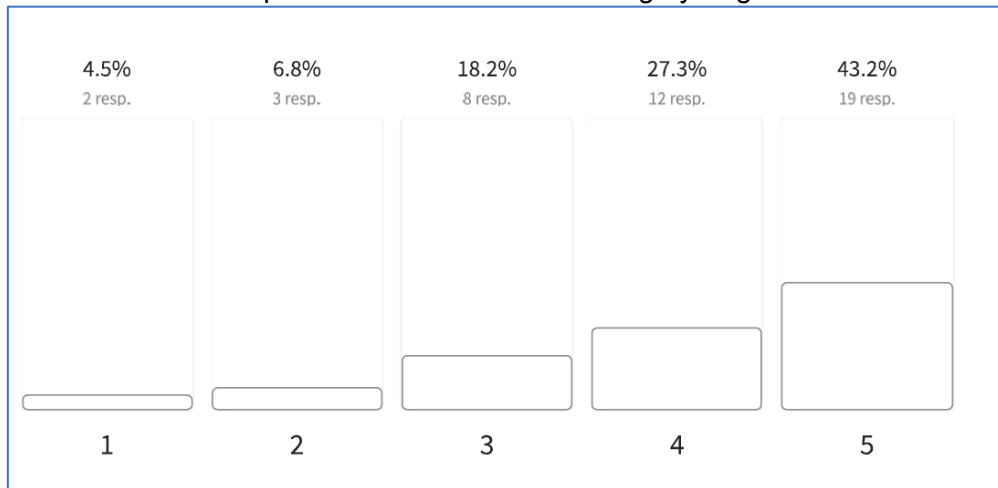


Figure 20 Rate the importance of having the training supported online on a scale of 1 to 5 with 5 being most important

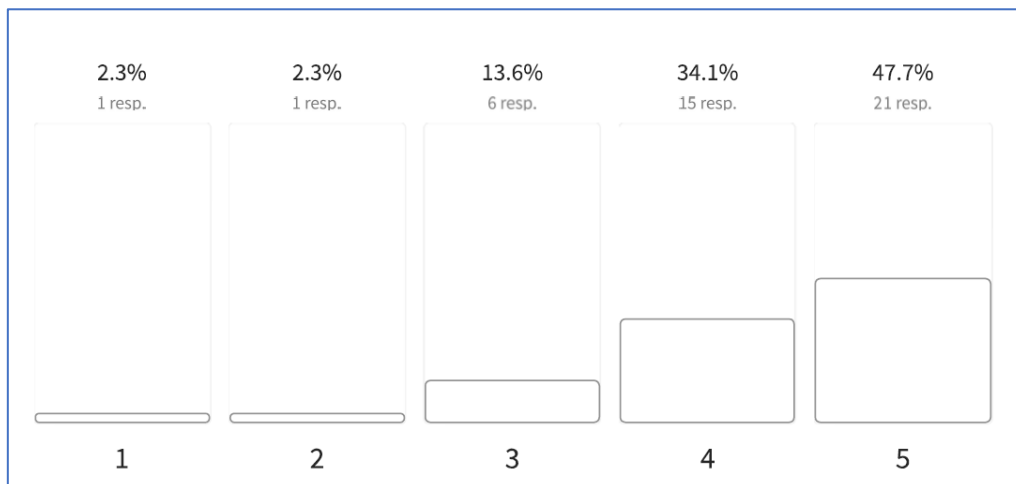


Figure 21 Rate the importance of having the support of a community of experts available beyond the training on a scale of 1 to 5 with 5 being most important

Within WP2 it is planned to develop learning level descriptors and outcomes to assist with stratification of the teaching materials where possible. Figure 22 provides a justification of the level targeted by the train the trainer programme in WP 3 and 4.

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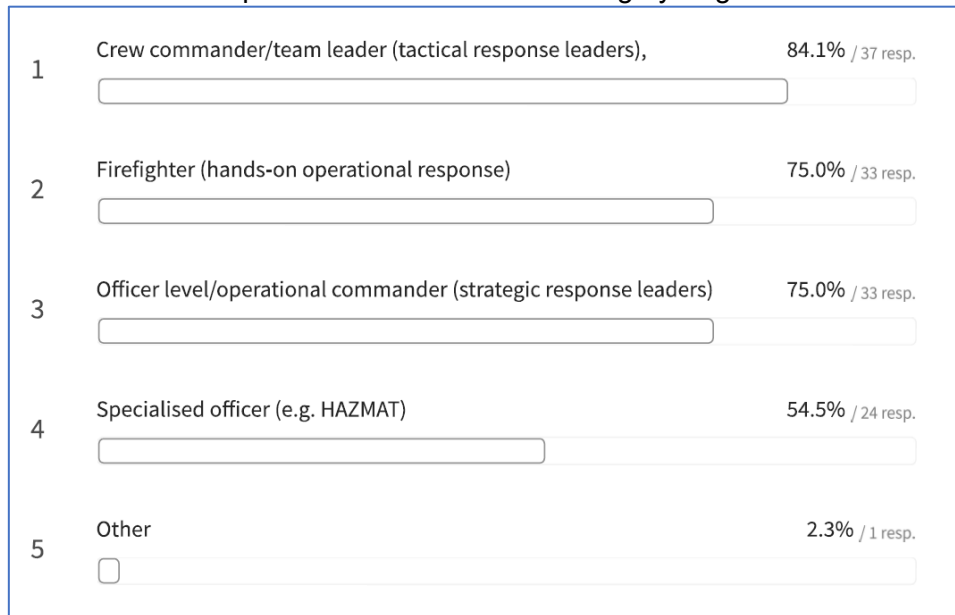


Figure 22 Indicate the level at which training in FCH would be most appropriate

4.5 Design of online resources

A goal of HyResponder is to provide a sustainable ePlatform for responders which will incorporate relevant online resources. Thus respondents were questioned on their experience and views of online resources.

Whilst the majority of respondents indicated that they used social media, specifically WhatsApp, LinkedIn, Twitter and Instagram, they were less experienced with online learning environments, indeed almost 50% indicated they had no prior experience the particular platforms used are listed in Table 3. As noted previously, it is expected that the COVID-19 pandemic in 2020 will result in a significant increase in accessing of online resources.

Figure 23 highlights the level the level of responder that the respondents felt would benefit most from online learning with the majority of almost 70% indicating officer level.

The perceived purpose of the online materials varied (Figure 24) but there was agreement that materials should be accessible both via desktop and smartphone.

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Table 3 Familiarity with online platforms

<i>Question: Have you used online educational platforms before? Please comment on the online educational platform you have used</i>
17 Respondents said they had no experience
Experience noted:
various online platforms the quality depends on the maker and funding and skills sets available to produce said platforms
OUI MAIS IL MANQUE UN SUPPORT DEMATERIALISE
LearnPro
different ones
Webex classes, Quizlet, PPT, PDFs
Local fireservice e-learning platform
Moodle
Yes, The training content is not comprehensive.
Of university, WIFI, ... my firetraing center
SELS,
Moodle
Yes, for example now we are training in Unmanned Aerial Vehicle flying online
si google
Yes. They can be effective for learning general contents if they are very well developed. Real time face to face teaching, even if it is remotely, may be a necessary complement.
not on an appropriate level
ILIAS, moodle
We have used online platforms before in order to prepare trainers, firefighters and other cases.
Zoom and Time Viewer (With telephone contact)
I have used meeting platforms like zoom, jitsi, microsoft teams
HyResponse,
Moodle
Google Classroom, Moodle, Massive Open Online Course (MOOC) Platform, Zoom, WebEx, Microsoft Teams, Skype
Ulster
Just generalities. Lack of concrete and in-the-field usable information.

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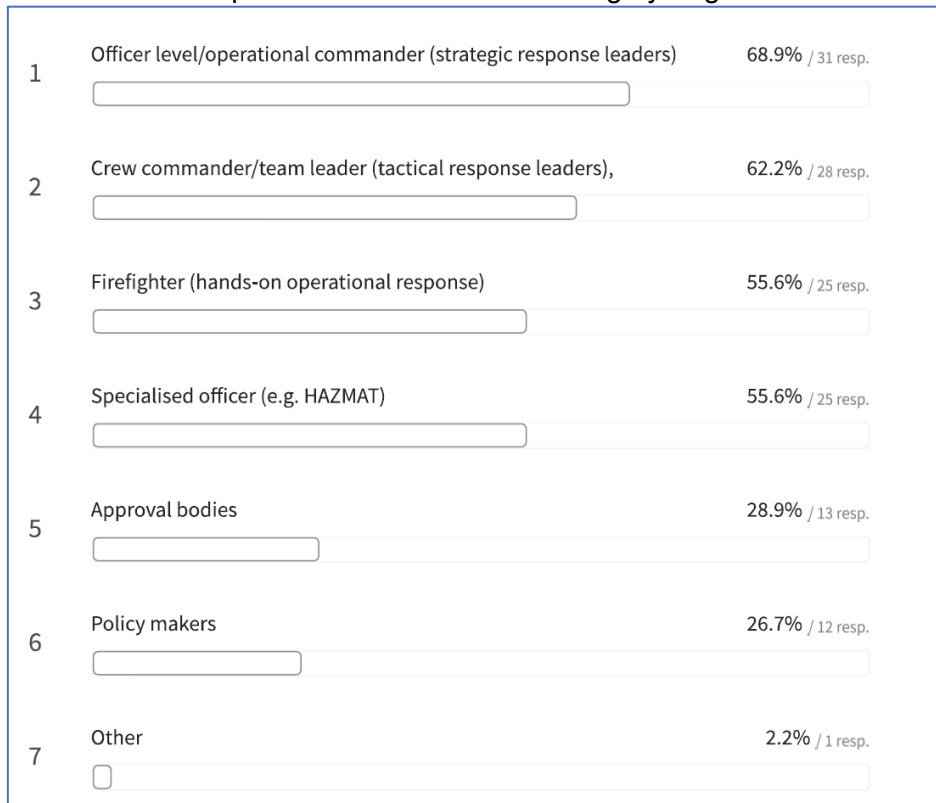


Figure 23 Who do you think would benefit most from online education

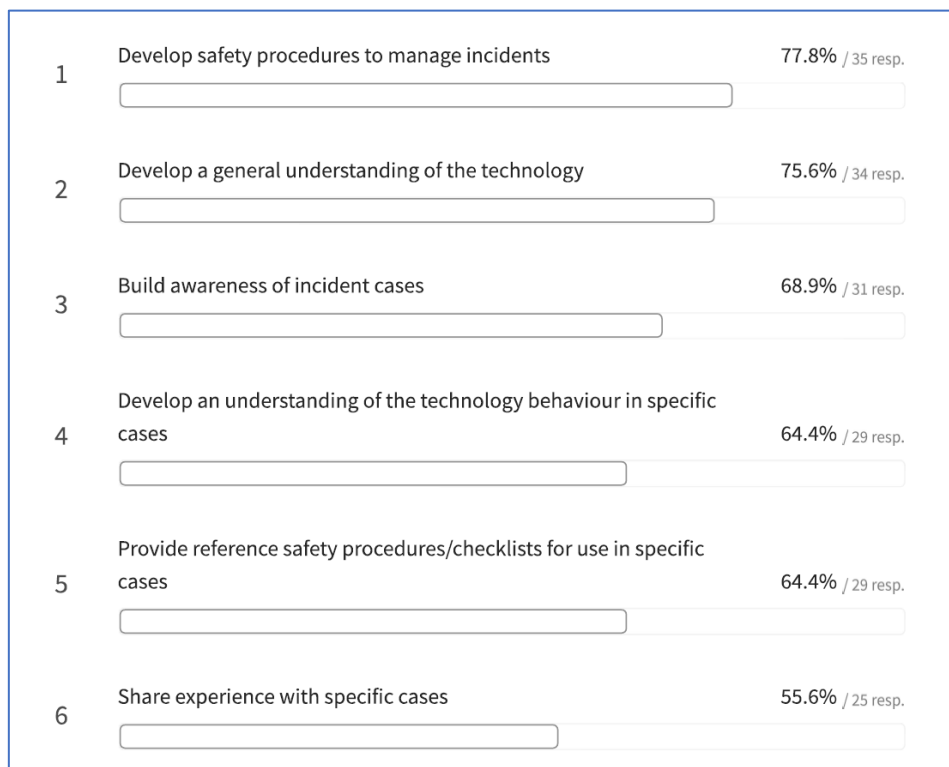


Figure 24 What should online resources help with the most

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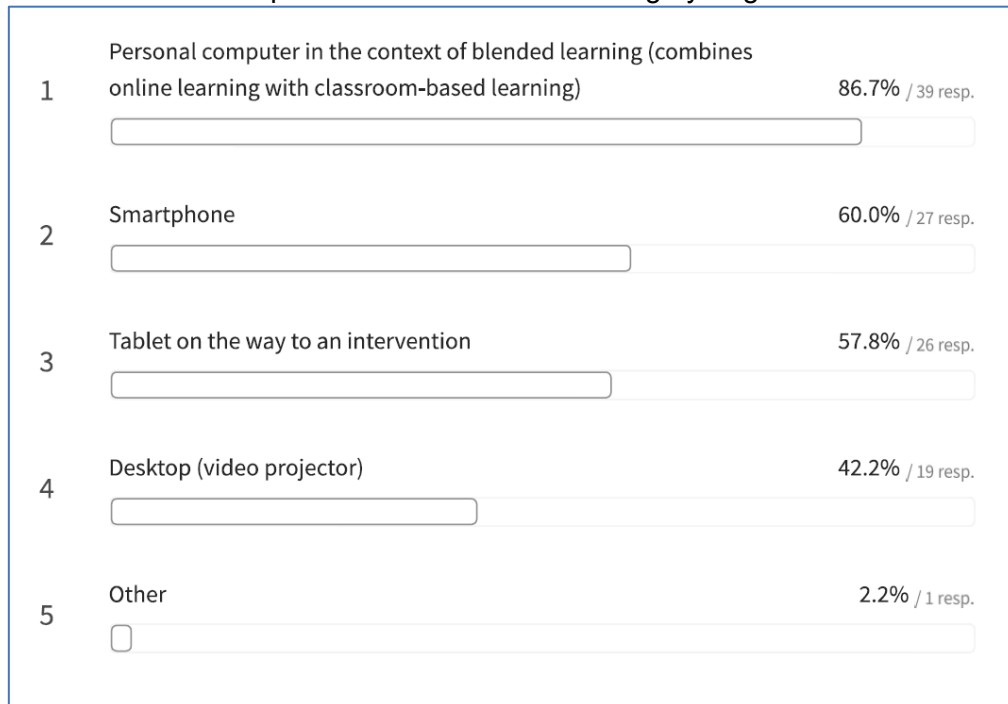


Figure 25 How should online resources be made accessible

4.6 Additional outcomes from the questionnaire

Respondents were asked if they would like to learn more about HyResponder and/or to become involved. Whilst their contact details are not given here from a data protection perspective, it should be noted that the SAB has been extended on the basis of the respondents.

5. Conclusions

As mentioned the original purpose of this deliverable was to assess the regional, national and international training activities for responders in accidents involving hydrogen. However it became clear that hydrogen specific training for responders is limited beyond that identified at the proposal stage of HyResponder. Thus an opportunity was taken to build a wider network of training organisations beyond the consortium and to identify their perceptions and needs for FCH training.

Again whilst it should be noted that this document describes a snapshot of ongoing activities and perceptions of training organisations, the questionnaire responses while informative, do not cover all possible training organisations throughout Europe. The findings have already been used to build the SAB and it is intended they will also be used to inform WP2 “Training materials development”, WP4 “National training programmes”, and WP5 “Dissemination and Sustainability”. A further survey may be considered later in the project to ensure the snapshot remains relevant.

It is suggested that the results of this survey are reported in 1 of three ways:

1. Revision of D.1 (this document)
2. Inclusion in D5.12 Recommendations on the Pan-European recognition and continuation of hydrogen safety training for responders
3. Inclusion in D5.11 International e-Forum for responders

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6. Appendix: Questionnaire

Welcome screen

This is your current draft. See the [published version](#)

Hy Responder

Introduction

The purpose of this questionnaire is to help shape the outputs of the HyResponder project (<https://hyresponder.eu/>).

We would like to hear from as many responders and responder training organisations as possible. Your participation in this questionnaire will help us do this, and is much appreciated.

Participation in the questionnaire is anonymous. Inclusion of your contact details is optional.

Start press Enter

Sample drop down menu to facilitate ease of completion

This is your current draft. See the [published version](#)

1+ Please select the country in which you are based *

Type or select an option

- Afghanistan
- Albania
- Algeria
- Andorra
- Angola
- Antigua and Barbuda
- Argentina
- Armenia

0% completed

Powered by Typeform

Questions set up in Typeform:

SECTION 1: Introduction

1. Country in which you are based (drop-down list)
2. Type of organisation (select all that apply)
 - a. Fire service
 - b. Police service
 - c. Paramedic/ambulance service
 - d. Other agency (coastguard border control)
 - e. Fuel cell and hydrogen private sector
 - f. Other industry
 - g. Education and training organisation
 - h. Research organisation
 - i. Other *(optional to say)
3. Name of organisation
4. In your country please indicate how responder training is generally provided (select all that apply):
 - a. Municipal or local level
 - b. Regional level
 - c. National level
 - d. Do not know
5. Who are the main training provider(s) for responders in your country or for your organisation (if known)?
6. Who is the sets the learning and training standards for responder training in your
 - a. Organisation
 - b. Region
 - c. Country (if known)?
7. Position in the organisation: (select all that apply)
 - a. I provide training for responders
 - b. I am a responder who undertakes training
 - c. I lead or contribute to the design of training for responders
 - d. I lead or contribute to the delivery of training for responders
 - e. None of the above
8. Do you or your organisation provide or access training for responders
 - a. Yes we provide or contribute to training for responders
 - b. Yes we access training for responders
 - c. No

(If a , go to question 9, if b go to 11, if no, skip go to question 16)

Training for responders by your organisation

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9. What training does your organisation provide directly to **responders**? (select all that apply)
- a. My organisation provides training for our employees (internal)
 - b. My organisation provides training for external groups
10. What is the region in which your organisation provides training for **responders**? (select all that apply)
- a. We provide training at regional/municipal/local level
 - b. We provide training at a National level
 - c. We provide training at an international level
 - d. Other (please specify)
11. What facilities for training does your organisation provide or access for responders (select all that apply)
- a. Classroom-based training
 - b. Operational training using practical facilities and training grounds
 - c. Virtual reality training
 - d. Online training
 - e. Other (to be specified)
12. What level of **responder** training does your organisation provide or access?
- a. Firefighter (hands on operational response)
 - b. Crew commander/team leader (tactical response leaders),
 - c. Officer level/operational commander (strategic response leaders)
 - d. Specialised officer (e.g. HAZMAT)
 - e. Other (please specify)
13. Do you provide or access training for responders in alternative fuels (please tick all which apply)
- a. LPG
 - b. CNG
 - c. Battery electric vehicle and Plug-in Hybrid
 - d. Biofuels
 - e. fuel cell vehicles
 - f. Other please specify)
 - g. We do not provide or access training in alternative fuels
- * if you do not provide training in any of the above then please proceed to question 14, otherwise skip on*
14. Please tick all that apply
- a. We do not see a need for training in alternative fuels at this time
 - b. We would like to access or deliver this training in alternative fuels but currently can not.
 - c. Other (comment)
15. Please indicate how you provide or access training for responders in alternative fuels

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- a. Classroom-based training
- b. Operational training using practical facilities and training grounds
- c. Virtual reality training
- d. Online training

16. Do you provide or access any training for responders in Hydrogen and/or Fuel cells specifically?

- a. Yes
- b. No
- c. If yes, please could you provide details

SECTION 4: Training for Responders in Hydrogen and Fuel Cell Technologies

17. Are you aware of training for **responders** available for hydrogen and fuel cell technologies?

- a. Yes*
- b. No

* Please provide a link/and or details:

18. Considering the development of training for responders in hydrogen and fuel cell technologies, please rate the importance of the following on a scale of 1 to 5 with 5 being the most important

- a. Training materials should be available in the local language
- b. Training materials should be supported with Virtual Reality training
- c. Training materials should be supported with operational training
- d. The training should be formally recognised or accredited (e.g. as CPD hours)
- e. Training should be delivered face to face
- f. Training should be accessible online
- g. Support or a community of experts should be available beyond the initial training

19. At what level do you think training in hydrogen and fuel cells for responders would be most appropriate?

- a. Firefighter (hands-on operational response)
- b. Crew commander/team leader (tactical response leaders),
- c. Officer level/operational commander (strategic response leaders)
- d. Specialised officer (e.g. HAZMAT)
- e. Other (please specify)

20. Are you familiar with the HyResponse project and related training (<http://www.hyresponse.eu>)

- a. I have not heard of it
- b. Yes, I have heard of it but have limited knowledge

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- c. Yes, I am aware of it and have used the materials
*IF ANSWER IS b or c THEN OPEN QUESTION 19, IF NOT THEN PROCEED TO 20.

21. What do you feel could be improved in HyResponse?

- a. Nothing it was matching your expectation
- b. The content
- c. The format used to deliver the content
- d. The trainers who delivered the content
- e. The training environment
- f. Other (to be specified)

22. Are you familiar with the Net Tools e-laboratory for fuel cells and hydrogen (<https://fch2edu.eu/home/e-laboratory/>)

- a. No, I have not heard of it
- b. Yes, I have heard of it but have limited knowledge
- c. Yes, I am aware of it and have used the tools

23. How would you describe your knowledge of hydrogen and fuel cells
scale here so box tick

SECTION 5: E-education

24. Who do you think would most benefit from **online education**? (select all that apply/or rank in order?)

- a. Firefighter (hands-on operational response)
- b. Crew commander/team leader (tactical response leaders),
- c. Officer level/operational commander (strategic response leaders)
- a. Specialised officer (e.g. HAZMAT)
- b. Policy makers
- c. Approval bodies
- d. Other (please specify)

25. What should **online resources** in hydrogen safety for **responders** help with the most?

- a. Develop safety procedures to manage incidents
- b. Develop a general understanding of the technology
- c. Develop an understanding of the technology behaviour in specific cases
- d. Build awareness of incident cases
- e. Develop skills to plan interventions
- f. Share experience with specific cases
- g. Provide reference safety procedures/checklists for use in specific cases
- h. Other (to be specified)

26. How should **online resources** in hydrogen safety for **responders** be made accessible?

- a. Desktop (video projector)

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- b. Personal computer in the context of blended learning
(*combines online learning with classroom-based learning*)
- c. Tablet on the way to an intervention
- d. Smartphone
- e. Other (to be specified)

27. Have you used online educational platforms before? If yes, please comment which one.

28. In general, to what extent do you use forums or social media to share learnings and best practices?

Comment: which is the forum or social media you use

SECTION 6: Conclusion and follow up

29. Have you any further comments that you would like to add?

INSERT TEXT BOX

30. Would you be happy for us to contact you for further information and with news about HyResponder?

- a. Yes (space for email)
- b. No

Many thanks for taking the time to complete this questionnaire!