

# Fuel Cells & Hydrogen Observatory

## Presentation for Hydrogen Business for Climate

*D Raine*

*24<sup>th</sup> June 2021*




# THE FUEL CELLS AND HYDROGEN OBSERVATORY

[www.fchobservatory.eu](http://www.fchobservatory.eu)




**Discover the FCH Observatory**



**Technology & Market**

Access technology, infrastructure and supply statistics relevant to the Fuel cell & Hydrogen sector, including shipment data, hydrogen refuelling and vehicle deployment data as well as supply and demand information related to industrial hydrogen.


[See more](#)



**Patents**

Understand the pattern of first patent registrations and monitor the trends in the sector over time.


[See more](#)



**Publications**

Review the trends in publications across the sector, including articles, technical and conference papers, reviews and project report.


[See more](#)



**Financial Support**

Search for National and European funding and finance opportunities of direct and indirect interest to stakeholders in the Fuel cell & Hydrogen space.


[See more](#)



**Policy & Incentives, Regulation, Codes and Standards**

Review regional, national and European information on policies and incentives as well as sector-specific Codes and Standards.

[See more](#)



**Education & Training - Coming soon**

Identify Education & Training courses with relevant Fuel cell & Hydrogen content, including location and types of course available. Relevant material available from courses or from projects is referenced.

- ▶ **Go to resource for all things fuel cells and hydrogen**
- ▶ **User friendly and reliable output**
  - charts, graphs and data downloads
  - Insight reports
- ▶ **Chapters on**
  - Technology & Market
  - Policies & regulation
  - Codes & Standards
  - Patents & Publications
  - Funding
  - Education & Training (to follow)
- ▶ **Global resource**

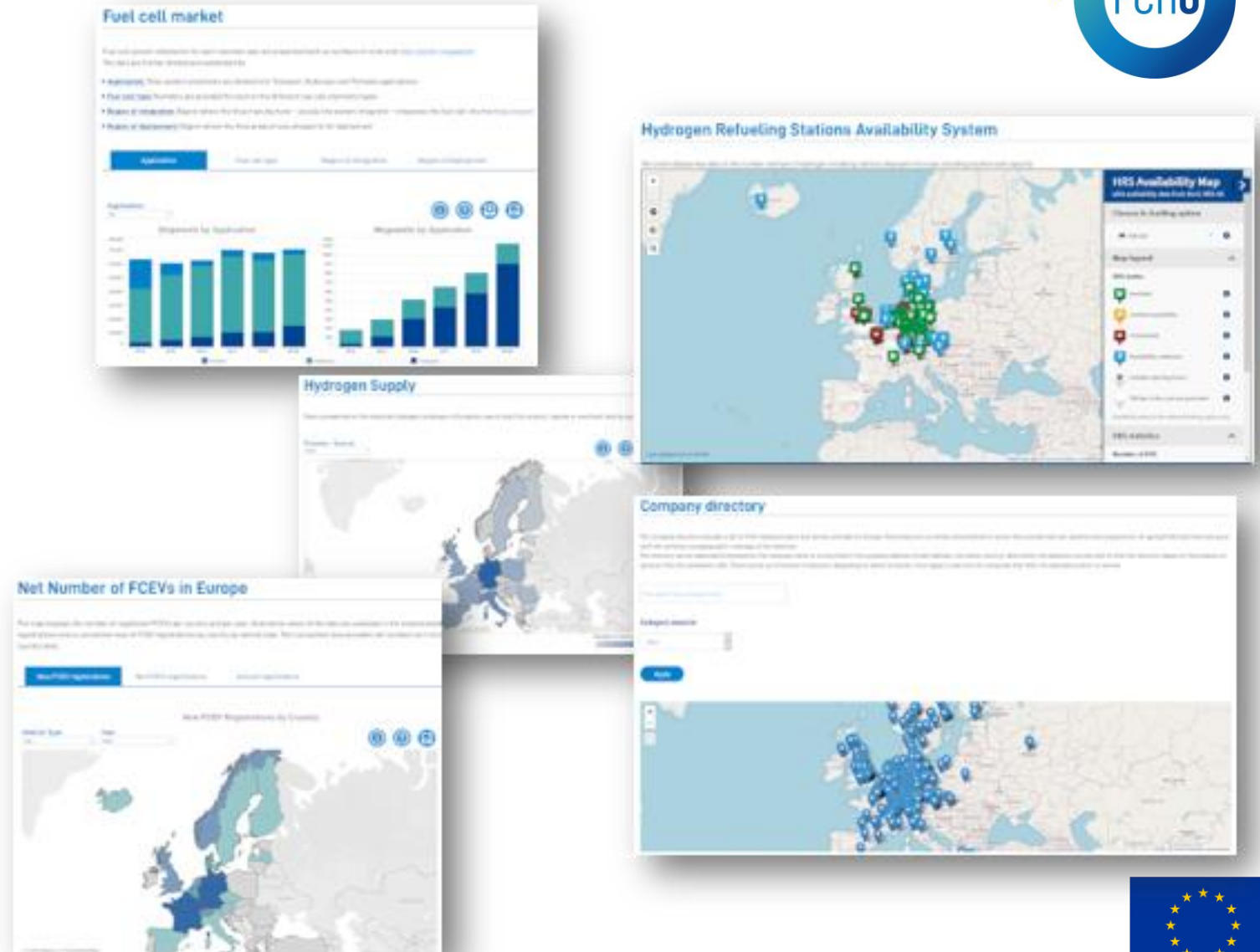


# TECHNOLOGY & MARKET

Providing a wealth of market data



- ▶ **Size of the FC market**
  - Gathered from manufacturers & aggregated
- ▶ **Hydrogen supply and demand**
  - baseline
- ▶ **Hydrogen refuelling stations**
  - Live data
  - Historical data
- ▶ **Registered FCEVs**
  - eafo.eu close collaboration
- ▶ **Company directory**
  - Fuel cell systems & components
  - Expansion for others in the value chain



# HYDROGEN SUPPLY & DEMAND



Baseline to monitor the transition to Green Hydrogen

## ► Hydrogen production capacity is presented

- by country
- by production technology
- By type of plant
  - Captive (for own consumption), Merchant (for sale), By-product

## ► Hydrogen consumption data

- is presented by country
- and by market
  - Ammonia production, Oil refining, Methanol, Other chemicals, Energy, Transport





# NATIONAL POLICIES



Benchmarking practices in Policies that promote or hinder development of hydrogen economies

## ► National Policies

- FCEVs, Stationary, HRS, Gas Grid, Industry, Other

## ► Network of National Correspondents

- Full list available on “about-us” section

## ► Yearly review of data

- Provide feedback (on scope and on content)

## National Contributors

The following individuals have provided important contribution in providing country specific policy and related data

Austria **Austrian Energy Agency**  
Peter Traupmann, Andreas Indinger, Werner Liemberger and Link Christoph

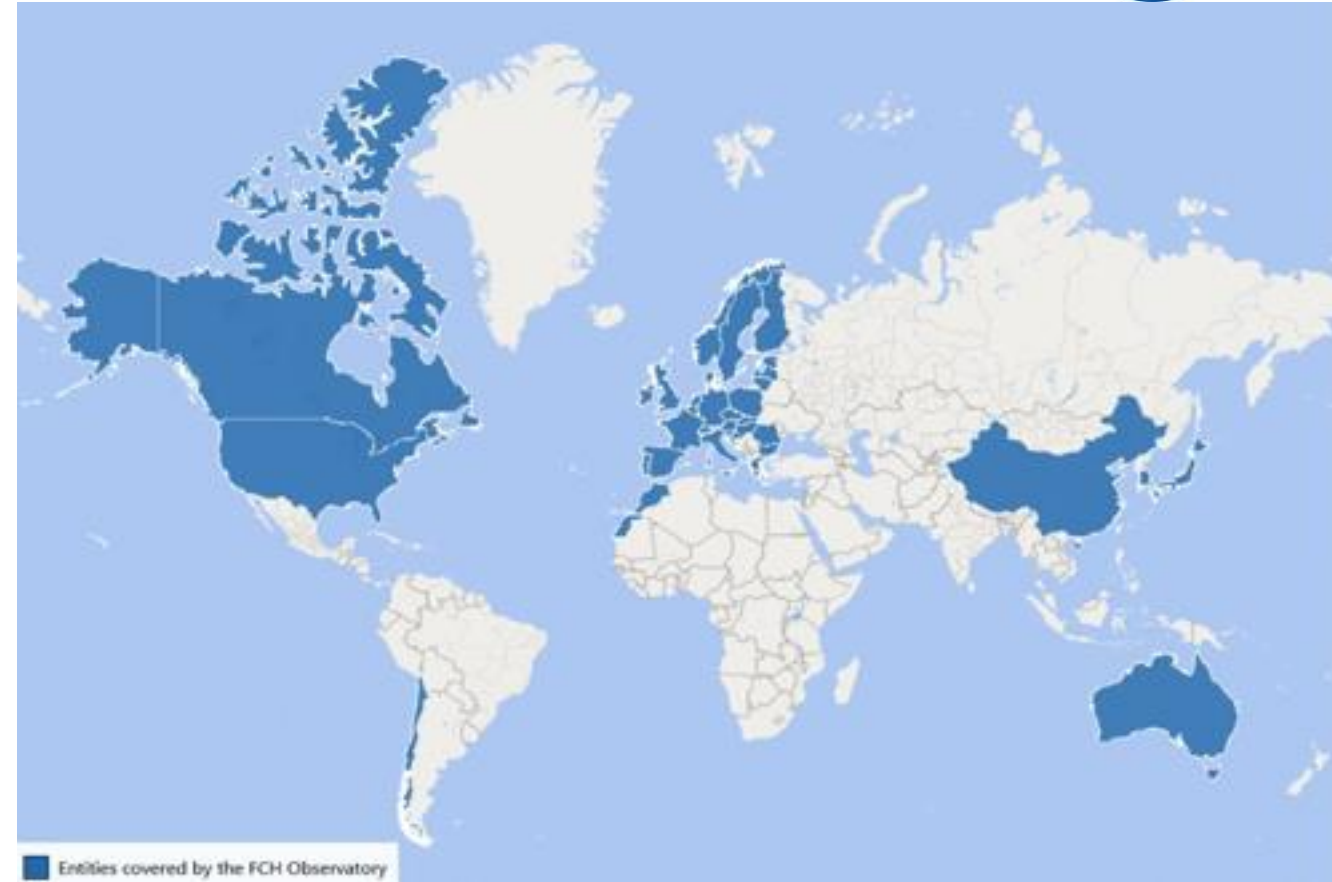
Belgium **WaterstofNet vzw**  
Adwin Martens and Isabel Francois

Bulgaria **Bulgarian Hydrogen, Fuel Cell and Energy Storage Association**  
Daria Vladikova

Czech Republic **HYTEP**  
Alex Doucek

Croatia **University of Split**  
prof.dr.sc. Frano Barbir

Denmark **BrintBranchen**  
Tejs Laustsen Jensen and Sofie Ulrik Neergaard



- FCHO includes also data from California
- Countries to be added: Canada, Cyprus, Estonia, Latvia, Lithuania, Luxembourg, Malta, and Morocco



# STANDARDS

## Signposting up to date hydrogen related standards

- ▶ All hydrogen related standards included and gathered through publicly accessible online platforms from the following standardization developing organizations:
  - ISO, OIML, IEC, CEN, CENELEC
- ▶ Information per standard on the FCHO
  - Title of the standard
  - Status of standard (published or under development)
  - Description of the standard
  - Direct link to the standard (and more information on the standard, such as a preview or table of contents)
  - Direct link to the scope of the Technical Committee responsible for drafting the standard
  - An overview of other categories to which the standard applies



**Title of Standard:** Gas infrastructure - Pipelines for maximum operating pressure up to and including 16 bar - Part 1: General functional requirements  
**Status of Standard:** Published  
**Description :** This European Standard describes the general functional requirements for pipelines up to the point of delivery, and also for buried sections of pipework after the point of delivery, for maximum operating pressures up to and including 16 bar for gaseous fuels in accordance with EN 437:1993+A1:2009, Table 1.  
**TC Scope:** CEN/TC 234 Scope  
[Direct link to this standard, and more information](#)  
**This standard applies to the following categories:**  
Infrastructure > Pipelines

# PATENTS & PUBLICATIONS



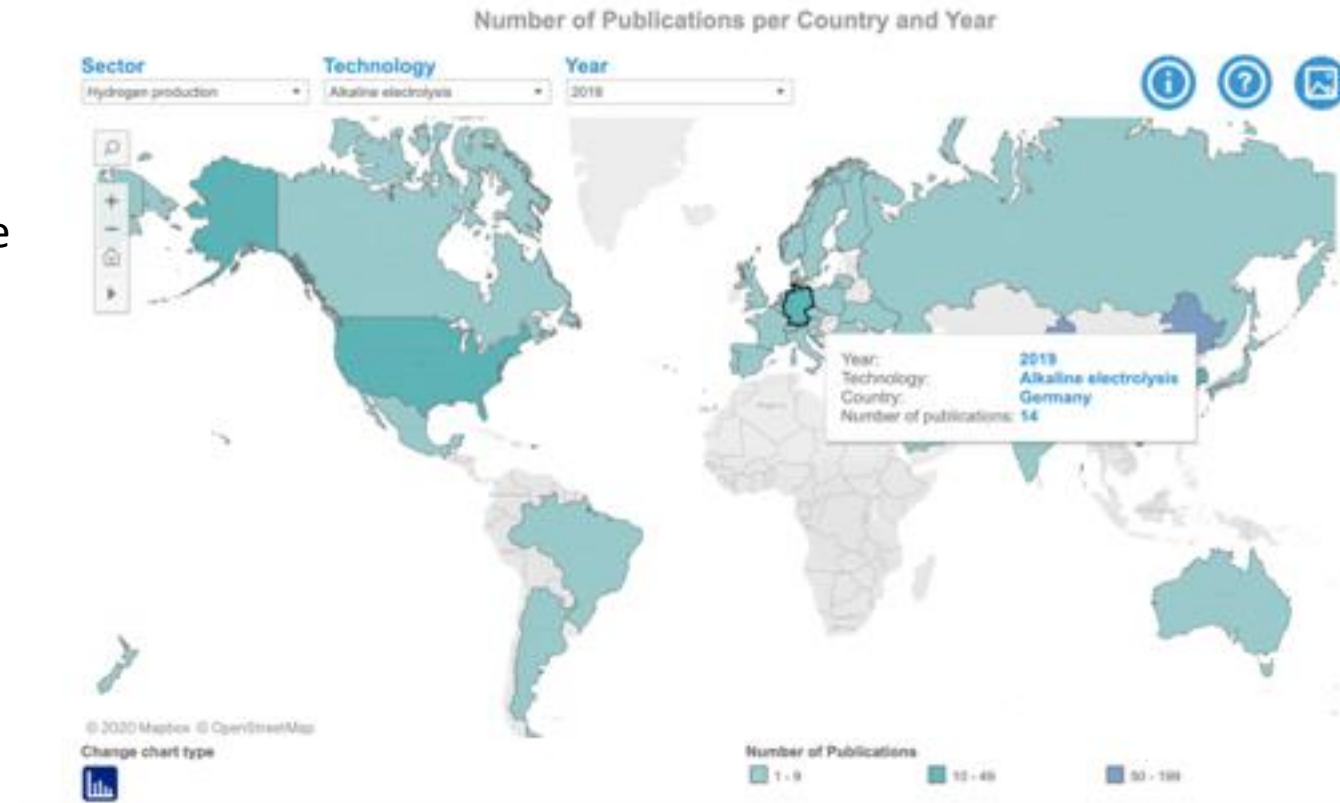
Monitoring trends in patents & publications in the sector

## ► Publications

- Annual data on global publications; conference papers, reviews articles and book chapters
- Data sourced from *Tools for Innovation Monitoring* (TIM) - IT tool developed by JRC with support of the FCHJU
- Filtered by
  - Country and by year
  - Sector and by technology

## ► Patents

- Annual data on global patent applications and patents
- Source: PatBase provided by MineSoft/RWS
- Filtered by
  - Country and by year
  - Sector and by technology



# FINANCIAL SUPPORT

Tool identifying public funding opportunities relevant to hydrogen projects



## ▶ EU Direct Funding programmes

- Horizon 2020, Life programme, Era-Nets, Eurostars...

## ▶ EU Indirect Funding programmes

- ERDF, ESF, CF, Interreg

## ▶ National Funding programmes (example FR.)

- ANR, ADEME, FUI

## ▶ Uses an AI interface (not keyword search)

## ▶ Updated in real time





# Education & Training

# EDUCATION & TRAINING CHAPTER



FCHO

- ▶ The Education & Training Chapter has two sub searchable sections
  - Training Materials
  - Training Courses
- ▶ Hyperlinks to courses, training providers and course materials included wherever possible
- ▶ Updated on an annual basis

## Education materials

Education materials publicly accessible online can be found in this subsection. Materials can be retrieved by 'level', as classified by the International Standard Classification of Education (ISCED), by course focus, by language or by source of material. You can use the different selectors to refine your search.

Free search (e.g. course title, type of materials, etc.)

ISCED: Any Course focus: HQ Production Language: Any Source: Any

Apply

COURSE TITLE	TYPE OF MATERIALS	SOURCE
Accumulo energetico	slides	HySchools <a href="#">view</a>
Activité d'apprentissage - Distribution de l'hydrogène	Exercice	HySchools <a href="#">view</a>
Alternative Fahrzeugkonzepte	Slides	HQ Training <a href="#">view</a>
	Slides	HQ Training <a href="#">view</a>
	Slides	HQ Training <a href="#">view</a>
	Slides	Trainity <a href="#">view</a>



# EDUCATION & TRAINING

A searchable database of training courses for the Fuel Cell & Hydrogen sector



## ► Work conducted by Hydrogen Europe Research

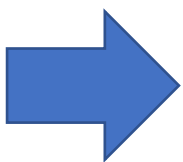
### ► Questionnaire drafted to survey

- Hydrogen Europe Research membership (~90 organisations)
- Hydrogen Europe members of the Skills working-group (~25 organisations)
- S3 Regional partnership on hydrogen valleys (~50 local and regional authorities)
- About 50 organisations (universities and others contacted in a generic email based on participation in project)
- The European Forum for Technical and Vocational Education and Training (EFVET)
- The European University Association (EUA)



Through the S3 partnership and Hydrogen Europe membership, the questionnaire was then shared in other networks:

- Régions de France
- CNRS





# EDUCATION & TRAINING

A searchable database of training courses for the Fuel Cell & Hydrogen sector



- ▶ **First full year of data collection completed in April**
- ▶ **Professional and vocational training are included**
  - *alongside Bachelor, Master, Doctorates, Post-doctorates, Summer schools, Internships, Workshops*
- ▶ **Training records can be retrieved by the course focus:**
  - Basic Electrochemistry
  - H2 Production
  - H2 Storage, Transport and Distribution
  - H2 End-uses: energy, power generation
  - H2 End-uses: transport/ industrial H2/stationary
  - Regulations, Codes, Standards
  - Safety
  - Life Cycle and Social Assessment, eco-design, recycling
  - Technical-economical evaluation



# EDUCATION & TRAINING OUTPUTS

A searchable database of training courses for the Fuel Cell & Hydrogen sector



- ▶ **More than 80% of the training courses were provided by Research & Technology Organisations (RTOs) and universities**

- ▶ **Other training providers responded:**

- Companies
- Professional training organisations
- Training courses from European projects
- Other higher education organisations
- Public entities
- Regional Clusters
- Others

- **372 courses identified to date, 18 countries**

**Postdoc at the German Aerospace Center (DLR)**

**Open postdoctoral positions**

**Location:** Cologne

**Duration:** Less than 1 year

More than 1 year and less than 2 years

**Language(s):** English, German

**Focus of the postdoc programme:**

- ✓ H2 Production
- ✓ H2 Storage, Transport and Distribution
- ✓ H2 End-uses: transports
- ✓ H2 End-uses: industry
- ✓ H2 End-uses: energy, power generation
- ✓ Safety
- ✓ Life-Cycle Assessment, eco-design, recycling
- ✓ Technical-economic evaluation

**List of PhD thesis produced by the organisation:** <https://elib.dlr.de/cgi/search/advanced>

Hyperlink to the Course where possible

Hyperlink to the Course provider

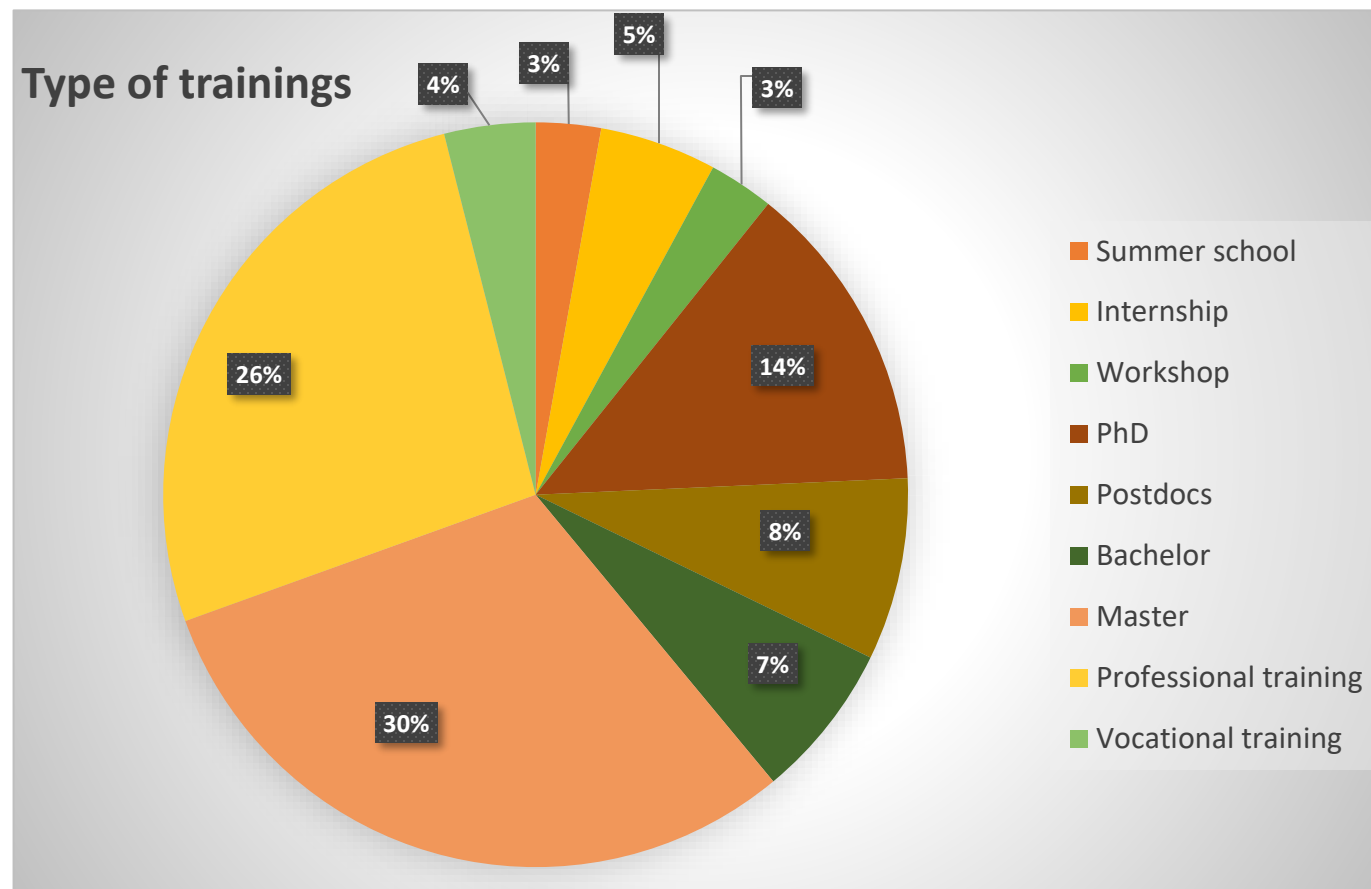




# TYPE OF TRAINING



- Masters courses are the most common surveyed with Professional training the second most populated



# LOCATION



## ► Ranking based on number of training courses available

- UK
- France
- Spain
- Italy
- Germany
- Netherlands



# FOCUS



% of training courses with a focus on the respective themes

- ▶ H2 Production - 64%
- ▶ H2 End-uses: transports - 62%
- ▶ Basic Electrochemistry - 57%
- ▶ H2 Storage, Transport and Distribution - 57%
- ▶ H2 End-uses: energy, power generation - 56%
- ▶ Safety - 45%
- ▶ H2 End-uses: industry - 38%
- ▶ H2 End-uses: buildings - 33%
- ▶ Regulations, Codes, Standards - 19%
- ▶ Life Cycle and Social Assessment, eco-design, recycling - 29%
- ▶ Technical-economical evaluation - 32%

***Provides an indication of the current most in demand/important topics within training courses***



# LOOKING FORWARD

Other aspects of the sector in the future to be investigated

## ► Widening the database

- Plans to widen the target respondents to HR/training organisations
- Identify national CPD contacts and databases
- Any other sources identified

## ► Widening the analysis

- Identify a criteria to determine the % of a topic in a course
- Including a 'follow on' indicator to describe what the course is providing preparation for *e.g. conception, manufacturing, installation, operation, maintenance, etc.*
- Specifying the type of role the course is targeting *e.g. engineers, technicians, doctorate, other categories to be defined*

## ► Across the FCHO, comparing socio-economic indicators alongside the availability of training i.e. skill gaps



### Education & Training

Identify Education & Training courses with relevant Fuel cell & Hydrogen content, including location and types of course available. Relevant material available from courses or from projects is referenced.

[See more](#)







**Please visit**  
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