Clean Hydrogen Partnership

European Hydrogen Safety Panel (EHSP)
Webinar "Safety planning and management in EU hydrogen and fuel cell projects“, 22 April 2022

HIAD 2.0 and HELLEN incidents databases

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Joint Research Centre of the European Commission

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“*High dwellings are the peace and harmony of our descendants.*

Remember the calamity of the great tsunamis. Do not build homes below this point.”

The Atlantic

Updated at 3:50 p.m. ET on March 16, 2022

TWO HUNDRED FEET up in the foothills that surround Aneyoshi, a tiny coastal village in Japan, warnings are engraved into the rocks. Most of the messages come from 19th-century survivors of large tsunamis that terrorized people along the coast. "High dwellings are the peace and harmony of our descendants," one inscription declares. "Remember the calamity of the great tsunamis. Do not build any homes below this point."

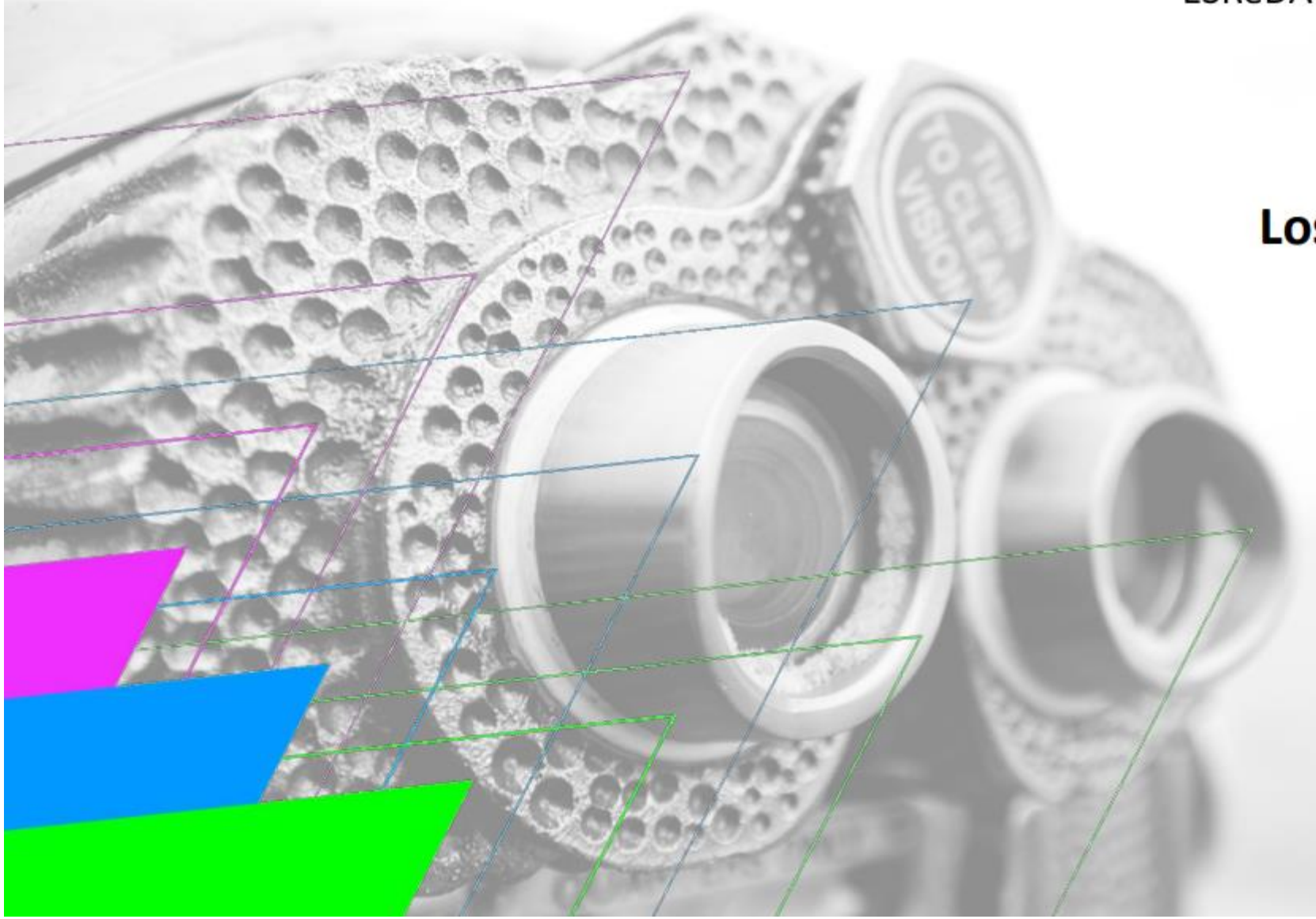
But more recent residents of coastal Japan did build below that point. Homes at first, but eventually nuclear facilities, which were built where they could be cooled by nearby ocean waters. On March 11, 2011,

Never again is a common refrain after traumatic disasters, but it's also a hard promise to keep. Memories fade over time. But more important, societies change, and so do their risk calculations.

https://www.theatlantic.com/ideas/archive/2022/03/fukushima-nuclear-disaster-management-onagawa/627070/

Enhancing Safety: The Challenge of Foresight

ESReDA Project Group *Foresight in Safety*



Chapter 4

Loss of Memory as a Cause of Failure of Foresight in Safety

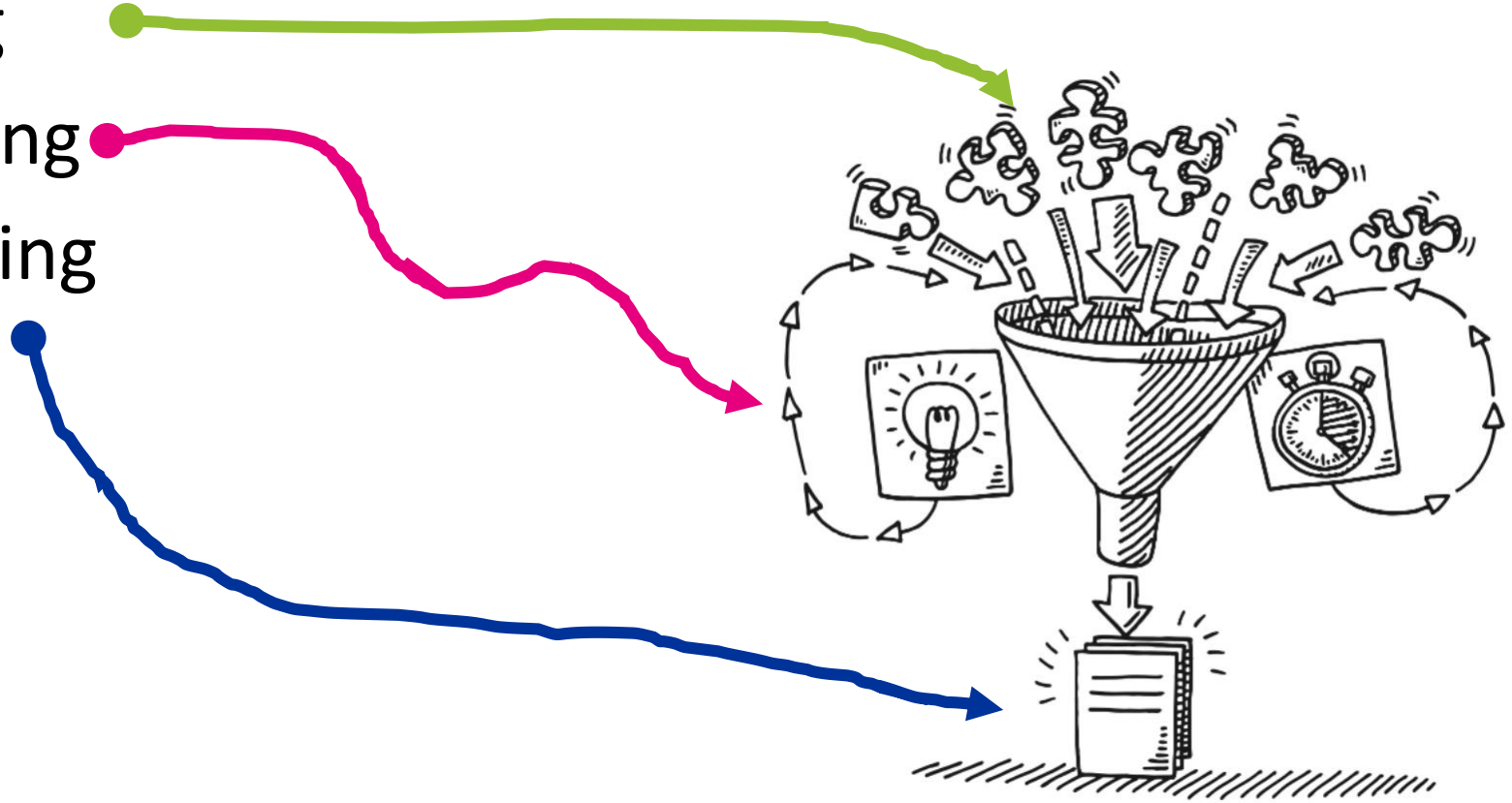
Miloš Ferjenčík
Nicolas Dechy

ESReDA
European Safety, Reliability & Data Association

Fighting *Loss of Memory*

The three human faculties of memorizing:

- storing
- encoding
- retrieving



http://getdrawings.com/database-drawing

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Basic terminology

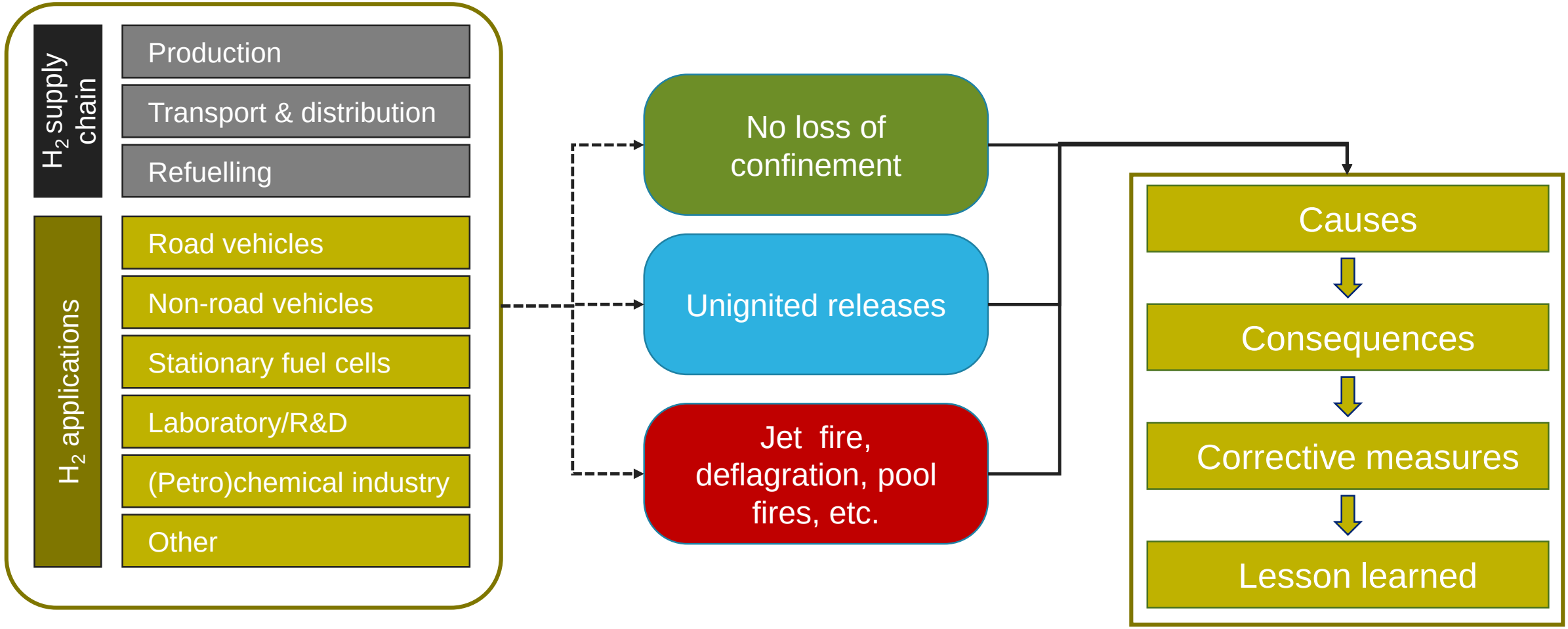
INCIDENT: an unplanned event that resulted in injury or ill health of people, or damage or loss to property, plant, materials or the environment or a loss of business opportunity

Note: The use of the term incident is intended to include the term accident.

[Source: ISO 29880-1]

NEAR-MISS: an unplanned event that under slightly different conditions would have resulted in an incident.

Database structure



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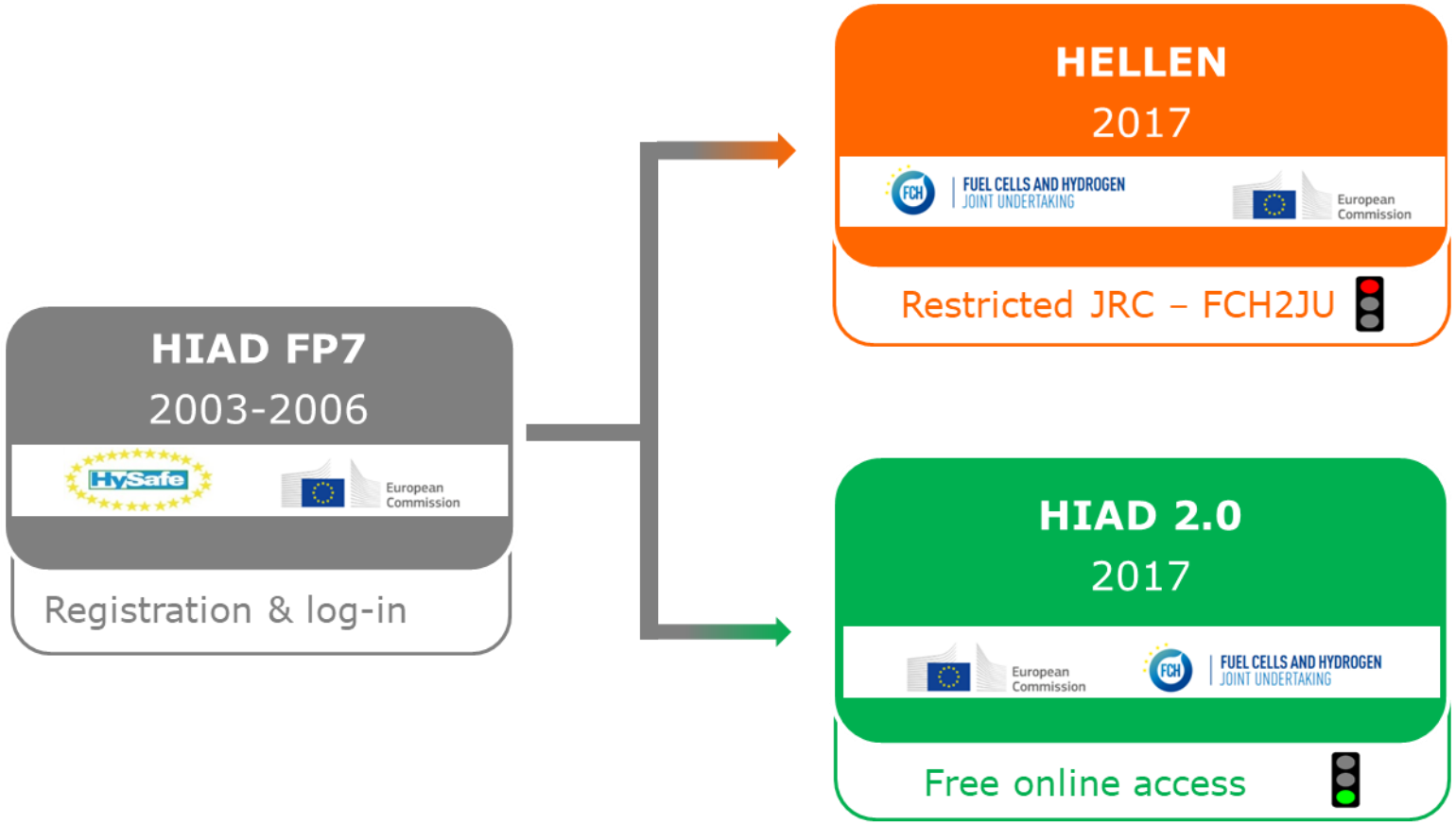
Two databases with two different scopes



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HIAD 2.0 knowledge flow

News, reports, other databases

ARIA dgpr srt barpi

eMARS

IChemE ADVANCING CHEMICAL ENGINEERING WORLDWIDE

CSB

NTSB National Transportation Safety Board

HIAD 2.0
Public sources Incidents

European Commission

Clean Hydrogen Partnership

EHSP + JRC public reports & recommendations
(see next presentation)

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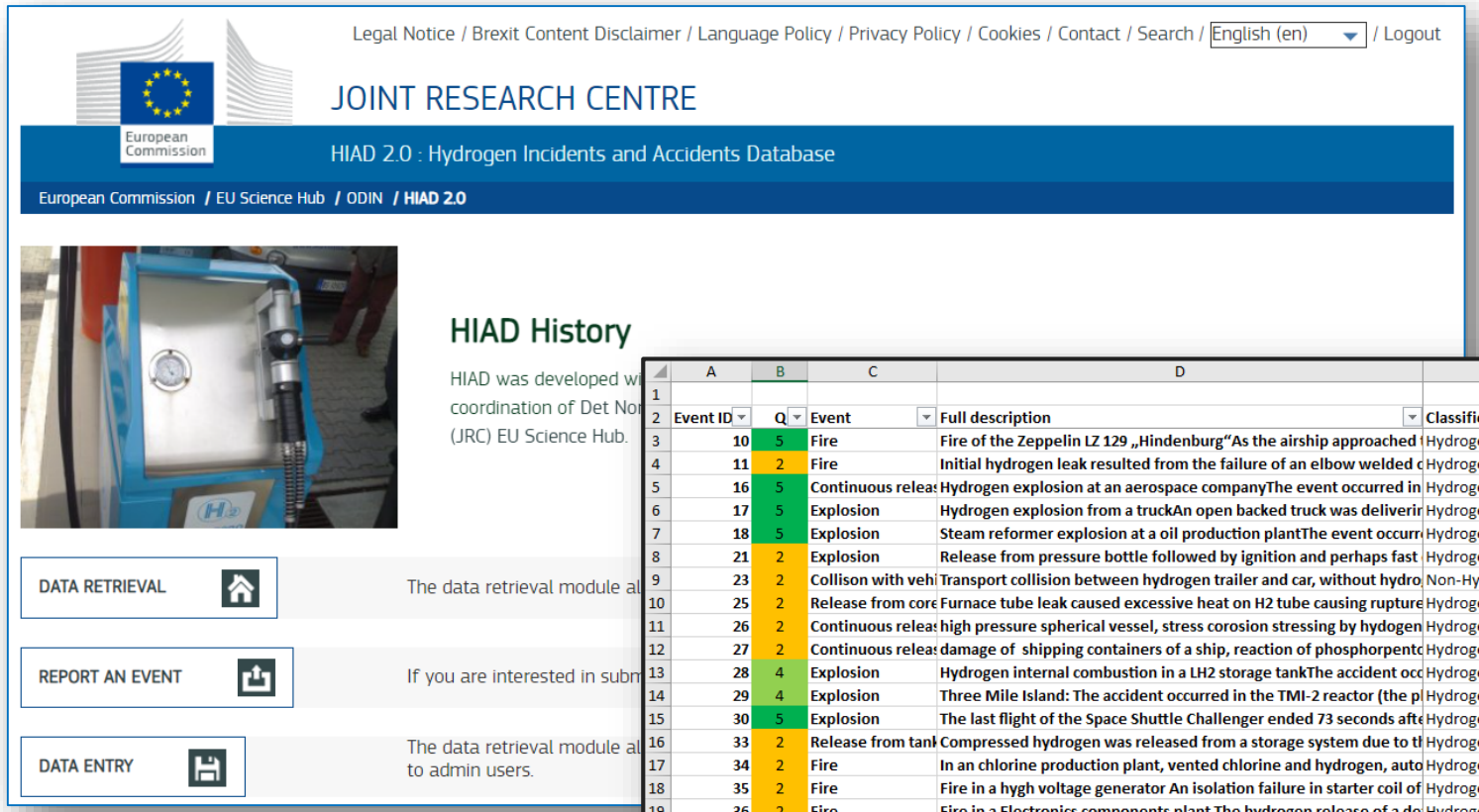
How to access HIAD



Since 2021 not accessible online, but via an Excel file

	A	B	C	D	E	F	G	H	I	J
1										
2	Event ID	Q	Event	Full description	Classification	Physical consequences	Application sta	Systems involv	Region	Country
3	10	5	Fire	Fire of the Zeppelin LZ 129 „Hindenburg“As the airship approached	Hydrogen system initiating event	Jet Fires and Explosions	Non-Road vehicle	zeppelin, gas stor		UNITED STATES
4	11	2	Fire	Initial hydrogen leak resulted from the failure of an elbow welded c	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	Failure of a 2-inch		UNITED STATES
5	16	5	Continuous releas	Hydrogen explosion at an aerospace companyThe event occurred in	Hydrogen system initiating event	Unignited Hydrogen Releas	Chemical/Petroch	support buildings		UNITED STATES
6	17	5	Explosion	Hydrogen explosion from a truckAn open backed truck was deliverir	Hydrogen system initiating event	Jet Fires and Explosions	Hydrogen transpo	Industrial pressur		SWEDEN
7	18	5	Explosion	Steam reformer explosion at a oil production plantThe event occurr	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	steam reformer		CANADA
8	21	2	Explosion	Release from pressure bottle followed by ignition and perhaps fast	Hydrogen system initiating event	Jet Fires and Explosions	Hydrogen transpo	Compressed hydr		PEOPLE REPUBLIC
9	23	2	Collison with veh	Transport collision between hydrogen trailer and car, without hydro	Non-Hydrogen system initiating event	No Hydrogen Release	Road vehicle	gaseous hydroger		
10	25	2	Release from core	Furnace tube leak caused excessive heat on H2 tube causing rupture	Hydrogen system initiating event	Unignited Hydrogen Releas	Chemical/Petroch	hydrogen pipeline		UNITED STATES
11	26	2	Continuous releas	high pressure spherical vessel, stress corosion stressing by hydogen	Hydrogen system initiating event	Unignited Hydrogen Releas	Chemical/Petroch	high pressure spe		GERMANY
12	27	2	Continuous releas	damage of shipping containers of a ship, reaction of phosphorpento	Hydrogen system initiating event	Unignited Hydrogen Releas	Non-Road vehicle	high pressure sph		CANADA
13	28	4	Explosion	Hydrogen internal combustion in a LH2 storage tankThe accident occ	Hydrogen system initiating event	Jet Fires and Explosions	Laboratory / R&D	liquid hydrogen ci		FRANCE
14	29	4	Explosion	Three Mile Island: The accident occurred in the TMI-2 reactor (the pl	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch			UNITED STATES
15	30	5	Explosion	The last flight of the Space Shuttle Challenger ended 73 seconds afte	Hydrogen system initiating event	Jet Fires and Explosions	Non-Road vehicle	external fuel tank		
16	33	2	Release from tank	Compressed hydrogen was released from a storage system due to th	Hydrogen system initiating event	Unignited Hydrogen Releas	Chemical/Petroch	hydrogen storage		UNITED STATES
17	34	2	Fire	In an chlorine production plant, vented chlorine and hydrogen, auto	Hydrogen system initiating event	Jet Fires and Explosions	Other	chlorine electroly		UNITED STATES
18	35	2	Fire	Fire in a hygh voltage generator An isolation failure in starter coil of	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	hydrogen pipe, hi		UNITED STATES
19	36	2	Fire	Fire in a Electronics components plant The hydrogen release of a de	Hydrogen system initiating event	Jet Fires and Explosions	Other	hydrogen supply l		UNITED STATES
20	37	2	Fire	Fire in a zirconium production plantDue to the failure of a exhaust s	Hydrogen system initiating event	Jet Fires and Explosions	Other	hydrogen exhaust		UNITED STATES
21	39	N	Fire	Fire on a hydrogen tanker, the hazmat crews evacuated the workers	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	Hydrogen tanker		UNITED STATES
22	40	5	Explosion	Hydrogen-air explosion in an ammonium plant.This resulted in the c	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	hydrogen vessel,		NORWAY
23	43	A	ntinuous releas	Hydrogen release from a road truck transporting liquid hydrogen	Hydrogen system initiating event	Unignited Hydrogen Releas	Hydrogen transpo	vent system, LH2-		UNITED STATES
24	44	5	Explosion	Hydrogen explosion and fire in a petrochemical complex. The explos	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	litol benzene onv		CANADA
25	46	2	Fire - hydrogen	Lightning caused fires at plant near Hamburg after igniting a hydroge	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	Ventilation pipe		GERMANY
26	47	3	Explosion	An explosion occurred involving a COY Microbiological Anaerobic Cl	Hydrogen system initiating event	Jet Fires and Explosions	Laboratory / R&D	microbiological ar		
27	49	2	Explosion	Explosion at chemical plant in Akita Prefecture involving hydrogen k	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch			JAPAN
28	51	2	Explosion	Explosion at Shreveport refinery involving hydrogen injured a worke	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch			UNITED STATES
29	52	4	Explosion	Hydrogen explosion in a unit of a nuclear power plant.The explosior	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	reactor cooling sy		
30	53	2	Explosion	3 workers were injured in the hydrogen explosion	Hydrogen system initiating event	Jet Fires and Explosions	Chemical/Petroch	-		FINLAND

HELLEN knowledge flow

Project events

CHIC

Hydrogen Mobility Europe

hyFIVE HYDROGEN FOR INNOVATIVE VEHICLES

3EMOTION environmentally friendly, efficient, electric motion

DEMOSOFC FCH2-JU PROJECT

HELLEN

Incidents and near misses

Clean Hydrogen Partnership

European Commission

JRC annual report to CleanH_2

Public anonymised & aggregated return of experience

Co-funded by the European Union

Projects commitment to HELLEN

Reporting to HELLEN is a commitment for all projects, as stated in all calls of all recent AWP's:

For all topics and related successful projects, any safety-related event that may occur during execution of the project shall be reported to the European Commission's Joint Research Centre (JRC) dedicated mailbox JRC-PTT-H2SAFETY@ec.europa.eu , which manages the European hydrogen safety reference database, HIAD and the Hydrogen Event and Lessons LEarNed database, HELLEN.

The input form for HELLEN

Pages

Intro | Provider information | General information | Initial situation | Application | Consequences | Causes for the event | Corrective actions | Lessons learned | References

Event report form

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Safety statistics *vs.* cases

We need your help because we must to know what has happened:

Safety database statistics are important (see next presentation)…

…stories and cases are also important, to complement & complete knowledge from statistics.

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Clean Hydrogen Partnership

A good example from H2TOOLS LL

Hydrogen Tools

https://h2tools.org/lessons/hydrogen-fuel-cell-vehicle-traffic-accident

HOME / LESSONS LEARNED / HYDROGEN FUEL CELL VEHICLE TRAFFIC ACCIDENT

Severity	Leak	Ignition
Incident	No	No

DESCRIPTION: On a Friday afternoon in 2007 a traffic accident occurred at the corner of two urban streets. Two vehicles were involved. Each vehicle contained a single driver (no passengers). Vehicle 1 was a Fuel Cell Vehicle. Vehicle 2 was a conventional Toyota Camry. Vehicle 1 was traveling west, approaching an intersection with a green light, and proceeded into the intersection. Vehicle 2 was traveling north on a cross street. The driver of Vehicle 2 incorrectly perceived a green light and proceeded into the intersection. The vehicles collided in the intersection.

The automotive company's preliminary evaluation of the vehicle following the accident proved that the safety systems functioned as designed. The Emergency Shut-Down Procedure activated, and the hydrogen in the storage vessels was isolated. Upon further evaluation, the automotive company determined that the damage to the vehicle was severe despite the appearance of minimal body damage. The impact of the collision occurred at the driver-side front quarter panel of the vehicle. The frame of the vehicle was damaged too significantly to repair. In order for the vehicle to return to operation, the front section of the frame from the damaged vehicle would need to be severed and removed. A frame from another vehicle would then need to be welded to damaged vehicle. The timeline for this process is lengthy, therefore, the vehicle has been retired and the fuel cell stack has been salvaged and reused in another vehicle. The fuel cell supplier conducted an investigation of the fuel cell power plant within the vehicle. The evaluation of the fuel cell proved that the fuel cell system remained intact and unharmed by the impact of the collision.

How to report in HELLEN

Use the HELLEN input form:
https://ec.europa.eu/eusurvey/runner/CleanH2_HELLEN

…and contact the JRC H2 safety mailbox and me:

JRC-PTT-H2SAFETY@ec.europa.eu

pietro.moretto@ec.europa.eu

Keep in touch/Thank you

European Hydrogen Safety Panel
ehsp@clean-hydrogen.europa.eu

For further information
https://www.clean-hydrogen.europa.eu/

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