Hydrogen as energy carrier in society: risk picture, risk awareness and public acceptance

Efthymia Derempouka

University of Bergen, Department of Physics & Technology

With support from the projects:

- *Safe Hydrogen Implementation: Pre-normative research for Ships* (SH2IPS)
- *Safe Hydrogen Fuel Handling and Use for Efficient Implementation 2* (SH2IFT-2)

I have engineering background (within Transportation) and a masters degree in Risk Management and Offshore Technology.

Experience with consequence modelling tools.

Background

Widespread use of hydrogen and hydrogen-based fuels as energy carriers in society may enable the gradual replacement of fossil fuels. To facilitate this development, the providers of hydrogen technologies must demonstrate that the risk for hydrogen systems will be equivalent, or even lower to this achieved by conventional fuels and energy carriers. This requirement is clearly stated in international regulations, codes and standards (RCS), such as the IGF Code from IMO (2016). To enable a comparison of the risk associated with hydrogen use versus to the risk of conventional fuels and energy carriers, it is vital to assess the strength of the knowledge in risk assessments of hydrogen-based systems, including the inherent uncertainties in the estimation of event frequencies and the calculation of consequences.

Furthermore, societal factors such as the awareness and perception of hydrogen risk amongst key stakeholders in the emerging hydrogen economy including the public, will influence the attitudes towards hydrogen technologies. Existing work (Thesen and Langhelle, 2008) indicates that the framing of hydrogen technologies in the media, and the messages communicated by key-stakeholders impact presumably the way people perceive the risk of hydrogen use.

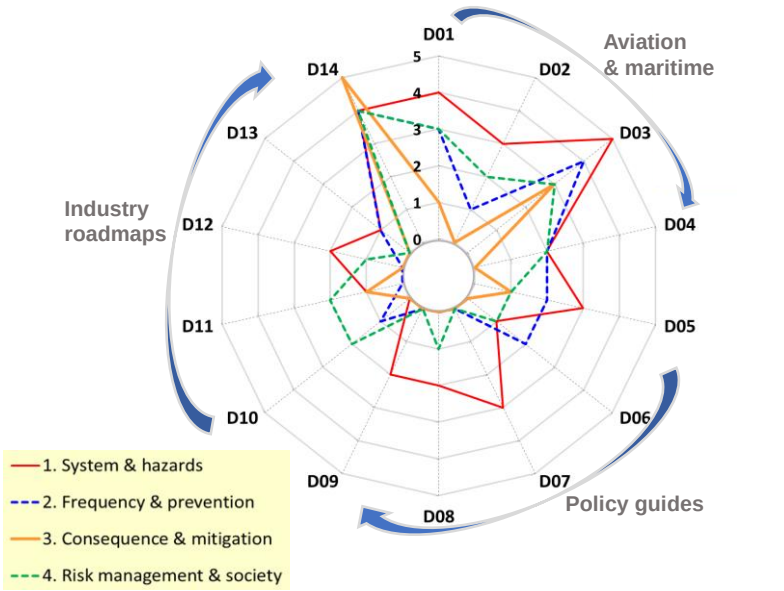

***Fig 1**. Results from the content analysis of the 14 documents. (Derempouka et al.,2022)*

Primary objective

- To analyse barriers & drivers for the implementation of hydrogen as an energy carrier in society.

Secondary objectives

- To investigate the perception and awareness of hydrogen as an energy carrier among key stakeholders in the emerging hydrogen economy including the public.
- To contribute towards the development of a science-based tool for the assessment of the strength of the knowledge supporting the risk assessment in hydrogen-based systems.

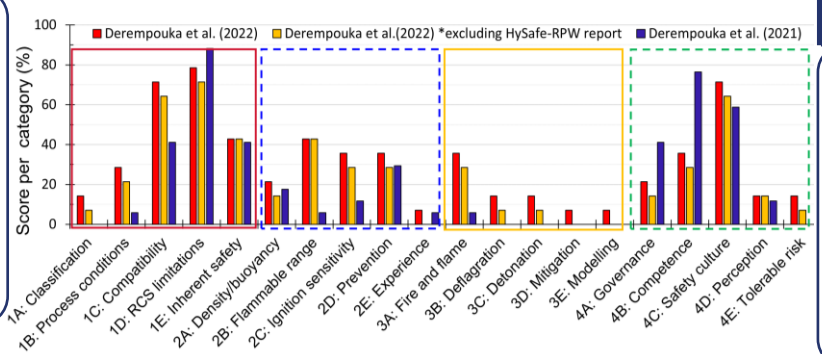

***Fig 2.** Score on safety per sub-category for all the documents addressed in the two studies (Derempouka et al., 2021; 2022)*

Estimated progress of the PhD project:

Just started ... **< 50 %** **> 50 %** **Almost done ☺**

Publications

- Derempouka, E.; Njå, O.; Skjold, T.; Haarstad, H.; Tvinnereim, E.M. (2023). Public perception of hydrogen: Response to an open-ended question. Proceedings tenth International Conference on Hydrogen Safety (ICHS2023)
- Bentsen, H. L.; Skiple, J. K; Gregersen, T. J.; Derempouka, E.; Skjold, T. (2023). In the green? Perceptions of hydrogen production methods among the Norwegian public. *Energy Research & Social Science*. 97: 102985 (11 pp.). DOI: https://doi.org/10.1016/j.erss.2023.102985
- Derempouka, E.; Skjold, T.; Njå, O.; Haarstad, H. (2022). The Role of Safety in the Framing of the Hydrogen Economy by Selected Groups of Stakeholders. *Chemical Engineering Transactions*. 90: 757-762. DOI: https://doi.org/10.3303/CET2290127
- Derempouka, E.; Skjold, T; Haarstad, H; Njå, O. (2021). Examining the role of safety in communication concerning emerging hydrogen technologies by selected groups of stakeholders. Proceedings Ninth International Conference on Hydrogen Safety (ICHS2021)

Hy School.no — Norwegian Research School on Hydrogen and Hydrogen-Based Fuels

HySociety

SH2IFT II

SH2IPS