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Life Cycle Assessment of Hydrogen for Heavy-duty Vehicles: Hydrogen Environment Protection, Analysis, Awareness and Review (HEAR)

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What did the research aim to address?

Hydrogen can be used as a potential fuel for heavy duty vehicles, however the full life cycle assessment of hydrogen production, delivery and use in Ireland is not well documented in literature.

The findings of this study are important for a range of stakeholders including; government and government agencies who can use the data and the results to inform policy and regulation to aid decarbonisation activities in transport; heavy duty vehicle operators, owners and their clients who rely on these vehicles and who need to make decisions on the future direction of their fleet, fuel or vehicle.

A literature review and desktop environmental Life Cycle Assessment (LCA) was conducted to evaluate the environmental impacts of hydrogen used in transport in Ireland, specifically – the production, transport & refuelling of hydrogen for heavy goods vehicles and compared against diesel.

What did the research find?

As part of the literature & data gathering the team engaged with many stakeholders, agencies and industry to help inform the methodology and also disseminate the results.

Through the LCA the results indicate that Green Hydrogen produced from renewable energy is the least harmful technology / transport fuel in key impact assessment categories including climate change and water pollution compared to diesel, and other production methods of hydrogen.

The LCA results and comparative analysis presented is new to literature. In addition in the process of developing the LCA the team have collected datasets called “inventories” that will assist future researchers to build on the existing findings which have become an important part within our dissemination activities.

Ultimately, there will always be a trade-off when selecting the most environmentally favourable method for hydrogen production and where that hydrogen should be used in application. These trade-offs depend on geographical, economic and social factors, political will and regulatory frameworks. Therefore, further research is needed to assess the whole life cycle costs of hydrogen in addition to the environmental considerations discussed in this work, hydrogen production pathways should also be evaluated from other perspectives, including techno-economic and socio-economic factors.

How can the research findings be used?

Mobility is fundamental in modern society but it must be decarbonised for the benefit of the environment, human health and climate change impacts.

The HEAR Life Cycle Assessment research findings allow stakeholders, including government agencies, researchers, the public and industry, to be informed on the full life cycle assessment of hydrogen production, delivery and use in Ireland, as well as ensure society buy-in is achieved.

The developed Life Cycle Assessment datasets, “inventories”, will also assist future researchers to build on the existing research findings for their particular future scenarios.

Therefore policy, regulation and supports can now be developed and implemented to remove fossil fuels such as diesel from our transport fleet and better understand where hydrogen fits in - to further help transform our transport system to have minimum impact on the environment, society and public health.

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