The Hydrogen Safety Shift: From Risk to Readiness

By: Joshua Dauda and Danah Kolstee, 2nd of July, 2025.

Hydrogen is back in the spotlight—hailed as a clean fuel for the future, ready to power trucks, heat homes, and fuel planes. But as hydrogen moves out of industrial plants and into everyday life, one big question keeps coming up: Is it safe? From infamous disasters like the Hindenburg to cutting-edge refueling stations in European cities, hydrogen has a complicated public image. In reality, it's not about fear—it's about facts. This article cuts through the myths and headlines to explore how hydrogen safety really works: the science, the systems, and the lessons from real-world projects. And it shows why ports, with their unique mix of scale, structure, and strategy, are becoming the proving grounds for making hydrogen both safe and scalable—starting with an ambitious new initiative across four North Sea ports.

Hydrogen safety - Facts and Fiction

Public perceptions of hydrogen safety have long been shaped by dramatic incidents—most notably the Hindenburg disaster of 1937 and, more recently, explosions in countries like South Korea. While these events are often cited as reasons to be cautious, they also underscore the need for robust safety standards, advanced technologies, and clear public communication.

But is hydrogen inherently more dangerous than other fuels, or simply misunderstood?

To answer that, we must first understand its core characteristics. Hydrogen is non-toxic, burns cleanly, and disperses quickly in open air—traits that make it an appealing clean energy carrier. However, it also ignites more easily than natural gas and burns with a nearly invisible flame, requiring specialized detection systems. Over time, hydrogen can cause certain metals to become brittle, which means some parts of our existing infrastructure—like pipelines, valves, and joints—may need reinforcement or replacement.

Unfortunately, these unique properties are often misunderstood, giving rise to persistent myths. For instance, it's falsely believed that hydrogen is toxic, or that it cannot be transported through existing gas pipelines. With proper retrofitting and safety measures, many pipelines can safely carry hydrogen. Like any energy carrier, hydrogen presents specific risks—but when managed correctly, its overall safety profile is comparable to fuels we already use every day.

The key lies in distinguishing fact from fiction, and ensuring that systems, protocols, and public understanding evolve together. Only then can hydrogen fulfill its potential as both a clean and safe solution for the future.

Examples of Hydrogen Safety in Practice

Across the Netherlands, hydrogen projects are already demonstrating how safety can be fully integrated into operations. In Alkmaar, for example, the NXT hydrogen refueling station is serving heavy-duty vehicles while also functioning as a training site for hydrogen safety procedures, emergency response, and technical testing. Meanwhile, the HEAVENN project (Hydrogen Energy Applications in Valley Environments for Northern Netherlands), coordinated by New Energy Coalition, is building a comprehensive hydrogen value chain that includes residential heating, public transport, and decentralized production, all designed with public safety as a central pillar. In every project, New Energy Coalition collaborates with municipalities, emergency services, and infrastructure operators to ensure transparency and community preparedness.

Safety Standards in Hydrogen

Hydrogen has been used in large volumes heavy industry for many decades, where safety is managed by a full Quantitative Risk Analysis (QRA), specific to that industrial site. However, for scaling hydrogen infrastructure to many (smaller) sites, it is simply too time-consuming and too expensive to do a full QRA for every occasion, therefore there is a need to develop standard operating procedures for “generic” hydrogen safety. Similarly, for electricity and natural gas, in the Netherlands, the BEI (Bedrijvsvoering van Elektrische Installaties) and VIAG (Veiligheidsinstructies aardgas) are in place, which also dictate the safe working instructions (VWI’s) for personnel working on the respective generic infrastructure. We do not have such instructions yet for hydrogen!

NSH2V Ports Contribution to Hydrogen Safety and Innovation in Ports

To develop a common safety standard for hydrogen, ports are the ideal development ground for such safety procedures, as large-scale, industrial activities (QRAbased) meet small-scale distribution and use of hydrogen in a well-regulated and controlled area.

This is exactly what we are trying to do in the NSH2V Ports project- an ambitious initiative co-led by New Energy Coalition, Ontwikkelingsbedrijf Noord-Holland Noord (ONHN), and a consortium of major European ports. Funded by the Interreg North Sea Programme, NSH2V aims to accelerate the development of safe and scalable hydrogen supply chains through North Sea port infrastructure. The project started in 2024 and will deliver a Masterplan for H2 use in four European ports by 2026.

NSH2V also promotes international knowledge exchange, harmonizing and enabling best practices to scale across European ports. In close cooperation with regional development agencies like ONHN, the project ensures that hydrogen integration is embedded in local spatial planning, workforce training, and port redevelopment strategies. By aligning technical innovation with governance and public awareness, NSH2V Ports is setting the standard for safe hydrogen deployment in one of the most complex and strategic environments of the energy transition: the port.

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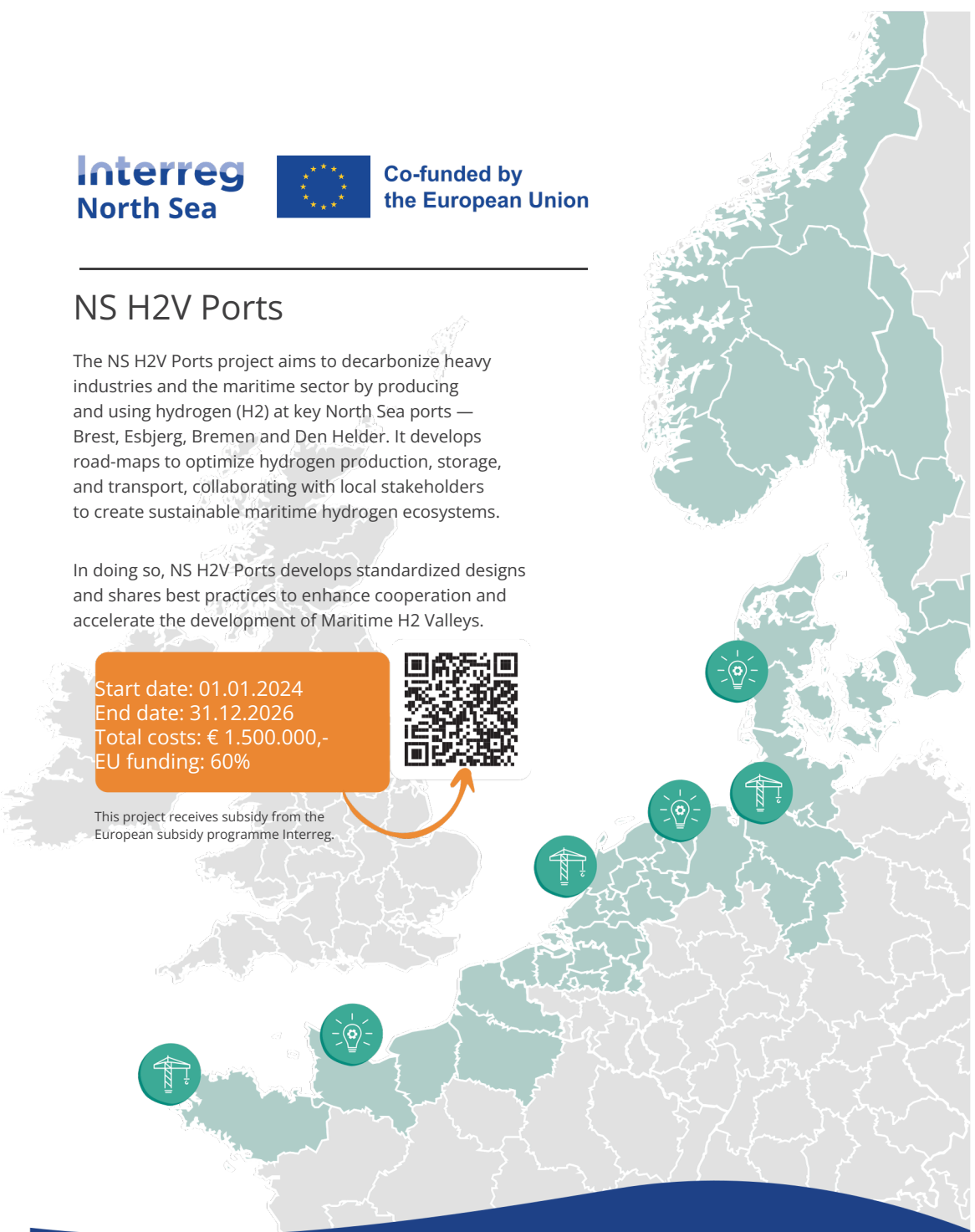
Interreg North Sea

Co-funded by the European Union

NS H2V Ports

The NS H2V Ports project aims to decarbonize heavy industries and the maritime sector by producing and using hydrogen (H2) at key North Sea ports — Brest, Esbjerg, Bremen and Den Helder. It develops road-maps to optimize hydrogen production, storage, and transport, collaborating with local stakeholders to create sustainable maritime hydrogen ecosystems.

In doing so, NS H2V Ports develops standardized designs and shares best practices to enhance cooperation and accelerate the development of Maritime H2 Valleys.



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