ROADMAP NORTHERN NL REGION

Northern Netherlands: European Hydrogen Valley

As the first European Hydrogen Valley, the Northern Netherlands has made significant strides in recent years towards the rollout of a hydrogen ecosystem. In order to accelerate chain development we need to work closer together, facilities need to be further integrated, and employers, employees, knowledge institutions and educational institutions must work together on innovative ways to develop competencies. This roadmap provides insight into the steps that the Northern Netherlands will take together with GroenvermogenNL to create a responsive labour market for green hydrogen.

Hydrogen Valley in Northern Netherlands

The Northern Netherlands is in the midst of making fossil-fuel-driven activities greener through, among other things, hydrogen applications. As a Hydrogen Valley, our region has already taken important steps towards the implementation of the regional investment agenda of €9 billion and the structuring of the hydrogen economy. Technical development, market application, and the demand for the right knowledge, skills and education are closely intertwined. From various perspectives, including those of employees, employers, governments and knowledge institutions, there is a need for policy instruments, legal frameworks, and development capacity to align investment plans and close the value chains even further.

A responsive learning, working and innovating culture is required to accelerate and scale up the restructuring of 66 thousand national jobs. This roadmap outlines the ambitions for jointly setting up this infrastructure, building on ongoing and upcoming initiatives. A regionally coherent approach, designed to be future-proof, is essential. It will allow for the alignment of training, testing and innovation tools to labour market requirements, policy and to financing programmes (regional and national), so that maximum synergy is achieved in goals and activities.

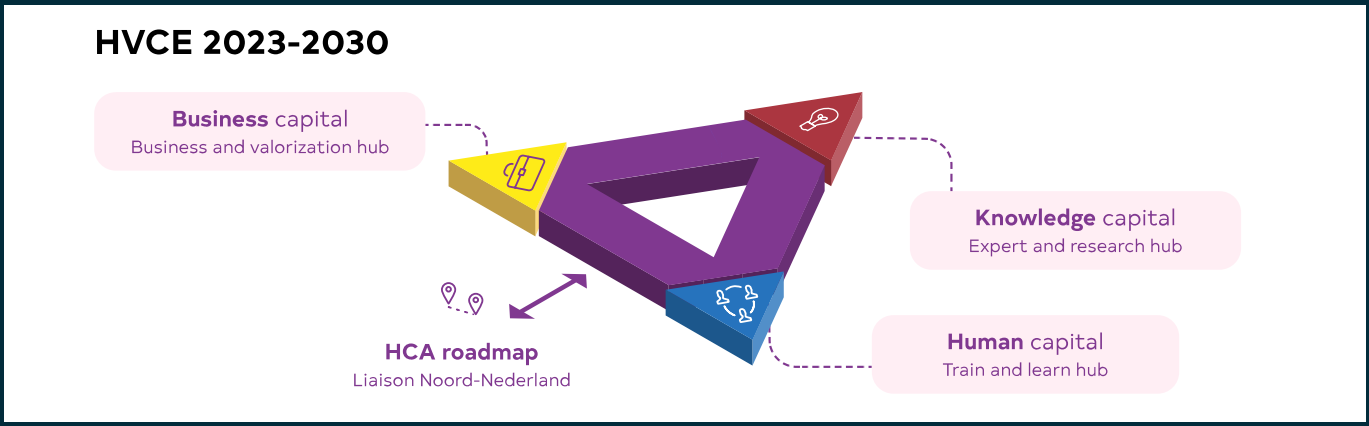
Scaling up hydrogen applications requires not only that we work together, but also a culture in which the (open) sharing of knowledge about working with hydrogen predominates. Developing technology, scaling up applications, strengthening learning communities and accelerating knowledge exchange (for example, through a digital knowledge platform) go hand in hand with flexibly aligning educational set-up to the needs of employers and employees.

> **The Northern Netherlands, together with GroenvermogenNL, wants to lead the way for a responsive labour market for green hydrogen as an example for the entire energy sector.**

The energy transition hinges on the timely addressing of shortages: physical infrastructure (congestion), sustainable generation (wind, PV), public space and workforce. The latter primarily involves practically trained professionals, and this shortage must be addressed across the board; there is a significant need for change in the approach to training programmes for vocational schools (MBOs). The shift that has been ongoing for decades in HBOs or higher vocational education (lecturers, practice-oriented research, learning communities) must see accelerated implementation in vocational education.

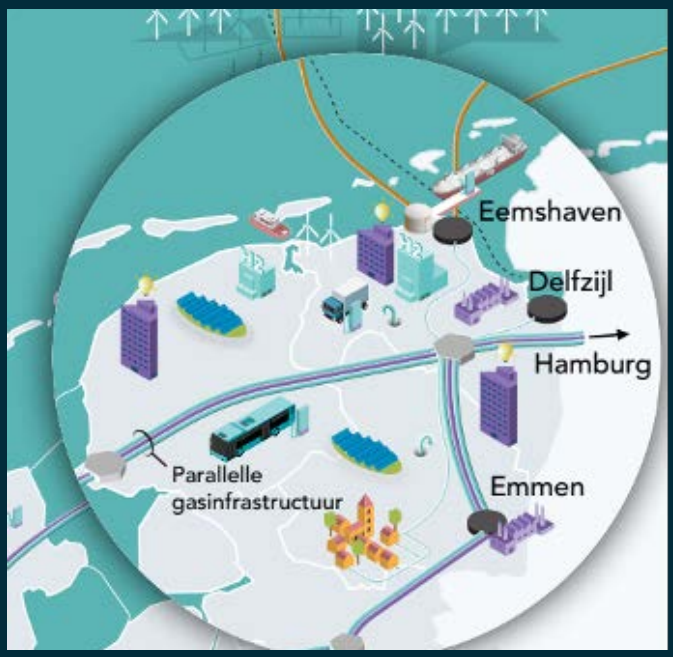
Armed with these tools and together with GroenvermogenNL, the Northern Netherlands wants to lead the way towards a responsive labour market for green hydrogen as a blueprint for the entire energy sector.

Regional overview



Cohesion between GroenvermogenNL HCA and ongoing regional initiatives (source: HVCE)

For the sustainability of the energy and raw materials supply, the use of emission-free hydrogen is essential. An investment plan with a volume of over €9 billion has been drawn up at the request of regional companies and governments. The main focus herein is on the (continued) development of a hydrogen ecosystem, while taking into consideration sectoral transitions to green jobs and the continued development of know-ledge in the field of hydrogen. The plan provides a section for initiating activities in the hydrogen chain (up-, mid-, downstream) (until 2025, up to 100 MW) as well as a section regarding the closing up and scaling up of chains (2030, installations on a GW scale). This creates the foundation for the further expansion of the Hydrogen Valley in Northern Netherlands with leading programmes such as HEAVENN, Hydrogen Network Nederland en NortH$_2$. Since then, the expected portfolio has been further expanded, both in scale and estimated investment size. Other programming around hydrogen is conducted through, among others, Baanbrekers within NPG (National Programme Groningen), where the hydrogen economy and circular economy are key pillars, Nij Begun, where green hydrogen becomes an integral part of the economic agenda for sustainable growth, and Hydrogen Valley Campus Europe (HVCE), where knowledge (valorisation), education and innovation are further integrated.

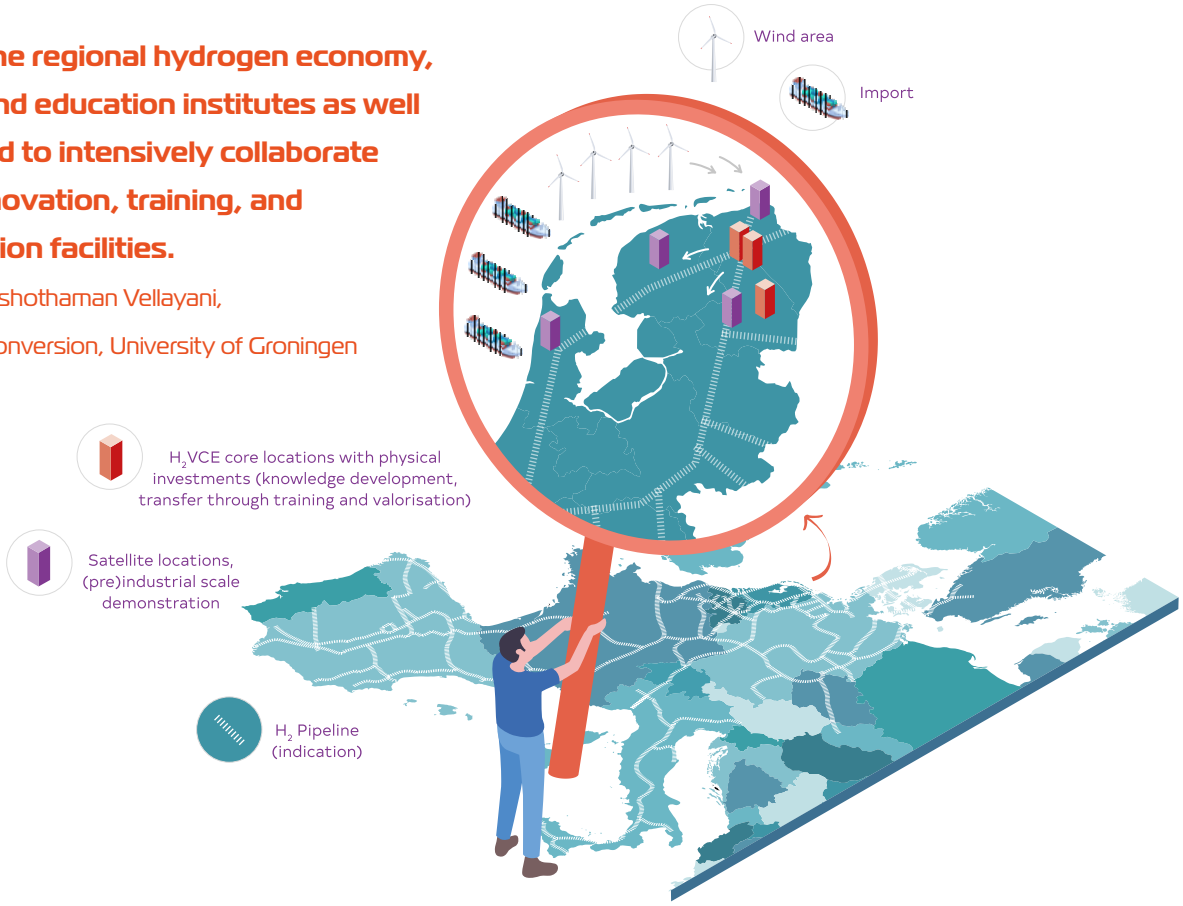


Indicative representation of the planned hydrogen ecosystem towards 2030 (source: hydrogen investment plan 2020)

To scale up the regional hydrogen economy, knowledge and education institutes as well as SMEs need to intensively collaborate on shared innovation, training, and experimentation facilities.

Prof Aravind Purushothaman Vellayani,

Chair of Energy Conversion, University of Groningen



Developments Hydrogen Valley Campus Europe (Source: HVCE)

Ambitions and intended activities

The Hydrogen Valley Campus Europe (HVC integrates and stimulates the knowledge ecosystem of regional campuses and training centres. Hydrogen Works (Waterst erkt, 2000 trained hydrogen professionals by 2027, continued development of existing curricular offerings within vocational/technical and university education into continuous hydrogen learning roadmaps) is an example of what is implemented under this umbrella. In addition, experimentation and training facilities are integrated, including the development of digital tooling for better accessibility and a flexible educational offering.

Looking ahead, it is important that:

- Reskilling/upskilling is facilitated as much as possible. A flexible and stackable Lifelong Learning (LLL) offering is crucial in this regard.
- Business activity, education, knowledge development and policy formation are more closely intertwined, in height (investment and development climate), width (innovation and start-ups) and depth (attractive region with appeal to other industries)
- Vocational education takes a more central position in the programming and implementation of the HCA
- Regional SMEs ar ucturally facilitated, such as with the Green hydrog booster in the greening of their process, including through knowledge sharing

Hydrogen technology is not only a bridge to a more sustainable future but also a catalyst for new opportunities in human capital and innovation.

Roelof Jan Boer, Chief IT/OT Resato International

Thus, with GroenvermogenNL, we are jumping on a moving train. Some programmes are already heading towards funding, some are in the concept phase or fall between the cracks in terms of funding resources. GroenvermogenNL steps in where there is a requirement for a facilitating role in HCA development, a connection needs to be made with national initiatives, and education and knowledge are developed.

Key stakeholders

Developments in the field of green hydrogen are widely supported in the region both between industries and at an administration level. The main stakeholders in ongoing and estimated initiatives are:

Regional partnerships:
New Energy Coalition, HyNorth, Groningen Seaports, Industrietafel Noord-Nederland, Northern Netherlands Collaboration, Hydrogen Valley Campus Europe

Trade organisations:
Techniek Nederland, NetbeheerNL, EBN, Wij Techniek, Bouwend Nederland

Knowledge institutions:
University of Groningen, University of the North, Watercampus Leeuwarden, ENTRANCE, TNO

Education:
Noorderpoort College, Drenthe College, Alfa-College, Firda, Centre of Expertise Water Technology, Hanzehogeschool Groningen, HanzePro, New Energy Business School

Businesses and institutions:
Gasunie, Nobian, Resato Hydrogen, Holthausen Clean Technology, DNV, Stork, RWE, Engie, Shell, NAM, Afeer,

Governmental administrations:
The provinces of Fryslan, Groningen, Drenthe; various councils, Learning Communities, water authorities

Networks:
Groningen business parks, Hydrogreenn,

These are all directly or indirectly involved in the regional liaison team of GroenvermogenNL in the Northern Netherlands. The liaison team conducts ongoing discussions and participates in (regional) meetings and initiatives concerning labour market issues and developments around (green) hydrogen.

Cohesion

In addition to successful collaboration clusters in the energy/manufacturing/water nexus (including Seaports, Chemiepark Delfzijl, Greenhouse campus, WaterCampus Leeuwarden), the Northern Netherlands has strong (public-private) partnerships for the development of the hydrogen economy, anchored in the first Hydrogen Valley of Europe and shaping the implementation of the investment agenda. HVCE is the programming of the knowledge ecosystem around hydrogen, within which various hubs address the learning, innovation and valorisation requirements through financing instruments at European (Horizon, Interreg, JTF), national (GroenvermogenNL, LLO-Catalyst, Katapult, MMIPs) and regional (NPG, Trailblazers, Nij Begun) levels. The approach of GroenvermogenNL is well-suited to the strengthening of a regionally cohesive approach, which facilitates the rollout to the closing of the local hydrogen chains at the national level.

GroenvermogenNL aligns with this perfectly: the six pillars with which the Northern Netherlands wants to build knowledge, education and collaboration impulses within GroenvermogenNL strengthen the partnerships and accelerate the rollout of activities within the existing programming of the knowledge and investment ecosystem.

1. **Ongoing regionally cohesive approach**
2. **Valorisation of the National Knowledge Platform for Hydrogen**
3. **Improved Positioning of Vocational Education in the HCA for green hydrogen**
4. **Scaling up of learning communities for Hydrogen**
5. **Lifelong Learning and new (integrated, time- and location-independent, digital, multimedia) ways of working, learning, innovating**
6. **Research and Development (linking with Human Capital agenda)**

Pillars Northern Netherlands HCA impulse green hydrogen

GVNL and HCA-GVNL

The hydrogen transition can only succeed if there are enough well-trained professionals and a sufficient influx of new talent. For this reason, GroenvermogenNL established the human capital agenda. Together, businesses, knowledge institutions and governments ensure an ecosystem that can meet this challenge. The ambition is realised through five pillars: regional investment programmes in six regions, a business programme for, among others, SMEs, the establishment of the Dutch Hydrogen Academy for national and international appeal, a national knowledge platform and a dynamic knowledge agenda that fosters community formation and provides insight into current labour market developments.

More can be found at: https://groenvermogennl.org/en/human-capital-agenda-energy-transition/.

This Roadmap lays the foundation for the regional investment programme of the Northern Netherlands region.

Liaison team and contact details

Jan-Jaap Aué
Director of ENTRANCE and Lecturer in Hydrogen Applications Hanzehogeschool. Regional Liaison
J.aue@pl.hanze.nl

Marcel Koenis
Director of Business Development at ENTRANCE.
M.j.m.koenis@pl.hanze.nl

Marieke Abbink
CEO of New Energy Coalition

Jeroen Rijnhart
General Manager of the Center of Expertise Water Technology

Harm van Lieshout
Lecturer in Human capital Hanzehogeschool

Willem Hazenberg
Researcher-Practitioner of Hydrogen in Manufacturing, Drenthe College and Senior Consultant Asset Management at Stork

Roeland Hogt
Researcher-Practicioner of Automotive, Coordinator of Hydrogen Education at Noorderpoort College

Arjen van der Meer
Research Coordinator and Project Leader at GVNL-HCA ENTRANCE
a.a.van.der.meer@pl.hanze.nl

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Credits
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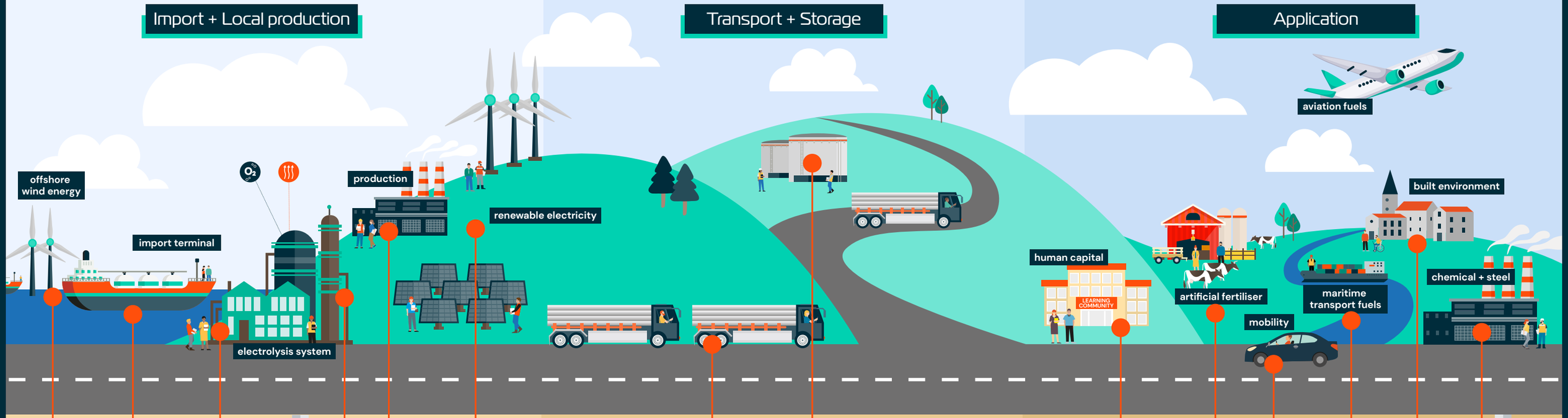
Human Capital Agenda: Impacting skills, training and education

groen vermogen nl

NETWORK OF LEARNING COMMUNITIES ACROSS THE ENTIRE CHAIN, SKILL VALORISATION, DUTCH HYDROGEN ACADEMY



Offshore wind energy, construction and maintenance, landfall

Import, transshipment and storage and transit – safety in large-scale application

Construction of production facilities, systems integration, sustainable solutions

Improvement of sustainability of electrolysis parts, reliability, circularity and reduction of expensive and scarce materials

Construction of production equipment, knowledge of smart chain partnerships and business models

Challenges in systems integration, e.g. minimising grid congestion and linking intermittent power generation of renewable energy to electrolysis systems

Knowledge of underground storage

salt caverns

Road transport, application in heavy road transport

Coordination of demand and supply of H_2 through flexible production, purchase, connection to the H_2 network and storage

Construction, modification and maintenance of pipes and infrastructure

Learning Communities, practical research, training and education, professionalisation of teachers and trainers, public-private partnership, LLL

Stimulating flexible H_2 demand, for example by adjusting application processes, and the development of (temporary) hybrid solutions

Local mobility, motor vehicles, tank installations, infrastructure

Maritime transport, application in heavy maritime transport

Built environment, decentralised application, systems integration

Chemical and steel industry. Hydrogen as a raw material and as an energy carrier

SAFETY, COST, SYSTEMS INTEGRATION, CERTIFICATION, INFLUX OF TALENTED YOUNG PEOPLE

CONNECTION WITHIN GROENVERMOGENNL WITH SCALED UP HR – HUMAN CAPITAL, COHESIVE HUMAN CAPITAL APPROACH, ENERGY TRANSITION