ROADMAP SOUTH-EASTERN NL REGION

Chemelot to be carbon neutral by 2050

Chemelot is on its way to becoming the first chemical cluster in Europe to be fully climate-neutral and circular by 2050. To achieve this ambition, access to and local production of sustainable hydrogen and energy are extremely important. Additionally, hydrogen can help to make freight transport more sustainable, and Limburg is one of the European freight transport hubs.

Sustainability as a priority

The regional hydrogen agenda of the South-Eastern Netherlands focuses on connecting to the national hydrogen infrastructure, alternative hydrogen production (other than through electrolysis) and its application in the (chemical) industry and freight transport (hydrogen trucks and inland shipping). Access to green hydrogen and green electrons are vital for the sustainability of Chemelot and the preservation of jobs. With the Groen-vermogenNL programme, the region is focusing on large projects in the field of green hydrogen and energy for the sustainability of the chemical industry. Chemelot is a hub of research, scaling up, human capital and network formation around sustainable hydrogen. Through the Chemelot Circular Hub alliance, numerous programmes are being vigorously pursued in collaboration with the community for the advancement of the energy and raw materials transition. This can make the industry cluster one of the flagship projects of the national agenda.

The priority is connecting to national hydrogen networks, starting with that of Gasunie in 2028. This will require significant investments over the coming years. In the research and scaling programme of GroenvermogenNL, the region focuses on the continued development of plasma technology for CO_2-free hydrogen production and other hydrogen production routes, such as the gasification of plastic waste, biomass and mixed waste. These primarily contribute to the self-sufficiency of a chemical industry cluster like Chemelot but can also find applications in inland shipping or heavy transport. Limburg is, after all, a European freight transport hub.

With the human capital agenda of GroenvermogenNL, the region aims to strengthen CHILL as a Learning Community, building on the successful formulae of the innovation-oriented Communities for Development and the Community of Practice that closely align with the field of work. Expanding and refining the (post) initial offerings where sustainable hydrogen has a place in the broader context of the 'twin transition' is another building block.

> **The first priority is the knowledge requirement from the business sector including governments and other organisations that want to apply hydrogen technology.**

Region overview

Like elsewhere in the Netherlands and neighbouring countries, Limburg faces a labour shortage in relevant hydrogen-related professions. As a shrinking region, with a limited supply of technicians and a large expansion and replacement demand, which also suffers from its border location and its image as a residential and work area, it faces multiple challenges at once. In terms of lifelong learning (LLL), various energy transition projects have been submitted or are underway. The (post) initial educational offerings pertaining to hydrogen (as an energy carrier) are currently relatively limited and mainly embedded within vocational education (applied in mobility).

Within the region, there is a particular ambition to strongly focus on the post-initial offerings around the 'twin transition', meaning both sustainable and digital. Just with the construction of the necessary hydrogen infrastructure and the construction of production facilities for sustainable hydrogen, the region will be busy for the next five years and could do with plenty of extra hands.

"Chemelot director Loek Radix says that access to green hydrogen is paramount for the sustainability of Chemelot. 'Hydrogen is, for instance, the raw material for ammonia, which in turn is a raw material for fertiliser and other products. We are still making hydrogen based on natural gas, which releases a lot of CO_2. Green hydrogen will reduce this emission significantly."

Main ambitions and activities

The establishment of the Learning Community Chemelot Learning & Innovation Labs ((CHILL) in the implementation of the Roadmap is an important first step. CHILL subsidiary Chemelot Talent Office also plays an important role in filling vacancies faster. Subsequently, through the use of the human capital strategy of GroenvermogenNL, among others, the region develops suitable (post-initial) educational offerings and aims to realise a (field) lab around chemical process intensification and an integrated energy system (V2G and P2G). We are fully committed to the installation and launch of the plasma pilot, which can produce CO_2-free hydrogen from methane. In addition, we are willing to support projects bilaterally, non-financially and financially if the necessary resources are allocated.

"According to Roger Miesen, CEO of RWE Generation SE, Limburg can serve as a blueprint for other locations in the Netherlands and Europe thanks to FUREC: 'FUREC is an excellent example of the circular economy at its best, with waste being used for the production of hydrogen. For the chemical industry, hydrogen offers great potential to make the raw material production process more sustainable and reduce its CO_2 emissions."

These goals cannot be implemented without working together. On a regional level, this would take place through the pursuit of an integrated approach with regional partners in R&D, scaling up and human capital. On a national level, we can come to smart exchanges and knowledge sharing with other regions. Internationally, there is collaboration with, for example, the Flemish HydrogenNet.

We aim to further expand the regional hydrogen community by organising events. All this contributes to the intended responsive ecosystem in which the dynamic demand for well-educated people from the market can continue to be met in the future. In this context, we further shape the regional Transition Academy and Work Centre.

Details of the activities in the Infographic on the last page of this document:

Planned activities		
Import and local production	**Transport and storage**	**Applications**
The sustainability of our chemical clusters, such as Chemelot, requires a large amount of green hydrogen. This represents the highest quality use of green hydrogen in the shape of fertilisers and plastics. Much of the hydrogen that we import and produce through offshore wind will be used by countries with heavy manufacturing. Additionally, we can also produce sustainable hydrogen domestically. This can be done locally at Chemelot by the gasification of bio, plastic or mixed waste, potentially covering up to 50% of the hydrogen needs at Chemelot. What cannot be processed on-site can also be applied elsewhere, such as in heavy transport.	The hydrogen that we import and produce through offshore wind must be transported via pipelines to an industry cluster like Chemelot. The planned connections to the hydrogen networks of Gasunie and Delta Rhine Corridor are therefore of vital importance. For smaller-scale hydrogen production and applications, such as zero-emission trucks or balancing the electricity network, the necessary storage capacity must be provided. Besides the connection to the national networks, the realisation of refuelling infrastructure for a transport hub such as Limburg is important.	In Limburg, the primary focus is on the use of hydrogen in manufacturing with the Chemelot chemical cluster at the forefront. Green hydrogen can be immediately deployed there for the highest quality application in materials. Where electrification does not provide a full solution, its application in other energy-intensive industries, such as steel and building ceramics, is also an option. In the slightly longer term, hydrogen offers perspectives for heavy transport, especially for Limburg, which is a hub for European goods flows. Finally, power-to-gas installations can contribute to a smarter energy network with less congestion.
Talent Talent is involved everywhere. Both in researching and developing new, better technology and applications and in constructing, installing, using and maintaining them. The construction of hydrogen production facilities and the construction of national hydrogen networks and the landfall at Chemelot alone will require a lot of heads and hands over the next five years.		

"Sandwiched between Germany and Belgium, the South-Eastern Netherlands only has a limited pool of Dutch workers. The region is therefore looking for creative, borderless solutions, says Björn Koopmans, coordinating liaison for the South-Eastern region. Examples are the anglicisation of education, facilitating labour migration, retraining for a job in the sustainability of industry and society and enticing children to choose technology."

Key Stakeholders

Core partners of the regional hydrogen agenda

The province of Limburg, Regional Development Company LIOF, Limburg Energy Fund (LEF); energy-intensive companies (Limburg Energy Agreement) including the Chemelot cluster itself and the transport and logistics sector; councils (Regional Energy Strategy); Ministry of Economic Affairs and Climate Policy, Ministry of Infrastructure and Water Management, Ministry of the Interior and Kingdom Relations, Netherlands Enterprise Agency (subsidies); Brightsite and Brightlands Chemelot Campus (research and pilot infrastructure); Hynetwork (subsidiary of Gasunie); the Port of Rotterdam Authority, the provinces of Noord-Brabant and Zuid-Holland (Delta Rhine Corridor); WaterstofNet (Euregional projects).

For knowledge diffusion and human capital

The Centres for Innovative Craftsmanship in Installation Technology (CIV-IL) with Gilde Opleidingen and iW-opleidingen as well as Built Environment (CIV-GOL) with Fontys, Zuyd, Gilde, VISTA, Building Netherlands and BouwMensen play key roles. For the process industry, there is CHILL with its innovation-oriented Communities for Development and the Community of Practice where Zuyd and VISTA actively develop their programmes with the business community. In addition, business associations LWV, MKB Limburg, Technology Coalition Limburg/Technology NL and the Chain Collaboration Platform South (built environment) contribute to knowledge circulation. Finally, the Hydrogen Coalition Limburg is working on a (virtual) academy focused on post-initial education and has already sought alignment with the Hydrogen Coalition Brabant and educational institutions such as Zuyd and HAN.

Arnold Stokking, Managing Director of Brightsite, considers plasma technology to be a game changer: 'Plasma technology has a great future in the chemical industry. In our opinion, it is the new process technology based on green electricity to produce hydrogen and other raw materials CO_2-free. This technology will play a major role in the sustainability transition of the chemical industry.

Cohesion with other projects

There are various human capital projects and project applications running in parallel. These are supported by different funds, both national and European. Examples include programmes from the National Growth Fund such as Scaling Up PPS Vocational Education and LLL-Catalyst, and the Just Transition Fund (JTF), as well as more regular funds, such as the Regional Investment Fund MBO, Interreg and ESF. This effort is coordinated in the region within the Liaison Team of GroenvermogenNL.

With regard to HCA GVNL, the JTF projects within the 'Werkcentrum' programme can contribute to ensuring that there are sufficient well-trained personnel available and that vacancies are filled more quickly (shortening time to job).

The JTF projects pertaining to the 'Transitie-academie' programme can, in conjunction with the SNEL project (PPS Scaling Vocational Education), be the frame of reference for the further development of training courses. As a Learning Community, CHILL, together with its subsidiary Chemelot Talent Office, stands at the crossroads of innovation, learning and working, bridging the gap between talent and businesses. Interreg projects such as Energy(k) Education (VLANED) and H_2 Booster (EMR) offer further opportunities for partnerships with partners from Flanders, Wallonia and North Rhine-Westphalia.

GVNL and HCA-GVNL

The hydrogen transition can only succeed if there are enough well-trained professionals and a sufficient influx of new talent. Therefore, GroenvermogenNL has established the human capital agenda. Together, businesses, knowledge institutions and governments take care of 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 takes care of 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 South-Eastern Netherlands region.

Liaison team region South-East

The Regional Liaison Team South-East is one of the six teams that has developed a supported Regional Roadmap within the framework of HCA Groenvermogen NL. Zuyd University of Applied Sciences acts as the project leader; the coordination of the Team and the design of the Roadmap are done from the triple helix alliance Chemelot Circular Hub.

- Zuyd University of Applied Sciences – Gino Van Strijdonck, Chair of the Material Sciences Lectureship (Project Leader)
- VISTA College – Gio Colombi, Education Manager of Innovation and Course Manager of Mechatronics
- Maastricht University – Gerard van Rooij, Professor of Plasma Chemistry (also affiliated with TU/e) and Head of the Brightsite Plasma Lab
- TNO – Hans Linden, Senior Project Manager/Business Developer of Plasma Technology at TNO and Programme Manager of 'Emission Reduction through Electrification' of Brightsite
- CHILL – Tim den Hartog, Senior Lecturer/Researcher Innovative Process Industry Zuyd University of Applied Sciences/CHILL
- Hydrogen Coalition Limburg – Peter Ramaekers, Executive Board Member
- LIOF – Jan-Willem Tolkamp, Business Developer Energy
- LWV – Sonja Demandt, Expertise Manager of Sustainability & Innovation
- Chemelot Circular Hub – Björn Koopmans, Programme Manager (Team Coordinator).

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Chemelot Circular Hub

Zuyd Hogeschool ZUYD

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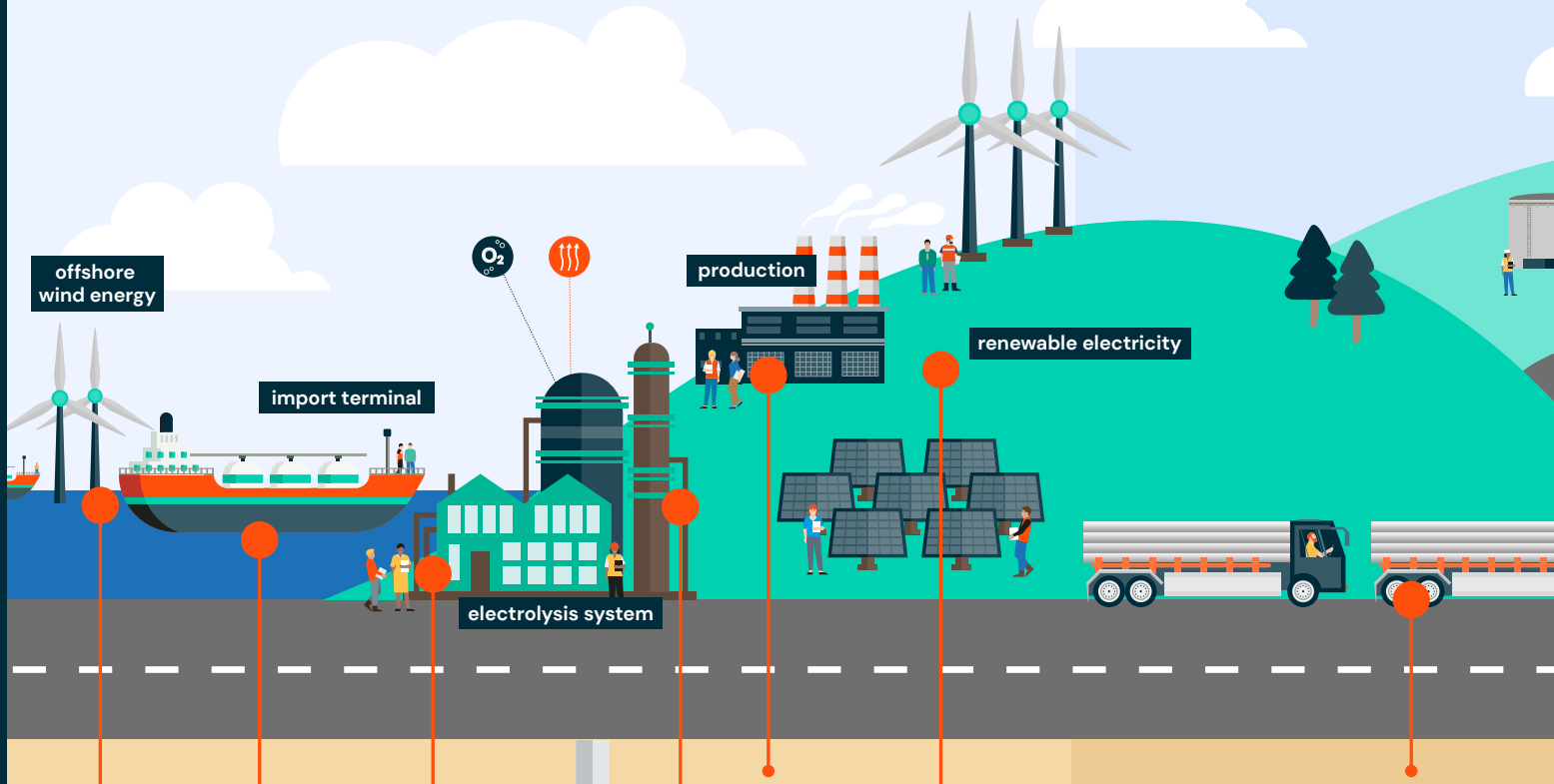
SIA Regieorgaan

Human Capital Agenda: Impacting skills, training and

NETWORK OF LEARNING COMMUNITIES ACROSS THE ENTIRE

Import + Local production

Transport



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

SAFETY, COST, SYSTEMS INTEGRATION, CERTIF

CONNECTION WITHIN GROENVERMOGENNL WITH SCALED UP HR – HUMA

education

groen vermogen nl

CHAIN, SKILL VALORISATION, DUTCH HYDROGEN ACADEMY

+ Storage

Application

oordination of
nand and supply
$_2$ through flexible
uction, purchase,
nection to the H_2
work 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

ICATION, INFLUX OF TALENTED YOUNG PEOPLE

N CAPITAL, COHESIVE HUMAN CAPITAL APPROACH, ENERGY TRANSITION