



# Green powerNL HCA Roadmap South

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Feb. 15, 2024

This project realized under the leadership of Zuyd University of Applied Sciences and Chemelot Circular Hub



Figure 1 - Source: RWE FUREC



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# Introduction

The present Roadmap stems from the appointment of the Regional Liaisons, for which Zuyd University of Applied Sciences has submitted an application to SIA as the sponsoring university. This appointment is part of work stream 2 of HCA GroenvermogenNL on Learning Communities and regional mobilization, and is aimed at developing a supported Regional Roadmap.

## Regional Liaison Team Composition.

On behalf of the penalizing Zuyd University, lecturer Gino van Strijdonck is acting as project leader. In order to ensure broad support, Zuyd University of Applied Sciences, through its membership in the triple helix Chemelot Circular Hub partnership, has commissioned program manager Björn Koopmans to coordinate the operation of the Regional Liaison Team and the preparation of the Regional Roadmap. That embedding in the Chemelot Circular Hub also secures alignment with other projects within the Growth Fund and JTF, among others, and other developments around hydrogen.

**The Roadmap was prepared by the Southeast Regional Liaison Team, composed of:**

- Zuyd University of Applied Sciences - Gino Van Strijdonck, chair lectorate in material sciences (project leader)
- VISTA college - Gio Colombi, education manager innovation and training manager 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 plasma technology at TNO and program manager 'reducing emissions via electrification' of Brightsite
- CHILL - Imke Welzen, business developer & chemistry team lead
- Hydrogen Coalition Limburg - Peter Ramaekers, executive board member
- LIOF - Jan-Willem Tolkamp, business developer energy
- LWV - Sonja Demandt, sustainability & innovation expert manager
- Chemelot Circular Hub - Björn Koopmans, program manager (team coordinator).

## Developments during the project

**Relative to the application we submitted regarding the project call 'Regional Liaisons & Learning Communities' two developments have occurred:**

- The first development concerns our scope and composition of the Regional Liaison Team. Originally we still put the focus on hydrogen as feedstock in chemistry at Chemelot / Circular Economy Action Plan / Chemelot Circular Hub with Zuyd, VISTA college, UM, TNO & CHILL as members of Regional Liaison Team. However, we quickly decided to 1) expand the scope to hydrogen as an energy carrier in mobility, among others, and 2) organizations like the Hydrogen

Coalition Limburg<sup>1</sup> including the regional development company LIOF and the regional branch of VNO-NCW, the Limburg Employers Association (LWV) to be included in the Regional Liaison Team.

- The second development concerns the advancing insight as a result of the project itself. The operation of the Regional Liaison Teams themselves; the mutual coordination between the teams within the HCA Green PowerNL core team, and the interregional cooperation around learning communities and knowledge platform have proved their worth. The organization of the Safari, the exchange on the design of the Roadmaps, the contribution to the various studies and the definition of a common narrative: without the project, this overview and at the same time in-depth view would not have been possible.

The implementation of the Roadmaps requires enhanced cooperation around a coherent approach to educational development, knowledge circulation from R&D, business-oriented programs, labor market approach, and monitoring thereof. To us, the continuation of the Regional Liaison Teams is a logical next step on the path we have embarked on.

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<sup>1</sup> The Limburg Hydrogen Coalition Foundation, following the example of Groningen, wants to restart as the "New Energy Coalition," with a broader scope focused on energy transition and not specifically hydrogen. Partnership and organizational form are currently being examined.

# Summary

- The South-East Regional Liaison Team is one of the six teams that, in the context of HCA Green Power NL, developed a supported Regional Roadmap in consultation with stakeholders. Zuyd University of Applied Sciences acts as project leader; the Team's coordination designing the Roadmap was done in the lap of the triple helix alliance Chemelot Circular Hub.
- Top priorities are connection to the national hydrogen infrastructure, alternative production of hydrogen (other than electrolysis) and application in (chemical) industry and also freight transport (hydrogen trucks and inland shipping). Access to green hydrogen and electrons are vital to making Chemelot more sustainable and preserving jobs. Limburg, as elsewhere in the Netherlands and neighboring countries, is experiencing labor shortages for relevant hydrogen-related occupations. As a shrinking region, with a tight supply of technicians and large expansion and replacement demand, which also suffers from its border location and its image as a place to live and work, it faces several challenges simultaneously. In terms of lifelong development, several energy transition projects have been submitted or are underway. The (post-)Initial training in hydrogen (as an energy carrier) is currently relatively limited and mainly embedded within secondary vocational education (applied in mobility). In addition, there is an ambition in the region to develop the post-initial offer.



Figure 2 - Gasunie hydrogen network 2030<sup>2</sup>

- GVNL's ambition to accelerate major projects around green hydrogen and energy in a key industry such as chemistry can give a boost to making Chemelot more sustainable. Chemelot is a hub of research, scale-up, HCA and networking around sustainable hydrogen. Through the triple helix alliance Chemelot Circular Hub, the surrounding area is included in

<sup>2</sup> [Gasunie starts construction of hydrogen network Netherlands](#)

the energy and resource transition and also made the connection with other agendas and programs. As such, the industry cluster can be one of the "flagships" of the national agenda. With its research and scale-up program, GVNL can contribute to the further development of plasma technology for the CO<sub>2</sub>-free production of hydrogen. By extension, this also applies to other routes of hydrogen production 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 application in inland navigation (hydrogen from ammonia via a plasma reactor) or trucks (hydrogen from gasification of plastic waste). HCA-GVNL can contribute to strengthening CHILL as a Learning Community for hydrogen applications inside and outside of chemistry; expanding and refining the (post-)initial offerings around sustainable hydrogen, including setting up a (virtual) Academy focusing on professionals; (re)connecting companies to the Learning Community, the national Knowledge, Learning and Development Platform, and the Academy; and organizing events aimed at informing and raising awareness about technological developments and useful applications.

- Setting up our Learning Community CHILL on the implementation of the Roadmap is an important first step. CHILL subsidiary Chemelot Talent Office also plays an important role as part of the labor market approach, whose ultimate goal is to fill vacancies faster. Through the organization of events, we want to further develop the regional hydrogen community. This contributes to the envisioned responsive ecosystem. An ecosystem is only responsive if it keeps its finger on the pulse of developments in education, research and innovation. That is why we are working on a regional agenda to monitor and adjust this where possible (e.g. extra efforts with regard to level 3 and 4 MBO graduates, which are badly needed for the construction of infrastructure, or managerial profiles with a large expansion demand). In this context, we are further fleshing out the regional Transition Academy and Work Center. We are doing this by formulating a suitable (post-)initial training offer and realizing a (field) lab around an integrated energy system (V2G and P2G) and chemical process intensification (with hydrogen as a concrete application including safety). We are fully committed to the installation and launch of the plasma pilot. In addition, we are willing to support projects bilaterally, non-financially and financially if the necessary resources are allocated for this purpose. In implementing these goals, cooperation is a must. Nationally when it comes to the Core Team HCA GVNL and the representation of the Southeast region in other consultations. Regional if it involves cooperation with one or more of the 5 other regional partners. International if it involves cooperation with e.g. the Flemish HydrogenNet. These 9 operational goals fall under 4 strategic goals: (1) learning by doing community, (2) academy, (3) accelerator and (4) collaboration. Here the so-called Communities for Development act as a community learning tool. In a CfD, students work (multilevel and interdisciplinary) with experienced professionals on field challenges. Training, innovation and professionalization are thus linked and the innovation chain accelerated.
- Cooperation is the leitmotif of the Regional Roadmap. Not only will the implementation of the Roadmap require strong cooperation among partners and with other partners from inside and outside the region. It is also essential that certain components of the national agenda be tackled nationally: a digital platform (knowledge map and digital learning environment), education and labor market research, promotional campaigns, coordination around education, research & innovation, and business-oriented programs. Where regional initiatives are already underway link them together, and do not set up new separate / parallel regional initiatives. Unless



the knowledge need in the region is so great, staff is not available from other partners, or a decision is made at the national level to proceed with these regional initiatives.

- Zuyd is pulling the operation of the Regional Liaison Teams and the implementation of the Regional Roadmap, this from its involvement in Learning Community CHILL. The Team also remains embedded in the operation of the CCH and is placed in the portfolio of the human capital pillar of the triple helix alliance CCH (HC). From that working group, we seek cooperation with other partners inside and outside the region at the level of actions. We also coordinate on the deployment of other national and European regulations relevant to the implementation of the Roadmap. The HC working group reports to the Region Board. However, decisions at the level of actions or projects are made by the partners involved themselves, unless the CCH itself is an involved party.
- To drive the implementation of the Regional Roadmap as well as to secure the national cooperation within the HCA GVNL core team, the continuation of the Regional Liaison Teams is a *conditio sine qua non*. In addition, envelope funding for specific actions in the Roadmap can accelerate their implementation. After all, the Regional Roadmaps contribute to the ambitions and goals of the national agenda.

# Reading Guide

Chapters	Outline content description
0. Context	Situation within Green PowerNL (GVNL) and the HCA pillar within GVNL
1. Environmental analysis	The regional hydrogen agenda as part of the Provincial Energy Strategy and the regional human capital agenda around energy transition and the 'hydrogen economy' in particular
2. Regional impact	Intended impact of roadmap, taking into account regional hydrogen agenda, human capital agenda around energy transition c.q. hydrogen, as well as the country-wide cooperation within GVNL
3. Program	Priority, strategic objectives arising from the environmental analysis and contribute to intended regional and national impact.
4. Operationalization	Elaboration of strategic objectives into operational objectives, actions and deliverables, with indicative planning
5. Indicators	Linking indicators to our goals, based on which we can measure the progress of our activities and make result-oriented adjustments
6. Organization	Governance for Roadmap implementation and countrywide collaboration within HCA Green PowerNL

# 0 Context

"All talent is needed and that requires a cohesive and recognizable approach both nationwide and for the different regions that get to work with those different programs."<sup>3</sup>

**GroenvermogenNL (GVNL) aims to accelerate the market for green hydrogen<sup>4</sup> and green chemistry. In doing so, GroenvermogenNL focuses primarily on connecting and strengthening existing initiatives in the areas of R&D, pilots, demonstrations and human capital (HCA GVNL).**

HCA GVNL is committed to ensuring sufficient and well-trained talent needed to accelerate the green hydrogen economy and has the ambition that vacancies are filled more quickly. From an integral vision of innovation, learning, HCA GVNL makes a strong case for the valorization of skills. Through a responsive ecosystem HCA GVNL aspires to set up activities to make new knowledge from innovation available faster in both mainstream education as for the education and training of professionals already working at companies.

Figure 3 - Coherence of program lines GVNL



HCA GVNL does this from a coherent approach, both within GVNL between the various program lines (HCA, R&D, pilots and demos) and between national and regional plans (Regional Roadmaps as part of the national agenda), and between the various incentive programs at the national and European level that also focus on the broader HCA Energy Transition (Growth Fund, JTF. and others)<sup>5</sup>

HCA GVNL provides the reason and framework for the elaboration of the Regional Roadmaps by Regional Liaisons, together with the realization and scaling up of Learning Communities one of the 5 work streams of HCA GVNL. The Learning Communities are the supporting entity within HCA GVNL, as a catalyst of translating new knowledge from research and innovation that can be accelerated through public-private collaboration. The Regional Liaisons are tasked with mobilizing the region and arriving at a supported Roadmap that matches the ambitions and core activities of the region and contributes to the implementation of the national agenda (see **Error! Reference source not found.**).

<sup>3</sup> [Human Capital Agenda Energy Transition - Groenvermogen \(groenvermogen.nl.org\)](https://www.groenvermogen.nl/)

<sup>4</sup> We use green and renewable hydrogen interchangeably. Our understanding of green hydrogen is not limited to hydrogen production via electrolysis of water with renewable energy, but includes all production routes that lead to CO<sub>2</sub>-free / climate-neutral production of hydrogen via plasma from methane or gasification of waste and biomass (with capture of residual gases).

<sup>5</sup> National Growth Fund programs LLO-Katalyst, Scaling up PPP Vocational Education, GroenvermogenNL, AiNed and N-puls; the Green and Digital Jobs Action Plan and the Technology Attack Plan, and the EU's Just Transition Fund (and to a lesser extent other EU programs such as e.g. ERDF).

Table 1 - HCA GVNL indicators and expected contribution regions.

	IndicatorsCountry	agendaExpected contribution regions
<b>Impact</b>	<ul style="list-style-type: none"> <li>• Shorten time to job</li> <li>• Responsive ecosystem</li> </ul>	<ul style="list-style-type: none"> <li>• Shorten time to job</li> </ul>
<b>Results (outreach and participation)</b>	<ul style="list-style-type: none"> <li>• 500 companies</li> <li>• 10,000 professionals</li> <li>• 80% of relevant courses and teachers</li> </ul>	<ul style="list-style-type: none"> <li>• 50 companies per region</li> <li>• 1,000 professionals per region</li> <li>• 80% of relevant courses and teachers in the region</li> </ul>
<b>Output</b>	<ul style="list-style-type: none"> <li>• Dutch Hydrogen Academy</li> <li>• Hydrogen knowledge platform</li> <li>• 10 Learning Communities</li> <li>• Learning &amp; Development platform companies</li> </ul>	<ul style="list-style-type: none"> <li>• 1 hydrogen academy per region</li> <li>• Min. 1 Learning Community/PPS per region</li> </ul>

Box 1 - Regional Roadmap as part of HCA GVNL

**HCA GVNL works around five work streams for 4 years:**

- Knowledge areas mapped;
- Realize and scale up Learning Communities and mobilize region;
- National Knowledge Platform knowledge exchange and training opportunities;
- National Package of Educational Programs Hydrogen;
- Innovation impulse SMEs and training impulse business.

**HCA GVNL focuses on 3 core activities during the first year:**

- Appointment of Regional Liaisons and the development of Regional Roadmaps (work stream 2);
- Develop and implement start-up activities for scaling up Learning Communities (workstream 2);
- The realization of a National Hydrogen Knowledge Platform (work stream 3).

Six colleges in six regions (Hanze, HAN, HvA, HR, HZ and Zuyd) have been approached to implement these core activities. To this end, they work jointly around the Learning Communities and the National Hydrogen Knowledge Platform and, with their Regional Liaison Teams, they each work out a Regional Roadmap, for which they coordinate among themselves in the national core team HCA GVNL.

# 1 Environmental analysis

In this chapter, we describe the regional hydrogen agenda and the regional human capital agenda around energy transition and the "hydrogen economy" in particular.

## 1.1 Regional hydrogen agenda

What we describe here as the "regional hydrogen agenda" is based on 3 underlying documents:

- the provincial policy framework around hydrogen, the Province of Limburg's Hydrogen Agenda 2.0, itself part of the Provincial Energy Strategy (PES)<sup>6</sup> ;
- Chemelot's development strategy, including the Cluster Energy Strategy 2030-2050<sup>7</sup> ;
- the euregional project H2 Booster (Interreg Euregion Meuse-Rhine)<sup>8</sup>

*Box 2 - Provincial Energy Strategy and Hydrogen Agenda.*

<b>About the Provincial Energy Strategy (PES) and the Limburg Hydrogen Agenda</b>	
<b>PES has 5 lines of action</b>	<b>Hydrogen Agenda is part of Action Line 1:</b>
<ul style="list-style-type: none"><li>- Action Line 1 Future-proofing infrastructure</li><li>- Action Line 2 Innovation and Skills (with KPIs around employment and creation of knowledge, learning and application environments)</li><li>- Action line 3 Limburg heat</li><li>- Action line 4 Social and fair energy transition</li><li>- Action line 5 Setting a good example</li></ul>	<ul style="list-style-type: none"><li>• Goal 1 Driving innovation for the application of hydrogen</li><li>- Goal 2 Achieving the necessary hydrogen infrastructure</li><li>- Goal 3 Increase demand for and scale up applications of hydrogen</li><li>• Goal 4 Cooperation and alliance building (for goals 1-3) in the field of hydrogen</li></ul>
Total from Limburg European Energy Fund subsidy programmes)	PES budget : € 14 .14 million (to be topped up with funding Energy Fund, LIOF, national and , LIOF, national and European subsidy programs)

<sup>6</sup> Provincial Energy Strategy 2020-2030 and 4<sup>de</sup> Progress Report PES 2023 ; Hydrogen Agenda 2.0 Province of Limburg

<sup>7</sup> Cluster Energy Strategy 2030-2050

<sup>8</sup> EMRH2Booster

**In essence, the focus of the regional hydrogen agenda is twofold:**

1. Hydrogen as a raw material: access to green hydrogen and energy is existential for Chemelot's sustainability and hence survival;
2. Hydrogen as an energy carrier: (small-scale) production for balancing electricity grid and applications of hydrogen in (energy-intensive) industry and heavy transport.

In addition to access to green hydrogen and energy, research into and scaling up of alternative hydrogen production (other than electrolysis) are particularly important to Chemelot. For Limburg / Meuse-Rhine Euregio, which is a multimodal crossroads for freight transport, transport, storage and distribution of hydrogen receives a lot of attention.

Below we summarize the priorities within the regional hydrogen agenda in summary table, making the breakdown into focus areas within hydrogen as a feedstock and as an energy carrier, and showing the current status projects/initiatives anno 2023:

Table 2 - Priorities Regional Hydrogen Agenda.

Priorities around hydrogen	Focus areas within hydrogen as a feedstock and energy carrier	Status of projects/initiatives 2023 <sup>9</sup>
<b>Transport, storage and distribution: Limburg/Euregion Meuse-Rhine artery freight transport</b>	<ul style="list-style-type: none"> <li>Hydrogen as a feedstock: connection to (inter)national hydrogen corridors and distribution via local hydrogen network/ring line</li> <li>Hydrogen as an energy carrier: filling stations for road (trucks) and (mobile) charging points for inland navigation</li> </ul>	<ul style="list-style-type: none"> <li>Study on construction of local hydrogen network (JTF project Hydra);</li> <li>Connection Chemelot to hydrogen backbone Gasunie anticipated in 2028; other LEA companies unclear (preference for electrification where possible)<sup>10</sup></li> <li>1 gas station operational in Horst and 1 in concept in Tegelen. Target is 3 gas stations by 2025 (TEN-T project HYRES). Started Local Energy Hub Venlo as an important logistics hub, in coordination with Germany and Belgium</li> </ul>
<b>Research and innovation: alternative production and energy storage</b>	<ul style="list-style-type: none"> <li>Hydrogen as a feedstock: alternative production of low- or zero emission hydrogen via (plasma) gasification</li> <li>Hydrogen as an energy carrier: electrolyzers / battolyzer for energy storage and conversion, and inland navigation</li> </ul>	<ul style="list-style-type: none"> <li>Plasmalab Brightsite ( pilot plant planned) and Brightlands Chemelot Campus (demo facility BrigH2 by 2028; also JTF project for pilot plant Hydrogen Utopia submitted)</li> <li>Provincial grant for 4 small-scale electrolyzers (1.75 MW) and Power-2-Gas plant in Spiesberg (in concept);</li> <li>Brightsite (investigating possible deployment of plasma technology inland shipping - conversion of ammonia to hydrogen)</li> </ul>
<b>Scaling up applications: alternative production and hydrogen trucks</b>	<ul style="list-style-type: none"> <li>Hydrogen as a feedstock: alternative low-emission hydrogen production via gasification of municipal waste and biomass</li> <li>Hydrogen as an energy carrier: deployment of hydrogen trucks (in relation to refueling stations)</li> </ul>	<ul style="list-style-type: none"> <li>FUREC project RWE around municipal waste<sup>11</sup>, also UNIPER and demo BrigH2 around biomass in pipeline (BrigH2 by 2025 FUREC &amp; UNIPER operational by 2027-2028)</li> <li>Target is 3 refueling stations and 180 hydrogen trucks by 2025</li> </ul>
<p><b>Cooperation in (eu)regional context around the above priorities</b></p> <p>Core partners of the regional hydrogen agenda are: Province of Limburg, LIOF (ROM), Limburg Energy Fund (LEF); companies Limburg Energy Agreement including Chemelot cluster itself and transport and logistics sector (incl. operators of filling stations such as Vissers Energy Group); municipalities Regional Energy Strategy; Ministry of Economic Affairs and Climate Change, Ministry of Infrastructure and Water Management, Ministry of the Interior and Kingdom Relations, Rijkdienst voor Ondernemend Nederland (subsidies); Brightsite and Brightlands Chemelot Campus (research and pilot infrastructure); Hynetwork (subsidiary Gasunie); Port of Rotterdam, Provinces of Brabant and South Holland (Delta Rhine Corridor); WaterstofNet (euregional projects).</p> <p>For knowledge diffusion, the Centra voor Innovatief Vakmanschap Installatietechniek (CIV-IL) with Gilde Opleidingen and iW-training and Gebouwde Omgeving (CIV-GOL) with Fontys, Zuyd, Gilde, VISTA, Bouwend Nederland and BouwMensen play a key role. For the process industry (and pharmaceutical sector)<sup>12</sup> there is CHILL with its innovation-oriented Communities for Development</p>		

<sup>9</sup> 4<sup>de</sup> Progress Report PES 2023 (pp. 17-24) and [Mission H2 & TKI Hydrogen Map](#) (projects Limburg)

<sup>10</sup> [Feasibility study opportunities for hydrogen in Limburg industry CE Delft 2021](#)

<sup>11</sup> As part of the two-day [Transition Finance Event Nov. 29-30, 2023](#), a session on RWE's FUREC project that produces hydrogen from mixed household waste took place at Chemelot.

<sup>12</sup> But then we are talking about small volumes of H2 and mostly molecular R&D focused on so-called hydrogenation such as e.g. InnoSyn and Chemtrix.

and the Community of Practice where Zuyd and VISTA actively develop their courses with the business community. In addition, business associations LWV, MKB Limburg, Techniek Coalitie Limburg/Techniek NL and Platform Ketensamenwerking Zuid (built environment) contribute to knowledge circulation. Finally, the Hydrogen Coalition Limburg is working on a (virtual) academy focused on post-initial training, and has already sought coordination on this with the Hydrogen Coalition Brabant and educational institutions such as Zuyd, Fontys and HAN.

### Box 3 - Hydrogen at Chemelot

#### About hydrogen at Chemelot

From the very beginning of Chemelot's existence, hydrogen has been an important building block for the production of ammonia and its conversion into fertilizers, melanin, acrylonitrile and caprolactam, among others. In the future, hydrogen can also be used to treat pyrolysis oil to replace crude oil.

Hydrogen production is about 200 kt per year, and is currently produced entirely from natural gas. According to current estimates, total hydrogen demand could increase to 240 kt per year by 2030 and 320 kt per year by 2050.

Sustainable hydrogen has an important role to play in making Chemelot even more sustainable. In the first place as a raw material, and this together with electrification in terms of energy supply. Besides volumes, the production method is also important: the ultimate goal is CO<sub>2</sub> emission-free hydrogen.

In the transition to sustainable hydrogen for Chemelot plays a role not only as a user but also as a producer of hydrogen.

**According to current estimates, fifty percent of the total hydrogen demand can eventually be supplied from local, sustainable production at Chemelot through various routes:**

- Initially, hydrogen production based on natural gas combined with CO<sub>2</sub> capture and storage (CCS), so-called blue hydrogen.
- Gasification of waste and biomass (investment projects FUREC/RWE around mixed municipal waste UNIPER and BrigH<sub>2</sub> around torrefied biomass wo. wood waste at Chemelot);
- Plasma conversion based on renewable energy (research project Brightsite, sustainable chemistry knowledge center at Chemelot);
- High Temperature Electrolysis, because of availability of low-grade steam/industrial waste heat (under evaluation).

The rest of the hydrogen should be supplied from outside the site, from Rotterdam and the Groningen/Eems Delta industrial cluster. The planned connection to the Gasunie hydrogen backbone with connections to other industrial clusters (which should be operational by 2030) and the Delta Rhine Corridor with pipelines from Rotterdam over Chemelot to the German Ruhr area are vital for this.



## 1.2 Regional Human Capital Agenda

### 1.2.1 HCA commitment to energy transition

Regarding energy transition in a broad sense, the PES includes two HCA actions, whose core partners, status anno 2023 and link with hydrogen we describe below<sup>13</sup> :

**1. Realizing an employment boost of 10,000 FTE years by 2030 vs. 1-1-2020 at the latest, due to the expected investments of the Limburgs Energiefonds (LEF), a revolving fund with a total size of EUR 235 million<sup>14</sup> .**

- **Partners:** fund manager LEF (Polestar Capital; Province of Limburg one of the shareholders), LEF advisory committee and companies applying for loans.
- **Status:** realization of 2,517 FTE (Q2 2023) is ahead of the 1,854 FTE planned.
- **Hydrogen link:** To date, no hydrogen projects have been supported by the LEF.

**2. To create a knowledge, learning and application environment for innovation and technology, education and training around the energy transition in which triple helix partners inside and outside Limburg work together and interpret national and international developments for application in Limburg.**

- **Partners:** Installation Technology (CIV-IL) with Gilde Opleidingen and iW-Training; Built Environment (CIV-GOL) with Fontys, Zuyd, Gilde, VISTA, Bouwend Nederland and BouwMensen; Process Industry with CHILL-CoP where Zuyd and VISTA are actively developing their MBO and HBO programs with industry, Brightsite (of which UM is a partner) and Brightlands Materials Center (o.a. energy-producing building materials); LWV; MKB Limburg, Platform Ketenensamenwerking Zuid; Techniek NL; LIOF; Province of Limburg
- **Status:** The Province is committed to the Technique Coalition Limburg, the Sector Acceleration Energy Transition Built Environment (SEGO) project and Chemelot Innovation and Learning Labs (CHILL). Furthermore, the Province is making a strong case for the Limburg Skills Agenda 2030, the Green and Digital Jobs Action Plan and the utilization of JTF funds for the labor market. At MBO, HBO and WO levels and from branch organizations, work is being done on profession-specific and practical training and course packages related to energy transition. In doing so, the above parties are appealing to various programs, including the Regional Investment Fund (CIV-IL, CIV- GOL, CHILL-CoP and others), Growth Funds PPS Scaling up Vocational Education, LLO Catalyst and Industry Coalition, and JTF. Various educational and labor market parties, in response to JTF and as a function of a coherent approach, developed 2 programs as a framework for project development and alignment: 'Work Center' and 'Transition Academy' (see 2.2.2 Connection to other HCA programs)
- **Link hydrogen:** Hydrogen is addressed at all levels of education; most pronounced within the mbo (senior secondary vocational education) where hydrogen technology is an elective component, mainly focused on mobility.<sup>15</sup> VISTA is also working on a fieldlab 'MobilityHouse', in which mobility and the built environment are part of an integrated energy network and hydrogen can also play a role in balancing the electricity network (Vehicle to Grid and Power to Gas).

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<sup>13</sup> 4<sup>de</sup> PES 2023 Progress Report (pp.32-34)

<sup>14</sup> [LEF Q2 2023 progress report.](#)

<sup>15</sup> Packages around hydrogen in the built environment and industry have now been developed by the MBO Council and will land as elective courses in various courses.

## 1.2.2 HCA commitment to hydrogen economy

Focusing on "hydrogen economy" in the narrow sense, we successively describe the labor market situation and the landscape around lifelong development (initial and post-initial training offerings).

### Labor Market

We have no insight into how many people are effectively working in the regional "hydrogen economy" today (partly due to the lack of an unambiguous definition). However, we can estimate the potential. According to a recent study by CE Delft, 1.2 million FTE are currently employed in hydrogen-relevant sectors in the Netherlands and this number would rise to 1.3 million FTE in 2030.<sup>16</sup> Annual inflows into these sectors in recent years have been 28,000 FTE graduate students, 35,000 FTE lateral entrants and 72,000 FTE foreign workers, totaling 135,000 FTE. The upper limit of cumulative direct labor demand over the 2024- 2030 period would be about 38,000 FTE, of which 31,000 FTE would be temporary jobs and 7,000 permanent jobs (about 1,000 FTE annually). Combined with the number of open vacancies in engineering, ict and transport & logistics and the evolution of labor demand in fields such as ict, chemistry and especially energy<sup>17</sup>, the tightness in the labor market for technical occupations will persist, most strongly for MBO profiles (level 3 and 4) around infrastructure, electrification and construction. In time, however, "fossil" jobs in industry and mobility will also be displaced and replaced by the phasing out of oil and natural gas. Still according to the CE Delft study, important knowledge themes fueling the labor demand are: electrochemistry, electrical engineering, process technology, chemistry, combustion technology, role of hydrogen in system integration and (micro)biology, and for the eastern and southern Netherlands, among others, the freight transport sector is also relevant.

Looking at Limburg specifically for engineering, ICT and transport & logistics, 113,000 employed people have a technical and ICT profession and 40,000 employed people have a transport and logistics profession<sup>18</sup>. Currently, 114,000 people are employed in the industry and transport & storage sectors combined.<sup>19</sup> The assumption is that in the next few years 'hydrogen jobs' will be created for the construction of the hydrogen backbone (one-time labor demand), in the field of transport (recurring labor demand, also replacing 'fossil' jobs) and as a result of making Chemelot more sustainable (both one-time and recurring labor demand for local infrastructure works, commissioning of pilot, demo and production installations, and operation and maintenance of both).

Beyond the potential, there is also the urgency surrounding green hydrogen and the energy transition. For example, the Limburg Territorial Just Transition Plan considers investment in access to green hydrogen as a precondition for maintaining 2,800 direct jobs at Chemelot.<sup>20</sup> Also, the development of labor demand around hydrogen (CE Delft) plays out against the backdrop of a labor market that, with respect to energy transition (broader than hydrogen), is experiencing increasing tightness

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<sup>16</sup> Labor market study hydrogen transition CE Delft 2023 (not yet publicly available on 22/10/2023).

<sup>17</sup> See [Technology Pact Monitor - Technology Pact 2023](#). Then we do not take into account the development within fields with staffing needs such as healthcare.

<sup>18</sup> [Labor MarketInZicht Limburg - Technical occupations CBS 2023](#)

<sup>19</sup> More specifically 75,600 persons employed in industry [Labor MarketInZicht Limburg - Industry CBS 2023](#) and 38,400 persons employed in transport & storage [Labor MarketInZicht Limburg - Transport and storage CBS 2023](#)

<sup>20</sup> [Territorial Just Transition Plan JTF South Limburg 2022](#)

not only technical occupations (Ecorys) but also non-technical profiles (ROA)<sup>21</sup>. This challenge is all the greater for a shrinking region like Limburg that not only already has a tight supply of technicians, but also faces a high expansion and replacement demand.<sup>22</sup> In addition, Limburg is perceived as a less attractive place to live and work.<sup>23</sup> At the same time, neighboring countries also experience tension on the labor market regarding technical professions and there are still bottlenecks in the employment of foreign employees or border workers, which is not unimportant given Limburg's border location. All these factors put even more pressure on the necessary investments in the hydrogen economy, at Chemelot and, by extension, other (energy-intensive) companies in Limburg.

### Lifelong development

We make the distinction here between the current regional supply of initial MBO, HBO and WO courses and post-initial courses within which hydrogen receives attention.

#### Initial training in mbo, hbo and wo

We focus on VISTA college (mbo), Zuyd Hogeschool (hbo) and Universiteit Maastricht (wo), because of their involvement in CHILL which we put forward as the Learning Community within our Regional Roadmap. For the sake of completeness, we also mention ROC Gilde Opleidingen (mbo) and Fontys Techniek & Logistiek, based in Venlo (hbo), and the private educational institution Notenboom (based in Maastricht).

Box 4 - Hydrogen-related initial training offerings.

Education type and institution	Hydrogen as a topic	Enrollment and graduate outflow in beta technology <sup>24</sup>
<b>mbo: VISTA and Gilde</b>	<p><u>VISTA college</u></p> <ul style="list-style-type: none"> <li>hydrogen technology elective course covering gray, blue and green hydrogen. MBO departments involved in these new technologies are: plant engineering, process engineering, industrial and maintenance;</li> <li>Also a lot of attention for hydrogen applications in automotive and built environment (as part of integrated energy system).</li> </ul> <p><u>Gilde Opleidingen</u></p> <ul style="list-style-type: none"> <li>including elective course on hydrogen technology in automotive mobility (pilot in 2022)<sup>25</sup></li> </ul>	<p><u>VISTA</u></p> <ul style="list-style-type: none"> <li>inflow: 833</li> <li>outflow: 930</li> </ul> <p><u>Guild</u></p> <ul style="list-style-type: none"> <li>inflow: 655</li> <li>outflow: 604</li> </ul>
<b>hbo: Zuyd and Fontys</b>	<p><u>Zuyd University of Applied Sciences</u></p> <ul style="list-style-type: none"> <li>education and research program Sustainable Chemistry with focus on flow chemistry/process intensification (i.e., pure use of hydrogen as a reactant), among others;</li> <li>activities mainly focused on linking research to field and partners such as VISTA in CHILL projects</li> </ul>	<p><u>Zuyd</u></p> <ul style="list-style-type: none"> <li>inflow: 490</li> <li>outflow: 481</li> </ul>

<sup>21</sup> [Labor demand in energy transition CE Delft 2022](#) ; [Climate policy and labor market Ecorys 2021](#) ; [Labor demand energy transition Southeast Netherlands ROA 2023](#)

<sup>22</sup> Labor market tension in Limburg is 3.62 for technical occupations and 7.35 for ict workers. [Labor marketInZicht - Labor market tension UWV 2023](#) ; the forecast of expansion and replacement demand exceeds 3%, putting Limburg among the highest scoring regions. [Labor MarketInZicht - Education and labor market POA-ROA 2022](#)

<sup>23</sup> Labor market study hydrogen transition CE Delft 2023, pp. 30, 88 and 93 (not yet publicly available on 22/10/2023);

<sup>24</sup> See [Technology Pact Monitor - Technology Pact](#) (figures inflow 2022-2023; outflow 2021-2022)

<sup>25</sup> [Hydrogen Technology in Mobility | Sustainable Smart Mobility](#).

	<p><u>Fontys</u></p> <ul style="list-style-type: none"> <li>• Within Fontys Techniek &amp; Logistiek (including mechanical engineering and mechatronics), hydrogen is offered as an energy carrier.</li> </ul> <p><u>Walnut Tree (private educational institution)</u></p> <ul style="list-style-type: none"> <li>• Training hydrogen for SMEs part of a new module Sustainable Economy ("DUEC"), in 3 groups of 10 students over a 10 class weeks of 3h/week.<sup>26</sup></li> </ul>	<p><u>Fontys</u></p> <p><i>No specific data for Venlo location in Monitor Techniekpact available</i></p> <p><u>Walnut Tree</u></p> <ul style="list-style-type: none"> <li>• 30 HBO3 students (major HBO Business Administration, minor HBO Hotel and Events).</li> <li>• No data available in Monitor Technology Pact</li> </ul>
<b>wo: Maastricht University</b>	<ul style="list-style-type: none"> <li>• attention to hydrogen in Circular Engineering and Business Engineering courses;</li> <li>• also in the Maastricht Science Program (as part of a broader whole, not specifically focused on hydrogen)</li> </ul>	<ul style="list-style-type: none"> <li>• inflow: 1549</li> <li>• outflow: 77</li> </ul>

Box 5 - Learning Community CHILL

### About Chemelot Innovation & Learning Labs (CHILL).

The Learning Community Chemelot Innovation & Learning Labs (CHILL) has been in existence for more than 10 years. CHILL is a public-private partnership of UM, VISTA college, Zuyd University, Province of Limburg, Fibrant, DSM, Sabic, Arlanxeo, AnQore, OCI Nitrogen, Vynova, Borealis and Sitech.

- Through a "Community for Development" (CfD), the connection is made between innovation of companies (especially SMEs) and the development of students. In these CfDs, students, professionals and teachers work and learn together on innovation issues around chemistry, with last years focus on circularity and sustainability of chemical processes.
- Through the scale up PPP 'Community of Practice' (CoP), CHILL together with VISTA college, among others, continues to build the ecosystem for education in chemistry from MBO courses in laboratory technology, process technology and industrial engineering.
- Through Chemelot Talent Office (subsidiary of CHILL), the recruitment, selection and training of lateral entrants for the process industry at Chemelot takes place, with an increasing focus on sustainability and sustainable alternatives (including green hydrogen) that will play an increasing role at Chemelot now and in the future.

#### CHILL in figures:

- 30 Communities for Development per year with 80 students at the secondary and college levels;
- 70 lateral entrants in training;
- More than 20 projects ongoing within various national and European programs including SIA (SPRONG, RAAK MKB/PRO), MOOI, ZonMW (Sports Innovation), Defense, Groeifonds PPS Opschaling Beroepsonderwijs, RVO/TSE, OP Zuid, Interreg Euregio Maas-Rhine, Interreg Netherlands-Germany, Erasmus+, Horizon 2020.

#### Post-initial training offerings

Formal offerings focused on green hydrogen applications (public, private, in-house) are currently very limited in the region.<sup>27</sup> Other than the automotive BBL courses offered by an MBO institution such as VISTA, there are no regional providers. Also no private providers (such as e.g.

<sup>26</sup> Module developed by Sonja Demandt (LWV), also a member of the South-East Regional Liaison Team

<sup>27</sup> Exploring post-initial training offerings green hydrogen KPMG 2023 (not yet publicly available on 22/10/2023)

Kiwa) located in the region itself. Nor do any companies appear to be organizing their own training internally beyond an initiation on the use of the facilities and informal learning while doing the job, with the exception of an engineering firm such as e.g. Volantis which itself is also involved in the Limburg Hydrogen Coalition. If they organize anything at all, they mostly refer to external providers with knowledge sharing afterwards within the company. This usually focuses on safety aspects.

More informative in nature are the regional events organized by LWV, the events on sustainable hydrogen at the Brightlands Chemelot Campus and the events within the framework of the Interreg Euregio Maas-Rhine project H2 Booster with LIOF and the Waterstof Coalitie Limburg (WCL), among others.<sup>28</sup> It is precisely to fill in that gap in the post-initial training offer that WCL wants to set up an Academy (by analogy with the Hydrogen Academy of Waterstofnet, itself the result of an Interreg Flanders-Netherlands project and also a partner in H2 Booster). We aim to embed this Academy within a broader 'Transition Academy' that responds to the digital, energy and raw materials transition. In this context, work is underway to further develop the LLO platform [Limburgleert.nl](https://www.limburgleert.nl)<sup>29</sup>, which would also house the UM offerings for professionals. Finally, dissemination also takes place around R&D, such as the plasma technology of UM and TNO that is being developed and scaled up within Brightsite at Chemelot.

### 1.2.3 Environmental analysis summarized

**Below we summarize the environmental analysis and list critical success factors:**

- Top priorities are connection to the national hydrogen infrastructure, alternative production of hydrogen (other than electrolysis) and application in (chemical) industry and also freight transport (hydrogen trucks and inland shipping). Access to green hydrogen and electrons are vital to making Chemelot more sustainable and preserving jobs.
- Limburg, like elsewhere in the Netherlands and neighboring countries, is experiencing labor shortages for relevant hydrogen-related occupations. As a shrinking region, with a tight supply of technicians and high expansion and replacement demand, which also suffers from its border location and its image as a place to live and work, it faces multiple challenges simultaneously.
- In the field of lifelong development, several energy transition projects have been submitted or are underway. The (post-)initial training offer around hydrogen (as an energy carrier) is currently relatively limited and mainly embedded within secondary vocational education (applied in mobility). In addition, there is an ambition in the region to develop the post-initial offer.

Critical success factors are the availability of green hydrogen, the attractiveness of technical occupations and of the region as a place to live and work. The extent to which we succeed in taking these to the next level will determine the regional hydrogen agenda and the HCA agenda.

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<sup>28</sup> The first edition of the Clean Hydrogen Conference at the Brightlands Chemelot Campus took place on May 18, 2021; the second on September 20, 2022. The conference focuses on research and innovation; [Event Zero Emission Mobility LWV April 4, 2023](#); [Best H<sub>2</sub> Practices in the Limburg Industry June 29, 2023](#); [Overview events EMR H2 Booster](#).

As part of the two-day [Transition Finance Event Nov. 29-30, 2023](#), a session on RWE's FUREC project that produces hydrogen from mixed household waste took place at Chemelot.

<sup>29</sup> [Limburgleert.nl](https://www.limburgleert.nl)

## 2 Regional impact

In this chapter we present the intended impact of the roadmap, taking into account the regional hydrogen agenda, the human capital agenda around the energy transition c.q. hydrogen as well as the country-wide cooperation within GVNL.

### 2.1 Positioning GVNL in relation to the regional hydrogen agenda

#### 2.1.1 National contribution to regional agenda

Taking into account regional priorities, GVNL is particularly relevant for R&D and scale-up to pilots and demonstrators of the alternative production routes of hydrogen via plasma chemistry and also gasification of plastic waste and biomass. For example, the activities of Brightsite's Plasma Lab fit seamlessly into R&D work package 1 "Carbon neutral hydrogen making," specifically "R&D towards transition technologies for CO<sub>2</sub> neutral hydrogen production from methane. By extension, this also applies to work package 4 "Hydrogen and green electrons for carbon-based chemistry" and work package 5 "Hydrogen and green electrons for nitrogen-based chemistry."

The other work packages within the R&D program also offer starting points for the regional priorities around transport and freight traffic, such as work package 2 'Transport and storage of hydrogen' and work package 3 'Direct use of hydrogen'. Participants in the recently approved HyTROS project within work package 2 include Gasunie, core partner in the regional hydrogen agenda, and HCA GVNL partners Hanze and HAN.

As for HCA GVNL, the operation of CHILL as a Learning Community and the ambition of the Waterstof Coalition Limburg around setting up a (virtual) Academy for post-initial training closely match what GVNL has in mind. Furthermore, HCA GVNL can contribute to expanding the initial training offer focused on sustainable hydrogen, which is relatively limited in Limburg. Although hydrogen as a raw material is discussed in the chemistry-related courses at Zuyd and UM, hydrogen technology as an energy carrier in e.g. mobility is only an elective at VISTA.<sup>30</sup>

The realization of the hydrogen backbone and Delta Rhine Corridor, the connection of Chemelot (and possibly other companies) to it and the construction of the local hydrogen network at Chemelot fall outside the scope of the GVNL program that focuses on research, scaling up, HCA and network activities. We cannot repeat it enough: access to both green hydrogen and green electrons is the top priority within the regional hydrogen agenda as a function of making Chemelot more sustainable and preserving jobs.

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<sup>30</sup> It is also an elective at Gilde (mbo) and is also offered at the Fontys Techniek & Logistiek courses and the private educational institution Notenboom (business administration).

### 2.1.2 Regional contribution to the national agenda

The Chemelot chemical industry cluster is an interesting location for GVNL, from a strategic and operational perspective.

Strategically, Chemelot's involvement can contribute to GVNL's ambitions around accelerating large hydrogen projects in key industries such as chemicals. Making Chemelot more sustainable, with a target of 25% of hydrogen production without CO<sub>2</sub> emissions by 2030 and 100% of hydrogen production without CO<sub>2</sub> emissions by 2050, can be a "flagship" for GVNL.

Operationally, several concrete projects tie in with the GVNL program lines around research and scale-up (such as the Plasma Lab and the further development into the Plasma Pilot). Also around HCA, with CHILL there is a successful public-private partnership between educational institutions and companies and an active Learning Community whose approach also appeals to other sectors outside chemistry. Moreover, steps have already been taken to organize a regional (virtual) Academy by the Waterstof Coalition Limburg.

In addition, there are several projects that are committed to setting up facilities for learners (generational students and lateral entrants), workers (additional and retraining; whether or not threatened by unemployment), job seekers and vulnerable groups. Facilities to make the lifelong development and labor market offerings broader and more flexible for the broad energy and resource transition (see Consistency with other agendas and programs).

The Regional Liaison Team provides the link between the national GVNL agenda, the regional hydrogen agenda and the HCA commitment to it. The organizations represented in the Team are involved in the implementation of the regional hydrogen agenda and the HCA around energy transition, and as such are themselves already part of the national intended responsive ecosystem within HCA GVNL.

The Team further helps ensure that other regional parties are connected to the GVNL initiatives around research, scale-up and networking and the HCA goals around outreach. The Team also ensures coherence with other programs. On the one hand by maintaining an overview of the project pipeline. On the other by sharply delineating projects that could be developed specifically within HCA GVNL from other programs where possible (to minimize stacking of different grants).

Specifically toward hydrogen, the Team has developed a program that is committed to broadly informing and raising awareness about hydrogen developments, strengthening existing training offerings with among others, field lab around mobility and built environment as integrated energy system and chemical process intensification, accelerate the research and scaling up of plasma technology for the CO<sub>2</sub>-free production of hydrogen as feedstock for chemistry and also as energy carrier in inland navigation (see next chapter).

### **On the symbiosis between Chemelot and region**

Making Chemelot more sustainable and accelerating the transition to a circular and climate-neutral economy are the focus of the Circular Economy Action Plan (hereafter CEAP)<sup>31</sup>.

Specifically for hydrogen, Chemelot has the goal of achieving 25% of hydrogen production without CO<sub>2</sub> emissions by 2030 and 100% of hydrogen production without CO<sub>2</sub> emissions by 2050.

Several hydrogen-related projects are currently underway: the two investment projects on gasification of waste and biomass mentioned above (FUREC/RWE, UNIPER and BrigH2), further development of plasma technology from Brightsite's Plasma Lab, and infrastructure works with planned connection to national hydrogen backbone in 2028 and later Delta Rhine Corridor, and envisaged study of local hydrogen network at Chemelot (JTF project Hydra).

In addition to innovation and infrastructure projects, the CEAP also includes a Human Capital Agenda (HCA) with activities aimed at strengthening the entire education chain; attracting and binding talents, and new state-of-the-art facilities for education and research. The HCA projects and also projects around social engagement on the transition have a broader scope than Chemelot as a location.

The CEAP is supported by the Chemelot Circular Hub (hereafter CCH), a broad triple helix alliance consisting of the companies DSM, Sabic and Fibrant; the Chemelot Foundation (industrial park) and the Brightlands Chemelot Campus (innovation campus); the municipality of Sittard-Geleen, the province of Limburg and the regional development company LIOF; the Green Chemistry New Economy Platform, and the research and educational institutions TNO, UM, VISTA college and Zuyd University of Applied Sciences.

## **2.2 Coherence with other agendas and programs**

### **2.2.1 Connection to regional, national and European agendas**

Apart from involvement in GVNL itself, we are involved in various regional, national and European agendas. This does not mean that we are directly involved in all these agendas, but that we follow them: these policy frameworks help determine the context in which we operate.

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<sup>31</sup> [CEAP Chemelot Circular Hub Transition Plan.](#)



In the table below we present an overview (non-exhaustive):

Table 3 - Connection to regional, national and European agendas

Agendas	
<b>Regional</b>	<p>General: Mission-Driven Economic Policy Framework Province of Limburg<sup>32</sup> , Regional Energy Strategy South Limburg<sup>33</sup> and Cluster Energy Strategy Chemelot 2030-2050<sup>34</sup> .            Focused on hydrogen: feasibility study and roadmap around hydrogen in Limburg industry (excluding Chemelot)<sup>35</sup> , and also Waterstofcoalitie Limburg (WCL)<sup>36</sup> .</p> <p>Specifically around HCA: Educational Agenda Limburg<sup>37</sup> (education chain); initiatives such as STEAM Limburg<sup>38</sup> (focused on primary education) and Limburg Leert<sup>39</sup> (focused on LLO), as well as the regional workings of Techniekpact<sup>40</sup> and Sterk Techniek Onderwijs<sup>41</sup></p> <p>Focused on hydrogen: organization Academy planned by WCL (including master class on hydrogen opportunities for companies)</p>
<b>Rural</b>	<p>General: the Multi-Year Mission Driven Innovation Program (MMIP) with the mission "climate-neutral industry with reuse of raw materials and products in 2050" and underlying programs 6 (closing cycles), 7 (CO<sub>2</sub> -free heat system), 8 (electrification and renewed processes) and 13 (robust and supported energy system)) and the KIA Energy Transition and Sustainability (agenda items 1 (spatial application from connection with Chemelot cq. Cluster Energy Strategy); 2 and 3 (Brightlands Chemelot Campus cq. CHILL as experimental space and support for business development), and 5 (CEAP as a framework for transition to circular economy). In addition, also the KIA Circular Economy (MMIP 2 Circular Raw Materials and Processes) and the KIA Key Technologies and Sustainable Materials (specific Multi-Year Programs 32 (Materials Innovations) and 59 (Climate Proof Chemistry with Brightlands Materials Center and Brightsite in the lead; also, among others, 33 (circular plastics), 56 (ECCM and electrification), 58 (bioaromatics) and 70 (process technology) relevant)            Focused on Hydrogen: Green Chemistry and Hydrogen Action Agenda<sup>42</sup> and H<sub>2</sub> platform<sup>43</sup></p> <p>Specifically around HCA: Roadmap Top Sectors<sup>44</sup> and initiatives such as Techniekpact<sup>45</sup> , Sterk Techniek Onderwijs<sup>46</sup> (focused on v/mbo), Platform Talent for Technology<sup>47</sup> and Center Youth Education Chemistry (C3)<sup>48</sup> . Also involved in, among others, hbo-thematic table Energy Transition and Sustainability and connected to mbo-raad (Techniek &amp; Gebouwde Omgeving).</p>
<b>European</b>	<p>General around hydrogen: European hydrogen strategy<sup>49</sup></p>

<sup>32</sup> [Mission-driven Economic Policy Framework Limburg](#)

<sup>33</sup> [RES South Limburg](#)

<sup>34</sup> [CES Chemelot 2030-2050](#)

<sup>35</sup> [Feasibility study CE Delft commissioned by Province of Limburg 2021](#); Roadmap Waterstof Limburg 1.0 carried out by Buck Consultants commissioned by Province of Limburg, LIOF and Waterstofcoalitie (not publicly available).

<sup>36</sup> See [Hydrogen Coalitie Limburg](#) (WCL) is hosting an official opening event on Oct. 21 at the Brightlands Chemelot Campus. In terms of operations, WCL currently focuses on mobility and the built environment.

<sup>37</sup> [Educational Agenda Limburg](#)

<sup>38</sup> [STEAM Limburg](#)

<sup>39</sup> [Limburg Learns](#)

<sup>40</sup> [Technology Coalition Limburg](#)

<sup>41</sup> [Strong Engineering Education South Limburg](#)

<sup>42</sup> [Green Chemistry and Hydrogen Action Agenda](#)

<sup>43</sup> [H2 platform](#)

<sup>44</sup> [Roadmap Human Capital Top Sectors 2020-2023](#)

<sup>45</sup> [Technology Pact](#)

<sup>46</sup> [Strong Engineering Education](#)

<sup>47</sup> [Platform Talent for Technology](#)

<sup>48</sup> [C3](#)

<sup>49</sup> See [European Hydrogen Strategy](#) and also TKI New Gas [Overview of Dutch and international organizations, projects and activities](#).

Cross-border: HydrogenNet <sup>50</sup> , including Interreg EMR project H2 Booster <sup>51</sup> in which WCL and LIOF are involved. Specifically around HCA hydrogen: European hydrogen observatory <sup>52</sup>
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## 2.2.2 Connection to other HCA programs

There are several projects and project applications underway within various funds. Below we highlight the national programs Regional Innovation Fund MBO and the Growth Funds PPP Scaling Up Vocational Education and LLO Catalyst. And regarding the European programs: Interreg, Erasmus+, Just Transition Fund. These are certainly not the only programs we focus on; this is a playing field that is constantly changing and offers new opportunities, think of Growth Fund Industry Coalition, OP Zuid or ESF+.

### Country programs

#### *Regional Investment Fund*

In 2020, the scale-up CHILL-Community of Practice (CoP) was awarded 1.2 million euros from the Regional Investment Fund mbo (RIF) through 2024, along with 6 other PPPs. With the RIF, the Ministry of OCW makes money available for sustainable public-private partnerships (PPPs) in vocational education. The goal is more attractive, contemporary MBO education with a better connection to the regional labor market. In the CoP the VISTA College, PPP CHILL, Hogeschool Zuyd, municipality of Sittard-Geleen, province of Limburg and the Brightlands Chemelot Campus work together with companies to create an ecosystem for education of learning and working in the chemical domain.

#### *Growth Fund PPP Scaling up vocational education*

Recently, the project SNEL was approved as one of 15 consortia in the Netherlands. Under the name SNEL (Samenwerkend Netwerk van Ecosystemen in Limburg), a connection was sought between existing PPPs in Limburg. In addition to lead partner Chemelot Innovation and Learning Labs (CHILL) on the Brightlands Chemelot Campus, these include Centrum voor Innovatief Vakmanschap Installatietechniek Limburg (CIV-IL), Gebouwde Omgeving Limburg (GOL) and Brightlands Smart Services Campus. These successful PPPs that each play an important role in the cooperation with the (SME) business community in the various technical sectors and vocational education.

With SNEL, the next step will be taken in the coming years to expand these PPPs and connect them geographically and substantively. This with the goal of jointly realizing an even greater impact together with the other partners Brightlands Campus Greenport Venlo, Bouwmensen Limburg, Gilde Opleidingen, IW ZUID-Oost, Leo Loopbaan, Open University, Stichting Onderwijs Midden-Limburg (SOML), Stadslabs Sittard-Geleen, VISTA college and Zuyd Hogeschool.

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<sup>50</sup> See [HydrogenNet project overview](#)

<sup>51</sup> [Interreg EMR H2 Booster](#)

<sup>52</sup> [Fuel Cells Hydrogen Observatory](#)

## **Content SNEL focuses on lifelong development around the "twin transition.**

- Sustainability: circular transition of materials, raw materials and processes in the process industry, built and agri-food environment
- Digitalization: as an accelerator of transitions through deployment of Artificial Intelligence, innovative digitalization solutions and big data (within SMEs and education)
- Innovation: of materials and processes of and for professional practice and in education

SNEL marks a starting point for the region to firmly establish cooperation in these areas in this region and boost the Circular Economy in Limburg, with a predetermined reach of 400 companies.

### *Growth Fund LLO Catalyst*

There are 5 project applications outstanding around the building blocks 'Driving developments and deployment of LLO solutions' (1 joint application Zuyd & VISTA) and 'Professionalizing LLO delivery organizations' (3 applications from Zuyd, UM and VISTA).

## **European programs**

### *Interreg Meuse-Rhine Euregio*

The now ended H2 Booster project focused on knowledge sharing, networking and planning around the development of the green hydrogen economy on a regional and Euroregional level.

Together with 7 other partners from Flanders, Wallonia, North Rhine-Westphalia, LIOF and Waterstof Coalitie Limburg were part of the consortium, which was led by WaterstofNet (itself born out of an Interreg VLANED project). A total of nearly 100 parties active around hydrogen were mapped<sup>53</sup>. Under the name Virtual EMR H2Booster, the hydrogen clusters WaterstofNet, Waterstof Coalitie Limburg, H2Hub Wallonia and Hydrogen Hub Aachen perform an advisory function in 6 areas: training/job; research and innovation hub; regulation, certification and licensing; project advice and financing; H2 networking; International H2 Europe.<sup>54</sup>

### *Interreg Flanders-Netherlands*

In the cross-border project Energy(k) Education, Zuyd and HZ, among others, are working together with 16 other Flemish and (southern) Dutch partners. This project, led by Avans Hogeschool, will recruit, train, retrain and upskill young people and adults for professions to enable the energy transition.<sup>55</sup>

### *Erasmus+*

The 'ChemSkills' project focuses on developing green and digital skills for the transformation of the chemical industry, in addition to skills to produce safe and sustainable chemicals by design within a climate-neutral energy-intensive ecosystem. It will identify skills already in existence and develop emerging occupational profiles and related qualifications covering higher and post-secondary vocational training levels (EQF levels 3 to 5) and tertiary levels (EQF levels 6 to 8).

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<sup>53</sup> [Euregional Hydrogen Network \(EMR H2 Booster\)](#).

<sup>54</sup> [Interreg EMR H2Booster](#)

<sup>55</sup> [Interreg VLANED Energy\(k\) Education](#)

The project, led by the European Chemical Employers Group, brings together social partners, industry associations, educational and research institutions, and governments to implement strategies to address skills shortages. Maastricht University and CHILL are part of the consortium of 34 partners in total.<sup>56</sup>

#### *Just Transition Fund*

The Just Transition Fund (JTF) is a European fund aimed at regions with additional challenges due to the ambition to be climate neutral by 2050. The JTF supports making the economy more sustainable and strengthening the labor market. In the Southern Netherlands, South Limburg is one of the three designated JTF regions. The contribution to a just transition of the (chemical) industry takes place along three tracks: innovation, infrastructure and labor market, with a total budget of € 57.6 million incl. EZK co-financing). Projects within the third track "labor market" promote the achievement of a more agile and resilient workforce in the entire JTF region of South Limburg. The budget for track 3 was for the first opening t.e.m.

September 29, 2023 totaling 13.1 million; for the second and final opening from December 2023, the amount is not yet fixed.

Following the first opening, 8 HCA projects were submitted for a total amount of € 12.8 million. The projects were developed from a coherent approach under the direction of the Labor Market Region of South Limburg, in which municipalities and UWV jointly shape the services to employers and job seekers, together with business, education and regional authorities with relevant labor market partners.

#### **They are part of two overarching programs in the context of the energy , resource and also digital transition:**

- Setting up a 'Work Center South Limburg', aimed at low-threshold facilities in the field of work and lifelong development for job seekers, (vulnerable) employees and employers: 4 projects aimed at HR advisory function MKB, side-instromers technique incl. Chemelot Safety & Skills Center, mobilizing students, job seekers, workers, and workers threatened with dismissal (VDL).
- Setting up a "Transition Academy South Limburg", aimed at strengthening the South Limburg network infrastructure for lifelong development: 4 projects aimed at guiding job-seekers distanced from the labor market to training (advance training infrastructure), further expansion of the Community of Practice and the development of a future-oriented college and university portfolio of initial and post-initial courses.

In total, all the projects together aim to reach, train, upskill or retrain 5,500 people for jobs in green chemistry (including 330 students and 130 teachers and practical trainers as part of teacher professionalization, as well as 520 people from the untapped potential).

Lead partners of these projects are: Leo Career (3 projects), Chemelot Talent Office (subsidiary CHILL), VISTA, UM, Zuyd, Municipality of Heerlen (Labor Market Region South Limburg). The projects involve various parties including companies, Techniek Coalitie Limburg, LWV, trade unions, WSP resp. UWV and municipalities....

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<sup>56</sup> [Erasmus+ ChemSkills](#)

For the sake of completeness, we mention that within the first track "Innovation" a pilot project on the production of hydrogen from plastic waste for e.g. mobility applications (Hydrogen Utopia) has been submitted and in the second track "Infrastructure" a project related to a study on the construction of a local hydrogen network at Chemelot (Hydra of USG managing the utilities at Chemelot). We cited these projects earlier in Table 2 - Priorities Regional Hydrogen Agenda.

### **2.2.3 Collaborative platform for elaboration of HCA projects.**

The Chemelot Circular Hub (CCH) is the collaboration platform for the elaboration of the Human Capital track within JTF and its coordination with other programs such as Growth Fund PPP Scaling Up Vocational Education, LLO Catalyst, and others.

In relation to HCA GVNL, the JTF projects within the program 'Werkcentrum Zuid-Limburg' can contribute to ensuring that sufficient well-trained personnel are available and vacancies are filled more quickly (shorten time to job). The JTF projects related to the program 'Transition Academy Zuid-Limburg' in conjunction with the project-SNEL (PPS Upscaling) can be the frame of reference for the further development of the training offer including an Academy for company-oriented post-initial training on sustainable hydrogen. In any case, the coherent approach from the two programs 'Work Center' and 'Transition Center' is paramount - whether supported through JTF or Growth Fund or other arrangement does not matter in itself; as long as they contribute to the regional plan.

As a Learning Community, CHILL stands at the crossroads of innovation, learning and working. Not only from the successful public-private partnership between educational institutions and industry through Communities for Development and the Community of Practice (RIF), but also with its subsidiary Chemelot Talent Office with which it bridges the gap between talents and companies at Chemelot.

Interreg projects such as Energy(k) Education (VLANED) and H2 Booster (EMR) in turn offer opportunities for further cooperation with partners from Flanders, Wallonia and North Rhine-Westphalia.

The Chemelot Circular Hub (CCH) is also the platform for regional cooperation within HCA GVNL, with the key players being the educational institutions UM, VISTA college and Zuyd Hogeschool together with the companies DSM, Sabic and Fibrant, and the province of Limburg, all of which are also involved in CHILL or the Community of Practice. As an established public-private partnership between educational institutions and companies, CHILL is the advance Learning Community within HCA GVNL, and CHILL's subsidiary Chemelot Talent Office makes the bridge to the labor market approach. CCH member LIOF is also part of the Regional Liaison Team, and together with LWV and Waterstof Coalitie Limburg (WCL) provides the connection with the business community. They each have a distinctive role in this: LIOF as a booster and financier of (business) projects, LWV informs and sensitizes companies, and WCL as a 'one stop shop' for advice and - in the future - training. In the framework of Brightsite, UM and TNO (jointly active in the Plasma Lab) also make the connection with R&D program GVNL.

### On CCH's starting position within HCA GVNL

We started from circular chemistry and a systems approach. We approach hydrogen primarily as a raw material. At the same time we also pay attention to developments in production, storage and distribution, and use and applications in other industries<sup>57</sup>, in the field of mobility (including the possibility of sustainable transport to/on site via inland navigation and road) and in the built environment. Here we see hydrogen as part of energy and raw materials transition from an integral system approach. Translated into training, we want to pay attention to hydrogen within our vocational, university and college courses, but we do not want to set up a separate hydrogen course (working through a modular approach and specific master classes).

**We use the CEAP as a compass: in terms of HCA, they have defined four leading projects for the period 2022-2025:**

1. "stall rooms": plug-and-play facilities for training and market-ready ideas and products;
2. binding talents: sufficient labor force, trained for transitions through additional promotion STEAM courses, continuous learning lines MBO-HBO-WO, adapted and new (English-language) courses, one-stop shop for employees and employers, and branding;
3. digitalization: automation and robotization of production processes, both to optimize these processes and to replace labor (due to labor shortages);
4. community of disruptive companies through commitment to radically innovative processes and targeted acquisition of gamechangers.

## 2.3 Regional impact summarized

**Below we summarize the regional impact we intend to achieve with GVNL and list critical success factors:**

1. GVNL's ambition to accelerate major projects around green hydrogen and energy in a key industry such as chemistry can give a boost to making Chemelot more sustainable. Chemelot is a hub of research, scale-up, HCA and networking around sustainable hydrogen. Through the triple helix alliance Chemelot Circular Hub, the environment is included in the energy and raw materials transition and also links to other agendas and programs. As such, the industry cluster can be one of the "flagships" of the national agenda.
2. With its research and scale-up program, GVNL can contribute to the further development of plasma technology for the CO<sub>2</sub>-free production of hydrogen. By extension, this also applies to other routes of hydrogen production such as the gasification of plastic waste, biomass and

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<sup>57</sup> In making the LEA farms more sustainable, the deployment of renewable hydrogen is almost entirely energetic and primarily dependent on the potential for electrification. Based on the 2019 natural gas demand, if no electrification takes place, that would be a maximum hydrogen demand of up to 97 kt/year. (LEA = Limburg Energy Agreement). See [Cluster energy strategy Chemelot 2030-2050](#), p.15

As for electrification, TenneT is investing 2 billion over the next 10 years in Limburg and North Brabant to expand and reinforce the e-infra, after announcing a temporary halt on new connections in 2022. Besides expansion and reinforcement, flexibility is also a challenge.

mixed waste. These primarily contribute to the self-sufficiency of a chemical industry cluster like Chemelot, but can also find application in inland shipping (hydrogen from ammonia via a plasma reactor) or trucks (hydrogen from gasification of plastic waste).

3. HCA-GVNL can contribute to strengthening CHILL as a Learning Community for hydrogen applications within and outside the chemical industry; expanding and refining the (post-) initial offer around sustainable hydrogen, including setting up a (virtual) Academy focusing on professionals; (re)connecting companies to the Learning Community, the national Knowledge, Learning and Development Platform, and the Academy; and organizing events aimed at informing and raising awareness about technological developments and useful applications.

The critical success factor is the speed of sustainability, which depends on several factors: access to sufficient green hydrogen at a reasonable price and the scaling up of alternative production routes in function of the highest possible degree of self-sufficiency. Also, the (MBO) talents to build the necessary infrastructure to ensure that access. In order to train these talents and lead them to a job, coherence with the regional HCA agenda in which hydrogen is part of a broader system approach to energy and raw materials transition and active cooperation with the other regions within HCA GVNL for the realization of additional training offerings are a must.

# 3 Program

Below we describe the building blocks of our program. These indicate where our priorities lie, what our strategic goals are. They flow from the environmental analysis and contribute to intended regional and national impact.

## 3.1 Strategic goals

We have linked 4 priority objectives to 4 scopes meet & inspire, learn & develop, innovate & scale up, and deepen collaboration.

### 1. Learning by Doing Community Hydrogen.

Central to this is the building of a Learning by Doing Community. This is located at the intersection of the 4 scopes, connects the other components of the program, and finds at Zuyd in CHILL the hub from which to coordinate the program and coordinate coherence with other programs.

**The Learning by Doing Community includes two aspects:**

- Further development of the existing ecosystem, both regional and euregional (including continuation of the Interreg EMR H2 Booster project), as a platform for exchange and cooperation between R&D and LLO institutions (within and outside the region), industry, governments and also citizens' initiatives. Regional events (such as those organized by the Brightlands Chemelot Campus, LWV and H2 Booster events with the help of WCL and LIOF) play an important role in attracting people to the hydrogen community. The organization of these events fall within the scope of 'meeting & inspiring'.
- Applying the methodology of CHILL, the so-called Communities for Development, with demand-driven/challenge-based innovation in collaboration with the companies involved and mainly college students guided by teachers/lecturers and also the Community of Practice (of which VISTA is the driving force). This from the scope of 'learning & development' around the use of sustainable hydrogen technology.

In relation to the national HCA GVNL, the Learning by Doing Community contributes to connecting regional educational and research institutions, labor market players, governments, industry and cluster organizations that want to commit to green hydrogen into the national intended responsive ecosystem. We put CHILL forward as the Learning Community within HCA GVNL. From CHILL, itself or through its subsidiary Chemelot Talent Office involved in various public-private LLO and labor market projects, we work towards training (future) staff and filling vacancies in the energy and raw materials transition faster.

In addition, we have specific objectives around LLO with the Academy and around R&D with Accelerator. At the intersection between LLO and R&D, we also aspire to develop a (field) lab on hydrogen technology and co-development projects in collaboration with Zuyd (chemical process intensification), UM (labs) and VISTA (field lab wo. MobilityHouse). We discuss these below.



## 2. Academy

With the Academy, we aim to set up (post-)initial training courses on green hydrogen in the region. For this we base ourselves on technical and non-technical knowledge needs among regional parties (companies, governments, other organizations). The Academy does not coincide with one institution or physical location, and should be seen as the bundling of hydrogen-related course offerings.

We are thinking of developing a range of courses as well as one or more field or living labs. We bring this under the previously mentioned program 'Transition Academy'. We also place the guidance of job seekers and employees in their search for an internship, job or jobcrafting within the framework of the 'Work Center' program.

The scope 'learning & development' is paramount here

As far as the field lab is concerned, we are thinking of chemical process intensification, with hydrogen as a concrete application at Zuyd and the expansion of the MobilityHouse at Vista. From an integrated energy system approach, the MobilityHouse combines mobility and the built environment (Vehicle to Grid/V2G). Here hydrogen can play a role especially in balancing the electricity grid (Power to Gas/P2G).

Later, living labs in a real environment with working installations can also be considered (from a pilot for safe application of reactions with hydrogen at Zuyd/CHILL to e.g. existing tank infrastructure)

For the courses, we are looking at what we can fill in through VISTA, Zuyd, UM, also Notenboom<sup>58</sup> or core partners of the Hydrogen Coalition Limburg (WCL). One of those WCL partners is the Flanders-based and cross-border active WaterstofNet (Hydrogen Academy). Our particular focus is on "train-the-trainer" modules, as a multiplier on knowledge sharing.

We also explicitly look at the offer of HCA GVNL partners such as HAN. Our approach is that we do not duplicate anything that already exists elsewhere and can be offered to regional parties (through hiring or shared employment) through agreements from other partners. Only in the event that staff capacity at other partners does not allow this and/or the knowledge need in the region appears to be so great, we set up parallel initiatives.

We are still considering how to organize post-initial course offerings. The Waterstof Coalition Limburg is holding discussions with possible partners on this subject. In connection with this, we are working on the further development of the LLO platform [Limburgleert.nl](https://www.limburgleert.nl) on the basis of a broader 'Transition Academy'.<sup>59</sup>

Besides knowledge sharing with companies, knowledge building with governments is very important. Focused on the national HCA GVNL, we also include it under the expected regional reach of 50 companies and 1,000 professionals. Setting up the Academy is in itself a goal within the national agenda. We also see this in conjunction with the nationally targeted Learning & Development for companies.

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<sup>58</sup> The Sustainable Economy module addressing hydrogen in SMEs was co-developed by Sonja Demandt (LWV) who is a member of the South-East regional liaison team.

<sup>59</sup> [Limburgleert.nl](https://www.limburgleert.nl)

### 3. Accelerator Hydrogen

Whereas the Academy is responsible for the dissemination of knowledge to companies, governments and other parties that want to work with hydrogen, the Accelerator focuses on the cross-fertilization between R&D and the field. It focuses on the (non-)financial support for the upscaling and roll-out of research results or the development of new activities. The scope here is 'innovation & scaling up'.

The Accelerator's project portfolio includes, first of all, the scale-up of the plasma lab to plasma pilot plant on Brightlands Chemelot Campus, led by Brightsite (with UM and TNO, among others). We also offer project support for the pilots from Hydrogen Roadmap Limburg (burners brick factory Wienerberger, Local Energy Hub Venlo incl. tank infrastructure and trucks)<sup>60</sup> and other business cases from the Interreg EMR H2 Booster project. The request for support comes from a company or consortium. LIOF plays a key role in this.

### 4. Collaboration

By cooperation, we primarily mean national cooperation around HCA program components. Here we distinguish between nationally to be developed and nationally to be aligned:

Table 4 - National cooperation with regional input vs alignment regional approach

To be developed nationwide with input from the regions	Regional approach to be aligned nationwide
<ul style="list-style-type: none"> <li>national e-platform (knowledge map and digital learning environment);</li> <li>national education and labor market research;</li> <li>international hydrogen academy (training in NL and partner countries),</li> </ul>	<ul style="list-style-type: none"> <li>educational, R&amp;D and business-oriented programs and interrelatedness;</li> <li>mentoring job seekers and lateral entrants through talent office, offering on-the-job training, jobcrafting, etc.</li> </ul>

Secondly, the cooperation between regions, both in the organization of training and the execution of research projects and setting up (field) labs, pilots or demos. Our starting point is also that we do not want to duplicate anything in terms of training that already exists elsewhere, unless the regional need for knowledge is so great or there is no human capacity in the partner regions to provide training. Our approach is also not that we have to participate in every research project, as long as knowledge dissemination is adequately organized.

From the Waterstof Coalition Limburg, discussions have previously taken place with SEECE/HAN around post-initial training. For training courses, geographical proximity is a plus (if relocation is expected of the participants or of the experts who are called in). Either way, the content is leading in setting up the cooperation; we are equally happy to cooperate with other regions.

<sup>60</sup> Roadmap Waterstof Limburg 1.0 performed by Buck Consultants commissioned by Province of Limburg, LIOF and Waterstofcoalitie 2021 (not publicly available).

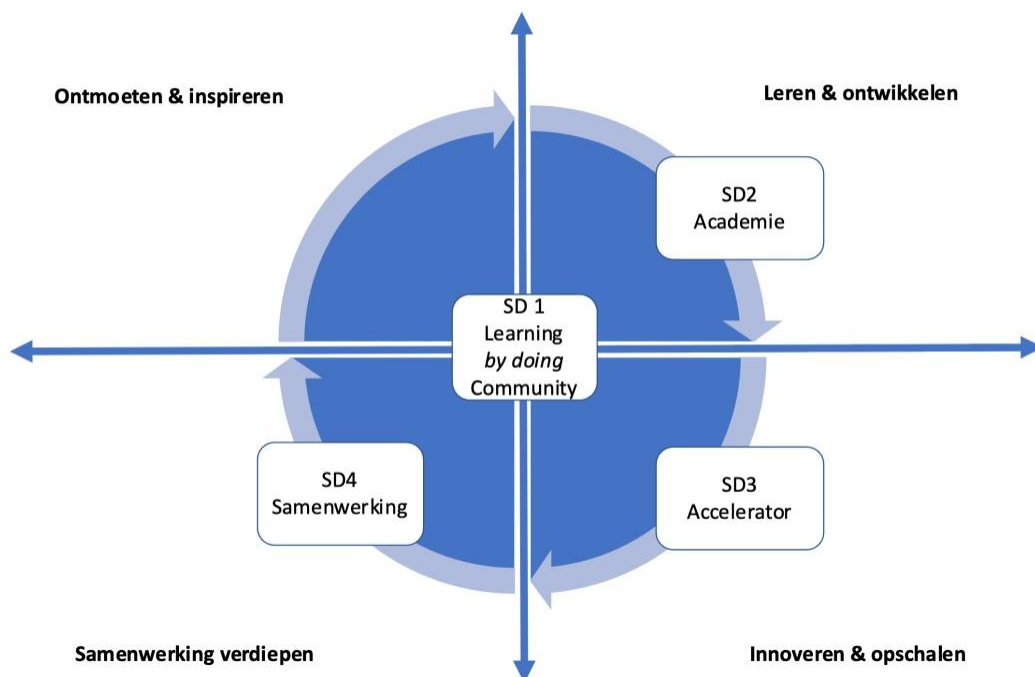
Third, cooperation in a European context, especially cross-border with Flanders and Germany. WaterstofNet is a passionate and adept partner, with whom LIOF and Waterstof Coalitie Limburg have collaborated in the H2 Booster project (Interreg Euregio Meuse-Rhine).

In short, "deepening cooperation" - national, interregional and cross-border - is our leitmotif and in itself one of the building blocks of our program.

### 3.2 Visualization of strategic goals

The figure below visualizes the strategic goals of the Roadmap. We elaborate on these with the operational goals in the next section.

Figure 4 - Visualization program



# 4 Operationalization

In this chapter, we elaborate the strategic objectives into operational objectives. We indicate who the trigger(s) are. In the next chapter we also link indicators and the contribution to the national agenda.

## 4.1 Translation of strategic to operational goals

Table 5 - From strategic to operational goals and their triggers.

Strategic goal (SD).	Operational Objective (OD).	Trekkers
<b>SD1 Learning by Doing Community</b>	OD 1.1. Establish Learning Community	Zuyd & CHILL
	OD 1.2. Develop regional education, research and innovation agenda (ROOIA).	coordinated by Zuyd
	OD 1.3. Organize events	LWV
<b>SD2 Academy</b>	OD 2.1. Develop course offerings and (field) lab within Transition Academy	Vista & Zuyd
	OD 2.2. Establish guidance workers from Work Center	Chemelot Talent Office & Leo Career
<b>SD3 Accelerator</b>	OD 3.1. Plasma pilot realize	UM & TNO (Brightsite)
	OD 3.2. Pilot hydrogenation realize	Zuyd
	OD 3.3. Support projects	LIOF
<b>SD4 Collaboration</b>	OD 4.1 Rural cooperation	Program Office HCA GVNL & Regional Liaison Teams.
	OD 4.2 Regional and international cooperation	topic/project-related, coordinated through Zuyd c.q. CHILL

As for the establishment of the Learning Community (OD 1.1), it involves promotion and acquisition of one or more hydrogen-related Communities for Development and the accommodation of the hydrogen community within the Community of Practice<sup>61</sup>.

With regard to the regional education, research and innovation agenda (OD1.2.), it is a matter of translating a three-yearly survey of the knowledge needs of companies, governments and others into education-, research- and business-oriented programs. With regard to education and research, Zuyd, VISTA, UM (in cooperation with TNO), and CHILL play a central role; with regard to business-oriented programs, LWV and LIOF are the main players.

<sup>61</sup> The [large scale intervention group of the CoP](#) provides a starting point for composing the regional stakeholder consultation (as well as conducting interviews for education and labor market research)

We have already explained the other operational goals in the previous chapter. Below we translate the operational goals into actions and deliverables, followed by an indicative schedule.

## 4.2 Planning, actions and deliverables

Table 6 - Actions and deliverables operational goals

Operational Objective (OD).	Actions	Deliverables
<b>OD 1.1. Establish Learning Community</b>	1a 1b	Working arrangements between Zuyd, CHILL and partners (Interim) evaluation
<b>OD 1.2. Develop regional education, research and innovation agenda (ROOIA).<sup>62</sup></b>	2a 2b	Elaborated ROOIA based on desk research <sup>63</sup> , national knowledge map, consultation with other regional liaison teams on their initiatives or participation in other national consultations <sup>64</sup> Recalibrate ROOIA based on monitoring and dialogue
<b>OD 1.3. Organizing events</b>	3a 3b 3c 3d	Event 1 Event 2 Event 3 Event 4
<b>OD 2.1. Develop course offerings and (field) lab within Transition Academy</b>	4a 4b	Elaborated offer based on ROOIA Adapted offer based on recalibration ROOIA
<b>OD 2.2. Establish guidance workers from Work Center</b>	5	Approach coordinated with Chemelot Talent Office & Leo Career i.f.v. Work Center (together with Transition Academy the framework for project development within various schemes).
<b>OD 3.1. Plasma pilot realize</b>	6	Pilot operational
<b>OD 3.2. Pilot hydrogenation realize</b>	7	Pilot operational
<b>OD 3.3. Support projects</b>	8	Business-oriented support (financial and non-financial) on point <sup>65</sup>
<b>OD 4.1 Rural cooperation</b>	9	Periodic consultations Core Team HCA, collaboration Learning Communities and Knowledge Platform, coordination knowledge map, coordination HCA-R&D-Scaling GVNL.....
<b>OD 4.2 Regional and international cooperation</b>	10	Mostly related to developing course offerings and (field) lab (whether or not as part of national or European projects)

<sup>62</sup> Here we also take into account e.g. labor market development and knowledge needs in non-technical professions and impact of the digital transition (as a solution direction for so-called labor-saving innovations). With regard to the digital transition, we cooperate with the [AI Hub/Brightlands Smart Services](#), in which Zuyd University of Applied Sciences is also involved, in addition to CHILL as Center of Expertise.

<sup>63</sup> Desk research in the form of e.g. follow up analyses of the [regional labor market](#) and [impact measurements Katapult](#) and monitor Top Sector Chemistry [Tracking Learning Communities](#) and [Education Labor Market Dashboard](#).

<sup>64</sup> Initiatives from HAN/SEECE or [Hydrogen Works!](#) of the Nez Energy Coalition in Groningen to name but 2 examples. Examples of 'other national consultations' are [Practorenplatform](#) and [Lectorenplatform](#).

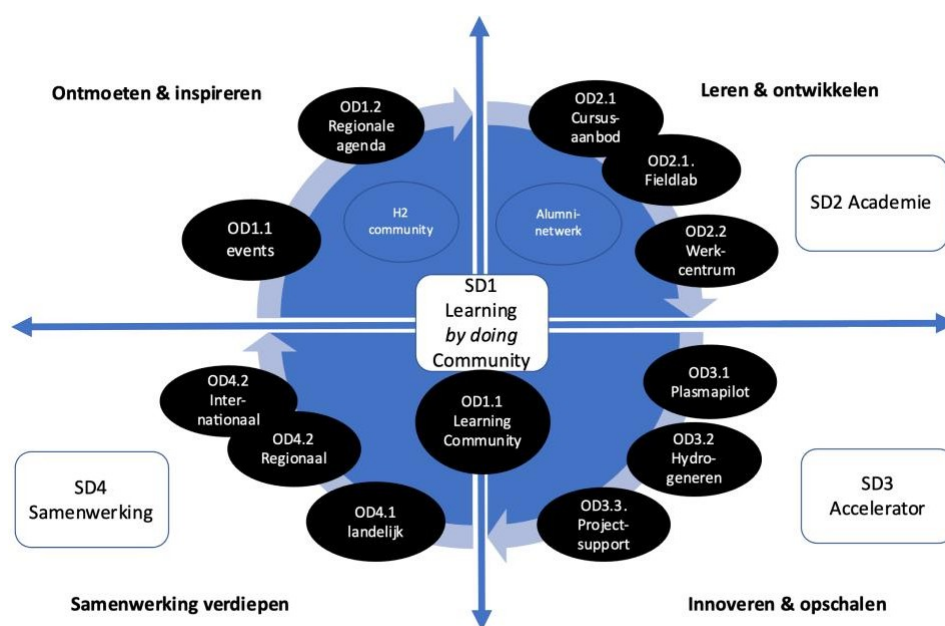
<sup>65</sup> This includes consultation with other ROMs and Learning Communities on existing or planned impulse programs.

Table 7 - Planning operational goals

Operational goal	Timing															
	2024				2025				2026				2027			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
OD 1.1.	1a								1b							
OD 1.2.	2a												2b			
OD 1.3.		3a				3b				3c				3d		
OD 2.1.		4a											4b			
OD 2.2.	5															
OD 3.1.	6															
OD 3.2.					7											
OD 3.3.	8															
OD 4.1.	9															
OD 4.2.	9															

### 4.3 Visualization operational goals

Figure 5 - Visualization operationalization



# 5 Indicators

In this chapter we link our goals to indicators (with target values) on the basis of which we can measure progress and make result-oriented adjustments. First we give an overview of the regional indicators, then we make the bridge to the parameters from the national agenda around impact, reach and output.

## 5.1 Indicators Regional Roadmap

Table 8 - Indicators Regional Roadmap

Strategic goal (SD).	Operational Objective (OD).	Target values	
<b>SD1 Learning by Doing Community</b>	OD 1.1. Establish Learning Community	Learning Community with 1 Community for Development	Community of Practice
	OD 1.2. Develop regional education, research and innovation agenda (ROOIA).	ROOIA including regional support (training and innovation vouchers)	
	OD 1.3. Organizing events	annual event with min. 100 participants	
<b>SD2 Academy</b>	OD 2.1. Develop course offerings and (field) lab within Transition academy	Annually 50 trainees post-initial training courses	Alumni network trainees, trainees and employees
		Annual use of Fieldlab by 75 students/scholars	
	OD 2.2. Establish guidance workers from Work Center	50 mentored trainees annually / employees	
<b>SD3 Accelerator</b>	OD 3.1. Plasma pilot realize	Plasmapilot	
	OD 3.2. Support projects	Annually 2 supported business projects in Limburg with the cooperation of Limburg actors	
<b>SD4 Collaboration</b>	OD 4.1 Rural cooperation	Integrated national digital knowledge platform including knowledge map and learning environment	
		Continuation of regional liaisons (possibly expansion Brainport/Brabant)	
	OD 4.2 Regional and international cooperation	Focused on course offerings and possible collaboration within R&D GVNL	

We also wish to work nationally on a framework for business-oriented support (elaboration of Dialogic exploration) and for shared facilities in relation to the national investment scheme infra (KIEM-SIA)

In addition, we would welcome 2 national promo campaigns, one for PO/VO (all students > 10 years) and one for professionals (aimed at 10,000 professionals according to output parameters national agenda).

## 5.2 Contribution Regional Roadmap to national agenda

For this, we return to **Error! Reference source not found**, where we fill in the expected contribution with the anticipated contribution. Then we further explain how we realize that contribution.

Table 9 - HCA GVNL indicators and anticipated contribution Southeast region

Indicators	National Agenda	Anticipated contribution Southeast region
Impact	<ul style="list-style-type: none"> <li>Shorten time to job</li> <li>Responsive ecosystem</li> </ul>	<ul style="list-style-type: none"> <li>Shorten time to job</li> <li>Regional parties connected</li> </ul>
Results (outreach and participation)	<ul style="list-style-type: none"> <li>500 companies</li> <li>10,000 professionals</li> <li>80% of relevant courses and teachers</li> </ul>	<ul style="list-style-type: none"> <li>50 companies per region</li> <li>1,000 professionals per region</li> <li>80% of relevant courses and teachers in the region</li> </ul>
Output	<ul style="list-style-type: none"> <li>Dutch Hydrogen Academy/Make Hydrogen Work</li> <li>Hydrogen knowledge platform</li> <li>10 Learning Communities</li> <li>Learning &amp; Development platform companies</li> </ul>	<ul style="list-style-type: none"> <li>Academy with course offerings and field lab</li> <li>Regional parties hooked up</li> <li>CHILL as a Learning Community</li> <li>Companies hooked up</li> </ul>

### Impact

- Shorten time to job: for faster filling of vacancies, the Work Center with parties such as Chemelot Talent Office (subsidiary CHILL) and Leo Career are standing in.
- Responsive ecosystem: this is where we need to connect the regional hydrogen community, which we bring together and build out in important following our events, with the other regional ecosystems.

### Result

- 50 companies per region and 1,000 professionals per region:
  - In promoting our annual event, this reach in terms of companies and professionals is achievable.
  - At the event itself we want to attract and connect at least 100 professionals a year to a hydrogen community of participating companies, governments and other organizations that want to work with hydrogen (demand side) and also training providers (supply side). So by "companies" we do not only include BVs.
  - With one or more of those parties, we want to work with students in a Community for Development within CHILL.
  - Through the Academy, we aim to immerse up to 100 professionals annually in water technology, through one or more courses, whether or not linked to the



field lab. Special focus on teacher professionalization resp. 'train-the-trainer' modules for a multiplier on knowledge sharing within the organization.

- 80% of relevant courses and teachers in the region
  - Determining which are the relevant courses is part of the ROOIA, the regional education, research and innovation agenda. We are turning to the recent CE Delft<sup>66</sup> study to make an initial delineation. We are also considering whether we should put extra energy into certain courses. We base this consideration on an analysis of knowledge needs in the regional hydrogen community, relevant developments in hydrogen technology and its rollout, and movements within the education and research landscape (training supply, inflow and outflow, teaching and research staff). From the CE Delft study, we know that the construction of hydrogen infrastructure will become important in the coming years, but also that scarcity is imminent just at MBO levels 3 and 4 around installation technology. From a recent ROA study, on the other hand, we know that for manager profiles, expansion demand is high.<sup>67</sup>

## Output

- Dutch Hydrogen Academy
  - We are not setting up a separate regional 'hydrogen campus', but are working from a network organization. This will also include parties from outside the region with regard to the courses on offer. We intend to accommodate the hydrogen-related courses in the LLO platform Limburgleert.nl, which will be further developed as part of a broader 'Transition Academy'.
- Hydrogen knowledge platform
  - We see connecting the regional developments around education, research and innovation (such as alternative production via plasma technology or realization of hydrogen infrastructure) as one task; getting the regional hydrogen community properly connected is another.
- 10 Learning Communities
  - CHILL is the advance Learning Community, with extensive experience in public-private partnerships. The success formula of the innovation-oriented Communities for Development with students, teachers and companies can be applied to hydrogen-related assignments. In turn, the Community of Practice provides the platform to embed the hydrogen community.
- Learning & Development platform companies
  - Here, too, we focus on hooking up companies, governments and other organizations. Furthermore, we see the Communities for Development (Learning Community CHILL), the post-initial course offerings and the field lab (Academy), as well as the deployment of trainees (Chemelot Talent Office and Work Center) as components of a regional Learning & Development platform in practice.

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<sup>66</sup> Labor market study hydrogen transition CE Delft 2023 (not yet publicly available on 22/10/2023).

<sup>67</sup> [Labor demand energy transition Southeast Netherlands ROA 2023](#)

# 6 Organization

**Below we describe how our governance is currently structured and how we plan to continue organizing ourselves in the future.**

## 6.1 Current governance

As indicated earlier (2.2.3), the Chemelot Circular Hub (CCH) is the platform for regional cooperation within HCA GVNL. The educational institutions UM, VISTA college and Zuyd University together with the companies DSM, Sabic and Fibrant, and the province of Limburg are all members of CCH. They are also all involved in CHILL c.q. Community of Practice. As an established public-private partnership between educational institutions and companies, CHILL is the advance Learning Community within HCA GVNL and CHILL's subsidiary Chemelot Talent Office makes the bridge to the labor market approach.

CCH member LIOF is also part of the Regional Liaison Team, and together with LWV and Waterstof Coalitie Limburg (WCL) provides the connection with the business community. They each have a distinctive role in this: LIOF as a booster and financier of (business) projects, LWV informs and sensitizes companies, and WCL as a 'one stop shop' for advice and - in the future - training. In the framework of Brightsite, UM and TNO (jointly active in the Plasma Lab) also make the connection with R&D program GVNL.

The Regional Liaison Team is currently embedded in the CCH organizational structure as a project group within the Fundraising Working Group of the the CCH. There are also Working Groups around Public Relations, Public Affairs (lobbying), Projects CEAP and CCH Community active. The JTF project group is also active within the Fundraising Working Group. The CCH is also the place where exchanges about project developments within various HCA programs take place. This happens within the working group around the HCA pillar of CCH. All working and project groups report to the CCH Regional Board.

Formally, Zuyd University pulls the project; a bilateral agreement has been made with each of the other partners within the Team on the operation of and contribution to the Team. To ensure embedding in CCH, the CCH program manager coordinates the operation of the Team on behalf of Zuyd.

The Zuyd project leader and the CCH program manager both represent the Team in the national Core Team HCA GVNL. The project leader follows up on the working groups around the Learning Communities and National Knowledge Platform; the CCH program manager is responsible for Regional Liaison Team and the Regional Roadmap, and other consultations regarding connection R&D-Scaling, Communication, Internationalization, Instrument Transition Paths. Both are each other's back up.

## 6.2 Future governance

Whereas the mission of the Regional Liaison Team was to develop a supported Regional Roadmap, the Team will have a different role in the implementation of the Roadmap. Under the direction of Zuyd, it will set the regional education, research and innovation agenda and monitor the implementation of the various actions.

As such, the composition and operation of the Team need not change. The Team reflects the different aspects within HCA GVNL (lifelong development, labor market approach, community building and business-oriented support) and also makes the connection with R&D and scaling up.

For the implementation of the specific actions there will of course be cooperation with the relevant partners inside and outside the region, such as e.g. Leo Career regarding the labor market approach within the framework of the 'Work Center' or e.g. HAN or WaterstofNet regarding the course offer. Some of these actions will also be translated into projects within national or European (subsidy) programs.

What we are currently still looking at, however, is the structural embedding of the Regional Liaison Team within the Chemelot Circular Hub (CCH), the positioning within Zuyd University of Applied Sciences and the relaunch of Hydrogen Coalition Limburg (WCL).

Now the Regional Liaison Team is a separate project group within the CCH. It can remain so, albeit not under the wings of the Fundraising Working Group but under the Humam Capital pillar (HC). With a view to coordinating the implementation of the Roadmap, the positioning within Zuyd (as lead partner) needs to be clarified. HCA GVNL has so far been approached project-wise by Zuyd, in anticipation of the possible follow-up trajectory. With lectorate Material Sciences as project leader, especially since it is active within CHILL. Furthermore, from that role, the lectorate has coordinated internally with other lectorates within the Department of Engineering (Smart Urban Redesign, Circular Product Engineering, Sustainable Energy) or Business (Innovative Entrepreneurship c.q. Creative and Circular Entrepreneurship, Employability). Again, this modus operandi need not change per se, but Zuyd is still looking at where to house this. By the supposed new call to renew the Regional Liaisons and implementation of the Roadmap, this will be clear.

In addition, WCL may make a relaunch as "New Energy Coalition" (working title, by analogy with Groningen). Discussions with potential partners are ongoing, and the organizational form has not yet been determined. One of the core activities of WCL (also considered as a priority in the regional hydrogen agenda c.q. HCA energy transition) is the setting up of a (virtual) 'academy' for post- initial training. Discussions have started to bring this under the LLO platform Limburgleert.nl.

## 6.3 Visualization governance

The figure below shows the full field of forces, specifically:

- SIA as the grant provider of the project, Zuyd as the leader of the project, and the other partners with whom Zuyd has concluded agreements. Together they form the Regional Liaison Team, which in the current governance was still a project group of the Fundraising Working Group (red block), but we will bring it under that of the HC pillar (black block) in the future governance.
- GVNL as a program, with HCA on one side, and R&D and scale-up on the other. The Regional Liaison Team is represented within the HCA Core Team and other working groups. Also, the Team is also involved in research and scale-up.
- The Regional Roadmap was elaborated by the Regional Liaison Team; the implementation also involves other parties, within Limburg (Leo Loopbaan e.g.) and beyond (e.g. HAN or WaterstofNet).
- GVNL is not the only scheme we (can) rely on to implement the Regional Roadmap. Other examples are PPP Scaling up and JTF. These focus on energy and resource transition, not specifically on hydrogen. From that perspective, our Roadmap is complementary and delineated from what has been submitted within that other scheme.
- As a triple helix alliance, CCH is where we look for support and a sounding board. However, ownership of the various actions in the Regional Roadmap lies with the lead partners involved and their partners.
- There is more at play in the Southeast than just GVNL. Crucial, for example, is Chemelot's connection to the hydrogen backbone and the Delta Rhine Corridor.

Figure 6 - Visualization Regional Liaison Team.

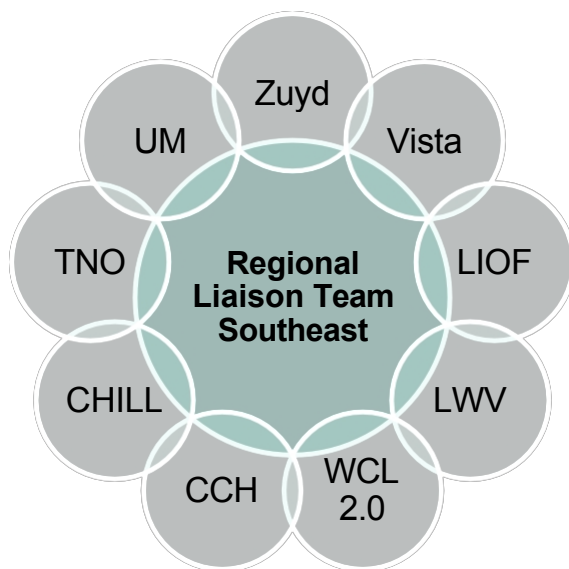
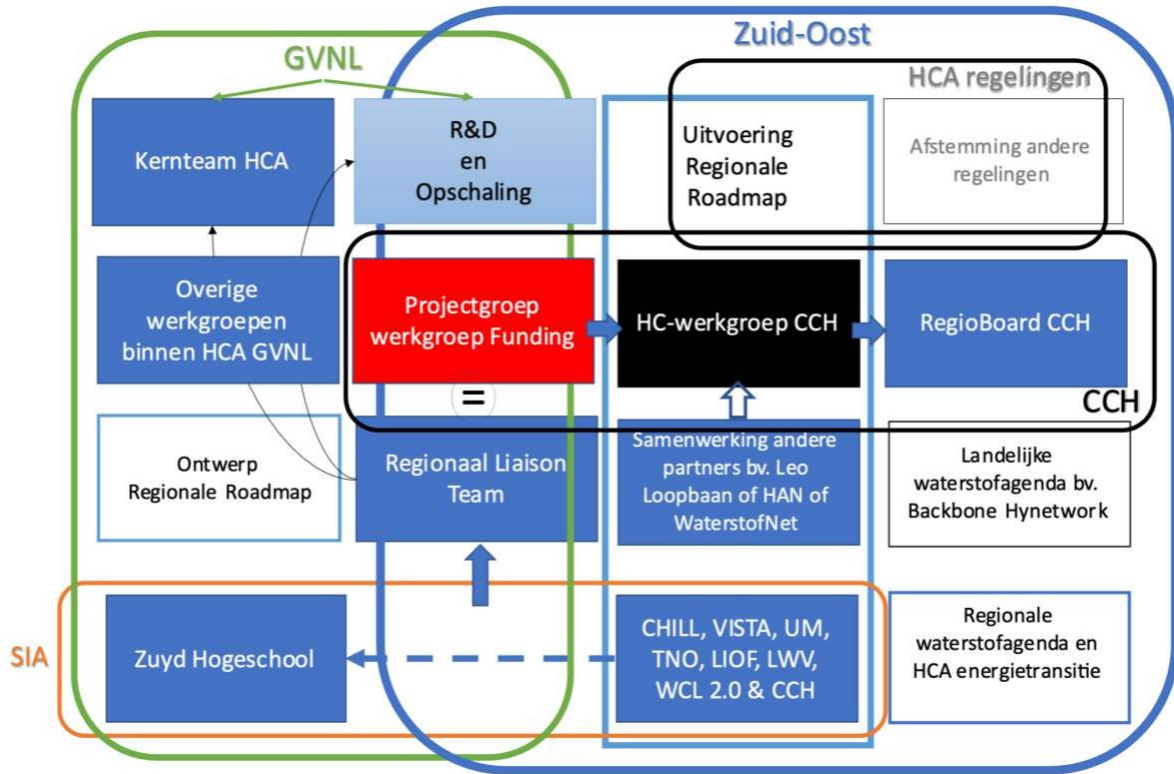


Figure 7 - Visualization of force field





**Justification:** This track/program was made possible by GroenvermogenNL, a national program of the Ministry of Economic Affairs & Climate, funded by the National Growth Fund and facilitated by Regieorgaan SIA, part of the

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