



**Interreg
North Sea**



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EHRIN

Driving a regional hydrogen economy

Competency framework for regional authorities



Project commissioned by SAMEEN, in association with Marike Hoekstra, for the province of Drenthe and co-funded by the European Union

EHRIN

Driving a regional hydrogen economy

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Interreg
North Sea



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Preface

Many regional authorities, such as provinces and regional development organisations, play a role in driving economic development and supporting the transition to more sustainable sources of energy. This entails building thriving communities of innovators and entrepreneurs, supporting all who pursue ideas with a positive societal impact. The attention for building a hydrogen economy with low CO₂ impact, can be understood in the light of the global climate concerns and the resulting UN Paris Agreement of 2015.

The question is not *if*, but *how* this can be achieved. How do we establish communities and networks for hydrogen market development in our regions? And what does it take to create a next step, build a joint plan or develop a supply chain? Part of the answer lies in the competencies and skills of people involved.

This report has been written as part of the EHRIN Interreg-NSR programme. The competency framework that will be presented is based upon both theory and practise. Although the framework was developed in Drenthe, the Netherlands, it can be used by regional authorities on an European scale. I would like to say a special thank you to Kees Boer, Jonas van Dorp and Alfred Middelkamp for sharing their real-life stories with us. I am also grateful for the information received from Lotte de Groen from TNO, the Dutch Organisation for Applied Scientific Research. Lastly, I would like to specially thank Marike Hoekstra from the province of Drenthe for her endless support during the project.

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Summary

Hydrogen is one of the most promising renewable energy sources, but regional authorities struggle to effectively engage with stakeholders and build a network to drive regional hydrogen development. This study is part of the Excellent Hydrogen Regions in Europe (EHRIN) project that aims to strengthen the cooperation governance for hydrogen development and explores the essential competencies of regional authorities to engage in new partnerships, extend networks and build a regional hydrogen economy. Literature research on how to drive innovation and build networks was performed and three interviews were conducted with officials working in the hydrogen field.

The three key roles that can drive regional hydrogen development in the Netherlands are policy officer, process manager and project manager. Literature indicates that the competencies that drive innovation and build networks are part of the term 'orchestrating innovation and capacity'. Regional authorities can orchestrate innovation by using and developing several competencies, such as networking and alliances, hydrogen development and strategy development. In addition, there are fundamentally more entrepreneurial competencies that spark regional innovation, such as inventiveness or the ability to be the linking pin between the internal organisation and stakeholders. These findings were corroborated by the three interviews. Firstly, Jonas van Dorp from Groningen Airport Eelde, indicates that the airport attracts stakeholders by communicating their ambitions and objectives with the region, advertising the airport as a physical hydrogen hub for stakeholders. Secondly, Kees Boer, project manager of the Hydrogen District project of the municipality Hogeveen, indicates that he and his team started with no prior knowledge on hydrogen, but by using his inventiveness and constantly integrating stakeholders with the project, they were able to realise the hydrogen district and build a strong hydrogen network. Lastly, Alfred Middelkamp is coordinator of industrial energy transition and hydrogen energy systems in the province of Drenthe. He is able to drive hydrogen development by using strong stakeholder management and his knowledge on standards and policies, which allows him to write regional policies and coordinate hydrogen projects.

Literature and the narratives were analysed and a list of core competencies to drive regional hydrogen development was constructed. The list is transformed into the competency matrix that describes each competency from basic to advanced sufficiency. A second matrix describes what sufficiency level the three regional authority roles should have in each competency to drive hydrogen. Concluding, regional authorities do not need prior hydrogen knowledge, but should communicate their ambitions and objectives clearly to stakeholders by organising events and participating in projects, which eventually creates a network and community. Actively involving all internal and external actors creates a support base for driving regional hydrogen development.

1 Introduction

The Excellent Hydrogen Regions in Europe (EHRIN) project aims to strengthen the cooperation governance for hydrogen development. The lead partner is the province of Drenthe, the Netherlands. Drenthe lies in the Hydrogen Valley, a multi-stakeholder coalition connecting all parts of the hydrogen chain in Northern-Netherlands. While hydrogen is one of the most promising renewable energy sources of the future, regional authorities struggle with effectively engaging with stakeholders and supporting parties to drive hydrogen development. This report explores the required competencies for regional authorities to engage in new partnerships, extend networks and build a regional hydrogen economy.

These competencies are investigated through desk research and interviews with three professionals. In study, the available human capital and competencies are leveraged on regional and European level. The outcome is a competency matrix that provides human resources with a tool to help regional authorities engage in external networks and build a regional hydrogen economy.

Chapter 1 introduces the problem and explains the outline of the report. Chapter 2 explores the different aspects, objectives and stakeholders of the EHRIN project. Chapter 3 describes three important roles of regional authorities and the competencies they require to drive hydrogen development. In chapter 4, literature on how regional authorities drive innovation and build networks is examined, which provides the literary framework for the competency matrix. In addition to this, three interviews were conducted with professionals in the hydrogen field, and their narratives are shared in chapter 5. In chapter 6, the competency matrix for the three regional authority roles is constructed based on the core competencies that are extracted from literature and narratives. In addition to this competency matrix, chapter 7 offers further recommendations and suggestions on how to drive hydrogen development.

2 EHRIN

EHRIN is part of the Interreg North Sea Programme 2021-2027. The goal of this programme is to foster a stronger and more sustainable North Sea Region through European cooperation in various projects. One of these projects is EHRIN, which started on June 1, 2023 and will last until November 30, 2024. The North Sea Region has an advantageous position for hydrogen applications and to be the frontrunner in the transition to renewable energy. However, there is no clear hydrogen development path and regional authorities struggle to drive hydrogen development with their stakeholders. EHRIN aims to strengthening their capabilities and accelerate hydrogen market development in the regions.

2.1 Objectives

The main objective of EHRIN is to strengthen governance for hydrogen development with three hydrogen projects. The project partners collaborate on these projects to build strong hydrogen energy network strategies that tackle the challenges faced by the North Sea Region in energy transition. The end product is a Take-Off Guide for regional authorities to drive hydrogen development, based on the knowledge gained through the three projects. This report is part of 'C.3 Relevance and context' of the EHRIN project proposal, which aims to produce an effective network

engagement strategy by leveraging the competencies and skills of regional authorities and municipalities. To develop such a strategy, EHRIN's project proposal asks the key questions:

1. What makes a productive network?
2. Which roles, relations and positions can be identified?
3. Which historical patterns play a role in a specific region?
4. How to design an effective network engagement strategy?
5. Which competencies can be identified?

The aim of this study is to investigate and answer questions 1, 2, and 5.

2.2 Partners

The province of Drenthe is EHRIN's lead partner and works in collaboration with the Office for Regional Development Leine-Weser (Germany) and the County Administrative Board Skåne (Sweden). The three partners are in different hydrogen development stages. The province of Drenthe is the lead partner and is situated in the Hydrogen Valley, a multi-stakeholder coalition that connects the entire hydrogen chain in the Northern-Netherlands. The Office for Regional Development Leine-Weser established a broad public-private network between seven municipalities and more than fifty private companies, all working on development, enhancement and commercialisation of hydrogen in Lower-Saxony. Lastly, the County Administrative Board Skåne is in the early stages of exploring and realising hydrogen development. The partners contribute to EHRIN through three pilot projects:

- Drenthe is researching and developing a hydrogen driven train that runs from Emmen (the Netherlands) to Sweden.
- The Office for Regional Development Leine-Weser contributes with their large public-private network that drives commercialization and development of hydrogen.
- The County Administrative Board Skåne wants to develop a Hydrogen Action Plan 2024-2028 to establish a network.

The Take-Off guide is based on the learning practices from the three projects. Furthermore, the EHRIN project is supported by various partners of expertise that enhance the dissemination of the results of EHRIN and will help to connect with other Interreg programmes.

3 Roles of regional authorities

Provincial and municipal governments are responsible for translating national policies and strategies to regional and local levels. Regional authorities work together with public authorities to implement and enforce decisions and regulations, ensuring that regions are financially and legally stable. There are various roles within a province or municipality, and each role requires a set of competencies and skills to execute certain tasks. Therefore, before diving into the competencies required for driving innovation, the varying roles of regional authorities are investigated. Dutch provincial governments consist of the parliament of the province and the members of the Provincial Executive board. The Provincial Executive is the daily management of the province that governs and formulates policies. The policies of the Provincial Executive are governed by provincial officials, who are the regional authorities that occupy executive positions (*Provinciale Staten*, z.d.). This study researches the roles of provincial officials, because through their executive decisions they can drive

hydrogen development based on numerous factors. Literature does not provide a set list of these roles, so roles that work on regional innovation and sustainability topics are extracted from LinkedIn and provincial websites. For generalisation, the three main roles that contribute significantly to driving regional innovation and that engage in networks are investigated in this report.

Policy officer

A policy officer is concerned with formulating, researching and implementing provincial policies. They formulate policies for their specific sectors and search solutions for problems. Policy officers transform the provincial programs' objectives into implementable policies, while constantly analysing and improving them. Generally, the listed competencies of policy officers are communication, persuasiveness, strategic thinking, problem solving, organisational insight, cooperation and research and analysis (*Beleidsmedewerker*, z.d.). They are required to perform multidisciplinary analyses of policies and to stay informed about the developments in their sector by communicating with stakeholders and organisations. Through this integral working method, they formulate comprehensive policies so that officials can effectively perform governing tasks. For example, the province of Drenthe has a policy officer Sustainable Mobility, who is mostly concerned with hydrogen. Formulating policies on hydrogen mobility requires extensive knowledge on hydrogen application, logistics, regulations, policies and standards regarding energy transition and renewable energies.

Process Manager

The job of a process manager is to strategically coordinate the processes. They analyse challenges and communicate with parties and stakeholders to construct an efficient and effective plan. With a strategic plan, process managers provide stakeholders, municipalities and the region with guidance to reach their objective. They support the program managers by designing a strategic framework and clearly formulate the objectives. Furthermore, they monitor processes, set deadlines and facilitate communication between the involved parties (Veth, 2019). The province of Drenthe has two process managers of renewable energy. Through their program, they drive the transition to renewable energy and one of their important competencies is knowledge on energy transition and renewable energies. Other stated competencies and know-how is energy policies, sustainability, science communication and local governments. Knowledge on energy policies and energy transition is integral to science communication for process managers. Science communication is an important competency, because it enables them to transform complex sustainability knowledge and policies into a strategic framework for officials. With this framework, officials with little to no industry knowledge on sustainability are able to use their own competencies to drive energy transition, whether by networking or executing their role as team leader.

Project Manager

Project managers are concerned with the smooth operation of projects. They coordinate their team, ensure deadlines are met and facilitate communication between employees. Managing the team revolves around managing deliverables against key performance indicators and ensuring that each task is executed efficiently and effectively. Literature states that project managers should have a broad view of specific applications and industry knowledge, but an in-depth understanding is not required. They are more concerned with providing the team with direction and managing deliverables (Aston, 2023). Generally, their competencies are described to be decision making, communication, strategy development, team management and technical competence. The province

of Drenthe has project managers for energy transition and various other sustainability topics. Other provinces indicate similar project manager roles, often with similar competencies. Their sustainability knowledge is broader and their competencies are centred around strategy management and team management.

4 Driving innovation and building networks

Innovation is often at the centre of an organisation's success. They strategically use their resources and competencies to grow and make an impact. The transition to renewable energy sources, such as wind and solar power, requires innovation and engagement strategies. People and organisations possess the 'tacit' knowledge to drive innovation and a clear innovation framework supports the identification and further development of competencies. At first glance, literature does not provide a clear competency framework specifically for regional authorities. Most frameworks keep to simple and general competencies, such as creativity, perseverance and behavioural descriptions. Vila et al. (2014), indicates the steps to productive innovation are the detection of innovation opportunities, proposal of new evaluated ideas and finally, adoption and implementation of a novel idea. Any individual competency that enables employees to play an active role in one of the innovation process steps is of importance to energy transition. Thus, this section explores literature on the competencies of regional authorities and organisations that drive innovation.

4.1 Governing energy transition

The description of competencies depends on the context or specific job or task it is used for. TNO describes competencies as 'the knowledge, skills and qualities that allow individuals to successfully execute tasks in ever changing circumstances' (*Skills: Een leven lang leren* | TNO, z.d.). These competencies translate into a sustainable working environment and innovation, so it is crucial for any organisation to leverage and manage them well. Researchers, companies and the Dutch government have released reports and papers on competencies that are fundamental to their business. The competency guide released by the Dutch government describes the competencies that are required to execute any governmental task. Among the described competencies are perseverance, integrity, collaboration, ability to motivate, listen, decision making, networking and many more (*Competentiegids Rijk*, 2021). These are generalised terms and this report aims to clarify more specific competencies that are essential for building innovative networks. In the early phases of energy and sustainability transition, important characteristics are networking, sustainable development and open-ended learning. Furthermore, governing sustainability transitions requires addressing complex dynamic multi-level systems, making it a highly complex and difficult societal challenge for policymakers and officials. Sustainability transitions are accelerated and strengthened through transnational linkages, infrastructure, local networks and proper resource management. However, there are various obstacles that hinder energy transition, for example when regional authorities do not know how to engage in multi-level networks. Van Dijk et al. (2022), indicate that literature mostly ignores governance capabilities and competencies to guide energy transition, resulting in the lack of a strategic framework for governing bodies. The report written by Van Dijk et al., provides a framework, in which four capacities are described for the governance of transitions: stewarding capacity, unlocking capacity, transformative capacity and orchestrating capacity. Orchestrating capacity is notable, because multiple literary sources describe it as the ability to align actors across scales by fostering policies and goals, facilitating communication and strategic alliances

between actors, and integrating resources across actors (*International Organizations As Orchestrators*, z.d.; Hodson et al., 2013). Furthermore, Hölscher et al. (2018), describe the three conditions that enable high-level orchestrating capacity to be strategic alignment of actors, mediation across scales and levels, and creation of opportunity context. While these three conditions are meant for governance on multiple levels, their descriptions share large similarities with specific competencies in an innovation and business context with stakeholders. Firstly, strategic alignment of actors is essentially stakeholder management, where different objectives, requirements and relations of stakeholders are managed. Moreover, stakeholders' strategies are integrated and aligned with the regional transition process and objectives (*Stakeholder Management*, 2023). Secondly, mediation across scales and levels is the competency of networking and creating alliances. Competency in networking allows employees to build new relationships and a network, facilitate communication between different actors and coordinate the network, enabling the distribution of knowledge and resources (Performance Management Consultants, 2024). Lastly, competency in policies, regulations and standards is similar to creation of opportunity contexts. By formulating policies, regulations and creating incentives, actors are provided with a strategy to drive energy transition. Thus, orchestrating capacity is a combination of multiple competencies, as is often also the case for management types. For example, in business terms, orchestrating capacity is innovation management based on the description of its components (Igartua et al., 2010).

Literature indicates the importance of orchestrating capacity for transitions, but does not mention the necessity of industry specific knowledge to execute tasks. Nonetheless, regional authorities will always require some knowledge development to be able to drive regional innovation. A paper by Von Malborg et al. (2007), suggests that local authorities can act as 'teachers' or 'tutors'. In the role of teacher, officials engage with stakeholders and are able to provide specific knowledge, information and guide companies that are developing environmental management capabilities. It must be stressed that regional authorities do not have to possess more industry specific knowledge than stakeholders, because this will rarely be the case. However, through programs and projects, regional authorities gain substantial experience in the application for permits, specific regulations and other aspects of regional innovation. They act as project managers and network coordinators, developing effective sustainability strategies and providing specific knowledge to companies in the network. Local authorities are not required to contain all sustainability development knowledge, but contribute a significant part of the management skills for companies to develop sustainable ideas.

Contrary to the teacher role, local authorities can also act as 'tutors'. As tutors, officials are advisors or consultants to companies within their network. In this case, local authorities support the development of sustainable strategies and skills by facilitating communication between stakeholders and promoting the exchange of knowledge, resources and competencies. Therefore, officials require more high-level competence in networking and managing stakeholders than sustainability knowledge. While the role of teacher and tutor are different, their focus on developing a sustainable region through a network and their communities is the same (Von Malmborg, 2007).

Overall, literature provides some valuable insight on the competencies required by regional authorities to drive regional innovation. Similarities have been found between described governance capacities and competencies, which were converted in business related terms such as stakeholder and innovation management.

4.2 Orchestrating innovation

In the previous section, the role of regional authorities in driving regional sustainability and energy transition was explored. However, there is still a lack of information and literature on how to engage with stakeholders to successfully develop innovations and achieve regional objectives. TNO was able to provide a competency framework to engage with innovative networks and stakeholders. TNO is a company that supports the Dutch government and (international) organisations in their operations and drives innovation. They aim to strengthen the Dutch economy and support societal transitions, which they do by focusing their impact on four themes: safety, health, sustainability and digitalisation (*Mission And Strategy | TNO, z.d.*). TNO has extensive experience with driving innovation and organises various related learning programs for organisations, such as ‘Orchestrating Innovation in public-private ecosystems’. In this program, they teach organisations how to develop the capabilities to build an environment for innovations of stakeholders. Orchestrating innovation is the ability to build a network and encourage collaboration and innovation. Furthermore, the different interests, knowledge and roles of stakeholders need to be managed to organise and guide innovation projects. A successful collaboration is based on creating common interests and a common goal for all participants. There are two key competencies to orchestrating innovation: analyse and connect. As an organisation, you have to analyse the stakeholders, network and the societal challenges of innovation projects. Organisations connect stakeholders and build a network, ensuring that they embrace their role and play their part in achieving results for the project (*Orchestrating Innovation | TNO, z.d.*).

Orchestrating innovation networks is not new, as various papers and reports on the topic have been released in the past (Hurmelinna-Laukkanen et al., 2022; Klerkx & Aarts, 2013; Toigo et al., 2021). Toigo et al. (2021), suggests there are three different orchestration approaches to innovation networks, based on the determination of the network. First, translative orchestration is about exploring the various stakeholders, their ideas and their knowledge value to eventually connect them based on a common objective. Second, transformative orchestration is about transforming knowledge and ideas from various interdependent stakeholders into innovations. Last, transcending orchestration is about capturing the value of innovations by allocating responsibilities to each stakeholder. The stakeholders have a joint strategy in which they all play their own role and coordinate effectively to reach the common goal. To reach more well-established networks and coordination, orchestrators require more advanced competencies. Thus, based on literature and the framework of TNO, I suggest there are three competence levels to orchestrate innovation: basic, intermediate and advanced. Each level indicates the necessary competency to orchestrate transition with the organisation and external stakeholders. The following competencies are essential to orchestrate innovation networks:

- *Networking and alliances*: The ability to engage in, maintain and coordinate relationships within the internal organisation and with stakeholders.
- *Strategy development*: The ability to develop and focus on the strategy and goals that resonate with all stakeholders based on the developments and trends in the field.
- *Knowledge, policy and standards*: The ability to acquire and use the required knowledge effectively. Moreover, you are informed on the political and societal developments regarding the topic.
- *Inventiveness*: The ability to drive innovation, establish the correlation between different ideas and information, think in solutions and change the status quo.
- *Connector*: The ability to create synergy within a group and to stimulate active involvement while taking the differences of internal and external actors into account.

The matrix below describes each competency based on its different sufficiency levels.

Competency	Basic	Intermediate	Advanced
Networking, alliances and mobilisation	You have some relationships with stakeholders and are familiar with their business. You can mobilise stakeholders in the network, connecting their interests with a common goal.	You have personal relationships with the most important stakeholders and you know their business through and through. You build alliances, promote collaboration and create a hub for stakeholders, connecting their interests with a common goal.	You have personal relationships with the most important stakeholders and you know their business through and through. You build alliances, promote collaboration and create a hub for stakeholders, connecting their interests with a common goal.
Strategy development	You facilitate the process for the network to develop a joint strategy that is adopted by all stakeholders	You develop a joint strategy in cooperation with your network that is adopted by all stakeholders.	You develop a joint strategy in cooperation with your network that is adopted by all stakeholders. You recognize internal and external developments, adapting the strategy accordingly.
Knowledge, policy and standards	By using your basic knowledge on the field, societal and political developments, you see opportunities.	You have intermediate knowledge on the field, societal and political developments. You see opportunities and know how to transform them into results.	You have advanced knowledge on the field, societal and political developments. In addition to your own knowledge, you have external sources that inform you of trends and developments. You are able to see opportunities and transform them into results.
Inventiveness	By combining your ideas with the ideas of others, you are able to face problems and resolve them.	You are able to quickly establish the correlation between new information and the project. Your ideas are significantly innovative and you integrate them with the ideas of others to implement them.	You are able to quickly establish the correlation between new information and the project. Your ideas are significantly innovative and integrated with the ideas of others, they change the status quo.

Connecting leadership and management			
	You acknowledge people's opinions and you know how to manage the internal organisation.	You acknowledge people's opinions and take them into account in the decision-making process. You manage the internal and external organisation, facilitating communication between them.	You acknowledge people's opinions and you manage the internal and external organisation. You create a support base by including everyone in the process, also taking their opinions into account in the decision process.

Table 1 "Several competencies from TNO's framework and a short description of the sufficiency levels"

The matrix provides a generalised overview of the different levels required to drive innovation networks. Process managers, project managers and policy officers can already possess one or multiple of the mentioned competencies at the minimum basic level. If an official is equally sufficient in all competencies, they can be a basic, intermediate or advanced orchestrator. Moreover, they can improve their competency by participating in projects and gaining experience. There are several suggestions to improve each competency:

- *Networking, alliances and mobilisation*: Organise and attend events, share networks with colleagues and exchange relevant information about stakeholders with internal and external actors.
- *Strategy development*: Often, strategy development improves along with competencies such as networking, knowledge, policies and standards. Aligning stakeholders' goals and creating a joint strategy requires orchestrators to know the entire playing field.
- *Knowledge, policy and standards*: Monitor political, societal, economic and other developments that are relevant for the field. Attend events, congresses and request the perspective and opinion of stakeholders. Seek information from the internal organisation by discussing topics with colleagues and organising events on relevant topics.
- *Inventiveness*: Monitor trends and developments, creating your own opinion on the topic. Seek for alternative solutions to problems and cooperate with colleagues to make decisions.
- *Connecting leadership and management*: Know your employees and colleagues, involve them in the decision process and stimulate them to share their opinion. Take employees to the organisations of stakeholders and facilitate communication between them.

The advice might seem simple to some, but often, the possibilities of a network are overlooked due to actors not knowing in what direction to point to. Chapter 4 provides a set list of competencies to govern and orchestrate innovation networks based on literature. Nonetheless, literature still lacks a standardised network engagement framework for regional authorities that guides them properly to drive innovation.

5 A day in the life

5.1 Interview with Jonas van Dorp

Jonas van Dorp has worked at Groningen Airport Eelde for 21 years and is currently manager Commerce and Business Development. In his current and previous positions, his main focus has always been on sales and development. In 2014, Van Dorp worked on a project in collaboration with several European airports and regional governments – supported by a Interreg North Sea subsidy program - to work on sustainability by for example performing gliding flights to save kerosine. Moreover, the extension of the runway at Groningen Airport Eelde was constructed with partial sustainable practices, so they were already familiar with sustainability. Normally, Van Dorp was mostly concerned with developing flight routes, but during the corona epidemic this came to a standstill. The airport had to reinvent themselves, and van Dorp came up with a project to support the airport's licence to operate: NXT Airport. The program he built consists of four pillars: sustainability, innovation, energy and education. Groningen Airport Eelde is still one of the frontrunners on sustainability and retains their position by constantly establishing new projects on sustainability. Van Dorp indicates that the key to their success has been collaborating with local organisations and small and medium sized enterprises (SMEs). With only 60 employees, the airport is also considered a SME. The advantage of working with local SMEs is that together, they are able to quickly and efficiently make decisions without having to go through a large and complex hierarchical structure. This results in quick decisions to improve sustainability and to set up projects. Nevertheless, the disadvantage of collaborating with local SMEs is that there can be a lack of knowledge or experience.

Groningen Airport Eelde mostly produces its own sustainable projects, but sometimes companies also approach them. This is due to the fact that they not only advertise themselves as a sustainable frontrunner, but also a test and demonstration location for companies and consortia. For example, GroenLeven approached the airport and built a 22-megawatt solar park between the runways. The solar park contributes to the airport's objective for all ground operations to be emission free by 2030. Consequently, the solar park sparked the interest in Sustainable Aviation Fuels (SAF), green hydrogen and green electricity, especially because the airport is situated in the Hydrogen Valley. Groningen Airport Eelde wrote a call for the funding program Horizon Europe in collaboration with the University of Groningen and New Energy Coalition. Although they did not receive the funding, they now had a consortium and drew the attention of local SMEs, which sparked new projects. The first component of driving innovation is sending a signal to the world and potential stakeholders. As a company, organisation or any business, it is necessary to put your ambitions for the future and projects on display, but, according to Van Dorp, they should always be achievable and concrete. There are multiple ways to display your ambitions and activities. This could be through LinkedIn or the press, but organising events and inviting potential stakeholders is also essential for attracting attention and to create a network. Groningen Airport Eelde has the ambition of developing a hydrogen ecosystem from production to distribution, so they approached stakeholders that could take part in any activity in the hydrogen chain. Subsequently, they became a breeding ground for a hydrogen development workforce by approaching schools and universities. From internships, generation hospitality to hands-on industrial hydrogen development, the airport offers several options and acts as an educational environment. Integrating and connecting several projects and ideas adds to their success. Groningen Airport Eelde and its partners aim to develop a hydrogen refuelling station, have hydrogen buses drive to and from the airport, and improve the currently

time-consuming bus route. Thus, they use their network to integrate the pillars sustainability, education and innovation.

Provinces and municipalities already have employees that extend and maintain the network of actors and stakeholders. They track the developments in their region and also know where to look for opportunities. They require a somewhat innovative and opportunistic mindset, while prioritising the interests of the province. Often, policy officers go to conferences and events to talk to potential stakeholders and communicate the ambitions and projects of the province. Therefore, employees that are the intermediate connection between stakeholders and the province need to be politically sensitive. They leverage the different aspects and opinions during a project, understanding the complexity of multidisciplinary projects. Van Dorp indicates that political sensitivity as a competency could be an important difference between a business developer and a developer working for the government. High political sensitivity results in the actual implementation of projects, while low political sensitivity could result in false promises and distrust in the government. Van Dorp indicates that his own competencies are creativity, assertiveness and perseverance. When he started with sustainable projects, he had no industry knowledge on hydrogen, but he was eager to learn and expand. He is mostly concerned with expanding the network, developing and designing projects, but project managers implement the projects and ideas. Project managers require vastly different competencies that he does not possess, especially project management itself.

Another factor to take into account in the innovation process are the elections every four years, since regional politics often change during the elections. Elections often decelerate the project processes and create an unpredictable future. Therefore, managing current and new stakeholders is of great importance for an efficient continuance of projects, also with new regional politics. Van Dorp emphasises the importance of knowing stakeholders, such as the elected deputies, aldermen, ministers and members of the parliament, in every aspect. In turn, they need to know every aspect of your company and projects. For Groningen Airport Eelde, it is important to highlight that they are not just a small-scale airport with commercial and holiday flights. Additionally, they provide flying lessons, KLM Flight Academy is located there, the airport is a base for trauma helicopters for emergencies, there are flights that transport donor organs and the airport provides the region with employment opportunities and a better business climate.

Van Dorp concludes that the key to driving innovation at Groningen Airport Eelde is that they promote themselves as a physical hub for sustainable aviation by performing strong stakeholder management. They are a connector by facilitating a breeding ground and network for predominantly regional companies and stakeholders, but nowadays also international stakeholders.

5.2 Interview with Kees Boer

Kees Boer is a project manager of the Hydrogen District project in the municipality Hogeveen, the Netherlands. The aim of the project is to supply the heating demand of the district with hydrogen energy by placing a hydrogen boiler in every house and transporting the hydrogen through the current gas pipe infrastructure. Boer has several tasks from manual labour to thinking out plans, but his most important task is managing the project and developing a strategy. He was asked to describe his competencies that drive innovation and make him a good fit as project manager. He identified perseverance, goal-oriented vision, stakeholder management, project management, the ability to maintain an overview, curiosity, the ability to see opportunities and to switch between disciplines. Switching between disciplines when working with different

departments and stakeholders is the key to being a great project manager, as well as acknowledging your own lack of knowledge on certain topics and asking for assistance. This project is such a novelty, that the next step in the project process is not always clear. Boer suggests that this often leads to a more short-sighted outlook on the project, but that every small step is thoroughly planned and executed. Due to the project being such uncharted territory, he requires an innovative mindset and constantly searches for the next step. He indicates that an innovative mindset and wanting to make a change is a competency in itself, especially the different aspects. The focus of an innovative project is not only on energy transition and strengthening the network, but also to help participants gain knowledge and develop new competencies. During the project, theory and reality often differ, which results in additional challenges. By implementing an idea or the objectives formulated in a report, a regional network is strengthened and new competencies are developed. For example, the consortium Hydrogen District Hoogeveen consisting of 22 stakeholders, the municipality Hoogeveen being one of them, wrote a report on the requisites for transforming the natural gas infrastructure into hydrogen. Around eleven of the involved stakeholders formed a strong and like-minded network. Each aspect was assessed by different stakeholders, from network administrators, knowledge institutes, lawyers to engineering firms. The establishment and execution of the hydrogen district is performed by constantly involving new stakeholders and integrally assessing challenges.

Although projects such as the hydrogen district require officials that apply for permits and execute important legal tasks, the officials with entrepreneurial abilities and networking competencies create the spark for innovative projects. This spark often occurs by using effective environmental management and stakeholder management. Regional authorities need to put their ambitions and projects on display, and then search for potential stakeholders. What is their position and what are their interests? Knowing all aspects of (potential) stakeholders allows for strong collaboration and effective implementation of innovative projects. Nonetheless, Boer suggests that internal organisation of regional authorities is just as important as the external organisation. To drive innovation, regional authorities need to involve different roles in the internal organisation from the start to the finish of the project. For example, licensors and regional implementation services are often not involved from the start, which results in eventual pushback when project applications do not adhere to conventional governmental ideas. By performing internal stakeholder management on departments and employees, regional authorities create an internal support base for hydrogen development. Thus, acting as a connector for external stakeholders, as well as the internal organisation, is fundamental to driving innovation.

Provinces and regional authorities have a beneficial position to act as a manager for energy transition projects and connect stakeholders. They frequently contemplate numerous projects, but fail to effectively execute them due to challenges impeding the actual realisation process. Realising innovative projects require regional authorities to choose a smaller set of projects and to only provide those with funding and resources. Deliberately chosen projects that are tailored to regional hydrogen plans and with the proper support base are generally more successful and easier to implement. For stakeholders to be interested, projects should pose clear success factors, in addition to governmental funding. Boer provides an example of how a network helps to acquire funding and realise projects. Generally, governmental funding is allocated after a public tender for the project. The hydrogen district project required a public tender for the hydrogen central heater boilers that were to be installed in homes. However, no one working on the project had any knowledge on how to publicly tender for a novel hydrogen boiler. In collaboration with multiple stakeholders, they produced a list of requirements for the boiler, ranging from technical capabilities to certifying the boiler. Due to their extensive network and lobbying strategy, they were able to fill any knowledge gaps and acquire funding for the hydrogen district project. Their network helped the project to obtain a Green Deal, collaborate with another town in the Netherlands, integrate with other projects

and to get in touch with network administrators and ministries. For their lobbying strategy, the project management hired someone who had great networking capabilities and could help implement the strategy with the contents created by Boer. The key to lobbying for the hydrogen projects was tailoring certain aspects of the project to subsidy requirements, which was only possible because the project had substantive content and a knowledge base provided by the stakeholders. Moreover, by creating a regional triangle of government, businesses and educational institutes, regional projects strengthen their support base. For example, the Dutch Ministry of Infrastructure and Water Management organised a summer school 'Safe Hydrogen Districts' in Hogeveen. In one of the classes, someone proposed building a glass house to show how the internal hydrogen techniques work. Subsequently, a regional political party organised a hackathon in collaboration with the Centre for Urbanism and the Alfa College to design such a house, which resulted in funding for the development of an actual hydrogen tiny house. Moreover, the development of the tiny house allowed the project to have a stand at the Trade Show Energy in Den Bosch, the Inner Court in Den Haag and they went to several more cities. Furthermore, they developed educational packages on hydrogen for schools and further extended their network. DOC33 and Alfa College now offer initial training courses on hydrogen, creating a future knowledge base for hydrogen development and providing a platform for hydrogen projects. The regional triangle of government, businesses and educational institutes strengthens the social value of projects, and the capability to use creative thinking skills and seek opportunities is what helps grow the support base of a project.

5.3 Interview with Alfred Middelkamp

Alfred Middelkamp started as project manager of industrial energy transition in 2021 in the province Drenthe. He has extensive experience in sustainable living and instituted energy counters for advice on sustainable living in Assen, Groningen and Leeuwarden. Currently, he is coordinator of industrial energy transition and hydrogen energy systems in Drenthe. Together with ten other officials, he coordinates the projects on energy systems and hydrogen, ensures there is a sufficient number of managers and investigates the support base for the different projects. He is mostly concerned with coordinating the more complex and politically sensitive projects, as well as writing policies. When asked about his role and the roles of regional authorities, he describes the four main roles to be policy officer or advisor, program manager, project manager and process manager. Firstly, the policy officer is tasked with writing a policy framework for development and innovation by transforming goals into an agenda. Secondly, the program manager transforms the agenda, such as a governmental energy agenda, into a chain of activities. Establishing projects, applying for funding and subsidy programs, and searching for regional initiators and potential stakeholders. Program managers provide synergy between programs and projects. Thirdly, the project manager ensures that the project receives optimal results with the provided funding and subsidies. Finally, the process manager is concerned with the processes required to receive results, funding and execution of activities.

On a daily basis, Middelkamp coordinates the different tasks and activities and meets with various employees and stakeholders. Half of his time is spent meeting with different people. He meets with stakeholders, project initiators and regional authorities that need help with challenges. The greatest challenge of his job is transforming external wishes and requirements into complete policies that align with the internal organisation. Furthermore, he presents project proposals and policies to the deputy who makes the final decision. Middelkamp describes the ability to manoeuvre between and connect different stakeholders, regional authorities and actors as a core competency for his job. As an example, he takes an electrolyser initiative in Emmen. He had to coordinate the different tasks and requirements of various parties, such as the initiator, a factory owner, financiers,

network operators, municipality, licensors, internal organisation, government and subsidy providers. Parties have different needs and might not always be concerned with the project as a whole, but are focused on their individual task. He has to constantly transform the project's goals into tasks that correspond to the actors. Thus, as coordinator or project leader you are required to possess a broad but not specific spectrum of technical knowledge. Not only does Middelkamp possess broad technical knowledge, but he is also able to piece together different projects, opinions, policies and information that form a complex informational structure. There are often no concrete guidelines or a framework that guide regional authorities during such innovative projects, so he has to be creative and have an innovative mindset.

Middelkamp suggests that the first step for regional authorities is to transform the national sustainability program into a regional program. The Dutch Program Energy Main Structure (Nederlandse programma Energiehoofdstructuur) outlines the national energy infrastructure required for the Netherlands to have a climate neutral energy supply by 2050. Regional authorities can formulate their own sustainable activities and objectives based on what differentiates them from other regions. For example, in some regions the energy demand is largely from the industrial sector, while other regions are mostly residential areas. Because the province of Drenthe and Groningen were able to differentiate themselves, they were the first to connect their infrastructure to the hydrogen backbone and were able to become frontrunners. Nonetheless, regions can start small to develop a hydrogen network. Middelkamp and his team leased five hydrogen cars just to become familiar with the topic. This resulted in them working on constructing a hydrogen gas station in Pesse, which at the time did not even have a business case. They obtained a lot of experience by applying for licences for hydrogen gas stations and applying for subsidies, which is the first step to setting up a network for hydrogen development. Middelkamp also highlights the fact that they put their ambitions and goals on display to attract potential stakeholders and companies, even when projects had not finished yet. Part of the success of hydrogen projects in Drenthe can be attributed to them being situated in the hydrogen valley, but participating in pilot projects gained officials such as Middelkamp further knowledge and experience. Currently, the province of Drenthe wants to develop a hydrogen chain in Drenthe. Developing the hydrogen chain entails creating demand, constructing infrastructure, securing funding, knowledge development and dispersion, and creating a development framework. Knowledge development and dispersion is essential for a hydrogen economy. For example, to build a hydrogen gas station, well-educated technicians and other professions are required, so it is important to create an educational environment. Furthermore, creating the framework for innovations, such as hydrogen, requires the government and regional authorities to constantly corroborate their choices and goals. Eventually, hydrogen projects attract stakeholders who accelerate development and regional authorities need to be mindful of matching demand, production and transport capabilities.

When asked what regional authorities should focus less on, Middelkamp suggests that regulations specifically developed for international stakeholders are partially hindering hydrogen development. Due to specific regional permit requirements and regulations for parties establishing factories or transitioning factories, companies are less likely to transition into more sustainable practices. When a company has multiple factories throughout Europe, they are less likely to improve their sustainable practices in a region with stricter regulations. Hydrogen is a European market, so regions should not impose strict regulations on the hydrogen chain. Middelkamp stresses that companies are not concerned with the prices of energy or strict regulations, but they only care if they are the same for their competitors. Nonetheless, some regulations are too technical or strict for innovative projects. This can delay or inhibit stakeholders applying for permits because innovative technologies might not meet regulation parameters. For example, Middelkamp mentions a company

that wanted to place a battery cargo container outside their building to store renewable energy. However, when they wanted to place the container, local authorities told them they first had to apply for a permit. Normally, companies apply for the permit because they need a cargo container for storage during construction, not for energy storage, but the initiator did not look into such regulations. Hence, it is important to include hardship clauses in regulations, so that they do not inhibit stakeholders driving innovation or expedite permit application.

As a last note, Middelkamp doubts whether regional authorities do not already have a network, either small or large, to drive hydrogen development. Regional authorities have policy officers that have knowledge in their field of work. They go to events, congresses, lunches and more to meet people and set up a network, also in the energy transition sector. He suggests that program and project managers can involve their colleagues by taking them to projects. Encouraging colleagues to actively participate in innovative projects, even if they do not possess the specific background of knowledge, creates an internal network and support base.

6 Competency Matrix

This section integrates the gathered information from literature and the interviews, constructing a list of core competencies for regional authorities to drive hydrogen development. The list is transformed into a competency matrix, which HR can use to guide regional authorities. Based on three traditional roles, process manager, project manager and policy officer, regional authorities can assess their proficiency in different competencies to drive hydrogen development by connecting actors, engaging with stakeholders and establishing networks.

6.1 Core competencies

In this section, the list of core competencies to drive hydrogen development are presented. Just as in section 4.2, the competencies are divided into three sufficiency levels: basic, intermediate and advanced. The choice of each competency and its sufficiency is corroborated based on literature and the interviews.

Networking and alliances

Networking is fundamental to driving regional hydrogen development. Regional authorities do not have to possess all the necessary knowledge or resources to develop hydrogen products and processes, and need stakeholders and organisations that can support them. Networking is described as building new relationships, connecting organisations and maintaining relationships. TNO emphasises the importance of thoroughly knowing your stakeholders and maintaining relationships, which allows regional authorities to mobilise and connect them to the regional objective. Furthermore, even when a region does not have a complete plan yet, by communicating their ambitions, they can attract stakeholders that can help them achieve their objectives. For example, Groningen Airport Eelde is promoted as a physical hub for sustainable aviation. The province of Drenthe is situated within the Hydrogen Valley, which regional authorities can also use to promote their advantageous position for hydrogen development. Alfred Middelkamp suggests that regions should transform the national sustainability program into a regional program based on what

differentiates them from other regions. The competency of building a network and related activities will be called *networking and alliances*. It is a combination of formal and informal relationships with stakeholders and activities that build and strengthen the network. Regional policy officers are fundamental to building networks by engaging with stakeholders and maintaining relationships. They connect the stakeholders to a common goal that is of interest to them, so they should have an intermediate sufficiency in networking and alliances. Based on policies, regional authorities establish projects that are managed by project managers. They coordinate their team, manage deliverables and aim for optimal results. By knowing their stakeholders, they are able to connect them to the common goal of the project and strengthen its results, so they require an intermediate sufficiency. Process managers support project managers, but they require an advanced sufficiency. They oversee the project's processes and mostly importantly, they facilitate communication between stakeholders and constantly network. Process managers promote collaboration and create a hub for the stakeholders, but instead of just connecting them to a common goal, they connect them to a regional goal.

Stakeholder Management

The competency networking and alliances is the predecessor of *stakeholder management*. Stakeholder management includes aligning the various stakeholders' requirements and expectations with the objective of the project, ensuring the involvement of stakeholders and keeping them satisfied. Stakeholder management is the ability to connect stakeholders to the project, influence them, ensure they know their impact and build a formal hub that functions as a team. Process managers constantly monitor the processes of the project, influence stakeholders and create an environment where stakeholders collaborate to solve problems. They have a central and fundamental position between the stakeholders and regional authorities, so they require an advanced sufficiency in stakeholder management. Policy officers, such as Middelkamp, transform expectations and requirements into policies that align with all stakeholders. They manoeuvre between and connect stakeholders and regional authorities, but they are geared to the internal organisation when formulating policies and do not influence stakeholders. Thus, they require an intermediate sufficiency. The project manager is supported in managing the stakeholders by the process manager, but still has a central role that connects the stakeholders and manages their participation. They are mostly concerned with managing the stakeholders' expectations and involving them, so they require an intermediate sufficiency, but do not influence them.

Hydrogen knowledge

To most regional authorities, the competency *hydrogen knowledge* would seem the most challenging out of all described competencies. At first glance, engaging with stakeholders and driving hydrogen development can seem difficult due to the lack of a regional knowledge base. However, the interviewees indicate that they did not possess any intermediate knowledge when starting with hydrogen projects. Experience and knowledge were gained by actively working on projects, which resulted in them developing new competencies. Nonetheless, policy officers should have intermediate hydrogen knowledge to be able to formulate complete policies. Alfred Middelkamp suggests that coordinators or project managers should eventually possess broad hydrogen knowledge, which is mostly acquired by organising events, exchanging information and ideas with colleagues, engaging with stakeholders and participating in projects. Furthermore, it is important to monitor political, societal and economic developments to broaden your knowledge and develop political sensitivity. When most regional authorities want to start driving hydrogen development,

they only require basic hydrogen knowledge. With more experience, they gain more knowledge and are able to see more opportunities to further drive development.

Standards, policies and regulations

When driving hydrogen development, the interviewees often encountered the multifaceted nature of innovative projects. Often, innovations and hydrogen projects do not fit regulations, standards and permits. Kees Boer indicates that when they started, no one was familiar with the standards and regulations to produce a hydrogen boiler. Together with their stakeholders, they gradually became familiar with regulations and permits they had to apply for. Alfred Middelburg and Jonas van Dorp faced the same challenges, but also learned through experience and participating in projects. Ultimately, by driving hydrogen development, regional authorities set a new standard for regional hydrogen ecosystems. The more specific and governmental knowledge on hydrogen merges into the competency *standards, policies and regulations*. At the start of hydrogen development, policy officers should have an intermediate sufficiency to formulate policies. Process and project managers do not require higher than basic sufficiency, because they can learn and improve by participation in projects.

Connecting leadership and management

Literature and the interviewees stress the importance of including the internal organisation from start to finish during projects, which is called *connecting leadership and management*. Kees Boer mentions that licensors and regional implementation services are often only involved when they are necessary, which results in pushback when project applications and proposals do not match their standards. For example, when the consortium Hydrogen District Hoogetveen wrote the hydrogen boiler report, all actors were included from the start, resulting in less pushback and a greater support base. Alfred Middelkamp also describes his ability to connect all actors internally in the process, who aid him in writing policies and coordinating projects. He suggests that program and project managers should involve their colleagues and invite them to go to stakeholders and events. Furthermore, literature suggests that connectors are essential to orchestrate innovation. By connecting internal and external actors, involvement is stimulated which results in better synergy and successful implementation of projects. With an advanced sufficiency in connecting leadership and management, project managers are able to motivate their team and stakeholders, consolidating the internal and external organisation. Policy officers maintain external relationships, include their opinions and formulate policies while taking the capacity and opinions of the internal organisation into account. They require an intermediate sufficiency, because they do not completely integrate internal and external organisation. Process managers require an intermediate level, because they provide a strategic framework and facilitate communication between actors, but mostly with the external organisation. They should constantly play a connecting role to monitor processes and guide actors, but they do not lead the team.

Inventiveness

Literature and the interviewees stress the importance of regional authorities that possess the competency of *inventiveness*. It often coincides with creativity and describes the ability to seek alternative solutions to problems and significantly impact regional hydrogen development. For example, Jonas van Dorp's inventiveness allowed him to redirect Groningen Airport Eelde and allow

them to become a frontrunner as a hydrogen hub. Kees Boer indicates that working on such innovative hydrogen development projects forces him to be innovative and curious. As a project manager, he wants to make real change and uses his innovative mindset to guide his team on developing the hydrogen district, step by step. Alfred Middelkamp uses his inventiveness to aggregate information and the different components of projects, allowing him to coordinate projects and formulate policies. Inventiveness is a core competency to drive hydrogen development by constantly seeking new innovation opportunities, with or without stakeholders. Especially process and project managers have an important role in processing information and using their inventiveness to support projects, so they at least require an intermediate competence in inventiveness. Policy officers are focused on formulating complete policies by using their solid knowledge base, but they do not need to be inventive to do so. So, they require a basic sufficiency. By gaining more experience and knowledge, regional authorities become better at recognizing opportunities, key players and changing the status quo with their ideas.

Strategy Management

One of the key components of orchestrating innovation is strategy development, which is called *strategy management* for regional authorities. Strategy management is the ability to leverage resources and processes to achieve goals by developing and monitoring the strategy. First, policy officers consult stakeholders and track developments to formulate long term guidelines and objectives. Thereafter, the project manager creates a joint strategy with stakeholders and is mostly concerned with obtaining results. Process managers support project managers by constantly monitoring the project's processes, setting deadlines and facilitating communication between stakeholders to solve challenges. Policy officers and process managers require advanced sufficiency in strategy management, because while their tasks are vastly different, they are both concerned with tracking development and formulating strategies. Project managers are supported by the process managers in their strategy and do not have to track all developments, so they only require an intermediate sufficiency.

Communication

It is important to differentiate the sufficiency in the competency of *communication*. At a basic sufficiency, all three roles should be able to facilitate communication in the internal organisation and translate information between employees. The ability to translate external information and ideas to the internal organisation, and the other way around, is indicated as an intermediate sufficiency in communication. Moreover, an intermediate sufficiency in communication is integral to competencies such as networking and stakeholder management. Lastly, when regional authorities have an advanced sufficiency in communication, they are able to transform internal and external ideas and information into a story that attracts stakeholders and motivates actors. Both project and process managers require an advanced sufficiency, because they constantly translate internal and external information between actors. Furthermore, they formulate a relevant story based on the information that resonates with all stakeholders. Most of the knowledge acquired by policy officers is provided by the internal organisation and is translated into a regional policy. They translate information into a framework instead of a story, so they require an intermediate sufficiency.

6.2 Competency Matrix

Based on the presented list of core competencies, a competency matrix is constructed that is shown in table 2. A short description is provided for each competency and its corresponding sufficiency levels. As aforementioned, the competency matrix can be used by HR functions to guide regional authorities to use and develop their competencies to drive hydrogen development.

Competency	Basic	Intermediate	Advanced
Networking and alliances	You have some relationships with stakeholders and are familiar with their business. You can mobilise stakeholders in the network, connecting their interests with the project.	You have personal relationships with the most important stakeholders and you know their business through and through. You build alliances, promote collaboration and create a hub for stakeholders, connecting their interests with a common goal.	You have personal relationships with stakeholders, engage with potential stakeholders and know their business through and through. You build alliances, promote collaboration and create a hub for stakeholders, connecting their interests with the regional goal.
Stakeholder Management	You are able to manage the different stakeholders' requirements and expectations. You connect the stakeholders to the project and they know their impact, keeping them satisfied.	You connect stakeholders and encourage collaboration, enhancing their influence and creating a sense of responsibility. Not only are they satisfied, but they know their influence and role in the project.	You actively influence the stakeholders, managing them closely so they know they are irreplaceable and valuable to the project. By promoting collaboration, stakeholders increase their impact and work together as a team.
Hydrogen knowledge	By using your basic knowledge on the field, societal and political developments, you see opportunities.	You have intermediate knowledge on the field, societal and political developments. You see opportunities and know how to transform them into results.	You have expert knowledge on the field, societal and political developments. In addition to your own knowledge, you have external sources that inform you of trends and developments. You are able to see opportunities and transform them into results.
Standards, policies and regulations	You are familiar with common standards, policies and regulations on hydrogen.	You know the standards, policies and regulations on hydrogen. You are familiar with what permits to apply for and solve problems regarding regulations.	You know the standards, regulations and permit applications required for hydrogen. You are able to advise stakeholders on these topics and help them to solve problems.

Connecting leadership and management	You acknowledge people's opinions and you know how to manage the internal organisation	You acknowledge people's opinions and take them into account in the decision-making process. You manage the internal and external organisation, facilitating communication between them	You acknowledge people's opinions and you manage the internal and external organisation. You create a support base by including everyone in the process, also taking their opinions into account in the decision process
Inventiveness	By combining your ideas with the ideas of others, you are able to tackle problems and resolve them.	You are able to quickly establish the correlation between new information and the project. Your ideas are significantly innovative and you integrate them with the ideas of others to implement them.	You are able to quickly establish the correlation between new information and the project. Your ideas are significantly innovative and integrated with the ideas of others, they change the status quo.
Strategy Management	You facilitate the process for the network to develop a joint strategy that is adopted by all stakeholders.	You develop a joint strategy in cooperation with your network that is adopted by all stakeholders.	You develop a joint strategy in cooperation with your network that is adopted by all stakeholders. You recognize internal and external developments, adapting the strategy accordingly.
Communication	You are able to communicate information and ideas between actors in the internal organisation.	You facilitate communication between the external and internal organisation. Furthermore, you translate ideas and information between actors.	You are able to translate internal and external ideas and information into a story that you communicate to stakeholders.

Table 2 “Competency matrix with the core competencies that drive hydrogen development”

Role	Policy Officer	Process Manager	Project Manager
Networking and alliances	Intermediate	Advanced	Intermediate
Stakeholder Management	Intermediate	Advanced	Intermediate
Hydrogen knowledge	Intermediate	Basic	Basic
Standards, policies and regulations	Intermediate	Basic	Basic
Connecting leadership and management	Intermediate	Intermediate	Advanced
Inventiveness	Basic	Intermediate	Intermediate
Strategy Management	Advanced	Advanced	Intermediate
Communication	Intermediate	Advanced	Advanced

Table 3 “Competency matrix with the core competencies that drive hydrogen development”

7 Recommendations

The competency matrix presented in this report can be used as a guide for regional authorities to engage with stakeholders and drive regional hydrogen development based on their own competencies. While only three roles were analysed, regional authorities can compare themselves to the role they most relate to and its corresponding competencies. The framework can be used by Human Resources functions and by regional authorities in general. The narratives based upon the interviewees, TNO’s framework and the desk research provided key insights on driving hydrogen development and building an innovation network. There are several further recommendations:

1. Regions can promote their plans and ambitions by organising events and approaching stakeholders. If a few stakeholders are attracted to regional innovative projects, more will follow. Important is that regions keep communicating their choices and ambitions in multiple ways.
2. What differentiates our region from other regions for hydrogen development? Become a visible and physical hub for stakeholders. As a physical hub, collaboration between stakeholders is encouraged and the network is strengthened.
3. Regional authorities do not require extensive industry knowledge to drive hydrogen development. Hydrogen development is mostly still uncharted territory, so perseverance and being eager to learn is fundamental. Knowledge on hydrogen development, regulations and permits is gained by participating in and organising events, participating in projects, discussing with colleagues and reading up on relevant information.
4. Fundamental to hydrogen development, or any innovation, is creating a support base by building a network of the regional government, businesses and educational institutes. By including all three, the support base is strengthened and the value for actors grows.
5. It was already highlighted as a core competency, but connecting leadership is absolutely fundamental to building a network. Encouraging stakeholders and colleagues to participate in every part of the process strengthens the network and creates a community. Together, go to events, congresses, lunches and stakeholders' physical locations to make hydrogen development tangible for all actors, even if they do not possess any industry knowledge yet.

The final recommendation for regional authorities is to use existing learning programs and invest in staff competencies. An example of such a program is 'Orchestrating innovation in public-private ecosystems', offered by TNO. Surely, there are more learning institutes throughout Europe that regional authorities can look into.

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