Interreg CENTRAL EUROPE

Co-funded by the European Union

H2CE

Work Package (WP) 2: (H2 ready regions: Support mechanisms for energy system transition and participation)

Version 1

March 2025

H2CE – Deliverable 2.2.3 – Report on the testing of regional H2 Competence Centres

submitted by City of Zagreb (PP10 – ZG)

Energy Agency of Styria (PP4 – EASt)

Regional Union of Chambers of Commerce of Veneto Region (PP7 - UCV)

North-West Croatia Regional Energy and Climate Agency (PP12 – REGEA)

March 2025

Content

Introduction 2

1. Methodology 3

2. Current capacities and strategic initiatives of Hydrogen competence centres in Croatia and Austria 5

3. Regional differences in the hydrogen supply chain: Croatia vs. Austria 8

4. Training offers in the H2 supply chain in Croatia and Austria 10

5. Developing transational competence profiles for hydrogen experts 12

6. Regional H2 Competence Centres: Advancing Hydrogen Innovation in Zagreb and Styria 16

6.1. Physical competence center for Hydrogen in Zagreb 17

6.2. Activities of the physical comptence center in Zagreb 19

7. Testing H2 competence centre 24

7.1. Findings from the Hydrogen hybrid webinar: Strategic outcomes 24

7.2. Transferability and integration into the H2CE collaboration platform: Incorporation of Hydrogen competence centers from Styria and Zagreb 29

Conclusion 30

Annexes 32

Introduction

Work Package (WP) 2 of the H2CE project, titled "H2-ready regions: Support mechanisms for energy system transition and participation" focuses on the development of an energy system model to determine an optimal and cost-efficient hydrogen infrastructure. This model is integrated into a GIS-based tool that facilitates the coordination of cross-regional hydrogen transition projects, identifying gaps and preventing overcapacities.

Activity 2.2 within WP2 is dedicated to establishing a standardized framework for regional H_2 Competence Centres, supporting capacity building for public and private stakeholders in the hydrogen-based energy transition.

This report evaluates a model designed to assess existing capacities, competence centres, and training programs within hydrogen (H_2) supply chains across diverse regional settings. The findings aim to inform the development of a structured framework for regional H_2 Competence Centres, fostering capacity building among public and private stakeholders. Additionally, the report contributes to the co-design of transnational H_2 expert profiles, aligning them with the distinct requirements of various supply chains and applications.

Hydrogen (H_2) is a pivotal element in the transition to a sustainable energy system, enabling decarbonization across industries, transportation, and energy storage. Establishing a robust hydrogen ecosystem demands specialized expertise and coordinated efforts among regional stakeholders. Regional H_2 Competence Centres play a vital role in facilitating knowledge exchange, strengthening capacity-building initiatives, and ensuring an effective and structured integration of hydrogen technologies.

This report examines multiple regional contexts to provide a comprehensive overview of H_2-related capacities and training opportunities. It outlines a unified framework for the establishment of H_2 Competence Centres while accommodating regional particularities. A central aspect is the co-development of transnational expert profiles to ensure that skill sets align with the evolving needs of hydrogen infrastructure planning.

Deliverable 2.2.3 evaluates the practical implementation of the regional H_2 Competence Centres developed previously in the H2CE project (see D.2.2.1), examining their effectiveness in mapping current capacities, training programs, and existing competence centres. This assessment ensures that proposed centres are optimally structured to address the needs of regional hydrogen infrastructure planning.

1. Methodology

The framework developed for testing hydrogen competence centres is designed to assess regional hydrogen ecosystems and evaluate their capacity to support the energy transition through training programs, stakeholder engagement, and cross-border collaboration. This methodology is continuously upgraded throughout the project and has been real-time tested during this stage. As part of the project, the Styria region in Austria and the City of Zagreb in Croatia are collaborating to identify a common framework for setting up regional hydrogen competence centres. These centres will play a crucial role in building the capacity of regional and local public and private stakeholders to effectively accompany the hydrogen-based energy transition in their respective regions.

The framework (blueprint) follows a shared methodological approach that focuses on co-designing the transnational profiles of hydrogen experts and developing training paths for public authorities and private actors, tailored to the specific needs of each regional context. This framework will be an integral part of WP3 – Developing the Central Europe Hydrogen Network and Collaboration Platform, led by the Institute for Public Service Development (IRVS) from Slovakia. The platform will support the regional hydrogen competence centres and will be progressively implemented throughout the project, with continuous testing and refinement to ensure its effectiveness and sustainability over time.

Deliverable 2.2.3, related to this framework, will lay the foundation for Output 2.2., which represents the "tested common framework for capacity centres." Developed collaboratively by Croatia and Styria, this framework will serve as a "pilot action." The successful implementation of this pilot will play a crucial role in contributing to Output 3.2., which involves the integration of the tested framework into the H2CE collaboration platform. This process will facilitate the transfer of best practices and enable the scalability of the hydrogen competence centre model across different regions.

In line with this, the City of Zagreb and Styria have worked together to test the methodology through a webinar, ensuring the active involvement of key regional stakeholders. The primary data collection method for this testing included surveys conducted during the webinar held on February 7, 2025. This event allowed participants to engage directly with the framework, providing valuable feedback and insights that will shape its future implementation.

The webinar gathered 45 participants from various sectors, including local and regional governments, industry, academia, project partners of the H2CE initiative, and institutions such as energy and climate agencies and hydrocarbon agencies. Participants represented key regions including **Zagreb and Northwest Croatia (Croatia), Styria (Austria), and Italy**, contributing to a comprehensive discussion on hydrogen development and cross-border collaboration.

The speakers were leading experts in their respective fields. **Dr. sc. Vjekoslav Jukić** (Croatia), Head of Sector at the Ministry of Economy and Sustainable Development, provided an overview of Croatia's strategic framework and hydrogen development potential. **Dr. sc. Valentina Đurek** (Croatia), Senior Project Manager at the North-West Croatia Regional Energy and Climate Agency (REGEA), presented a regional analysis of hydrogen potential in Northwest Croatia. **Assoc. Prof. Dr. sc. Ankica Kovač** (Croatia), Head of the Power Engineering Laboratory and Hydrogen and Fuel Cells Laboratory at the University of Zagreb, discussed the hydrogen value chain, focusing on production and application.

From Austria, **Markus Simbürger** (Styria) from Green Tech Valley Cluster GmbH highlighted the importance of cross-border cooperation and the development of hydrogen valleys, while **Stefan Fink** (Styria) from Energienetze Steiermark presented best practices in hydrogen deployment through the Renewable Gasfield Gabersdorf project. Additionally, **participants from Italy** contributed expertise on hydrogen technologies and policy frameworks, offering a broader European perspective.

In addition, qualitative insights were gathered through expert discussions, stakeholder workshops, and direct consultations with key industry representatives and policymakers.

To evaluate the capacities, competence centres, and training offers, several key criteria were considered, including:

- The scope and depth of available training programs, particularly their alignment with industry needs and European hydrogen strategies.
- Institutional expertise and resources dedicated to hydrogen research, development, and education.
- Accessibility and certification standards of training programs across different regions.
- Industry involvement and partnerships in fostering hydrogen-related education and workforce development.

Different materials and presentations were tailored to various stakeholders to address their specific interests and expertise levels in both Croatia (City of Zagreb / Northwest Croatia) and Styria (Austria). The goal was to provide a comprehensive overview of the hydrogen landscape, share best practices, and align regional hydrogen initiatives with both national policies and international standards.

Croatia

In Croatia, the assessment focused on:

1. **Regional Hydrogen Potential in Northwest Croatia**: This included an analysis of infrastructure readiness and resource availability, offering key insights into the region's capacity to support hydrogen development.
2. **Strategic Framework and Market Opportunities for Hydrogen in Croatia**: This session explored Croatia's policy direction for hydrogen development, emphasizing both current and future market opportunities for hydrogen technologies.
3. **Hydrogen Value Chain in Croatia – From Production to Application**: This covered the various stages of hydrogen production, storage, and application, as well as identifying key players and technological advancements within the Croatian hydrogen sector.
4. **Best Practices from International Experts**: To provide a broader perspective, international experts shared successful hydrogen implementation models from other countries, which helped inform Croatia's strategic direction for hydrogen development.

These targeted materials were designed to inform and guide the strategic planning of the Hydrogen Competence Centre in Croatia, ensuring that regional programs and initiatives align with national needs and international best practices.

Austria

In Austria, the focus was on connecting the most important actors/experts. On the one hand we have someone who is particularly good at networking and exchanging ideas across borders. Then we have someone who is strongly anchored in development and implementation and can already show a best practice example. And we have an important research facility.

Key elements of the Austrian approach included:

1. **Green Tech Valley's Cross-Border Network**: This facilitated hydrogen collaboration on various levels, fostering partnerships across regions to maximize hydrogen deployment in Europe. It is a well-established network comprising over 300 partners in green technologies across the energy and environmental sectors. This collaboration facilitates a strong regional, national, and international network, which is essential given the cross-border nature of hydrogen technologies.
2. **Energienetze Steiermark GmbH – Hydrogen Integration**: This organization is actively involved in integrating green hydrogen into Austria's existing gas infrastructure. Additionally, their participation in the **Renewable Gasfield project** involves producing green hydrogen via electrolysis and examining

its use in grid injection or conversion into synthetic methane (SNG), supporting the region's energy transition.

3. **HyCentA's Training Programs**: HyCentA develops training materials targeting various groups, aiming to spread hydrogen knowledge and best practices within the region.

With these three organizations—**Green Tech Valley**, **Energienetze Steiermark GmbH**, and **HyCentA**—Austria boasts a strong network and expertise in hydrogen technology, making it a key player in the development and transferability of hydrogen competence centres.

Both Croatia and Austria have contributed valuable insights to the H2CE project, which will be peer-reviewed and integrated into the H2CE collaboration platform. This integration will facilitate knowledge transfer and ensure that best practices in hydrogen competence centre development are shared across regions. By unifying the approach to data collection, stakeholder engagement, and capacity building, the project will ensure that the hydrogen competence centres are effectively implemented and scalable across different regions.

2. Current capacities and strategic initiatives of Hydrogen competence centres in Croatia and Austria

In recent years, both Croatia and Austria have made significant strides in developing their capacities and competence centres focused on hydrogen technologies. These efforts are crucial for advancing the hydrogen economy and promoting sustainable energy solutions in the region.

Croatia - City of Zagreb

In Croatia, several key institutions and initiatives are at the forefront of hydrogen development. The **University of Zagreb**, particularly its *Faculty of Mechanical Engineering and Naval Architecture*, plays a pivotal role in research related to hydrogen technologies. The university is dedicated to developing innovative solutions for hydrogen production, storage, and utilization, contributing both academically and practically to the advancement of this field.

A major institution now driving hydrogen-related activities in Croatia is the **Croatian Hydrocarbon Agency (CHA)**. In July 2024, the agency commissioned a comprehensive study on the application of hydrogen in Croatia, marking a significant step towards the integration of hydrogen into the country's energy strategy. By focusing on research, regulatory frameworks, and strategic planning, the Croatian Hydrocarbon Agency is positioning itself as a key player in the national hydrogen transition.

Additionally, the **Green Energy Cooperative** is focused on promoting renewable energy initiatives, including hydrogen projects, and engages local communities in developing sustainable energy solutions. Their involvement ensures that grassroots efforts align with national and EU objectives for energy transition.

Despite these efforts, Croatia currently lacks a **dedicated hydrogen information centre** that would serve as a central hub for knowledge exchange, stakeholder support, and public awareness. The establishment of such a centre is crucial for coordinating hydrogen-related activities, facilitating investments, and educating stakeholders on the potential of hydrogen technologies.

The One-Stop Shop, also referred to as the Competence Centre for Hydrogen and Green Technologies in Zagreb, represents a pioneering initiative in Croatia. This project, the first of its kind in the country, is designed to provide a centralized platform for education, consultation, and project coordination within the hydrogen sector. By offering expert support, facilitating networking opportunities, and delivering practical implementation guidance, the Competence Centre aims to address a critical gap in Croatia's hydrogen ecosystem. This initiative will not only support the sector's growth but also serve as a model for future developments in Croatia.

Austria - Styria

In Austria, significant advancements have already been made in hydrogen technology, particularly in the region of Styria. With two well-known universities, we have a major focus on academic training in the field of hydrogen. **Graz University of Technology (TU Graz)** is researching for the past 50 years in the fields of electrochemistry and hydrogen. The **Centre of Hydrogen Research** combines the expertise of more than 160 scientists ranging from basic research to applied technologies and systemic aspects and involves the following institutions:

- The **Hydrogen Research Centre Austria** (**HyCentA)** is one of the most important research centres when it comes to hydrogen. It is independent and located in Graz based on the Graz University of Technology. The HyCentA is the only extra-university research institution in Austria and exclusively dedicated to research and development on green hydrogen technologies. With their unique know-how they cover the entire value chain – production, distribution, storage and application of renewable hydrogen. The centre collaborates with various stakeholders, including leading companies and scientific partners to drive innovation and practical applications in the hydrogen sector.
- The **Institute of Chemical Engineering and Environmental Technology (CEET)** is an electrochemistry and hydrogen lab. The focus is on characterization and life cycle assessments of fuel cells and electrolysis cells, development of industrial hydrogen processes.
- The **Institute of Thermodynamics and Sustainable Propulsion Systems (iTnA)** provides innovative and internationally recognized teaching and research in the interconnected system energy, engines, traffic and environment and to contribute to the solution of problems that affect the environment. One focus is emissions and immissions, thermodynamics and electrochemistry.
- The **Institute of Thermal Engineering** research on high-temperature electrolysis and fuel cells, hydrogen burners for the industry and sustainable thermal engineering solutions.
- The **Large Engines Competence Centre (LCE)** puts their focus on sustainable energy and transport systems as well as maritime engine solutions.
- The **Bioenergy and Sustainable Technology GmbH (BEST)** conducts research on hydrogen production through the thermal gasification of biomass and waste, as well as the use of microbes for CO_2-based gas fermentation.

In collaboration with the **Austrian Institute of Technology (AIT)** the TU Graz offers a joint doctoral program in hydrogen technologies. This program aims to accelerate the development of innovative and efficient technologies to produce green hydrogen. The AIT is also actively involved in hydrogen research, specifically in fuel cell technology and hydrogen production methods. A key focus is the development and validation of materials, components, and systems for hydrogen fuel cells. This includes the development of electrode materials and the optimization of fuel cell systems. AIT works closely with industry partners to develop practical applications for hydrogen, supporting the transition to a hydrogen economy through cutting-edge research and technological advancements.

In addition to the TU Graz, the **Montanuniversität Leoben** is also intensively involved in hydrogen research and technology. In 2024, a hydrogen and carbon research centre was established in collaboration with well-known companies. This centre focuses primarily on the production of hydrogen through the pyrolysis of natural gas. **Materials Centre Leoben** (MCL) is a leading research institution in the field of materials science, working on projects aimed at developing materials and technologies for the hydrogen economy and is based at Montanuniversität Leoben. The **Polymer Competence Centre Leoben (PCCL)** is a research centre specializing polymers and plastics engineering. It participates in project focused on developing materials for hydrogen storage and transport.

The **Green Tech Valley Cluster** is a network of over 300 partners in southern Austria, dedicated to advancing green technologies in energy and environmental sectors. It fosters innovation through matchmaking, knowledge transfer, and international collaborations. In the hydrogen sector, the cluster plays a key role in promoting green hydrogen, supporting research institutions like HyCentA, and driving large-scale initiatives such as Europe's firs "Hydrogen Valley" at TU Graz. This project brings together 17 initiatives to develop hydrogen solutions for industry, with planned investments of € 578 million over the next five years.

The focus in Styria (or even Austria) is currently strongly on academic programs. There are some job-related training courses (like **TÜV Austria Academy**) and training provided by energy sector companies. However, there are no dedicated apprenticeships or widely established hydrogen-specific training programs in the education system, as seen in traditional technical or craft professions. The TÜV Austria Academy offers the **Certified Hydrogen Specialist TÜV®** training program, which provides professionals with in-depth knowledge of hydrogen technologies. This certification covers topics such as the properties of hydrogen, legal frameworks, safety aspects, and practical applications in various industries. This certification program is designed for professionals who want to expand their expertise in hydrogen technology and obtain a recognized qualification. In Styria, in addition to university programs, there are also events initiated by the regional government which focus on energy related topics. There are two formats worth mentioning:

- The **Energiecamp Murau** is an annual conference organized on behalf of the regional government of Styria since 2015. Its goal is to raise awareness of current challenges in the energy sector and present ecologically and economically viable solutions. The event combines information, discussion, and entertainment. The target audience includes professionals from business and politics, as well as students. In 2024 the topic was **"Hydrogen - Power for change"** with the focus on the role of hydrogen in Austria's energy transition. Topics included the origin of hydrogen, possibilities for domestic production, and the use of hydrogen in mobility. During this event we were also able to present H2CE and be part of a discussion.
- The **Energy Lunch** has been an informational and networking event organized by the regional government of Styria since 2003. It addresses current issues and challenges related to the energy transition, promotes knowledge exchange, and spreads innovative solutions. At its core is an open discussion between experts and the audience. The event is aimed to all individuals working in the fields of energy, climate, and the environment. On February 5th, 2025 the Energy Lunch focused on **"Larg-Scale Storage - A Key Technology for the Energy Transition"**.
- The **Long Day of Energy** is an annual event in Styria focused on energy, sustainability, and innovation. The aim is to make the topic of energy tangible and visible throughout Styria in a way that has an impact on the population. The so-called "energy showcases" can make their company accessible to the interested population. The hydrogen sector is also made accessible. The energy showcases include HyCentA, Renewable Gasfield Gabersdorf and a hut on the mountain that stores excess solar power in hydrogen. The countless locations reach a broad, interested population.

Both formats provide a platform for networking and exchanging ideas among professionals and interested individuals in the energy sector outside of an academic setting.

On community level there is a **Climate Protection and Energy Model Region (KEM)** that deals heavily with the topic of hydrogen. KEM Gabersdorf-Schwarzautal aims to reduce CO_2 emissions through clean energy generation from solar, wind, water, and biomass, with the goal of achieving a complete transition away from fossil fuels. A key project within this KEM is the "Renewable Gasfield", a hydrogen production facility that is coupled with a methanization plant and integrated with an existing biogas facility. This innovative project enables the production of environmentally friendly, storable hydrogen as well as green natural gas, making it a unique initiative in Austria. The KEM has set up an information station to educate and raise awareness among the local population about hydrogen in general. Such low-threshold initiatives can be easily implemented in other communities with minimal effort. This is how the population can be made aware of the topic of hydrogen.

While Styria/Austria has few well-established hydrogen initiatives, Croatia is still in the early stages of building its hydrogen ecosystem. The One Stop Shop for Hydrogen and Green Technologies in Zagreb represents a groundbreaking step in bridging this gap by offering a dedicated knowledge hub for hydrogen technologies—something that currently does not exist in Croatia. By fostering collaboration between public authorities, entrepreneurs, researchers, and investors, this initiative will play a crucial role in advancing the hydrogen infrastructure planning in Croatia.

The strong collaboration between Croatia and Austria, particularly through initiatives like this one, offers a valuable opportunity for knowledge transfer, technological exchange, and joint research. By leveraging Austria's expertise and Croatia's growing interest in hydrogen, both countries can accelerate the steps for integrating hydrogen into energy planning on regional and in Croatia even on national level. They will be

therewith enabled to contribute to a cleaner, more sustainable energy future in line with European Union goals.

3. Regional differences in the hydrogen supply chain: Croatia vs. Austria

The hydrogen (H_2) supply chain in Europe is developing at different speeds across regions, reflecting variations in policy frameworks, infrastructure investment, industrial demand, and technological readiness. Croatia and Austria, despite their geographical proximity, exhibit significant differences in the development of their hydrogen supply chain, shaped by their respective energy strategies, economic structures, and regulatory environments.

Austria has positioned itself as a leader in hydrogen adoption, with a well-defined **National Hydrogen Strategy** that aligns with the **EU Hydrogen Strategy** and the **Austrian Energy and Climate Plan**. Austria's strategy prioritizes **green hydrogen production**, aiming to integrate hydrogen into key industrial sectors, transport, and energy storage. The **Hydrogen Initiative Austria (WIVA P&G)** and regional programs, particularly in Styria, are driving advancements through public and private investments.

Croatia adopted its **National Hydrogen Strategy for the period 2021-2050**, which outlines the role of hydrogen in decarbonizing the economy and integrating renewable energy sources. The strategy emphasizes the **development of domestic hydrogen production capacities**, the establishment of necessary infrastructure, and the promotion of hydrogen applications in industry, transport, and energy storage. However, despite having a strategic framework in place, the implementation process is still in its early stages. In July 2024, the **Croatian Hydrocarbon Agency (CHA)** commissioned a study on hydrogen applications in Croatia, signalling increased government attention to this sector and laying the groundwork for future projects.

Austria has a **more advanced hydrogen production landscape**, with several operational and planned **electrolysis projects** focused exclusively on green hydrogen. Companies like **Verbund** and **OMV** are investing in large-scale electrolysis projects, leveraging Austria's renewable energy capacity, particularly **hydropower**, to produce low-carbon hydrogen. Austria also has **industrial hydrogen production sites** integrated into refineries and chemical industries, ensuring a stable supply for domestic use.

Croatia, on the other hand, currently lacks significant hydrogen production infrastructure. While it has **high renewable energy potential** (solar and wind), hydrogen production is still in the research phase. The **National Hydrogen Strategy** envisions the deployment of **electrolysis facilities** to produce green hydrogen, but large-scale investments have yet to materialize. Some pilot projects are under development, but the country remains reliant on **natural gas**, and **blue hydrogen** (produced from natural gas with carbon capture) could be an interim solution until green hydrogen production scales up.

Austria has a **well-developed gas infrastructure**, making it easier to integrate hydrogen into existing networks. The country is actively working on **hydrogen transport and storage solutions**, including blending hydrogen with natural gas and developing **hydrogen pipelines**. Hydrogen refuelling stations are expanding, particularly in urban areas and along key transport corridors, supported by the **H2Mobility Initiative**.

Croatia's infrastructure for hydrogen is currently **underdeveloped**. The country has a well-established **natural gas network**, which could be repurposed for hydrogen in the future, but no dedicated hydrogen pipelines or large-scale storage facilities exist. Croatia has **only a limited number of hydrogens refuelling stations**, making hydrogen adoption in transportation more challenging. The lack of infrastructure remains a key barrier to scaling up hydrogen applications.

Austria has **high industrial hydrogen demand**, particularly in **steel production, chemicals, and refining**. Companies like **voestalpine** are investing in hydrogen-based steelmaking to reduce carbon emissions. The transport sector is also integrating hydrogen, with **fuel cell buses, trains, and heavy-duty vehicles** already being deployed.

In Croatia, industrial demand for hydrogen is currently **low**, limited mostly to **refineries and chemical plants**. The **National Hydrogen Strategy** envisions the expansion of hydrogen use in **heavy industry and transportation**, but so far, no large-scale industrial projects have been implemented. In transportation, hydrogen adoption is minimal, with **no hydrogen-powered public transport fleets** currently in operation. However, initiatives like the **One Stop Shop for Hydrogen and Green Technologies in Zagreb** aim to accelerate hydrogen integration in urban mobility.

Austria benefits from **strong public and private investments**, with substantial funding from the **EU Green Deal, Horizon Europe, and private sector stakeholders**. Regional cooperation, particularly with Germany and other Central European countries, strengthens Austria's hydrogen economy. **Austrian companies are active in international hydrogen trade, positioning the country as a future hydrogen exporter.**

In Croatia, investments in hydrogen remain **limited**, with most funding coming from **EU programs** and pilot projects. The **lack of private sector engagement** and a **fragmented regulatory framework** slow down hydrogen adoption. However, cooperation with Austria, particularly through **joint research and knowledge exchange programs**, could help Croatia accelerate its hydrogen transition. The collaboration between **Zagreb and Styria**, for example, is expected to facilitate technology transfer and business partnerships.

Austria has developed a **mature and integrated hydrogen supply chain**, supported by **strong policies, infrastructure, and industrial demand**. Croatia, despite having a **National Hydrogen Strategy**, is **still in the early stages of implementation**, with **limited infrastructure and hydrogen production capacity**. The establishment of **a centralized hydrogen information centre, such as the One Stop Shop for Hydrogen in Zagreb, represents a pioneering initiative** to bridge this gap.

By strengthening **international cooperation, attracting investments, and developing a clear roadmap for implementing the National Hydrogen Strategy**, Croatia can accelerate its hydrogen transition and integrate into the **broader European hydrogen network**. Austria, with its advanced expertise, could serve as a strategic partner in this process, supporting Croatia in scaling up its hydrogen economy in alignment with EU climate goals.

4. Training offers in the H2 supply chain in Croatia and Austria

At the national level, hydrogen-related training programs and structured capacity-building initiatives in Croatia remain limited. However, through the identification of five key hydrogen-related projects, including H2CE, Croatia has begun establishing a more coordinated approach to hydrogen development. These projects, spanning different EU funding programs, provide a foundation for knowledge exchange, stakeholder collaboration, and best practice integration. Collaboration between European-funded hydrogen projects is essential for accelerating innovation and overcoming regulatory and financial barriers. To support this effort, representatives from REGEA participated in the Green Hydra intersectoral workshop on July 25, 2024, held at the Croatian Hydrocarbon Agency. The event focused on improving policies for SME engagement in hydrogen technologies, providing guidance on financing mechanisms and regulatory frameworks.

To maximize synergies, the City of Zagreb and REGEA have established strong connections with these hydrogen initiatives, working closely with project partners through joint workshops, knowledge transfer activities, and strategic networking. A key milestone in this process was the regional workshop held on February 18, 2025, at the Energy Institute Hrvoje Požar (EIHP). This event, organized within the GREET CE project (Interreg Central Europe, coordinated by KSSENA), gathered stakeholders from Slovenia and Croatia, facilitating discussions on regulatory barriers, technology integration, financing models, and the scaling of hydrogen solutions.

The five hydrogen-related projects identified in Croatia, which form the basis for further cooperation and knowledge transfer, include:

1. H2CE (Interreg Central Europe): Empowering H2- ready regions in Central Europe.
2. HyEfRe (Interreg Central Europe): Developing hydrogen integration models for renewable energy systems, including interactive decision-support tools for electrolyser optimization and system power estimation.
3. NACHIP (I3 – North Adriatic Clean Hydrogen Investment Platform): Focused on cross-border investment strategies, financial models, and scaling up clean hydrogen production and infrastructure.
4. Green Hydra (Interreg Europe): Enhancing SME engagement in the green hydrogen value chain through policy improvements and targeted support measures.
5. Danube Indeet (Interreg Danube): Addressing regulatory and legislative gaps, while promoting business models for hydrogen market deployment.

These initiatives provide a strong platform for collaboration, ensuring that knowledge and resources are leveraged across projects to support the development of a sustainable hydrogen economy in Croatia.

Despite limited national-level training offerings, several initiatives have emerged to enhance hydrogen knowledge and expertise. One of the most significant contributions comes from Prof. Dr. Ankica Kovač, a leading expert from the University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture. Since 2019, she has been organizing hydrogen and fuel cell training programs, with REGEA participating in sessions held in Zagreb (March 26–27, 2024) and Dubrovnik (September 29 and October 3, 2024). These training sessions are being integrated into both online platforms and the physical Centre of Competence for Hydrogen in Croatia, ensuring long-term accessibility and practical application.

In addition to technical training, Dr. Kovač has played a pivotal role in public engagement and policy advocacy. She is the founder of the Regional Hydrogen Energy Conference (RHEC), which has been held annually since 2021, bringing together industry leaders, policymakers, and researchers to discuss hydrogen advancements and policy frameworks. Further expanding public outreach, she delivered a lecture titled "Hydrogen – Myth or Hit?" on September 6, 2023, at the University Library in Pula, as part of the BOLSTER project and the initiative "A Green Library for a Green Transition."

Beyond higher education, Dr. Kovač has contributed to hydrogen awareness at the primary school level, co-authoring a 7th-grade Technical Culture textbook ("Svijet tehnike 7U" – World of Technology 7U), where hydrogen energy is explained through a comic strip format, making it accessible to young students. Recognized as one of the most influential women in the energy sector, she actively promotes gender inclusion in the energy transition while shaping Croatia's hydrogen strategy.

By combining academic expertise, EU-funded project collaboration, and targeted capacity-building initiatives, Croatia is establishing a robust and scalable hydrogen competence network. The integration of five key hydrogen projects, alongside strong partnerships with universities, industry, and SMEs, ensures that Croatia is well-positioned to contribute to the EU's decarbonization goals while fostering regional hydrogen innovation.

Like Croatia / City of Zagreb, there are few hydrogen-related training programs in Styria / Austria. The TÜV training program was already mentioned in Chapter 2. But there are important hydrogen projects focus on research, development, and collaboration:

- H2GreenTECH (Interreg Slovenia - Austria): This project aims to strengthen cross-border research and innovation capabilities for advanced hydrogen technologies. It fosters synergies between businesses, research centres, and universities while establishing a "one-stop-shop" hydrogen centre for companies, researchers, and students.
- H2GreenFUTURE (Interreg Slovenia - Austria): This project addresses the challenges of developing hydrogen technologies for the transition to a carbon-neutral society in Slovenia and Austria. It focuses on the development of pilot infrastructures, competence building, and establishing a comprehensive innovation ecosystem with a stable regulatory framework.
- Z-T-G 002 Hydrogen: This project explores opportunities for increased hydrogen utilization in Styria. It analyses international hydrogen strategies and evaluates potential future pathways to develop a sustainable hydrogen strategy for the region.
- HI2 Valley: It is a joint hydrogen project involving Upper Austria, Styria, and Carinthia. The project aims to reduce dependence on natural gas imports while creating a robust domestic green hydrogen market, securing industrial jobs, and promoting a sustainable future for Austria and Europe. The EU is supporting it with an initial grant of 20 € million.
- HyCentA: The HyCentA has already been mentioned but for Styria and for the integration of hydrogen in general it is of great importance.

As part of the **Competence Centre testing phase**, **project partners from Croatia and Austria** have developed and implemented tailored materials for various stakeholder groups, ensuring alignment with **regional priorities and sector-specific expertise**. The shared focus was on:

- **Hydrogen Potential Analysis** – Infrastructure readiness and resource availability in Northwest Croatia and Styria
- **Strategic Framework and Market Opportunities** – Policy direction and investment potential
- **Hydrogen Value Chain Development** – From production to application, including key industry players
- **Best Practices and International Models** – Lessons learned from leading hydrogen regions

This structured approach ensures that **hydrogen competence centres are effectively set up**, enabling their **scalability and integration** within the **H2CE Collaboration Platform**. The project's methodology demonstrates how regional **competence centres** can drive **hydrogen innovation, knowledge transfer, and cross-border cooperation**, supporting the long-term development of a sustainable hydrogen economy.

5. Developing transational competence profiles for hydrogen experts

From the inception of the project, we have systematically identified and engaged key stakeholders across Croatia and Austria who are involved in hydrogen research, development, and implementation. This comprehensive network includes regional authorities, private sector companies, academic institutions, policymakers, the Croatian Hydrocarbon Agency, representatives from the non-profit sector, and other relevant actors. Transnational competence profiles for hydrogen experts could be designed to reflect the diverse skills and knowledge required to work in the growing hydrogen sector across various countries. These profiles would need to encompass technical, regulatory, environmental, and economic aspects of hydrogen production, storage, transport, and utilization.

To establish and operate the Hydrogen Competence Centre in Croatia and Austria effectively the profiles could be divided into the following areas:

1. **Technical Competence**
   - **Hydrogen Production Methods:** in-depth understanding of various hydrogen production technologies, such as electrolysis (green hydrogen), steam methane reforming (blue hydrogen), and biomass gasification.
   - **Electrolysis and Fuel Cells:** Expertise in the operation, maintenance, and optimization of electrolysis units and fuel cells.
   - **Hydrogen Storage and Transport:** Knowledge of hydrogen storage methods (e.g. compressed, liquid hydrogen) and distribution infrastructure (pipelines, tankers).
   - **Renewable Energy Integration:** Ability to design and integrate hydrogen production systems with renew sources (solar, wind, hydropower) for green hydrogen.
2. **Regulatory and Policy Knowledge**
   - **National and International Regulations:** Understanding of hydrogen-related policies, certifications, and regulations in different countries, such as safety standards, emission reduction targets, and incentives for green hydrogen projects.
   - **Sustainability Standards:** Knowledge of sustainability certifications and lifecycle assessments of hydrogen production to ensure compliance with carbon reduction goals.
   - **EU Green Deal and Hydrogen Roadmaps:** Awareness of EU-wide hydrogen strategies, such as the EU Hydrogen Strategy and Fit for 55 packages.
3. **Project Management end Economic Competence**
   - **Feasibility and Cost-Benefit Analysis:** Ability to evaluate the feasibility, economic viability, and financial models for hydrogen projects, including investments in infrastructure, production facilities, and R&D.
   - **Supply Chain Management:** Competence in managing and optimizing hydrogen supply chains, including production, storage, and distribution.
   - **Innovation and Market Development:** Understanding the global hydrogen market trends, including the development of new business models, partnerships, and market entry strategies.
4. **Interdisciplinary and Communication Skills**
   - **Cross-Border Communication:** Ability to collaborate across borders with multinational teams and stakeholders in the hydrogen sector, fostering cooperation and knowledge exchange.
   - **Public Awareness and Education:** Skills to communicate complex hydrogen topics to different audiences, from policymakers to the general public, and educate on hydrogen safety potential, and environmental impact.
   - **Stakeholder Engagement:** Engaging with local governments, industry partners, and communities to promote hydrogen solutions and build public trust.
5. **Safety and Environmental Competence**
   - **Hydrogen Safety:** Expertise in the handling, storage, and transportation of hydrogen, including the understanding of safety measures and risk management protocols.

- **Environmental Impact Assessment:** Understanding the environmental impacts of hydrogen production and usage, and the ability to assess and minimize these impacts.

6. **Innovation and Research Skills**
    - **Research and Development:** Expertise in advancing hydrogen technologies through R&D, focusing on improving efficiency, reducing costs, and increasing scalability of hydrogen solutions.
    - **Collaboration with Academic and Research Institutions:** Experience working with universities, research centres, and innovation hubs on hydrogen-related projects and initiatives.

These transnational competence profiles ensure that hydrogen experts can work effectively in the global hydrogen economy, adapting to different regulatory environments, technological advancements, and market needs across various regions. For the areas just mentioned the following responsible or target groups can be defined:

1. **Engineers:** Responsible for the design, development, and optimization of hydrogen production, storage, and distribution systems, with expertise in chemical, mechanical, and electrical engineering.
2. **Technicians:** Skilled in operating and maintaining hydrogen technologies, ensuring that systems function efficiently and safely. They require training in safety protocols and equipment handling.
3. **Researchers and Academics:** Experts focused on driving innovation through research and the development of new methodologies for hydrogen production and utilization, ensuring alignment with the latest scientific advancements.
4. **Policymakers:** Individuals who shape regulatory frameworks and national energy strategies, ensuring that hydrogen initiatives align with European directives and fostering an enabling environment for development.
5. **Project Managers:** Professionals who oversee the execution of hydrogen projects, ensuring that objectives are met on time and within budget while effectively managing resources and stakeholder engagement.
6. **Business Development Specialists:** Focused on creating partnerships and securing funding opportunities, these individuals play a crucial role in the sustainability and growth of hydrogen projects.

Below are the key experts involved in the development of the Competence Centre, who have been supporting our project from the very beginning.

Dr.sc. Vjekoslav Jukić, Head of Sector at Ministry of Economy and Sustainable Development is a key policy maker in the energy sector, playing a crucial role in the development of hydrogen policies and regulatory frameworks in Croatia. As the head of the sector within the Ministry of Economy and Sustainable Development, he has been instrumental in shaping national energy strategies, including the adoption of Croatia's Hydrogen Strategy for 2021–2050. His expertise lies in EU energy policy, strategic planning, and international cooperation, making him a pivotal figure in advancing the hydrogen economy.

Mr Jukić's department is responsible for drafting procedures, regulations, and implementation frameworks that govern hydrogen production, distribution, and integration into the energy system. His direct involvement in policymaking ensures that Croatia aligns with European directives and best practices in the transition to a sustainable energy future. Having direct support from the Ministry is of great importance for projects of this scale, as it facilitates regulatory alignment, funding opportunities, and the overall institutional backing needed to successfully implement hydrogen-related initiatives. His leadership and experience in managing complex governmental projects provide a strong foundation for advancing hydrogen technologies and infrastructure in Croatia.

Assoc.Prof.Dr. sc. Ankica Kovač, Head of Power Engineering Laboratory and Hydrogen and Fuel Cells Laboratory from the University of Zagreb Faculty of Mechanical Engineering and Naval Architecture is the lead expert in the field of green hydrogen in Croatia.

She plays a pivotal role in the development of the Hydrogen Competence Centre, bringing invaluable academic expertise and technical leadership to the project. As a key stakeholder, her involvement provides significant added value, ensuring the centre remains aligned with the latest scientific advancements and industry best practices.

She is head of Power Engineering Laboratory. Prof Kovac holds her Ph.D. in green hydrogen production, i.e. hydrogen production via water electrolysis using solar energy. She is a Guest Editor of the International Journal of Hydrogen Energy. Ankica is the founder of the Regional Hydrogen Energy Conference – RHEC. She designed the first Croatian hydrogen-powered bicycle and installed the first Croatian hydrogen refuelling station. To promote hydrogen transportation, in cooperation with Toyota Croatia Inc., she organized Croatia Mirai Challenge as the road trip from Zagreb to Brussels. She is the project leader of 'Securing electrical energy in the case of climate extremes and natural disasters' within which will be a developed system based on green hydrogen production and usage in fuel cell stack. This project is funded through European Fund for Regional Development. Furthermore, she is the project leader of 'Advanced methods of green hydrogen production and its transportation' funded through the Croatian Science Foundation. As a member of the Executive Committee of The Collaboration Programme on Advanced Fuel Cells, she is the official representative of the Republic of Croatia. Ankica is a member of the Council of the President of the Republic of Croatia for Energy Transition and Vice President of the Croatian Hydrogen Association. She was awarded the Croatian Woman of Influence Award in the category of Leadership and Innovation.

The support of the academic community is of critical importance to the success of the Hydrogen Competence Centre. UNIZG-FSB has been engaged in hydrogen research since as early as 2000, and today, under Prof. Kovač's leadership, it continues to drive innovation in hydrogen technologies. Her extensive expertise in green hydrogen production—particularly hydrogen generation via water electrolysis powered by solar energy—directly informs the strategic direction of the centre. This ensures that the materials and infrastructure being developed in the coming months will effectively address the technological and educational needs of the hydrogen sector.

Prof. Kovač's contributions extend beyond academia into practical implementation and policy influence. She has spearheaded numerous initiatives, including the design of Croatia's first hydrogen-powered bicycle, the establishment of the country's first hydrogen refuelling station, and the organization of the Croatia Mirai Challenge, a hydrogen mobility project in cooperation with Toyota Croatia Inc. She also leads key research projects funded through the European Fund for Regional Development and the Croatian Science Foundation, focusing on securing energy resilience through green hydrogen technologies.

The formal establishment of the Hydrogen and Fuel Cells Laboratory at UNIZG-FSB in January 2025 marks a significant milestone for Croatia's hydrogen ecosystem. This new facility will serve as a cornerstone for research, innovation, and workforce development, directly supporting the Hydrogen Competence Centre's mission. Through her leadership, the centre will benefit from state-of-the-art research capabilities and academic rigor, ensuring that it becomes a leading hub for hydrogen expertise in the region.

One of the key stakeholders from the private sector providing support for the H2CE project **Dr. Danica Maljković** a prominent figure in Croatia's hydrogen sector, bringing over 20 years of experience in the energy industry, with a focus on the hydrogen economy, renewable energy, and energy efficiency. She holds a Ph.D. in Power Engineering and an MBA in Energy Economics. Currently, Dr. Maljković serves as the Chief Technology Officer (CTO) of *Indeloop*, an innovative clean energy startup based in Zagreb, specializing in producing green syngas from organic waste materials. In addition to her role at *Indeloop*, she is a Researcher, Engineer, and Consultant in the Energy and Power Engineering sector, with expertise in hydrogen production, green technologies, innovation for sustainable energy, renewable energy sources, and the circular economy. *Indeloop* is a technology company focused on developing and commercialising innovative systems for hydrogen production. *Indeloop's* main research and development activities are in thermochemical gasification of organic materials for hydrogen production. Furthermore, *Indeloop* is active in developing projects of hydrogen production from electrolysis together with development of photovoltaic and hydro renewable energy projects for coupling with hydrogen electrolysis.

Since 2021, Dr. Maljković has been the President of the Board of the Association for Hydrogen Economy within the Croatian Chamber of Commerce. Her leadership extends to the European level, where she was

appointed Chair of the Clean Hydrogen Partnership Governing Board in October 2024. This partnership, a collaboration between the European Commission, Hydrogen Europe, and Hydrogen Europe Research, supports research and innovation activities in hydrogen technologies across Europe.

Dr. Maljković's extensive experience and leadership positions uniquely position her to significantly enhance the Hydrogen Competence Centre in Croatia. Her deep understanding of hydrogen technologies and regulatory frameworks can guide the centre in developing robust training programs and research initiatives. Her active involvement in both national and European hydrogen organizations ensures that the center's strategies align with current policies and industry trends. Moreover, her network of industry and academic contacts can facilitate valuable partnerships, fostering innovation and knowledge exchange within the centre.

By integrating Dr. Maljković's expertise and leveraging her strategic insights, the Hydrogen Competence Centre can strengthen its role as a leading institution in advancing hydrogen technologies and applications in Croatia and beyond.

Vesna Kučan Polak is the **Director of Business Development and New Technologies at The Croatian Hydrocarbon Agency** where she is a key stakeholder in Croatia's hydrogen economy. In July 2024, Agency introduced the Hydrogen Development and Implementation Plan Study, defining implementation areas and projects related to clean hydrogen, encompassing production, transportation, distribution, utilization, storage, and associated technologies.

Vesna has cultivated a strong collaboration with REGEA and the City of Zagreb, facilitating knowledge exchange and sharing best practices in hydrogen advancements. With over ten years of experience in the renewable energy sector, she has focused the last three years on hydrogen projects. Her career began at a national oil and gas company in research and development, followed by roles in commercial, supply, and logistics operations. Vesna holds a master’s degree in chemical engineering and has pursued postgraduate studies in both chemical engineering and business, equipping her with a robust foundation in technical and business aspects of the energy sector.

As a project and team leader, she has successfully led multidisciplinary teams on various renewable energy initiatives, including biofuels and hydrogen, ensuring effective stakeholder communication and project delivery. With her extensive experience and dedication to advancing hydrogen technologies, Vesna Kučan Polak continues to play a pivotal role in shaping Croatia’s hydrogen economy and developing a Centre of Competence for hydrogen initiatives.

These stakeholders have continuously supported our project activities, fostering a collaborative environment essential for advancing hydrogen initiatives. Additionally, as project partners, REGEA and the City of Zagreb actively participate in their hydrogen-related initiatives, ensuring a mutual exchange of expertise and strengthening synergies across various sectors. This approach reinforces a well-coordinated and strategically aligned effort toward the development and integration of hydrogen technologies in Croatia.

Collaboration with international experts enhances the capabilities of the Hydrogen Competence Centre. Partnerships with institutions from countries such as Austria facilitate knowledge transfer and the sharing of best practices in hydrogen technologies. This collaboration can lead to joint research projects, training programs, and innovative solutions that address the unique challenges of the hydrogen sector in Croatia. As an example of good cooperation, a “Training on hydrogen and fuel cells” that took place last year can be highlighted here. Among others, Ankica Kovač, an expert from HyCentA, and Valentina Đurek from PP 12 were represented.

By leveraging local expertise and fostering partnerships with international experts, the centre will align with global best practices and drive innovation. This integrated approach will yield significant advancements in hydrogen initiatives, supporting Croatia’s strategic goals for sustainable energy development and reinforcing its role in the emerging hydrogen economy.

In Styria, the most important experts in the hydrogen sector were involved in increasing H2 competence. Together with **Martin Sagmeister** from HyCentA (independent H_2 research centres on the TU Graz), which was already mentioned, basic training materials were created for communities and schools. Martin Sagmeister is project manager and senior researcher at HyCentA and conducted the training for KEM managers. Further and future trainings also beyond national borders can be discussed.

Markus Simbürger works at Green Tech Valley (green technology hub) and is primarily active in the networking area. With the HI2 Valley (Hydrogen Industrial Inland Valley) he knows what is happening in Styria and across the federal borders and with a new Valley in the east of Austria, the neighbouring countries of Central Europe will also be included.

Stefan Fink from Energienetze Steiermark GmbH (responsible for the operation, maintenance, and expansion of electricity and gas distribution in Styria) plays a key role in projects integrating green hydrogen into the existing gas infrastructure. One notable example is the “Renewable Gasfield” project, which focuses on the production and utilization of green hydrogen and can be highlighted as a best practice example.

6. Regional H2 Competence Centres: Advancing Hydrogen Innovation in Zagreb and Styria

City of Zagreb is strategically aligning its energy policies with the broader objectives of the energy transition, placing a strong emphasis on hydrogen as a key enabler of decarbonization. A central initiative in this effort is the establishment of a dedicated **One-Stop Shop (OSS)** designed to foster sustainable technologies, with a particular focus on hydrogen. This platform serves as a collaborative hub, engaging academic institutions, businesses, public authorities, and citizens to facilitate the development, deployment, and integration of hydrogen technologies into the regional energy system.

Through a comprehensive suite of activities—including educational programs, advisory services, and technological demonstrations—the OSS provides businesses and the public with essential knowledge on hydrogen as a clean energy solution. A pivotal step in Zagreb’s green mobility transition is the planned deployment of hydrogen-powered buses and the parallel development of hydrogen refuelling infrastructure. These measures align with the city’s overarching objective of achieving climate neutrality by 2030, in accordance with European Union climate policies.

Zagreb’s commitment to hydrogen integration is further reinforced through synergies with renewable energy projects, such as solar power installations and energy efficiency initiatives. These complementary efforts collectively contribute to reducing fossil fuel dependency. To successfully replicate Zagreb’s approach, other regions must not only invest in hydrogen infrastructure but also implement awareness campaigns and educational initiatives targeting both the public and policymakers.

To support this transition, the City of Zagreb offers extensive resources for all interested stakeholders, including structured educational programs and a digital knowledge repository. The OSS will serve as a key facilitator of sustainable development and technological innovation, providing continuous access—24/7—to crucial information, guidance, and expertise. By bringing together stakeholders from diverse sectors, including academia, industry, public institutions, and the general public, the OSS will drive forward the practical implementation of hydrogen technologies.

Recognizing the need for structured expertise and capacity building in hydrogen technologies, the City of Zagreb is developing a Regional H_2 Competence Centre as part of Activity 2.2. This initiative will be housed within the 'Zagreb Green Office,' a dedicated OSS currently being developed to support the city’s sustainability and energy transition objectives. This centralized OSS is a pioneering effort, as no similar

initiative currently exists in Croatia. It aligns with the EU's climate objectives and Zagreb's commitment to achieving carbon neutrality by 2030.

The H_2 Competence Centre will serve as a knowledge and innovation hub, offering a structured framework tailored to regional needs. By adopting a modular approach, it will provide targeted guidance that aligns with the specific opportunities and challenges associated with hydrogen deployment in the region. This strategic initiative will enhance local expertise, foster knowledge sharing, and facilitate the adoption of hydrogen solutions across multiple sectors.

The centre's structure, objectives, and key functions are comprehensively outlined in this report, ensuring a clear roadmap for its successful implementation. By leveraging expertise from municipal offices, research institutions, and industry stakeholders, the Regional H_2 Competence Centre will play a crucial role in advancing hydrogen technology adoption, strengthening cross-sector collaboration, and supporting Zagreb's long-term sustainability goals.

The H_2 Competence Centres will offer comprehensive, structured guidelines through a modular approach tailored to regional specificities. This framework will address the unique opportunities and challenges associated with hydrogen deployment in each region. The structure, objectives, and core functions of the H_2 Competence Centre are detailed in this report.

In **Styria**, there is an understanding of the need for hydrogen for the energy transition, especially in the industrial sector. There are already a number of institutions working on the topic of hydrogen. Especially at a scientific and academic level. But interest is not only great in the industrial sector. Municipalities are also interested in the topic of hydrogen but often don't know how to approach the topic. The training documents that were developed as part of the project are available for this purpose.

In Styria there is the "municipal service", which is commissioned by the state of Styria and is operated and carried out by the Energy Agency of Styria. The municipal service brings certain subject areas closer to the Styrian communities. Municipalities have the opportunity to make inquiries about specific topics via the municipal service. This portal makes it possible to convey topics to interested communities. The municipal service can offer webinars, further trainings or information materials. Information can also be disseminated via the climate and energy model regions or "e5 municipalities" (communities that are committed to energy efficiency and climate protection). The interest in the area of hydrogen is very high, which is why a transfer of information and knowledge is necessary. The training materials provide a basis to rise the H2 competence in Styria and can be passed on to interested communities or schools.

6.1. Physical competence center for Hydrogen in Zagreb

The Physical Competence Centre, also known as the "One-Stop Shop" for Hydrogen and Sustainable Energy, will be located at Maksimirska 5 in the heart of Zagreb, ensuring easy accessibility for all citizens, including individuals with special needs. Positioned on the ground floor, the location is easily reachable by all, including people with mobility challenges. Its proximity to city administration and key administrative centres reflects the City of Zagreb's strong commitment to addressing energy, environmental, and sustainability challenges. By strategically situating the center in such a visible area, the city demonstrates its dedication to advancing the energy transition, supporting decarbonization, and promoting sustainable practices.

The location is highly accessible due to its proximity to major transport lines such as trams and buses, making it convenient for stakeholders, citizens, and businesses to engage with the center. This central position facilitates the organization of events, seminars, and educational programs related not only to hydrogen technologies but also to other green and sustainable initiatives. The center will be a focal point for discussions on a broad range of sustainable energy topics, including the decarbonization of heating and cooling sectors, smart cities, and other key urban projects aimed at promoting sustainability and energy efficiency. By placing the One-Stop Shop in this prominent location, Zagreb seeks to create a symbolic connection between city administration, scientific institutions, and local businesses, reinforcing cooperation

and support for local green initiatives. Citizens will have direct access to information and resources about hydrogen and sustainable energy technologies, thus contributing to raising awareness and fostering public participation in the city's clean energy transition.

Picture 1: Exterior view of the One-Stop Shop

The One-Stop Shop will be designed as a modern and flexible space to provide visitors with a comprehensive understanding of hydrogen solutions and other green technologies. Upon entering the space, visitors will be welcomed at a reception desk, where they can gather basic information about the H2CE project and other sustainability initiatives. A small, comfortable area with a table and chairs will be available for one-on-one consultations and short meetings, allowing for personalized discussions between visitors and project representatives.

A key feature of the center will be the presentation area, capable of accommodating between 10 and 20 people. This area will be divided by a movable partition, allowing flexibility for various uses such as workshops, seminars, and educational presentations. Modern technology will be integrated into the space to support high-quality presentations and interactive educational sessions. Additionally, walls will feature displays showcasing educational content and visuals about energy solutions, sustainability, and decarbonization strategies.

A dedicated exhibition section will allow visitors to experience and explore energy technologies firsthand, with a focus on renewable energy solutions, energy efficiency, and hydrogen technologies. The design of the space will incorporate natural materials and neutral colors to promote simplicity, elegance, and eco-consciousness. The use of existing furniture will be prioritized where possible to expedite the opening process, while carefully selected new elements will enhance both functionality and aesthetic appeal. Green elements, such as plants, will be integrated into the design to further emphasize the ecological focus of the H2CE project.

The goal of the One-Stop Shop is to create a space that is both functional and inspiring—a venue where innovative ideas on sustainability and energy transition can meet practical solutions. The center will play a crucial role in educating citizens and entrepreneurs about hydrogen technologies and broader sustainable energy initiatives, thus contributing to Zagreb's efforts in decarbonizing various sectors of the economy.

Construction of the One-Stop Shop is currently underway, with an anticipated completion date set for early May 2025. Once operational, the center will become a hub for education, information, and collaboration on hydrogen technologies, energy efficiency, decarbonization efforts, and other green projects. In the interim, the City of Zagreb is utilizing the ZgForum as a temporary space to promote hydrogen-related projects and other sustainable energy initiatives.

The ZgForum is a dedicated venue managed by the City of Zagreb, specifically under the City Office for Economy, Environmental Sustainability, and Strategic Planning. It serves as a public communication space, hosting a range of activities aimed at engaging citizens in the city's development. This space is designed to encourage active participation in shaping development policies, engage in public discussions, and facilitate the presentation of key projects related to sustainability and decarbonization.

At ZgForum, the City of Zagreb will present a variety of projects, not limited to hydrogen but also encompassing energy efficiency, smart grids, sustainable urban planning, and the decarbonization of heating and cooling systems. The forum will be an important tool for fostering dialogue and collaboration among citizens, policymakers, and businesses, with a focus on the city's green transition. Through public exhibitions, panel discussions, workshops, round tables, and online presentations, the ZgForum will ensure active citizen involvement in the implementation of key energy projects.

Zagreb is actively leading the way in addressing key sustainability challenges, focusing on decarbonization across sectors such as transportation, heating, cooling, and energy production. The One-Stop Shop for Hydrogen and Sustainable Energy will play a vital role in this effort, offering a central location for citizens, businesses, and stakeholders to learn about and engage with green energy technologies.

The One-Stop Shop will provide a comprehensive range of information on hydrogen technologies, energy efficiency, decarbonization of heating and cooling systems, smart grids, sustainable urban mobility, and other green energy solutions, offering citizens and stakeholders access to the latest developments and best practices in these areas.

These initiatives, in conjunction with the One-Stop Shop and ZgForum, will strengthen Zagreb's position as a leader in sustainable urban development and energy transition. The collaboration between city administration, scientific institutions, and local businesses will be key to ensuring that Zagreb becomes a model city in the green energy sector, making a significant contribution to Croatia's overall decarbonization goals.

In conclusion, the One-Stop Shop for Hydrogen and Sustainable Energy in Zagreb will serve as a critical space for education, engagement, and collaboration on clean energy technologies. Through its strategic location, modern facilities, and broad scope of activities, the center will help guide the city—and the region—toward a sustainable and carbon-neutral future.

6.2. Activities of the physical comptence center in Zagreb

The City of Zagreb is dedicated to driving the energy transition by establishing a Competence Centre – One-Stop Shop – a central hub for education, consultation, and project coordination focused on hydrogen technologies and green energy solutions. This initiative aligns with the EU's climate goals and supports Zagreb's strategy for achieving carbon neutrality by 2030.

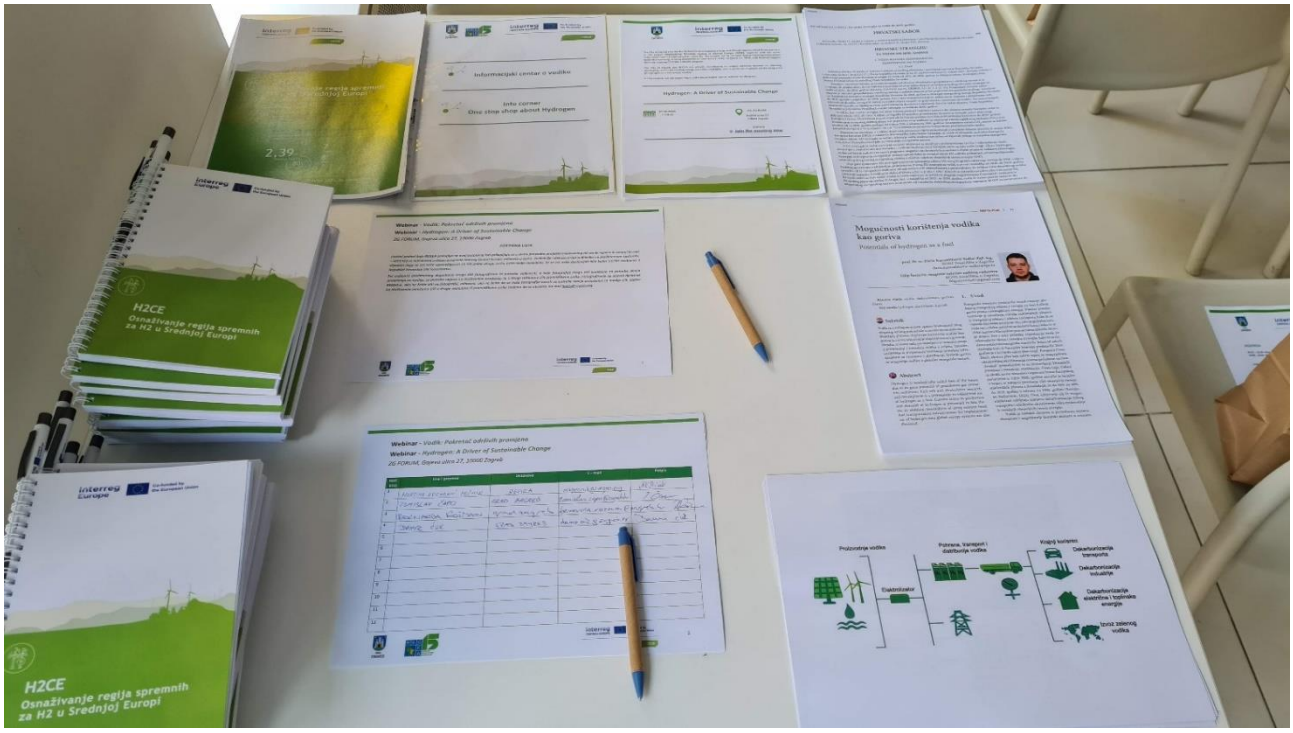
The City of Zagreb's One Stop Shop for hydrogen technologies and green energy was officially launched in **March 2024** at the ZG Forum, serving as an interim location until the permanent One Stop Shop is established at **Maksimirska 51, Zagreb**. This temporary setup has allowed the City of Zagreb to begin the process of knowledge dissemination, stakeholder engagement, and project coordination in the field of hydrogen technologies.

The Hydrogen One Stop Shop has been operating **Monday through Friday, from 9:00 AM to 5:00 PM**, during which time it has been open to the public, businesses, and key stakeholders.

The **Hydrogen One Stop Shop** in Zagreb operates with a dedicated staff member present on-site at all times. Additionally, a representative from the **City of Zagreb's Office for Economy, Ecological Sustainability, and Strategic Planning** is available as needed to provide expert support and assistance to

visitors. This ensures that all inquiries regarding hydrogen technologies, sustainability, and related initiatives are addressed in an informed and efficient manner.

The One Stop Shop serves as a central hub for a wide range of hydrogen-related resources and services, designed to support the city's transition to a sustainable energy future. It houses an extensive collection of materials related to Croatia's hydrogen strategy and its broader environmental goals. Among the resources available are the **Croatian Hydrogen Strategy (2021-2050)** and the **Development and Implementation Plan Study** commissioned by the Croatian Hydrocarbon Agency. In addition, visitors have access to expert reports, brochures, and other educational materials that focus on **the potential of hydrogen technologies for a net-zero future**, as well as valuable resources developed by institutions like the **Styrian Energy Agency** and **HyCentA**.



Picture 1: Materials from the physical Competence Center (One Stop Shop)

Picture 2: Materials from the physical Competence Center (One Stop Shop)

Picture 3: Materials from the physical Competence Center (One Stop Shop)

This centralized repository ensures that all stakeholders, including businesses, citizens, and researchers, have access to essential and up-to-date knowledge, which is crucial for the successful development and implementation of hydrogen-related projects in Croatia. The One Stop Shop provides a wealth of information that is accessible in one place, helping to guide informed decision-making in the hydrogen sector.

Furthermore, the center actively engages with the public through a range of activities, including expert-led consultations, workshops, and information dissemination. The presence of these materials and the operational structure of the One Stop Shop enhance its role as a key player in disseminating hydrogen-related knowledge and fostering collaboration among stakeholders, both locally and internationally.

On average, the One Stop Shop has seen between **20 to 30 visitors per month**, with significant interest from citizens, local entrepreneurs, and public administration representatives. The majority of inquiries were related to **hydrogen in public transport**, **available financial mechanisms for hydrogen projects**, and **how**

hydrogen can be integrated into the energy transition. Stakeholders have shown particular interest in understanding how hydrogen technologies can contribute to **decarbonizing public transport and urban infrastructure**.

The One Stop Shop serves several critical functions for the hydrogen and green energy sector in Zagreb:

1. **Information dissemination** – The centre provides access to a wide range of resources, including brochures, regulatory frameworks, and educational materials related to hydrogen technologies. It also offers an information desk where visitors can receive tailored advice on hydrogen projects.
2. **Workshops & Seminars** – The space hosts regular workshops and expert-led seminars on hydrogen technologies, focusing on practical applications in various sectors, including energy, heating, transport, and industry.
3. **Networking & Collaboration** – The One Stop Shop provides a venue for networking events, panel discussions, and matchmaking between local businesses, researchers, and policymakers.
4. **Consulting services** – Expert consultations on project development, funding options, regulatory compliance, and technical implementation are available to both private and public stakeholders.
5. **Public Awareness & Education** – The centre organizes public exhibitions, demonstrations, and educational initiatives in partnership with local institutions like the University of Zagreb and REGEA, providing citizens with insights into hydrogen's role in sustainable energy.

Building on the testing phase, the future operation of the Hydrogen One Stop Shop in Zagreb will focus on key activities. It will organize workshops on hydrogen production technologies, integration into public transport, and EU regulations and funding. Networking formats such as monthly "Hydrogen Breakfasts" and regular online meetings will connect local and regional stakeholders, while business pitch events will foster innovation and investment in the hydrogen sector.

Collaborations with Styria will involve expert exchanges and joint research projects on hydrogen applications in public transport, heating, and industrial decarbonization. Public engagement will continue with seminars, hands-on demonstrations, and collaborations with academic institutions like the University of Zagreb. The centre will also support businesses by facilitating access to EU funding and connecting them to regional investment platforms. These activities will ensure the continued development of hydrogen technologies in Zagreb, contributing to the city's sustainability and energy transition goals.

By hosting these resources, the Hydrogen One Stop Shop not only strengthens Croatia's hydrogen ecosystem but also serves as an integral part of the national and regional efforts to transition towards a more sustainable and net-zero energy future. This initiative represents a commitment by the City of Zagreb to advance its strategic environmental goals while ensuring that citizens and businesses are equipped with the knowledge and support needed to drive forward innovation and sustainable energy practices.

7. Testing H2 competence centre

Through joint efforts between the City of Zagreb and Styria, a solution was developed and tested in two stages. First, a **hybrid webinar** served as the initial testing phase, where stakeholders engaged in discussions on hydrogen adoption. This allowed for real-time feedback and valuable insights. The second stage of the solution involved integrating the two regional hydrogen competence centres into a central **H2CE collaboration platform**, forming a **pilot action** that connects Zagreb and Styria into a digital network.

The central platform, within **WP3**, will facilitate networking among key public and private stakeholders across nine Central European regions, including local, regional, and transregional actors. It aims to establish H2-ready regions through a comprehensive and interactive platform, promoting collaboration across regions. The platform will engage policymakers, energy utilities, and regional stakeholders, helping them become familiar with the H2CE collaboration framework. This will be achieved through newsletters, online seminars, and questionnaires, evaluating the platform's suitability and acceptance.

Additionally, project partners will leverage their networks to invite other regions across six partner countries to participate, gather feedback, and help refine the platform. The **pilot action** will demonstrate the effectiveness of the solution in integrating the two regional centres into a unified digital platform, serving as the foundation for the broader H2CE collaboration.

This **dual approach**—testing the solution through the webinar and integrating the competence centres into the central platform—supports **Output 3.2**, advancing the hydrogen transition in both Zagreb and Styria while providing a model for future regional collaboration across Europe.

7.1. Findings from the Hydrogen hybrid webinar: Strategic outcomes

The City of Zagreb and the North-West Croatia Regional Energy and Climate Agency (REGEA) held a professional webinar in a hybrid format on the topic: Hydrogen: A Driver of Sustainable Change. The event took place on February 7, 2025 (Friday), at ZG FORUM, Gajeva Street 27, 10000 Zagreb, and 45 people participated online and in person.

As partners in the Empowering H2-ready regions in Central Europe (H2CE) project, funded by the Interreg CENTRAL EUROPE program, the City of Zagreb and REGEA actively contributed to the discussion on energy transition strategies, with a special focus on hydrogen integration as a key energy carrier.

Dr. Valentina Đurek opened the webinar with an in-depth analysis of the hydrogen potential in Northwest Croatia, conducted for the needs of the H2CE project. Her presentation examined the feasibility of hydrogen adoption in Zagreb, Zagreb County, and Krapina-Zagorje County, based on data collected from industry stakeholders, policymakers, and research institutions. The study revealed that 66.7% of stakeholders are actively engaged in hydrogen-related research and innovation, with participation from a diverse range of entities. These include industry stakeholders such as energy companies, transport operators, and manufacturers who are exploring hydrogen as an alternative fuel. Policymakers at the local and national levels are involved in shaping regulations and strategies to facilitate hydrogen adoption. Research institutions and universities contribute through technological advancements, feasibility studies, and knowledge transfer to industry partners. Additionally, public sector organizations, including municipalities and regional energy agencies, are playing a role in promoting infrastructure development and integrating hydrogen into sustainable energy planning. The strong engagement of these stakeholders underscores a growing commitment to advancing hydrogen technology despite challenges related to investment costs, regulatory frameworks, and infrastructure limitations.

Hydrogen is considered a viable alternative fuel, particularly for public transport, logistics, and heavy-duty vehicles, while the energy sector sees it as a potential solution for energy storage and grid balancing. However, she identified significant challenges, including high initial investment costs, regulatory uncertainty, and limited infrastructure for production and distribution. To overcome these barriers, she

emphasized the need for financial support mechanisms, public-private partnerships, policy clarity, and infrastructure expansion, including the development of refueling stations and electrolysis facilities.

After her presentation, Dr. Vjekoslav Jukić from the Croatian Ministry of Economy and Sustainable Development followed with an overview of Croatia's strategic framework for hydrogen development. His presentation positioned Croatia's hydrogen strategy within the broader European Green Deal and REPowerEU initiatives, which aim to achieve carbon neutrality by 2050. He detailed Croatia's Hydrogen Strategy until 2050, adopted in March 2022, which serves as the national roadmap for hydrogen production, storage, and utilization across various sectors, including transport and industry.

Dr. Jukić highlighted the North Adriatic Hydrogen Valley (NAHV) project, a cross-border initiative involving Croatia, Slovenia, and Italy, supported by € 25 million in EU co-financing and over € 200 million in private investments. The NAHV project aims to establish a comprehensive hydrogen ecosystem encompassing production, distribution, and industrial applications. Additionally, he outlined key financial mechanisms supporting hydrogen development in Croatia, including the Recovery and Resilience Plan, the European Regional Development Fund, and the Modernisation Fund.

The presence and support of the Ministry of Economy and Sustainable Development are crucial for advancing hydrogen initiatives in Croatia, ensuring alignment with EU directives and attracting investment. Dr. Jukić's participation in person provided valuable insights and reinforced the government's commitment to fostering hydrogen development. He also praised the temporary One Stop Shop, recognizing its role in streamlining administrative processes and facilitating investment in hydrogen projects.

After the presentations by Croatian experts, we hosted sessions featuring external specialists invited in collaboration with PP4 Energy Agency Styria. With their support and network, we engaged renowned experts from Austria and Italy, who provided in-depth insights and valuable expertise, allowing us to learn how pilot projects are being developed abroad and to explore best practices related to hydrogen from their perspectives.

Markus Simbürger from the Green Tech Valley Cluster in Austria presented the Hydrogen Industrial Inland Valley (HI2) initiative, a large-scale hydrogen valley project spanning Upper Austria, Styria, and Carinthia. With a total investment of € 578 million, the project is set to produce over 10,000 tons of hydrogen annually and integrate it into industrial and mobility applications. His presentation outlined the phased approach to implementation, which includes the development of hydrogen production facilities, underground storage, and distribution networks through pipelines and trailers. He emphasized the importance of coordinated regional efforts, regulatory support, and financial backing in establishing Austria as a key player in the European hydrogen market. The HI2 Valley project exemplifies how regional hydrogen hubs can contribute to broader European energy security and decarbonization goals.

Following the lecture by Mr. Markus, the session continued with a presentation by Assoc. Prof. Ankica Kovač from the University of Zagreb, a pioneering figure in hydrogen development and one of the key contributors to the drafting of Croatia's Hydrogen Strategy.

Prof. Kovač provided a comprehensive analysis of the hydrogen value chain in Croatia, with a particular focus on production, infrastructure, and application. She outlined the strategic evolution of Croatia's hydrogen sector, emphasizing key milestones such as the adoption of the Croatian Hydrogen Strategy until 2050 and the launch of research initiatives supporting green hydrogen production. Additionally, she highlighted ongoing projects aimed at strengthening the national hydrogen infrastructure, including the planned construction of multiple hydrogen refuelling stations, the deployment of electrolysis facilities, and the integration of hydrogen-powered public transport vehicles.

Furthermore, Prof. Kovač elaborated on Croatia's role within the broader European hydrogen refueling network, stressing the importance of research and innovation in securing the long-term sustainability of hydrogen adoption. Her insights underscored the transformative potential of hydrogen in Croatia's energy transition and economic development.

The support of the academic community, particularly from distinguished experts such as Prof. Kovač, is of paramount importance to the H2CE project. Their expertise and research contributions not only enhance the technical and strategic dimensions of the project but also ensure that the latest scientific advancements are effectively integrated into real-world applications. Such collaboration between academia and industry is instrumental in positioning Croatia as a key player in the European hydrogen economy.

Stefan Fink from **Energienetze Steiermark GmbH** introduced the Renewable Gasfield Gabersdorf project, a pioneering initiative focused on integrating hydrogen production with renewable energy sources. The project, which began in 2018 with an investment of € 10.5 million, aims to produce green hydrogen and synthetic natural gas (SNG) using a combination of electrolysis and biogas upgrading. He provided detailed insights into the technical aspects of the project, including the production capacity, hydrogen storage solutions, and the role of the facility in supplying regional industrial consumers. The Gabersdorf facility features an advanced hydrogen refuelling infrastructure, automated trailer filling systems, and a high efficiency methanation plant. The project serves as a best-practice model for hydrogen development in Styria and demonstrates how integrated energy solutions can enhance grid stability and support industrial decarbonization.

The final presentation, delivered by **Matteo Benvenuti** from Codognotto Italia, focused on the **H2MA – Green Hydrogen Mobility for Alpine Region Transportation** project, an initiative aimed at accelerating the adoption of green hydrogen mobility in the Alpine region. The project, which runs from 2022 to 2025, is supported by € 2.27 million in funding and involves key stakeholders from the transport and logistics sectors. His presentation addressed the main challenges in rolling out hydrogen infrastructure, including financial constraints, technical and operational barriers, and regulatory fragmentation. He introduced a GIS-based planning tool developed by H2MA to support decision-makers in optimizing the placement of hydrogen production and refueling infrastructure. The project aims to create transalpine zero-emission routes by synchronizing hydrogen mobility strategies across multiple EU countries. He emphasized the importance of cross-border collaboration, public-private partnerships, and policy alignment in overcoming existing barriers and ensuring the successful deployment of hydrogen mobility solutions.

The webinar provided a comprehensive and insightful discussion on the future of hydrogen in Croatia and neighbouring regions. The presentations underscored the significant progress being made in **hydrogen research, policy development, and infrastructure expansion**, while also highlighting the **challenges** that must be addressed to enable large-scale hydrogen adoption. Key themes included the **need for sustained investment, regulatory clarity, cross-border cooperation, and technological innovation**. With multiple hydrogen projects underway, Croatia and its regional partners are positioning themselves as leaders in the transition toward a hydrogen-based economy.

The webinar served as an essential **platform for knowledge exchange**, showcasing the progress being made in hydrogen research, policy development, and infrastructure expansion while also addressing the challenges that must be tackled for large-scale hydrogen adoption. The event was also a valuable test for the Competence Centre in Zagreb, fostering collaboration between the Energy Agency of Styria, the City of Zagreb, and REGEA. It demonstrated the **importance of structured and interactive webinars where stakeholders can exchange critical information on hydrogen-related developments**. A total of 45 participants attended the webinar, with 19 presents in person and 26 joining online, reflecting strong engagement across different sectors. The added value of this event was evident through the participation of external experts and a representative from the Croatian Ministry of Economy and Sustainable Development, who provided crucial insights into the legislative framework for hydrogen in Croatia. Additionally, the academic contribution from Assoc. Prof. Ankica Kovač further enriched the discussion by emphasizing **research-driven approaches to hydrogen adoption**.

Key stakeholders actively participated in the webinar, representatives from the Croatian Hydrocarbon Agency, which commissioned the Study on the Development and Implementation Plan of Croatia's Hydrogen Strategy until 2050. This study, presented in July 2024, defines the objectives, measures, and implementation dynamics of the Strategy, providing the foundation for meeting obligations under the Renewable Energy Directive. Croatia adopted its Hydrogen Strategy until 2050 in 2022, based on the EU Hydrogen Strategy for a Climate-Neutral Europe, adopted by the European Commission in 2020. The strategy sets a national target for 36.6 % of gross final electricity consumption to come from renewable sources by

2030. Through coordinated efforts and a clear vision, Croatia can successfully transform its economy and ensure a sustainable future for its citizens.

Croatia is one of the first European countries to implement a Hydrogen Strategy, laying the foundation for a range of renewable energy projects. The country's Energy Strategy and Low-Carbon Strategy set a goal of reducing greenhouse gas emissions by approximately 74 % by 2050 compared to 1990 levels. Reaching these objectives necessitates the development of robust infrastructure for hydrogen production, distribution, and supply, as well as incentives for hydrogen-powered vehicles, ships, and trains.

In the electricity sector, hydrogen will play a key role in energy storage, enabling greater integration of renewables. In heating and cooling, hydrogen offers a sustainable alternative to fossil fuels, supported by regulations on renewable gases and their integration into the natural gas transmission and distribution network.

In transport, hydrogen is an alternative and complementary solution to electric mobility, particularly for heavy-duty road transport, urban logistics, passenger and freight rail transport, and maritime, inland waterway, and air transport. While the application of green hydrogen in industrial decarbonization and transport is still in its early stages, projects such as the North Adriatic Hydrogen Valley lay the groundwork for optimism regarding future developments.

Croatia's key hydrogen stakeholders have recognized this event and the temporary One Stop Shop as highly significant initiatives. Their establishment marks a crucial step toward fostering an enabling environment for hydrogen development, aligning national efforts with EU objectives, and reinforcing Croatia's position as a leader in the hydrogen transition.

By leveraging EU funding, fostering public-private partnerships, and ensuring regulatory clarity, these initiatives have the potential to drive Croatia and its regional partners towards a hydrogen-based economy, supporting energy security, carbon reduction, and economic growth in the years to come.

For further inquiries, the presenters provided their contact details, offering opportunities for collaboration and continued dialogue on advancing hydrogen technologies and infrastructure.

Picture 4: Photo from physical location in ZG Forum

Picture 5: Photo from physical location in ZG Forum –Dr. Vjekoslav Jukić, a representative from the Croatian Ministry of Economy and Sustainable Development, delivering a presentation.

7.2. Transferability and integration into the H2CE collaboration platform: Incorporation of Hydrogen competence centers from Styria and Zagreb

The development of the digital platform is underway, in collaboration with the IRVS – Institute for Public Service Development from Slovakia, bringing valuable expertise and best practices. This initiative is part of Work Package 3 (WP3) – Developing the Central Europe Hydrogen Network and Collaboration Platform, which aims to support the hydrogen transition across Central Europe through the integration of regional knowledge and insights.

The platform will feature dedicated sections for the Zagreb and Styria regions, tailored to their specific contexts. It will offer training materials, key documents, and resources related to hydrogen, available in Croatian, German, and English. These will include important policy documents such as the Croatian Hydrogen Strategy (2021–2050), the Development and Implementation Plan, and relevant studies from the Energy Agency of Styria, along with legislative content related to hydrogen transition, providing stakeholders with critical insights into regional strategies and implementation frameworks.

Designed to promote collaboration, knowledge exchange, and innovation, the platform will serve as a centralized hub for stakeholders across the region, including public authorities, energy utilities, and private sector actors. By summer 2025, it will provide a comprehensive overview of hydrogen initiatives, project promotion, legislative updates, and best practices. Stakeholders will benefit from access to essential resources, including financial support information, and will be able to connect through inquiry forms and social media links.

The platform will enhance collaboration between regional actors, supporting the exchange of expertise and facilitating the uptake of the H2 Competence Centre framework across both Zagreb and Styria. It will ultimately strengthen the role of both Zagreb and Styria as key hubs for hydrogen technologies, fostering the transition to a hydrogen-based economy across Central Europe.

Furthermore, the platform will serve as an essential tool for the collaboration between regional actors, connecting stakeholders and creating a collaborative space for sharing information and discussing hydrogen developments in the context of Central Europe. Through the integration of the Zagreb and Styria competence centres, the platform will enhance the uptake and transferability of the H2 Competence Centre framework across these regions and provide a robust platform for ongoing cooperation and innovation in the hydrogen sector.

Conclusion

The testing of regional Hydrogen (H_2) Competence Centres in Croatia and Austria represents a significant milestone in advancing hydrogen-based energy transitions. These centres play a vital role in fostering knowledge exchange, supporting workforce development, and ensuring the effective implementation of hydrogen technologies. Their establishment aligns with the broader objectives of the European Union's Hydrogen Strategy, the European Green Deal, and national decarbonization goals, positioning both countries as key contributors to Europe's hydrogen economy.

The approach to testing these centres was comprehensive and methodical, designed to assess their ability to support regional hydrogen ecosystems effectively. The methodology included structured stakeholder engagement, evaluation of existing capacities, and practical implementation through pilot initiatives. A key aspect of this process was the organization of a hybrid webinar, which brought together policymakers, industry representatives, and academic institutions. This event facilitated discussions on the current state of hydrogen development, regulatory challenges, and opportunities for future investments.

In parallel, a detailed analysis of regional hydrogen infrastructure, policy frameworks, and training programs was conducted. The evaluation focused on institutional support, industry participation, and the availability of structured educational programs. This ensured that the Competence Centres were aligned with the specific needs of each region while maintaining a transnational approach to hydrogen expertise development.

A major outcome of this testing was the establishment of a physical Hydrogen One Stop Shop in Zagreb, providing a centralized hub for education, advisory services, and stakeholder coordination. This initiative was complemented by Austria's well-established hydrogen research and training programs, which continue to drive technological innovation and market deployment. Both countries demonstrated a strong commitment to cross-border collaboration, leveraging their respective strengths to develop a harmonized framework for hydrogen competence development.

Hydrogen Competence Centres are critical in accelerating the hydrogen transition by providing structured education, policy guidance, and technological support. These centres act as knowledge hubs, equipping stakeholders with the expertise needed to implement hydrogen solutions effectively. By facilitating regulatory clarity, promoting research and innovation, and offering specialized training, they bridge the gap between policy objectives and practical deployment.

One of the fundamental contributions of these centres is their role in stakeholder coordination. By fostering collaboration between public institutions, private enterprises, and academia, they create an integrated ecosystem that drives market development. Their ability to provide technical support and strategic insights ensures that businesses and local authorities can navigate the complexities of hydrogen adoption with confidence.

Public awareness and acceptance of hydrogen technologies are also key priorities. Through educational initiatives, public consultations, and demonstration projects, these centres work to build trust and engagement among citizens and policymakers. This aspect is particularly crucial for securing long-term investments and ensuring the social acceptance of hydrogen as a sustainable energy carrier.

Both Croatia and Austria have made significant progress in establishing and testing their Hydrogen Competence Centres. The One Stop Shop in Zagreb has emerged as a pioneering initiative, offering businesses, researchers, and policymakers a dedicated space for accessing hydrogen-related information and support. Through structured training sessions, expert consultations, and networking events, the centre has already contributed to strengthening Croatia's hydrogen ecosystem.

Similarly, Austria's extensive research institutions and industry collaborations have reinforced its position as a leader in hydrogen innovation. The presence of dedicated research hubs, specialized training programs, and large-scale pilot projects has enhanced the country's capacity to integrate hydrogen into various

sectors. The close cooperation between Austria and Croatia has enabled the exchange of best practices, ensuring that both countries benefit from a shared pool of expertise and resources.

The successful testing of these competence centres underscores the need for continued investment in hydrogen education, infrastructure, and regulatory frameworks. To maximize their impact, future efforts should focus on scaling up the One Stop Shop model, expanding the network of competence centres, and integrating them into broader European initiatives. Enhancing cross-border cooperation will be essential for aligning national strategies with EU policies, facilitating knowledge transfer, and strengthening the regional hydrogen economy.

Financial support mechanisms should be reinforced to encourage innovation and infrastructure development. Access to EU funding programs such as Horizon Europe and the European Regional Development Fund will be critical in sustaining long-term growth. Additionally, streamlining regulatory processes and simplifying approval mechanisms will accelerate project implementation and attract private sector investments.

Public-private partnerships will play a central role in driving market adoption. By fostering collaboration between governments, industry stakeholders, and research institutions, these partnerships will facilitate the commercialization of hydrogen technologies and enhance their integration into existing energy systems.

The Hydrogen Competence Centres in Croatia and Austria have demonstrated their potential to serve as catalysts for the hydrogen transition. Their ability to provide education, policy support, and technological expertise ensures that regional stakeholders are well-equipped to navigate the evolving hydrogen landscape. The One Stop Shop in Zagreb has set a strong precedent for structured stakeholder engagement, while Austria's research and training initiatives continue to contribute to advancements in hydrogen technology.

The integration of these competence centres into the H2CE Collaboration Platform will further strengthen their role in Central Europe's hydrogen development. Beyond their physical presence, these centres will be digitally embedded within the platform, providing an interactive and continuously updated knowledge base for stakeholders. This digital expansion will enable broader access to training resources, policy guidance, and collaboration opportunities, ensuring that expertise in hydrogen technologies is readily available across borders. By maintaining a shared commitment to innovation, cooperation, and capacity building, Croatia and Austria are laying the foundation for a sustainable hydrogen economy that aligns with European climate goals. Continued investment and collaboration will be key to ensuring that these centres remain at the forefront of Europe's clean energy transition.

Annexes

- **Presentation from the hybrid webinar**
- **Materials of the One Stop Shop**