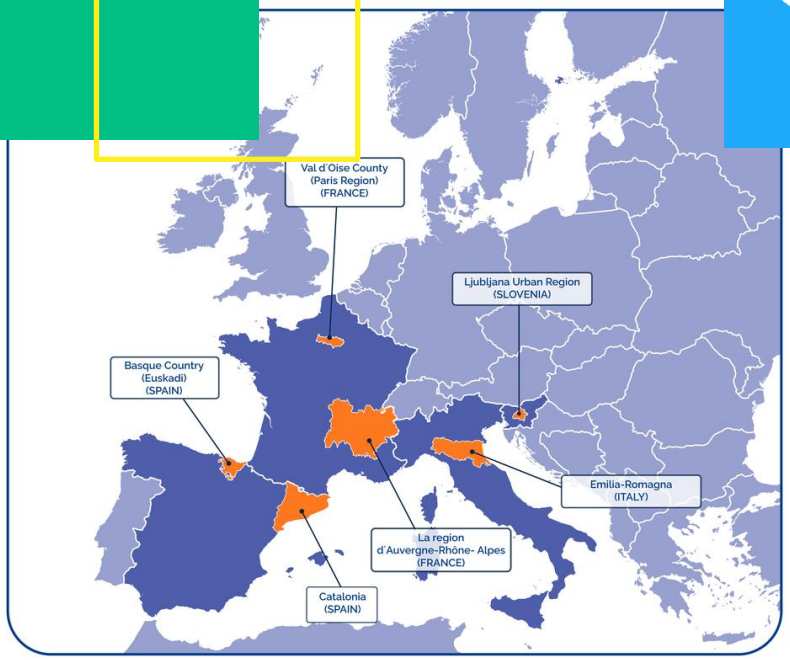
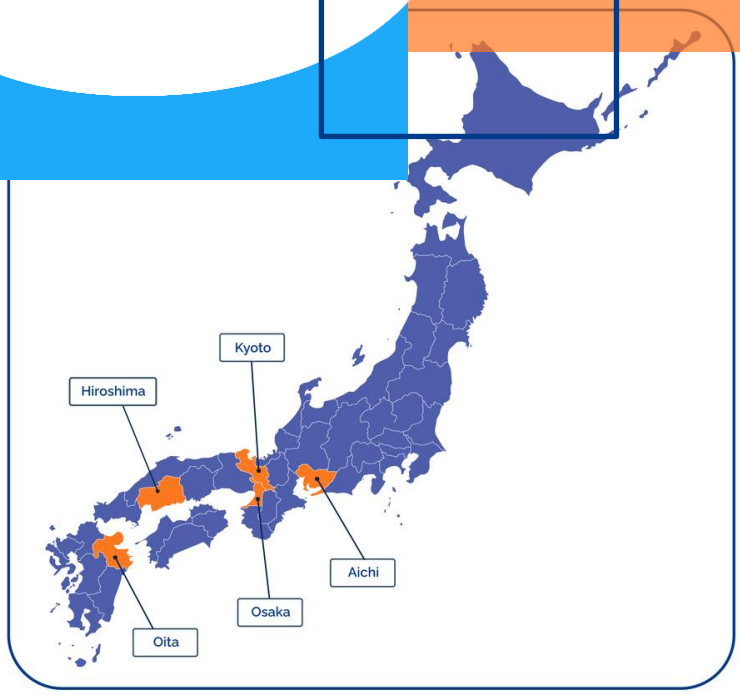
THEMATIC CLUSTER CASE STUDY

No.1

Hydrogen

EU-Japan Region to Region Innovation Cooperation





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Hydrogen

Hydrogen projects in EU regions and Japanese prefectures represent significant steps toward achieving carbon neutrality and advancing sustainable energy solutions. Both are actively developing policies and infrastructures to promote hydrogen use, with a focus on green hydrogen. Establishing hydrogen supply chains is key, and both regions can make significant contributions, particularly in the areas of technology, infrastructure development, and the international exchange of good practices. Collaboration between EU regions and Japanese prefectures on hydrogen projects offers substantial mutual benefits, including economic growth and environmental improvements.

EXECUTIVE SUMMARY

This collaboration between EU regions and Japanese prefectures marks a major advancement in energy transition, decarbonization, and economic growth through the promotion and deployment of hydrogen. Both the EU and Japan are deeply engaged in integrating hydrogen technology into their energy transition strategies. In the case of the EU, this is especially notable after Russia's invasion into Ukraine promoted a transition to alternative energy sources in the EU, and after the rapid growth of electrolysis technologies in hydrogen production. Both the EU and Japan are formulating policies and building infrastructure designed to foster the adoption of hydrogen, especially green hydrogen. Central to these efforts is the establishment of hydrogen supply chains, where both regions are making

significant contributions. Their focus extends to the technological sphere, infrastructure enhancement, and the deployment of hydrogen-powered innovations, such as fuel-cell vehicles.
The EU's strategy is closely aligned with its climate and energy policies, focusing on green hydrogen production within its renewable energy framework. Conversely, Japan prioritizes technological innovation, particularly in fuel cell technologies and the application of hydrogen in mobility. Investment in hydrogen technologies is robust in both regions, with the EU allocating funds through various regional and pan-European programs, while Japan channels investment primarily through national projects and the private sector. Approaches to infrastructure development differ: the EU aims to integrate hydrogen into its existing energy systems, whereas Japan focuses on building new, specialized hydrogen infrastructure.
This collaborative effort underscores the commitment of both the EU and Japan to hydrogen as a key energy source, reflecting their distinct policy, economic, and technological landscapes,

MAIN CHALLENGE AND SOLUTION

Each of the EU regions and the Japanese prefectures participating the EU-Japan Region-to-Region Innovation Cooperation has its own set of challenges and has taken commensurate measures for promoting the use of hydrogen. The distinctive activities in each region / prefecture is implemented by the plans and projects listed in the table below.

Initiatives in EU Regions	
Auvergne-Rhone-Alpes, France	Zero Emission Valley (ZEV) Project aims to deploy fuel cell vehicles and hydrogen stations for its goal to build the largest hydrogen mobility network in Europe. Hympulsion is a public private partnership tasked with installing and operating hydrogen refueling stations.
Basque Country, Spain	Basque Hydrogen Corridor (BH2C) is an initiative focusing on the development of a hydrogen production, distribution, and consumption ecosystem for industrial use. It aims to leverage the Basque Country's industrial and technological capabilities in establishing a sustainable hydrogen economy.
Catalonia, Spain	Hydrogen Valley of Catalonia is led by the Department of New Technologies, aiming to establish a new society and economy based on green hydrogen.
Emilia Romania, Italy	Offshore plants for green power production and agri-solar plants are actively promoted to harness green power production through wind, floating photovoltaic (PV), and hydrogen (H2) technologies.
Ljubljana Urban Region, Slovenia	North Adriatic Hydrogen Valley (NAHV) project is led by Holding Slovenske Elektrarne (HSE), the largest electricity producer and trader in Slovenia, supported by the Horizon Europe programme
Val d'Oise, France	"Hydrogen Airport" Joint Venture is promoted by Groupe ADP, in collaboration with Air Liquide. Hydrogen Pipeline Study between Paris-CDG and Paris-Orly Airports is conducted. SAF, including hydrogen, is anticipated as one of the alternatives to fossil fuel in ground operations and aircraft.

Initiatives in Japanese Prefectures	
Aichi	Aichi Low-carbon Hydrogen Supply Chain 2030 Vision is an initiative to realize a hydrogen-based society across the entire region through coordinated efforts among

	various stakeholders. There are hydrogen filling station and hydrogen fuel cell vehicles in Chubu International Airport
Osaka	The H_2Osaka Vision 2022 aims to leverage the upcoming World Expo 2025 in Osaka, Kansai, to enhance collaboration among industry, academia, and government. In Kansai International Airport, hydrogen fueling stations are invested and hydrogen fuel cell forklifts are deployed.
Oita	Green hydrogen production projects using geothermal power are undertaken.

In both the EU and Japan, significant progress is being made in technological and infrastructure development related to hydrogen. In Japan, emphasis is placed on the use of hydrogen in the mobility sector, particularly with fuel cell vehicles, alongside developing the necessary infrastructure to support this. Conversely, Europe is advancing towards the production of green hydrogen, leveraging renewable energy sources and focusing on establishing comprehensive supply chains that incorporate this sustainable approach. While the strategies differ between the EU and Japan, the mutual exchange of knowledge and good practices is proving to be immensely beneficial for both. This collaboration highlights the diverse yet complementary pathways each is taking towards a hydrogen-driven future.

RESULTS AND IMPACT

In November 2022, delegations from six EU regions, divided into two groups, visited five Japanese prefectures. This was followed in June 2023 by a reciprocal visit, during which representatives from five Japanese prefectures, grouped flexibly, toured six EU regions. These visits included comprehensive tours of various initiatives on hydrogen and fostered productive meetings and discussions. The sites visited in Japan were mostly demonstrations of technology for end-use, while those visited in the EU were mostly on technology on hydrogen production.

The delegations from the EU regions visited key sites in Japan, including Chubu International Airport in Aichi and Kansai International Airport in Osaka. They observed hydrogen refueling stations, fuel cell vehicle operations (such as forklifts), and a green hydrogen production plant utilizing geothermal power in Oita. Conversely, the representatives from the Japanese prefectures focused on European hydrogen initiatives during their visit. They engaged in presentations and discussions on projects like the Zero Emission Valley in Auvergne-Rhone-Alpes, the Hydrogen Corridor in the Basque Country, Catalonia's Hydrogen Valley, and the Hydrogen Airport in Val d'Oise. Additionally, they visited a hydrogen refueling station in Auvergne-Rhone-Alpes.

These reciprocal visits were highly beneficial, offering opportunities for direct observation of innovative practices at each facility. They also significantly enhanced interpersonal relations and led to the formation of new partnerships among research institutions and companies, paving the way for future collaboration in hydrogen technology and infrastructure development. The importance of international collaboration is that it could lead to a harmonization of certifications and regulatory frameworks, that would eventually develop international markets.

Fig.1 Toyota's Fuel-Cell Vehicle "Mirai" and a hydrogen refueling station in Chubu International Airport, Aichi Prefecture

Fig.2 A Fuel-Cell cell vehicle (forklift) in Chubu International Airport, Aichi Prefecture

Fig.3 Green Hydrogen Plant using geothermal energy, Oita Prefecture

Fig. 4 Hymulsion's FC charging station, Auvergne Rhone Alpes

LESSONS LEARNED

The collaboration between EU regions and Japanese prefectures in promoting hydrogen use and deployment marks a significant stride in energy transition, decarbonization, and economic growth. Here are their key lessons and insights:

Focus: In the EU, hydrogen strategy is intricately woven into broader climate and energy transition policies, with a special emphasis on green hydrogen production as part of its renewable energy strategy. Conversely, Japan zeroes in on technological innovation, focusing particularly on fuel cell technologies and hydrogen's application in mobility.

Funding and Investment: Both regions demonstrate strong investment in hydrogen technology. The EU typically channels funds through a variety of regional and pan-European programs. This has led to equity investment for some startups. Japan, on the other hand, primarily steers investments through national projects, complemented by significant private sector involvement, who are mainly incumbents. The difference in the size of the projects between the EU and Japan, seems to depend on the scale of investment, with those of the EU being substantially larger than those of Japan.

Infrastructure Development: Both regions are committed to infrastructure development, albeit via differing routes. The EU aims to seamlessly integrate hydrogen into its existing energy systems. In contrast, Japan leans towards the creation of new, specialized hydrogen infrastructure.

Supply chain: To support businesses establish a low-emission hydrogen supply chain, Aichi Prefecture established a certification system that shows if carbon emissions generated during production and transportation are less. Such certification systems, standards, regulations that address the environmental attributes of hydrogen are very important for further global dissemination, and need to be mutually recognized among different countries.

Training: In the EU, there is interest in hydrogen training programs. For example, vocational training of engineers, programs designed to promote R&D in the academia. There is, however, more room for programs that would enhance citizen understanding towards a hydrogen-based society.

In summary, while both the EU and Japan are dedicated to integrating hydrogen into their energy strategies, their varied approaches mirror their unique policy environments, economic frameworks, and technological emphases

THE IURC PROGRAMME

The International Urban and Regional Cooperation (IURC) programme enables cities in different global regions to link up and share solutions to common problems. It is part of a long-term strategy by the European Union to foster sustainable urban development in cooperation with the public and private sectors, as well as representatives of research and innovation, community groups and citizens. Through engaging in IURC, cities will have the chance to share and exchange knowledge with their international counterparts, building a greener, more prosperous future.

The IURC programme is an opportunity for local governments to learn from each other, set ambitious targets, forge lasting partnerships, test new solutions, and boost their city's international profile. Its activities will support the achievement of policy objectives as well as major international agreements on urban development and climate change, such as the EU Urban Agenda, the UN Sustainable Development Goals, and the Paris Agreement.

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