Geomap Manual

April 2025

Disclaimer

The aim of this manual is to provide comprehensive guidelines on the functionality of the **geomap tool**, its practical applications, and its value in exploring the European hydrogen market. Developed by the European Hydrogen Observatory (EHO), the geomap is a customizable and interactive tool designed to consolidate and visualize hydrogen infrastructure data, offering users a valuable resource for strategic planning, market analysis, and decision-making in the hydrogen sector.

The data in the geomap is based on the individual datasets of the EHO on hydrogen production, end-use, pipelines and refuelling stations (HRS). The authors believe that this data comes from reliable sources, but do not guarantee the accuracy or completeness of this information.

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1.0	April 2025	In this version, the data represent the situation as of September 2024 for hydrogen production, consumption, pipelines and refuelling stations.

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List of abbreviations

Abbreviation	Definition
CCS	Carbon Capture and Storage
DSOs	Distribution System Operators
EHO	European Hydrogen Observatory
EU27	The 27 countries of the European Union
EFTA	European Free Trade Association (Iceland, Liechtenstein, Norway and Switzerland)
HRS	Hydrogen Refuelling Station
LCOH	Levelized Cost of Hydrogen
LSOs	LNG System Operators
SMR	Steam Methane Reforming
SSOs	Storage System Operators
TSOs	Transmission System Operators

Overview

In the transition towards a sustainable energy future, having a clear overview of the entire hydrogen value chain is essential for its successful deployment. Understanding where and how hydrogen is produced, transported, stored, and consumed helps stakeholders make informed decisions, plan infrastructure, and identify opportunities for investment. The ability to analyse hydrogen production facilities, refuelling stations, pipelines, and end-use applications in a structured and accessible way is crucial for accelerating the hydrogen economy.

The geomap, along with the individual maps developed by the European Hydrogen Observatory, are interactive tools designed to support this transition by visually mapping the European hydrogen market. They provide users with key data on hydrogen infrastructure, allowing them to focus on specific parts of the value chain, such as only hydrogen production, or gain a broader perspective by integrating multiple stages of the value chain. The tools allow cross-country comparisons, helping stakeholders assess the status of hydrogen projects across different regions in Europe.

This report serves as a guide to using the geomap, explaining its features and how users can leverage its insights. Additionally, it provides a link to the individual maps, specifying their relevance based on the user needs or area of focus. The data presented in this report is based on the individual datasets of the EHO on hydrogen production, end-use, pipelines and refuelling stations (HRS) as of September 2024. The interactive geomap tool can be accessed on the European Hydrogen Observatory website.

The first chapter introduces the geomap, outlining its purpose, key benefits, and core functionalities. It provides an overview of the tool's interface, explains the available filter options, and guides users on how to navigate and utilize the tool effectively.

The second chapter explores the individual interactive maps available for hydrogen production, pipelines, refuelling stations, and consumption, linking them to the underlying data collection methodology. It details the information presented in each map and explains how users can analyse and compare hydrogen infrastructure across different regions based on the datasets that underpin each segment of the value chain.

The third chapter showcases use cases that demonstrate the geomap's practical applications. These examples highlight how users can explore hydrogen infrastructure across Europe, supporting informed decision-making and strategic planning.

Table 1 provides an overview of the use cases examined.

Use cases overview

Table 1. Overview of use cases.

Use case	Focus	Parts of the value chain considered	Country
Investigating a single part of the value chain			
Use case 1	Finding H_2 production facilities in southern Italy	Production	Italy
Mapping existing hydrogen infrastructure for finding clean hydrogen infrastructure opportunities			
Use case 2	Case study Rotterdam area	Entire value chain	Netherlands
Use case 3	Case study Marseille area	Entire value chain	France

01

Introduction

Introduction

This chapter introduces the geomap concept, highlighting its objective and key benefits for users. It also provides an overview of the geomap tool, breaking down its interface and functionalities, and explains the various input data options available, offering a comprehensive guide to utilizing the tool effectively.

1.1. Geomap concept

In the constantly changing realm of clean energy, the pursuit of sustainable alternatives to traditional fossil fuels has become increasingly important. Hydrogen, often seen as the fuel of the future, has attracted considerable interest. Nevertheless, to develop clean hydrogen infrastructure, it is essential to provide tools that enhance understanding of the existing production processes, distribution infrastructure and end-use applications. This is the objective for which the geomap was created.

The geomap is a customizable and interactive tool developed by the European Hydrogen Observatory (EHO) that allows to explore the existing European hydrogen infrastructure. It offers details on the location and main attributes of hydrogen production plants, pipelines, refuelling stations and end-use applications. By providing this data, the geomap is designed to foster collaboration between production, distribution, and end-use stakeholders.

Next to the geomap that includes all parts of the value chain, the EHO also offers various interactive individual maps that focus only on one part of the value chain: hydrogen production, hydrogen pipelines and storage, hydrogen refuelling stations, and hydrogen demand. We recommend using these individual maps when you are focusing on only one part of the value chain, since they give a more focused perspective.

For a broader understanding of these datasets and further insights into the hydrogen market, please refer to the European Hydrogen Observatory (EHO) report "The European hydrogen market landscape".

This manual focuses on the functionalities of the geomap, and its connection to individual maps, demonstrating their practical applications and value as critical resources for screening the existing hydrogen infrastructure in Europe.

1.2.

Geomap overview and functionalities

This section provides an overview of the geomap interface and key functionalities. As shown in Figure 1, the geomap is an intuitive and interactive tool designed to enable users to explore, filter, and analyse data on the European hydrogen market. Covering the entire EU27, EFTA, and the UK, the geomap presents hydrogen infrastructure on a plant-by-plant basis, offering a detailed view of the sector.

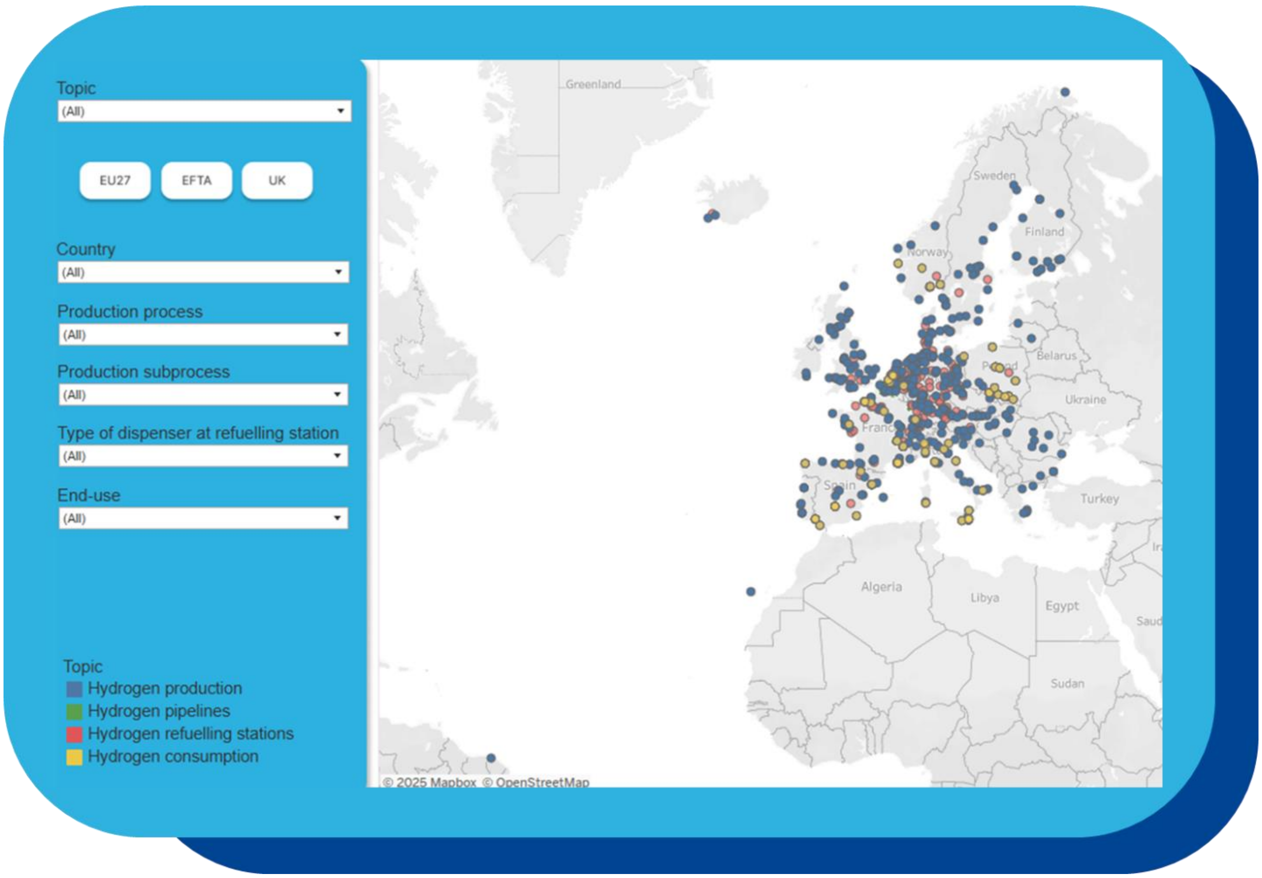


Figure 1. Geomap interface.

One of the main features of the geomap is its filtering panel on the left, which allows users to customize their view based on specific aspects of the hydrogen value chain. Users can choose to see data on hydrogen production, refuelling stations, pipelines, and/or end-use industries. The tool also enables filtering by country group and country, making it easy to focus on regional infrastructure. Additionally, users can refine their search further, for example, by selecting different hydrogen production processes and sub-processes, dispenser types at refuelling stations, or specific industrial uses like ammonia, methanol, refining, and chemicals. The information behind these filters is detailed in Table 2.

Table 2. Geomap filter categories and selection options.

Filter categories	Selection options
Topic	Allows a selection of 4 parts of the value chain: production, pipelines, end-use and HRS.
Country group	Allows a selection of 3 different country groups: EU27, EFTA and UK.
Country	Allows a selection of 32 different countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Iceland, Liechtenstein, Norway, Switzerland and the UK.
Production process	Allows a selection of 4 hydrogen production processes: reforming, reforming with carbon capture (CC), by-product and water electrolysis (both existing plants and plants under construction).
Production subprocess	Allows a selection of 4 subprocesses involved in by-product production: chlor-alkali, ethylene, sodium chlorate and styrene.
HRS dispenser type	Allows a selection of 3 specific dispenser types for the hydrogen refuelling stations: 700 bar for cars, 350 bar for cars, and 350 bar for heavy-duty (HD) vehicles.
End-use	Allows a selection of 11 end-use applications of hydrogen: ammonia production, methanol synthesis, refining, other chemical processes and emerging applications such as blending in natural gas pipelines, e-fuels production, industrial heat, residential heat, power generation, mobility, and steel.

Additionally, the geomap offers customizable map layers, allowing users to activate or deactivate specific elements of the hydrogen market to tailor their analysis. Clicking on specific locations within the map generates detailed data pop-ups, displaying key information such as facility type, operational status, and technical specifications.

Users can follow the step-by-step guide in Figure 2 to learn how to customize their search by applying filters effectively. Figure 3 provides a visual representation of the available filters in geomap, illustrating how users can refine their analysis by selecting different parts of the hydrogen value chain.

These features make the geomap a valuable resource for policymakers, industry professionals, researchers, and investors who require accurate and accessible data to support decision-making, strategic planning, and market analysis. The following sections will provide a more detailed explanation of each functionality, guiding users on how to explore and utilize the geomap effectively.

Figure 2. Step-by-step guide to apply filters and customize data view in the geomap.

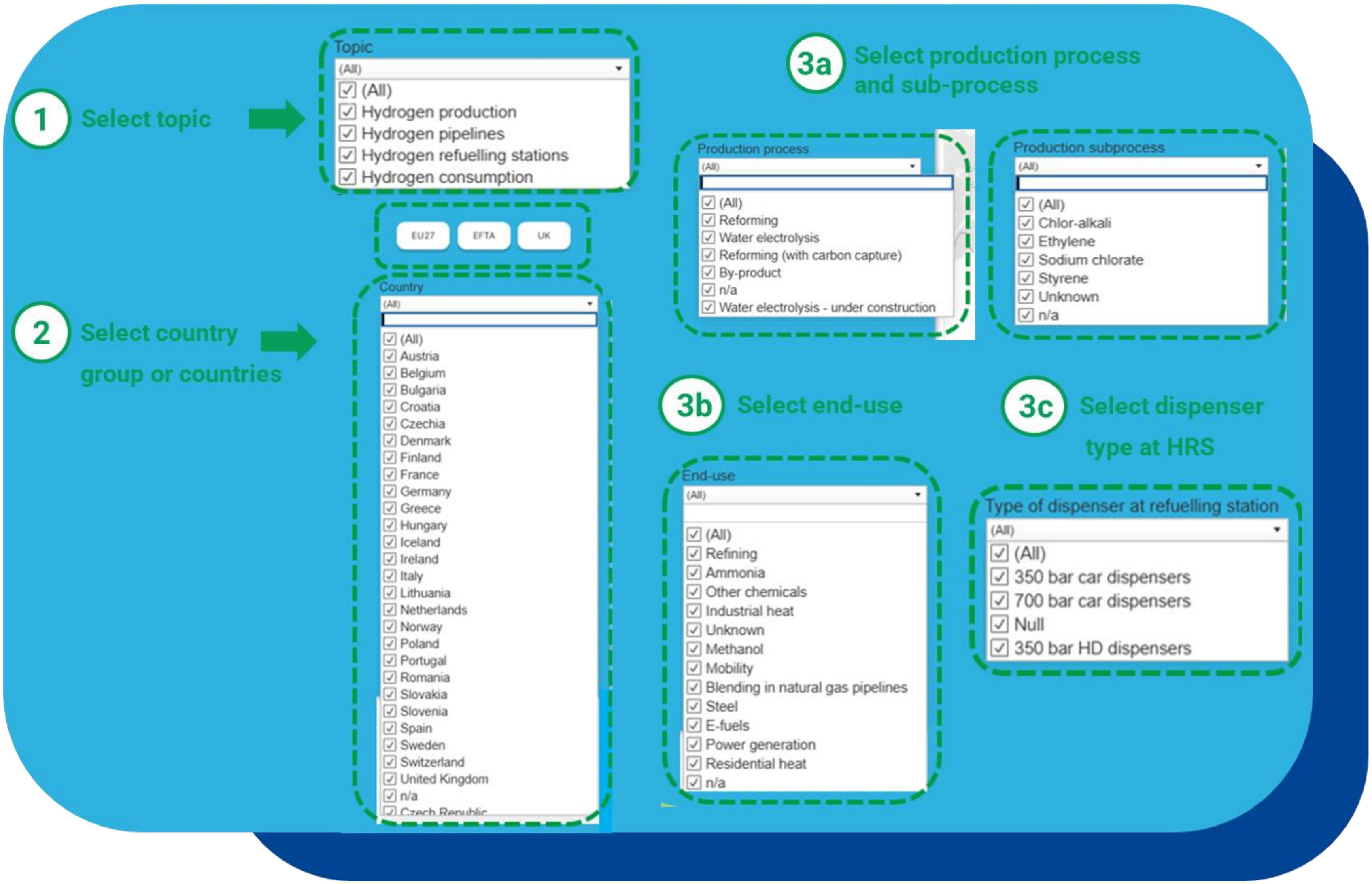


Figure 3. Visual representation of the available filters in geomap.

02

Methodology

Introduction

This chapter explores location-specific data that the EHO has available across the different stages of the hydrogen value chain, detailing the methodology and data sources behind each of the datasets. It also examines how the geomap is connected to the individual maps for each part of the value chain, providing users with detailed, location-level insights. These insights can be effectively used to guide decision-making in hydrogen deployment, infrastructure development, and strategic planning.

2.1.

Hydrogen production

The geomap provides insights on hydrogen production at a plant-by-plant level, offering detailed information on individual facilities and allowing users to explore key attributes of each facility.

This dataset is based on the individual datasets of the European Hydrogen Observatory (EHO) on hydrogen production, as of September 2024. The data reflects the situation of 2023 and was estimated by Hydrogen Europe based on a set of assumptions[1] and verified with industry stakeholders. Estimates are made where exact data is unavailable, ensuring the most accurate representation of hydrogen production in Europe.

While geolocation data for all hydrogen production facilities across Europe is available, plant-specific information on production capacity, annual output, and end-use for conventional (fossil-based) hydrogen production facilities is included only for six countries: France, Italy, Netherlands, Norway, Poland, and Spain. Where exact production capacities are confidential, manual adjustments have been made to align with publicly available data or approximate values. Additionally, to limit the data research efforts of the data provider, only water electrolysis installations with a production capacity of at least 0.5 MWel are visualized in the geomap.

The available data parameters for each plant are presented in Table 3.

[1] For a detailed overview of the assumptions, please refer to the relevant page of the hydrogen production.

Table 3. Available data on hydrogen production plants in the geomap.

Attribute	Description
Facility name	Name of the hydrogen production plant.
Country & city	Location details, including exact geographic coordinates.
Production capacity	Available production capacity at the facility.
Production method	Type of hydrogen production (reforming, reforming with carbon capture, by-product production and water electrolysis).
By-product source	If applicable, specifies the source for by-product production, either ethylene, styrene, chlor-alkali or sodium chlorate.
End-use application	Sectors where hydrogen is used (e.g. refining, ammonia, methanol, power generation, etc.).

In addition to the geomap, two individual hydrogen production maps are available: one presenting aggregated national data on total hydrogen production across Europe (EU27, EFTA, and the UK) and another displaying plant-by-plant data with additional details.

While the geomap allows a broad view of all parts of the hydrogen value chain, the hydrogen production plants are all displayed in a single colour (blue). Although it allows filtering by production process, it does not visually differentiate processes by colour. In contrast, the individual plant-by-plant hydrogen production map does offer this more granular view, displaying the production processes in different colours simultaneously. Additionally, it includes extra filtering options, such as the ability to set a range for production capacity, providing a more detailed and interactive analysis.

Users seeking a high-level overview of total production trends should make use of the aggregated map, whereas those interested in detailed production plant level data, should explore the individual plant-by-plant map. For a more comprehensive analysis of how hydrogen production connects with other parts of the value chain, the geomap is the recommended option. Figure 4 compares these maps, highlighting their distinct levels of detail and functionality. The individual hydrogen production maps are available at [Hydrogen Production | European Hydrogen Observatory.]

Figure 4. Comparison of geomap and individual hydrogen production maps.

2.2.

Hydrogen pipelines

The geomap provides insights into the existing hydrogen transmission infrastructure, offering detailed information on individual pipelines and enabling users to explore key attributes at a location-specific level.

This dataset is based on the individual datasets of the EHO on hydrogen pipelines, as of May 2024. The data was collected through desk research conducted by Deloitte and represents operational hydrogen pipelines across Europe.

Mapping pipelines enables users to understand how hydrogen is transported across regions, identifying key corridors for distribution and potential bottlenecks.

The available data for each pipeline is presented in Table 4.

Table 4. Available data on operational hydrogen pipelines in the geomap.

Attribute	Description
Pipeline length	Total length of the hydrogen pipeline (in kilometers, km).
Pipeline owner	Entity responsible for owning and operating the pipeline.
End-users	Industries utilizing the transported hydrogen (chemicals, petrochemicals, or a combination of both).
Pipeline typology	Type of pipeline infrastructure (only dedicated hydrogen pipelines are represented in the maps of EHO).
Capacity	Maximum hydrogen flow capacity through the pipeline (in cubic meters per hour, m^3/h).
Pipeline diameter	Width of the pipeline (in millimeters, mm), indicating capacity for hydrogen transport.
Pipeline pressure	Operating pressure of the pipeline (in bars, bar), determining hydrogen flow efficiency.
Status	Current stage of the pipeline (only operational hydrogen pipelines are represented in the maps of EHO).
Start and end location	Geographic details of the pipeline route, including origin and destination points.

In addition to the geomap, an individual hydrogen infrastructure map is available, offering a more detailed breakdown of pipeline networks and storage facilities. The geomap presents the location and key attributes of operational dedicated hydrogen pipelines across Europe, providing a high-level overview of the infrastructure. Meanwhile, the individual map categorizes pipelines by infrastructure type, distinguishing end-users such as chemicals, petrochemicals, or a combination of both. Additionally, this map integrates information on hydrogen storage by type, covering depleted gas fields, hard rock caverns, and salt caverns.

Users seeking a broad geographical overview of existing pipeline locations and main attributes, in combination with other parts of the value chain, should refer to the geomap. Those requiring detailed insights only into existing pipelines and storage locations should explore the individual hydrogen pipeline and storage map.

It is also recommended to explore the [hydrogen infrastructure map] for a full-scale understanding of Europe's planned hydrogen infrastructure. The hydrogen infrastructure map, developed by a collaboration of the European hydrogen backbone initiative and key industry stakeholders including transmission system operators (TSOs), distribution system operators (DSOs), storage system operators (SSOs), and LNG system operators (LSOs), consolidates a broad range of planned hydrogen projects, including transmission and distribution pipelines, storage facilities, terminals, ports, and production and end-use locations.

Figure 5 compares these maps, highlighting their distinct levels of detail and functionality. The individual map on hydrogen pipelines and storage is available at [Hydrogen Pipelines and Storage | European Hydrogen Observatory].

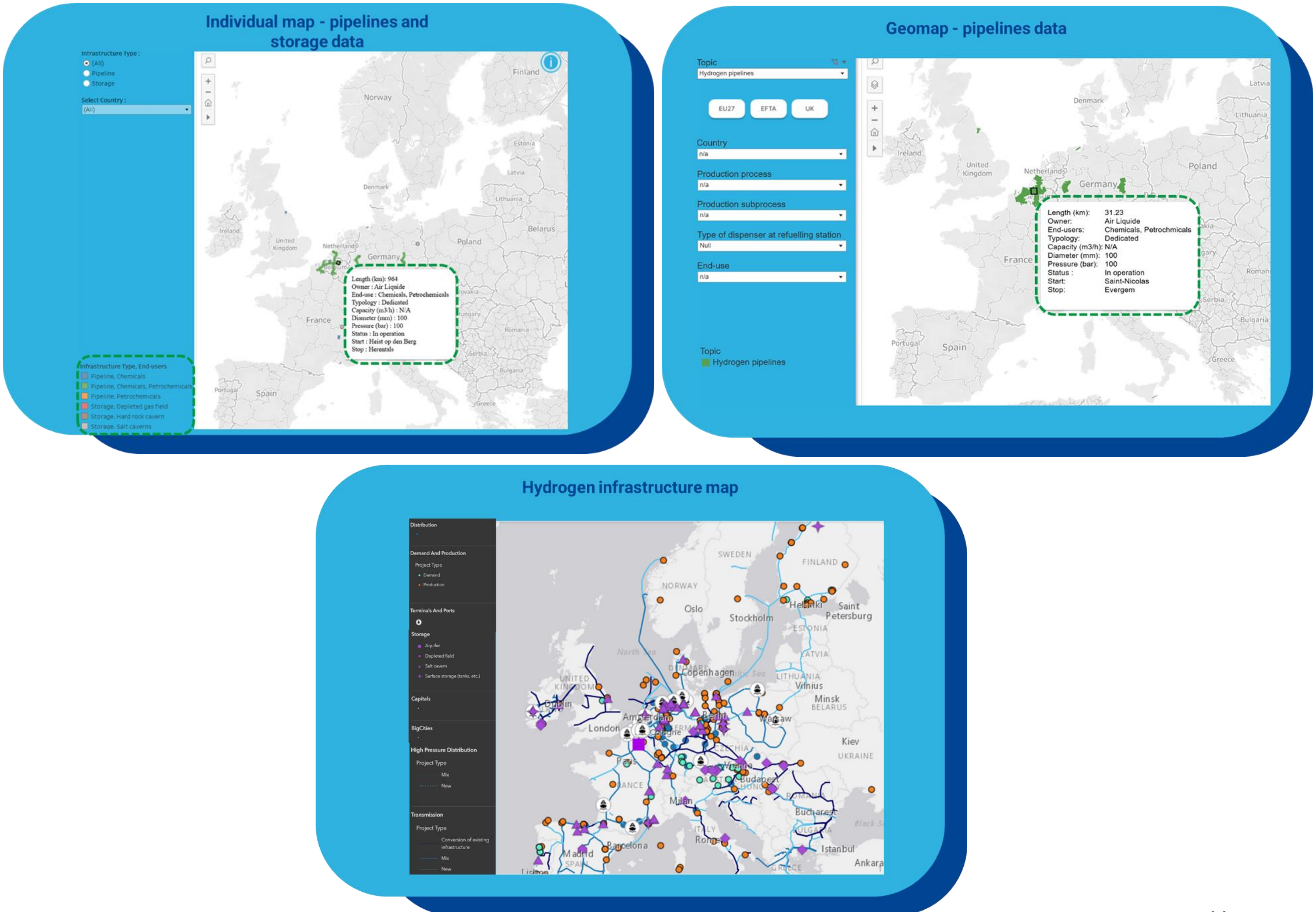


Figure 5. Comparison of geomap individual hydrogen pipelines and hydrogen infrastructure maps.

2.3.
Hydrogen refuelling stations

The geomap provides key insights into hydrogen refuelling station (HRS) infrastructure across Europe, supporting the expansion of hydrogen-powered transport. Users can explore location-specific details and key attributes of each station, enabling them to assess existing coverage, identify infrastructure gaps, and plan new deployments.

This dataset is based on the individual datasets of the European Hydrogen Observatory (EHO) on HRS, sourced from the HRS Availability Map on an annual basis, with the most recent update in May 2024. Only operational and public HRS are included in the dataset. The HRS Availability Map actively monitors the availability status of all HRS in real time.

Mapping hydrogen refuelling stations helps users understand the distribution network, ensuring alignment between hydrogen production sites, transport networks, and refuelling points. This integrated approach supports infrastructure planning and decision-making for mobility stakeholders.

The available data for each HRS, presented in Table 5, provides valuable insights that can support investment strategies and policy planning.

Table 5. Available data on publicly accessible and operational hydrogen refuelling stations in the geomap.

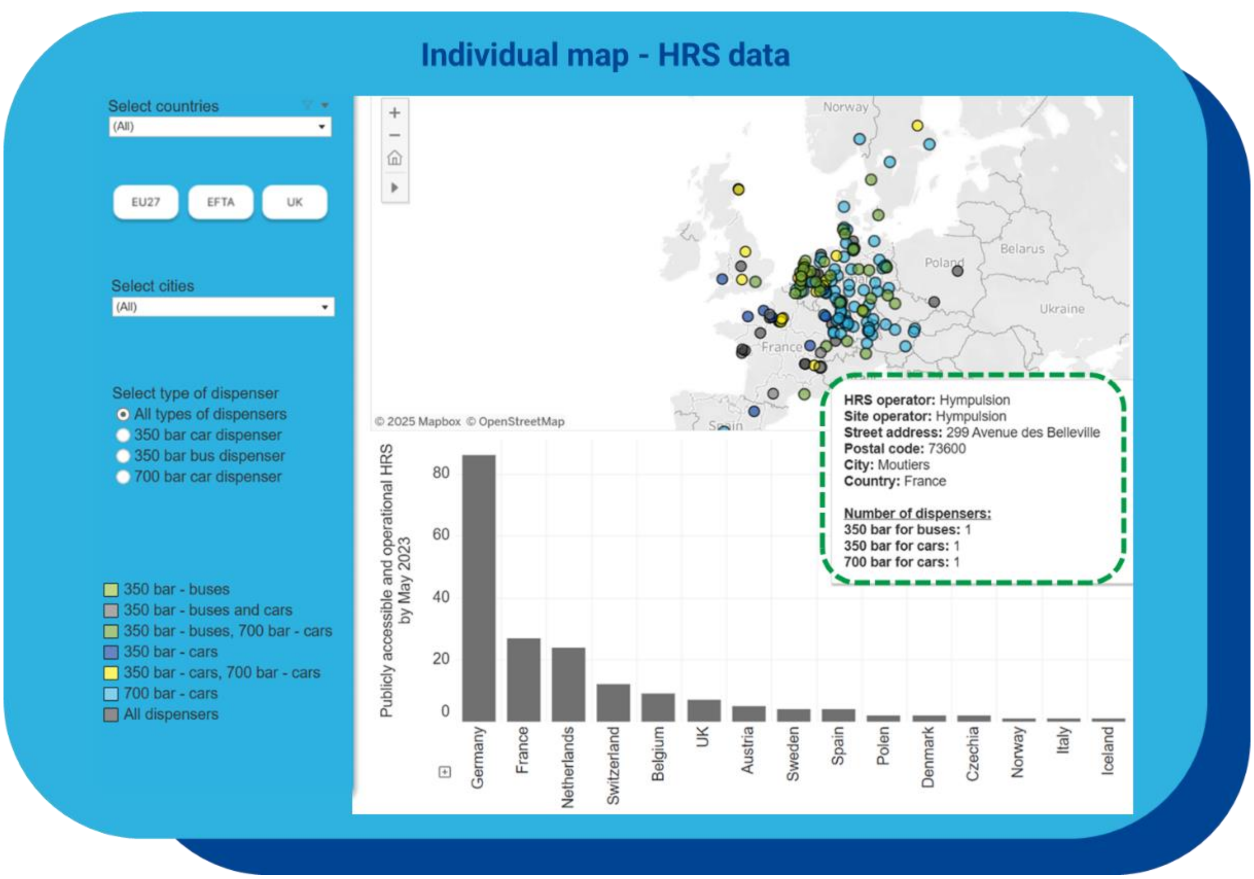
Attribute	Description
HRS operator	Entity responsible for the hydrogen refuelling station.
Site operator	Organization managing on-site operations of the HRS.
Location details	City, country, street address, and postal code of the HRS.
Number of dispensers	Number of available dispensers categorized by pressure level.
350 bar for cars	Availability of dispensers suitable for cars requiring 350 bar.
700 bar for cars	Availability of dispensers suitable for cars requiring 700 bar.
350 bar for heavy-duty vehicles	Availability of dispensers for heavy-duty vehicles at 350 bar.

In addition to the geomap, an individual hydrogen refuelling station (HRS) map is available, offering a more detailed breakdown of dispenser availability. The geomap presents the location of all operational public HRS across Europe, providing a high-level overview of the refuelling infrastructure, in combination with other parts of the value chain. While users can filter the geomap to display only one specific dispenser type at a time (e.g., 350 bar for cars, 700 bar for cars, or 350 bar for heavy-duty vehicles), when all HRS are shown together, it is not possible to distinguish between different dispenser types.

Meanwhile, the individual map provides granular insights into each HRS, detailing which dispenser type(s) are available at each station. Additionally, the individual map includes a bar chart displaying the total number of HRS per country, offering a quantitative overview of the refuelling infrastructure in scope.

The combination of hydrogen refuelling station locations and dispenser availability in a single map provides a valuable perspective on refuelling network coverage, supporting infrastructure planning and decision-making for mobility stakeholders. Users seeking a broad geographical overview of HRS locations, in combination with other parts of the value chain, should refer to the geomap. On the other hand, those requiring only detailed insights of HRS, such as dispenser availability at each station or a country-level summary of HRS distribution should explore the individual map.

Figure 6 compares these maps, highlighting their distinct levels of detail and functionality. The individual map on hydrogen refuelling stations is available at [Hydrogen Refuelling Stations | European Hydrogen Observatory](#).



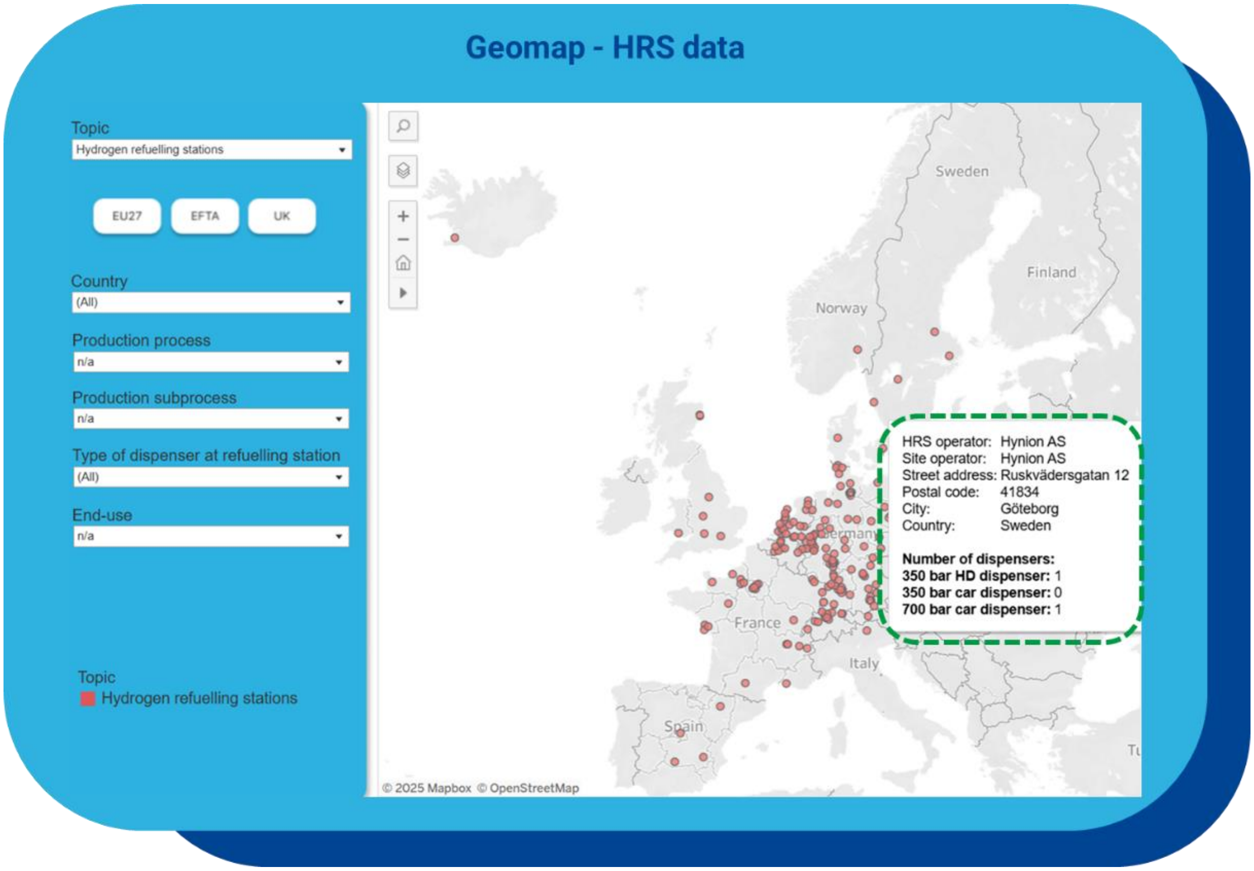


Figure 6. Comparison of geomap and individual hydrogen refuelling stations maps.

2.4.

Hydrogen end-use

The geomap provides insights on hydrogen consumption at a plant-by-plant level, offering detailed information on individual hydrogen-consuming facilities and allowing users to explore key attributes at a location-specific level.

This dataset is based on the individual datasets of the European Hydrogen Observatory (EHO) on hydrogen consumption, reflecting data from July 2023 and July 2024. The data was estimated by Hydrogen Europe based on a set of assumptions[2], updated annually, and verified with industry stakeholders.

In the geomap, users can access the location and main attributes of hydrogen-consuming plants across six countries: France, Italy, Netherlands, Norway, Poland, and Spain. The available data for

[2] For a detailed overview of the assumptions, please refer to the relevant page of the hydrogen demand.

each plant is presented in Table 6, which outlines the key attributes provided.

It should be noted that for the sectors included in the plant-by-plant outputs, the sum of the consumption of each plant in a country may not correspond to the aggregate consumption for that sector in that country due to merchant hydrogen that could not be assigned to a specific consumption point but whose overall final end use is known. In other words, only consumption for captive hydrogen producers (e.g., ammonia, refineries or "other chemicals") that have their own SMR units is reflected in the plant-by-plant outputs.

These data are valuable for users as they track how and where hydrogen is being consumed across Europe. By providing insights into demand patterns, the information helps users to understand the potential role for clean hydrogen in replacing fossil fuels in key industries such as ammonia, methanol, and refining. This detailed data supports informed decision-making for both stakeholders in the hydrogen value chain and those looking to identify regions with growing hydrogen demand, facilitating strategic planning for sustainable energy solutions.

Table 6. Available data on hydrogen-consuming plants in the geomap.

Attribute	Description
City	Location details, including the exact geographic coordinates of the plant.
Owner/Project Name	Name of the owner or the project associated with the hydrogen consumption facility.
End-Use	Sectors where hydrogen is used (refining, ammonia, methanol and other chemicals).
Total Consumption (kt/year)	Total hydrogen consumption at the facility, measured in kilotonnes per year (kt/year).

In addition to the geomap, two individual hydrogen demand maps are available: one presenting aggregated data on total hydrogen consumption across Europe (EU27, EFTA, and the UK) and another displaying plant-by-plant data with additional details.

In contrast to the geomap, the plant-by-plant individual map provides more granular insights, including different colours for end-use applications, interactive sliders, and filtering options.

Users seeking a high-level overview of total consumption trends should refer to the aggregated map, which includes a bar chart showing the total consumption of clean and conventional hydrogen per country in kt/year. Meanwhile, those interested in detailed plant-level data, such as end-use applications, should explore the plant-by-plant map.

For a more comprehensive analysis of how hydrogen consumption connects with other parts of the value chain, the geomap offers an integrated perspective. Figure 7 compares these maps, highlighting their distinct levels of detail and functionality. The individual hydrogen consumption maps are available at Hydrogen Demand | European Hydrogen Observatory.

Figure 7. Comparison of geomap and individual hydrogen consumption maps.

03

Use cases

Introduction

This chapter presents a series of use cases to demonstrate the unique properties of the geomap on the European Hydrogen Observatory website. These examples highlight the potential of the geomap as a powerful tool for obtaining detailed insights into the current hydrogen landscape in Europe. By exploring key functionalities, such as looking into a specific part of the hydrogen value chain or combining the different parts of the value chain, these combined use cases offer comprehensive insights. Together, they illustrate how the geomap can support decision-making and strategic planning.

3.1.

Overview

Three use cases are designed to help users determine which EHO geomap tool to use based on their specific interests while also demonstrating the full range of capabilities these tools offer.

The first use case explores a user that is focusing on one specific segment of the hydrogen value chain, in this case hydrogen production. In this case, it is recommended to use the individual hydrogen production geomap. The use case investigates which production plants are available for an end-user in southern Italy.

The second and third use cases shift focus to the unique advantage of the general geomap, which is its ability to compare multiple aspects of the entire hydrogen value chain.

In the second use case, the area of Rotterdam is investigated on its existing hydrogen infrastructure. In the third use case, this is done for Marseille. In both use cases, the potential for clean hydrogen uptake is investigated. Table 7 provides an overview of the different use cases examined.

Table 7. Overview of the use cases.

Use case	Focus	Parts of the value chain considered	Country
Investigating a single part of the value chain			
Use case 1	Finding H_2 production facilities in Italy	Production	Italy
Mapping existing hydrogen infrastructure for finding clean hydrogen infrastructure opportunities			
Use case 2	Case study Rotterdam area	Entire value chain	Netherlands
Use case 3	Case study Marseille area	Entire value chain	France

3.2.

Investigating a single part of the value chain

Use case 1 - Investigating H_2 production in a specific country

The first use case examines an off taker in southern Italy with an expected new clean hydrogen demand, seeking an existing producer. To facilitate this search, where only one part of the value chain is examined, it is recommended to make use of the individual hydrogen production geomap instead of the general geomap for more advanced filtering capabilities (see also Chapter 2 for the individual maps of other parts of the value chain).

Use case 1: Finding existing clean hydrogen facilities in southern Italy

The EHO hydrogen production website offers two maps. The first map provides the aggregated results by country and production process, whilst the second one provides plant-by-plant data. In this use case, the analysis begins with the first map, as shown in Figure 8. By simply clicking on a country, users can instantly access detailed information on hydrogen production within that region. In this case, zooming into Italy reveals a summary of the country's hydrogen production output.

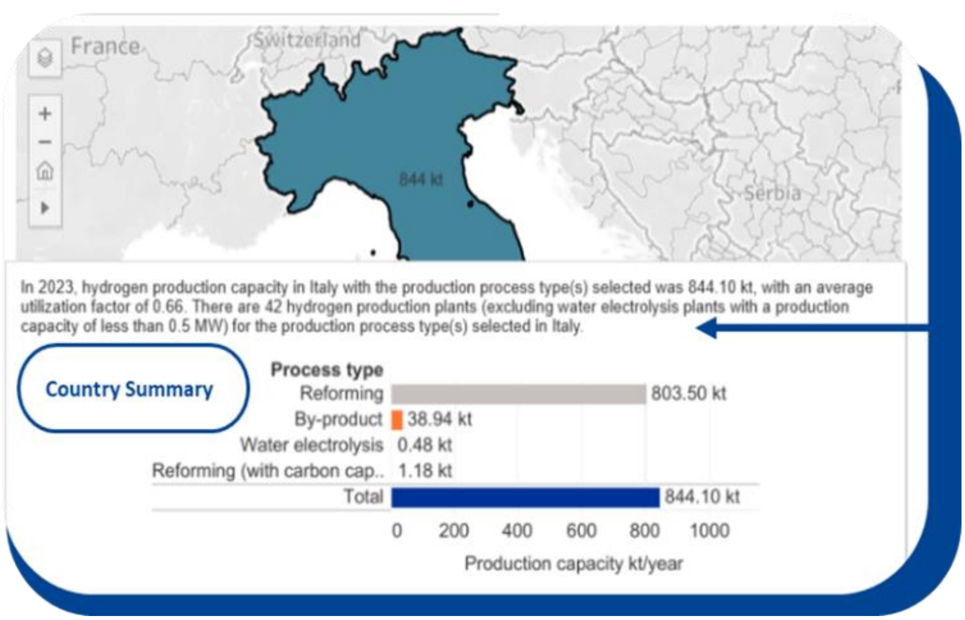


Figure 8. Overview H_2 facilities in Italy.

As shown in the summary above, Italy's total hydrogen production capacity in 2023 was 844.10 kt, placing the country among the top five hydrogen producers in Europe. Most of this production comes from reforming processes (95%, 803kt). The remaining capacity is distributed as follows:

- **By-product production**: 38.9 kt (4.6%)
- **Reforming with CCS**: 1.2 kt (0.14%)
- **Water electrolysis**: 0.48 kt (0.056%)

The availability of clean hydrogen production is thus still limited in Italy. Based on the plant-by-plant geomap, Figure 10 illustrates the existing hydrogen production facilities in Italy for the reference year 2023. In total, Italy hosts 32 hydrogen production plants of which:

- **20 facilities with reforming processes**
- **9 by-product facilities**
- **2 water electrolysis facilities**
- **1 reforming facility with carbon capture**

For an end-user looking for a clean hydrogen producer in southern Italy, the geomap shows that only one water electrolysis production plant is currently available with a capacity of 0.21 kt/year. Next to water electrolysis, the geomap also indicates the presence of several hydrogen by-product production facilities in southern Italy. It is recommended to click on each facility to register the technical specifications of the different facilities, including the company name, the annual production volumes and the current hydrogen end-use.

When looking for companies that are active in the hydrogen value chain, e.g. in this case clean hydrogen production companies, the European Hydrogen Observatory offers an additional tool to facilitate this search: [Matchmaking](). This feature allows users to find companies on a map, based on the hydrogen activity selected. For some companies, the website address and the contact details are also provided.

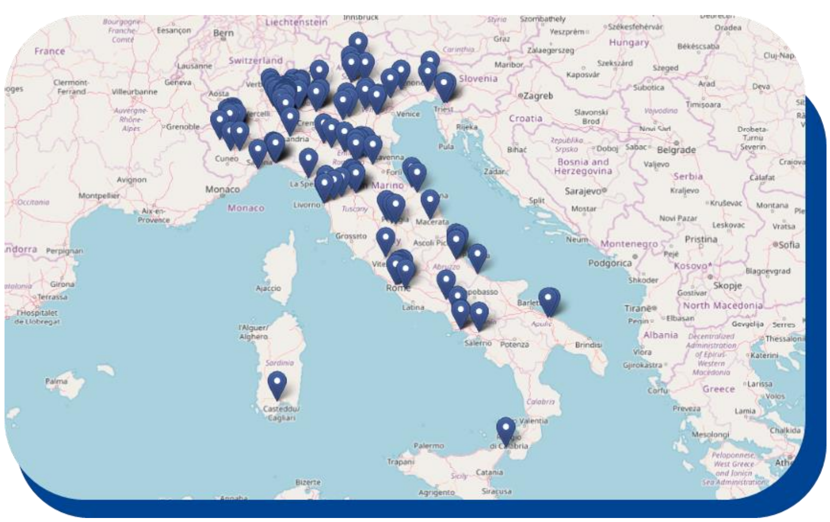


Figure 9. Hydrogen Matchmaking.

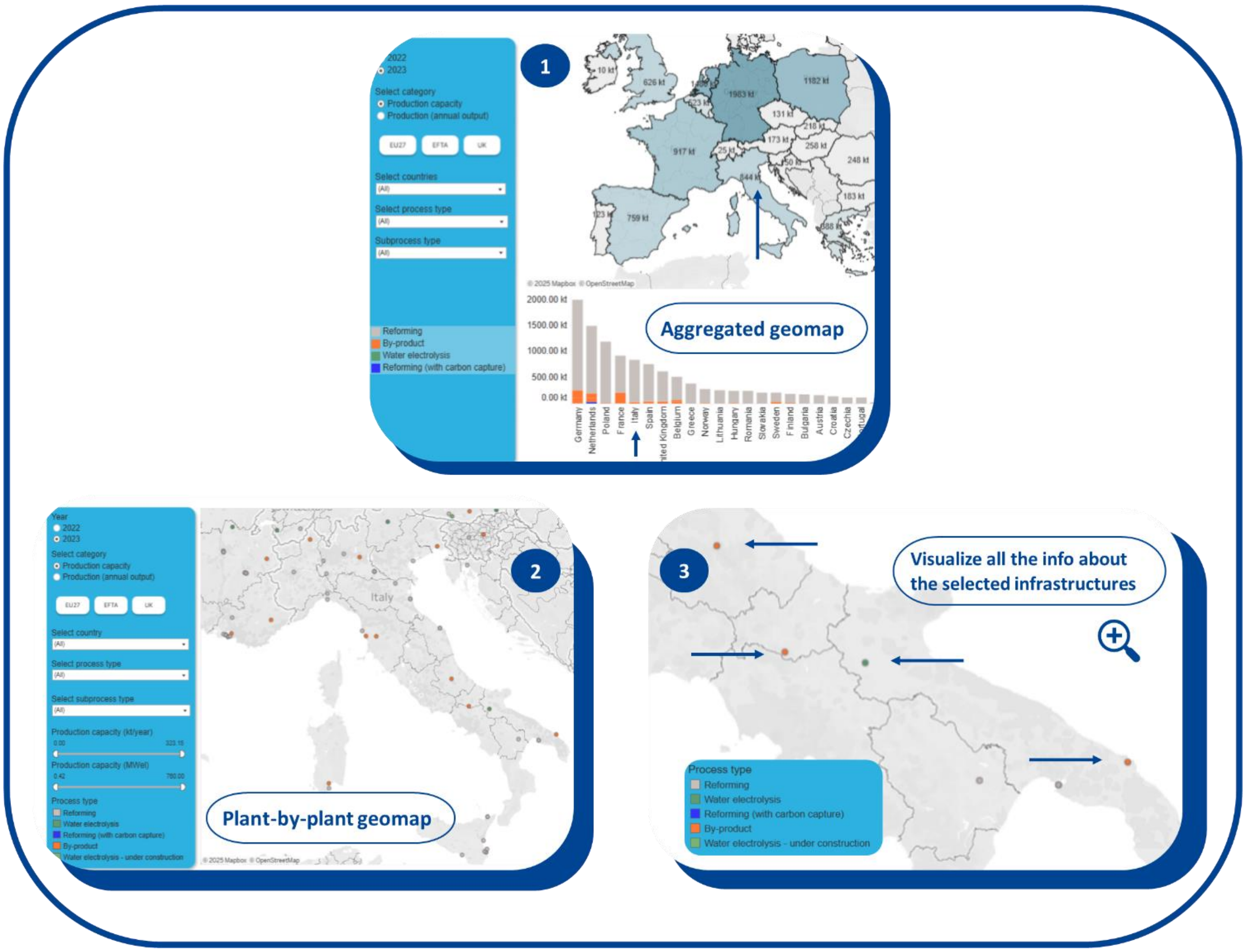


Figure 10. Use case 1, summary: H_2 production facilities in Italy.

Another recommended EHO tool, when looking into clean hydrogen production, is the LCOH calculator. The LCOH calculator allows calculating the costs of water electrolysis in all the different EU countries. For Italy, based on 2023 electricity prices, the tool indicates the lowest production cost at 6.96 €/kg when alkaline water electrolysis is directly combined with solar panels. The EHO also offers a manual for the LCOH calculator that explains all the functionalities in detail. A final EHO page that is recommended to explore in this context is the one on national hydrogen policies and legislations. In this case, it gives an overview of all the Italian policies and legislations available for the whole hydrogen value chain, including subsidy schemes, that can be useful for the off-taker to strengthen the business case.

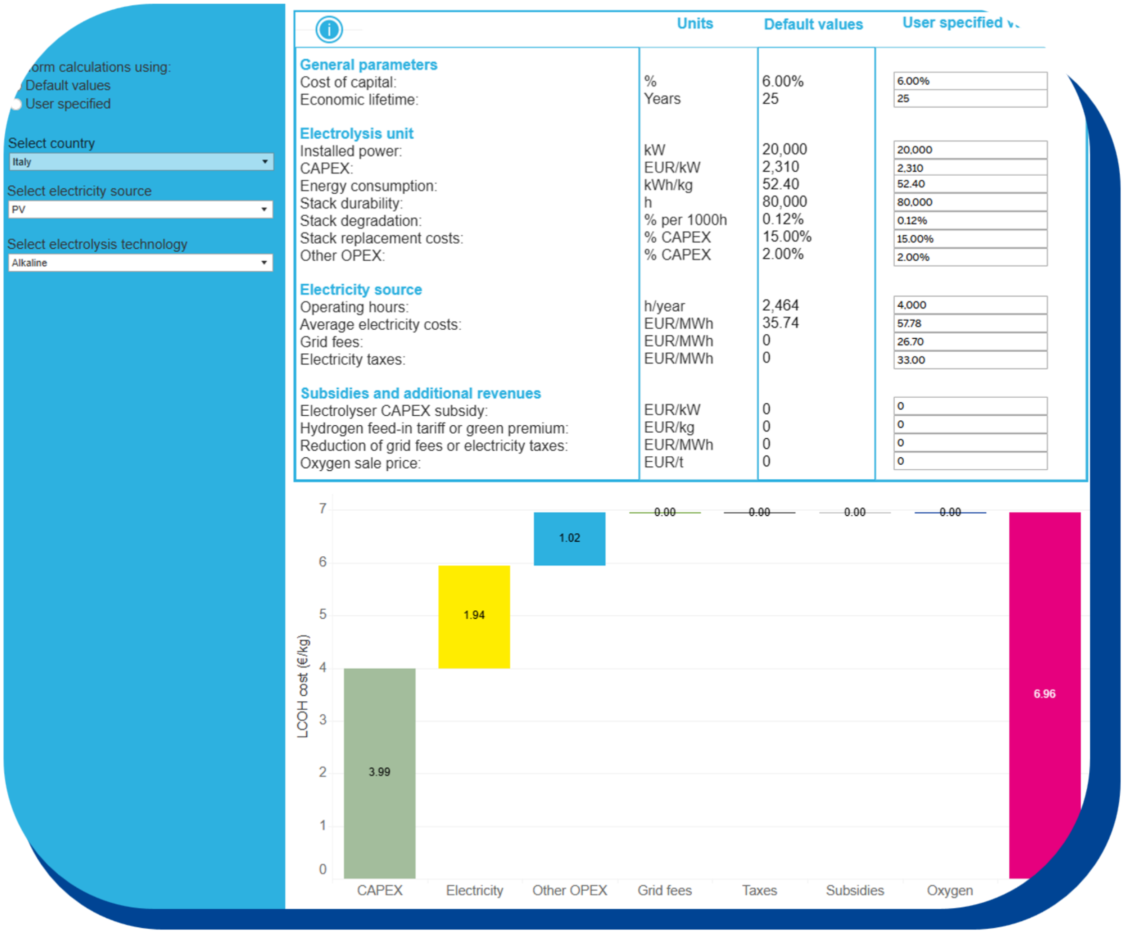


Figure 11. Homepage LCOH calculator.

3.3.

Mapping all existing hydrogen infrastructure for finding clean hydrogen infrastructure opportunities

Use case 2 - Finding clean hydrogen infrastructure opportunities through the geomap

The second use case focuses on entrepreneurs seeking new clean hydrogen opportunities by evaluating the existing infrastructure. In this case, this is done for the Rotterdam area. The EHO geomap offers valuable insights to support this decision by providing a comprehensive overview of the existing hydrogen value chain (Figure 12). The first step in the analysis is to make an overview of all the existing infrastructures and compare it with the adoption of clean hydrogen technologies.

Use case 2: Case study for the Rotterdam area

By hovering over each of the infrastructures, this information is easily captured, or alternatively the datasets can be downloaded for each of the different parts of the value chain. A summary of the existing infrastructure is given in Table 8, while a complete overview of all the plants is presented in the Appendix.

Figure 12. Rotterdam hydrogen infrastructures overview in the geomap.

Table 8. 2023 Rotterdam hydrogen facilities overview.

Part of the value chain	Sub-topic	Number of infrastructures	Total activity
Production	Reforming	9 plants	586.96 kt/year capacity
	By-product	2 plants	34.84 kt/year
	Reforming with CC	1 plant	41.57 kt/year
	Water electrolysis	1 plant (demonstrator)	0.45 kt/year
	Water electrolysis under construction	2 plants	36.88 kt/year
End-use	Refining	4 plants	314.32 kt/year consumption
Hydrogen refuelling stations		1 HRS for heavy-duty vehicles and cars in the Rotterdam area, in addition to two HRS in close proximity.	
Hydrogen pipelines		Rotterdam is part of a 964 km hydrogen pipeline network of Air Liquide, connecting it to other big industrial clusters as Antwerp and Ghent. In addition, it is also part of a 50 km network of Air Products.	

As summarized in Table 8, the Rotterdam area had an annual hydrogen production capacity in 2023 of 664 kilotons (kt), which is almost 45% of the total capacity in the Netherlands. Most of this capacity (88.4%) is from reforming, while 5.2% is obtained as by-product of industrial processes and 6.3% from reforming with carbon capture. Only 0.067% is derived from water electrolysis.

The primary end-use of hydrogen in the region in 2023 was the refining sector, which consumed 314 kt per year in 4 different plants. The second largest end-use in the region is other chemicals (assigned to 208 kt of the production output). This hydrogen is consumed as merchant hydrogen and therefore the individual plants are not captured in the database, only captive hydrogen plants are available in the geomaps (as mentioned in section 2.4). In terms of hydrogen distribution availabilities, the geomap shows that the region is well equipped. It is connected to two different large hydrogen pipeline networks and has one HRS in the region, and two in close proximity.

In terms of clean hydrogen production, the current production volumes in Rotterdam remain relatively low compared to fossil-based hydrogen production. As indicated in Table 8, hydrogen derived from water electrolysis and carbon capture represents less than 6.5% of the total production capacity. However, two new water electrolysis plants are already in construction, representing another 5.6% of the total capacity.

Next to these new production projects that are under construction, the current hydrogen end-use volumes indicate that there is sufficient room for additional clean hydrogen consumption before it has replaced all fossil-based hydrogen demand.

This large potential for clean hydrogen deployment in the region is also recognized by the different actors. The port of Rotterdam is collaborating with various actors in the region with the aim of making Rotterdam an international hub for hydrogen production, import, application and transport. Also in this use case, users can take advantage of the EHO Matchmaking tool, to find collaboration opportunities.

Beyond the clean hydrogen production projects already under construction, many other large scale initiatives are being planned. This includes the green hydrogen projects of BP/HyCC (H_2-Fifty) Uniper (Hydrogen to Maasvlakte) and Air Liquide (ELYgator), in addition to the blue hydrogen projects of Onyx Power, Air Products and Air Liquide.

On top of domestic production, Rotterdam's status as a major international port makes it an attractive entry point for hydrogen imports, whether in its pure form or as derivatives such as ammonia and methanol. Several projects are already exploring import pathways, such as done by Gasunie and Vopak (ACE terminal), Air Products and Gunvor, and OCI.

This use case illustrates that the hydrogen geomap can provide a comprehensive view of the existing hydrogen infrastructure in any area, which allows the assessment of a region's capacity for clean hydrogen deployment.

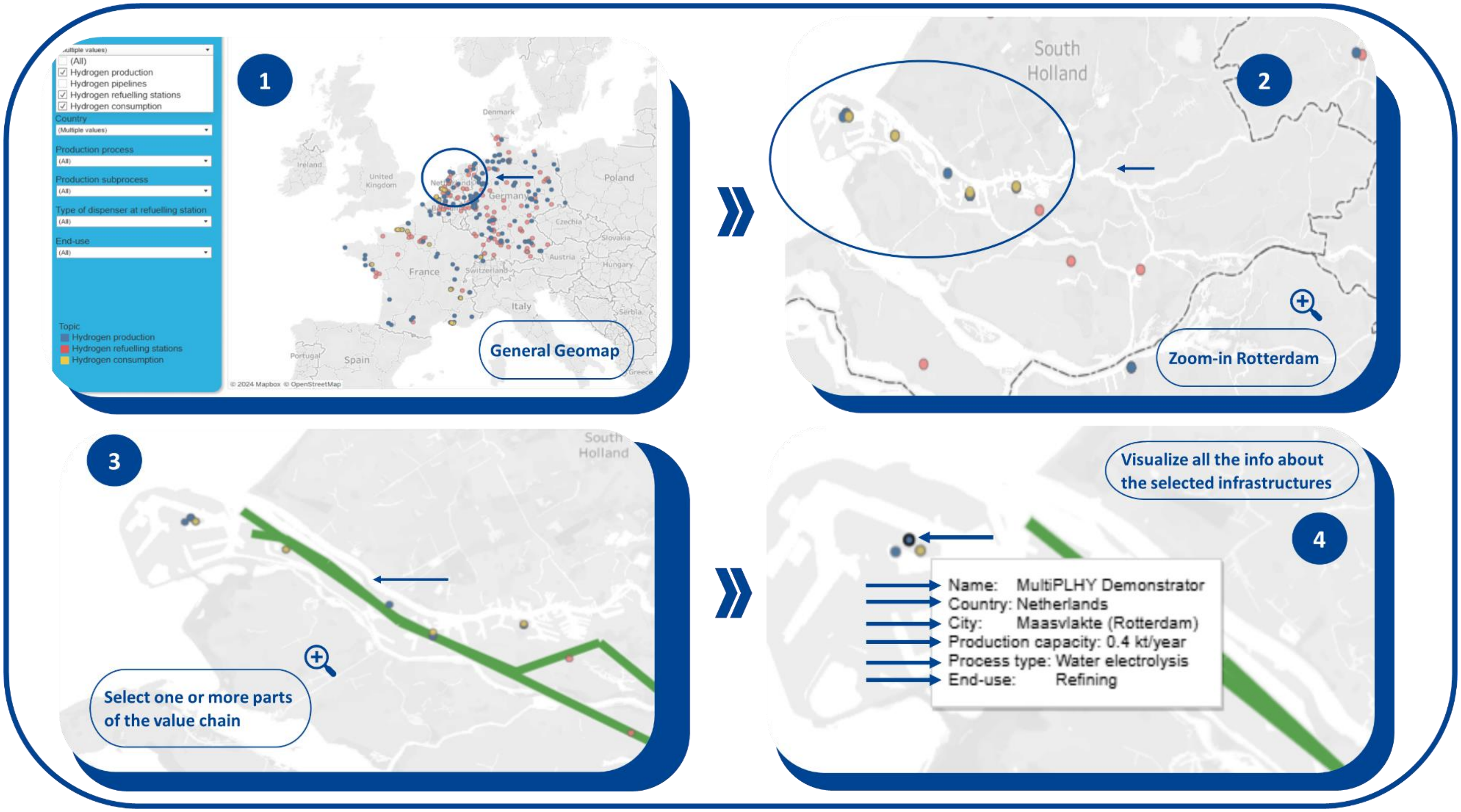


Figure 13. Use case 2, summary.

Use case 3 – Using the geomap as a tool for finding new hydrogen valley areas.

In this third use case, a similar analysis is performed for the Marseille area in France. Unlike Rotterdam, fewer clean hydrogen initiatives have been developed for the Marseille region, e.g. it is not yet linked to an existing hydrogen valley (see Figure 15).

Similar as for Rotterdam, in this use case, it is explored whether the Marseille area has significant potential for additional clean hydrogen infrastructure developments by examining the existing hydrogen infrastructure.

Use case 3: Case study for the Marseille area

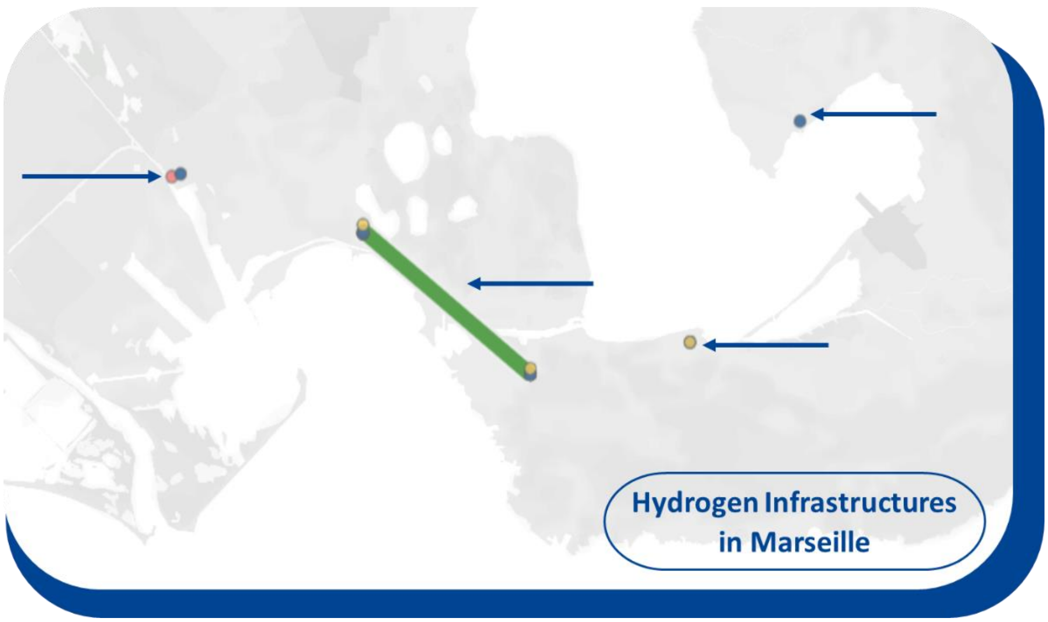


Figure 14. Marseille, hydrogen infrastructure overview from the geomap

To assess this potential, an overview of the region's existing hydrogen infrastructure has been compiled based on the EHO tools and datasets, with a summary presented in Table 9, and a more detailed breakdown of individual projects and facilities included in the Appendix.

As summarized in Table 9, the Marseille area had an annual hydrogen production capacity in 2023 of 142 kt, or 15.5% of total in France. The majority of this capacity (72.1%) originates from reforming, while 27.8% comes from by-product of industrial processes. In contrast, hydrogen derived from water electrolysis accounts for only 0.13% of total production capacity, indicating that clean hydrogen currently plays a minimal role in the region's hydrogen supply.

Table 9. 2023 Marseille hydrogen facilities overview.

Part of the value chain	Sub-topic	Number of infrastructures	Total activity
Production	Reforming	6 plants	102.65 kt/year capacity
	By-Product	4 plants	39.54 kt/year capacity
	Water electrolysis	2 plants	0.18 kt/year capacity
End-use	Refining	3 plants	84.23 kt/year consumption
Hydrogen refuelling stations		1 in Fos-sur-Mer with two 700 bar distribution lanes.	
Hydrogen pipelines		8.82 km pipeline network of Air Liquide	

The primary end-use of hydrogen in the Marseille area in 2023 is in the refining sector, which consumed 84.23 kt over 3 plants. The remaining hydrogen production output (17.04 kt) is linked to hydrogen consumption for other chemicals or the end-use is unknown. Finally, a smaller amount of hydrogen (121 ton), originating from the water electrolysis installations, is used for blending with natural gas.

Additionally, in terms of distribution capacity, the region has a hydrogen pipeline network extending 8.82 km and a hydrogen refuelling station with two 700 bar distribution lanes.

This analysis shows that the total hydrogen production and consumption volumes in the Marseille area are significant. However, in terms of clean hydrogen uptake, the volumes remain extremely limited compared to fossil-based hydrogen. The database also features no clean hydrogen projects that are already in construction. Therefore, this area has a lot of potential for new clean hydrogen projects.

This potential has been captured by multiple actors, including the announced green hydrogen projects of H2V Fos and Port of Marseille, in addition to Air Liquide and Total Energies. Moreover, a new hydrogen pipeline linking Barcelona and Marseille is also announced (BarMar-H2med).

Figure 15. Use case 3 summary. The third image in this figure is a screenshot from the Hydrogen Valley map, accessed on March 2025*

Conclusion

The geomap is a customizable and interactive tool developed by the European Hydrogen Observatory (EHO) to provide comprehensive insights into the existing European hydrogen infrastructure. It allows users to explore production facilities, pipelines, refuelling stations, and end-use applications, fostering collaboration among stakeholders across the hydrogen value chain.

Beyond the main geomap, the EHO also offers several specialized maps focusing on the different parts of the hydrogen value chain, including hydrogen production, pipelines and storage, refuelling stations, and hydrogen demand. These targeted tools enable users to conduct more precise analyses depending on their specific needs. Users seeking an overarching view of the existing infrastructures across the whole value chain may opt for the geomap, while those requiring in-depth insights at a more detailed level in a specific part of the value chain are encouraged to explore individual maps.

The tools provided by the EHO are updated annually to ensure users have access to the latest developments in hydrogen infrastructure. To further demonstrate the practical applications of these tools, a series of use cases have been developed. Overall, these use cases have demonstrated that by leveraging tools like the geomap and analysing regional infrastructure, stakeholders can identify strategic investment opportunities and support the development of new hydrogen hubs, accelerating the transition towards a sustainable hydrogen economy.

In addition to the geomap, the EHO offers other valuable tools to support decision-making in the hydrogen sector. The Matchmaking tool enables users to identify companies active in different segments of the hydrogen value chain, facilitating partnerships and industry connections. Additionally, the Levelized Cost of Hydrogen (LCOH) calculator provides valuable insights into the cost of water electrolysis across various EU countries, helping stakeholders assess economic feasibility. Lastly, the EHO's dedicated section on national hydrogen policies and legislations provides an overview of regulatory frameworks, including subsidy schemes, to support the growth of the hydrogen market.

By integrating these tools, the European Hydrogen Observatory continues to enhance transparency, support informed decision-making, and drive forward the development of a robust hydrogen economy in Europe.

Appendix

Overview of the H_2 facilities in Rotterdam and Marseille

This appendix includes reference tables for use cases 2 and 3, utilizing data from the individual geomaps and the general geomap.

Table 10. 2023 H_2 production facilities in Rotterdam.

Facility	Production process	End-use	Production capacity	City
Shell	Reforming	Refining	230.0 Kt/year	Pernis
BP	Reforming	Refining	11.8 kt/year	Europoort Rotterdam
Neste	Reforming	Refining	54.9 kt/year	Rotterdam
Air Products	Reforming	NA	17.8 Kt/year	Merseyweg
ExxonMobil Chemical	Reforming	Refining	26 kt/year	Botlek
Air Products	Reforming	Other Chemicals	102 kt/year	Botlek
Air Liquide	Reforming	Other Chemicals	9.5 kt/year	Botlek
Air Liquide	Reforming	Other Chemicals	114 kt/year	Botlek
Air Liquide	Reforming	Other Chemicals	21 kt/year	Botlek
LyondellBasel/Covestro	By-Product	Refining	17.0 kt/year	Rotterdam
Nobian Netherlands	By-Product	NA	17.8kt/year	Botlek
Pernis Shell CC	Reforming + CC	Other Chemicals	41.57 kt/year	Pernis
MultiPHLY Demonstrator	Water electrolysis	Refining	0.4 kt/year	Rotterdam
Holland Hydrogen (Phase 1) – from 2026	Water electrolysis – under construction	Refining	35.76 kt/year	Maasvlakte - Rotterdam

AmpHytrite – from 2025	Water electrolysis – under construction	NA	1.12 kt/year	Maasvlakte - Rotterdam

Table 11. 2023 H_2 consumption facilities in Rotterdam.

Facility/ Owner	End-use	Consumption rate	City
Neste	Refining	53.11 Kt/year	Rotterdam
BP	Refining	11.41 Kt/year	Europort Rotterdam
ExxonMobil Chemical	Refining	25.43 kt/year	Botlek
Shell	Refining	224.37 kt/year	Pernis

Table 12. 2023 H_2 pipelines in Rotterdam.

Facility/ Owner	Length	End-use	Diameter and pressure
Air Products (total)	50 km	Chemicals and Petrolchemicals	NA
Air Liquide (total)	964 km	Chemicals and Petrolchemicals	100 mm and 100 bar

Table 13. 2023 H_2 refuelling stations in Rotterdam.

Facility/ Owner	Number of dispensers	Street address	City
Air Liquide	350 bar HD dispenser: 1 700 bar car dispenser: 1	Groene Krusiweg 397	Rhoon
Refuelling stations closely connected, **but outside** of Rotterdam are listed below			
Hyystream Greenpoint	700 bar car dispenser: 1	Laan der Verenigde Naties 113	Dordrecht
Air Liquide	350 bar HD dispenser: 2	Reedijk 7S	KE Heinenrood

Table 14. 2023 H_2 production facilities in Marseille.

Facility/ Owner	Production process	Production capacity	City
Air Liquide	Reforming	/	Fos Tonkin
ExxonMobil	Reforming	34.79 kt/year	Fos Sur Mer
Air Liquide	Reforming	19.70 kt/year	Lavera
Petrolneos Refining Ltd.	Reforming	27.86 kt/year	Lavera
Total	Reforming	19.60 kt/year	La Mede
AGA gas	Reforming	0.7 kt/year	Fos
Kem One	By-product (chlor-alkali)	9.3 kt/year	Fos sur Mer
Kem One	By-product (chlor-alkali)	9.5 kt/year	Lavera
Ineos/TotalEnergies	By-product (ethylene)	12.64 kt/year	Lavera
LyondellBasell	By-product (ethylene)	8.03 kt/yeat	Berre l'Etang
Juptier 1000 (PEM)	Water Electrolysis	0.09 kt/year	Fos Sur Mer
Jupiter 1000 (ALK)	Water Electrolysis	0.09 kt/year	Fos Sur Mer

Table 15. 2023 H_2 consumption facilities in Marseille.

Facility/ Owner	End-use	Consumption rate	City
ExxonMobil	Refining	27.74 Kt/year	Fos sur Mer
Petrolneos Refining Ltd.	Refining	40.86 Kt/year	Lavera
Total	Refining	15.63 kt/year	La Mede

Table 16. 2023 H_2 refuelling stations in Marseille.

Facility/ Owner	Number of dispensers	Street address	City
Air Liquide	350 bar HD dispenser: 2 700 bar car dispenser: 3	Zone industrielle de Fos le Tonkin	Fos sur Mer

Table 17. 2023 H_2 pipeline in Marseille.

Facility/ Owner	Length	End-use	Diameter and pressure
Air Liquide	8.82 km	Chemicals	NA