H2med BarMar

enagas natran Teréga

Co-funded by the European Union

# BarMar

## PCI 9.1.4 – Spain–France hydrogen interconnection

Non-Technical Summary
April 2026

# CONTENTS

# PUBLIC CONSULTATION AND ENGAGEMENT WITH LOCAL STAKEHOLDERS

The French section of the project falls within the scope of the Environmental Code. The consultation process is therefore to be conducted under the auspices of the National Commission for Public Debate (CNDP), which ensures that the public is properly informed and able to participate in projects with an environmental impact. In France, the consultation will take place from 6 May to 12 July 2026.

In Spain, the preliminary public participation phase will be conducted in accordance with the manual of procedures applicable to Projects of Common Interest, published by the Ministry for the Ecological Transition in October 2023. It is scheduled to deployed between May and July 2026.

## WHAT ARE THE AIMS OF THESE CONSULTATIONS?

The consultation is to enable discussion of the project's rationale, objectives, characteristics and key issues.

- Integrate environmental, social and territorial sensitivities from the outset.
- Provide clear, understandable and accessible information about the project.
- Ensure the right to participation and explain how it can be exercised throughout the entire process.
- Enable direct communication channels between the public and the project team.
- Incorporate the contributions received to improve the project and support decision-making.

## WHO ARE THESE CONSULTATIONS AIMED AT?

BarMar will endeavour to involve both socio-economic players and the general public. Anyone with an interest in the project has the opportunity to obtain information and express their views.

# THE PROJECT IN BRIEF

## WHAT IS BARMAR?

**BarMar is an undersea pipeline for transporting renewable hydrogen between Spain (Barcelona) and France (Fos-sur-Mer). It is also a segment of the H2med corridor, which is helping to create a European hydrogen transport network by linking Portugal, Spain, France and Germany.**

For the European Union, producing and transporting this renewable hydrogen within our continent serves two main objectives: decarbonising industry and ensuring energy sovereignty (chapter 1).

Hydrogen is indeed essential to the energy transition (chapter 2). It is used to decarbonise carbon-intensive industrial processes, such as steelmaking, textiles and fertiliser production, as well as for new industries such as sustainable aviation fuels. This decarbonisation is only effective if the hydrogen itself is produced in a low-carbon way: this applies in the case of renewable hydrogen obtained by electrolysis of water using electricity from renewable sources.

H2med is the response of the Member States and the European Union to a clear industrial reality:

- The Iberian Peninsula is developing significant capacity for renewable energy and renewable hydrogen production;
- France is both a producer and a consumer, and
- German industry needs large volumes of renewable hydrogen to decarbonise.

This led to the launch of the H2med initiative in 2022, which was rapidly translated into the BarMar project (chapter 3).

## WHAT ARE THE MAIN CHALLENGES FACING THE PROJECT?

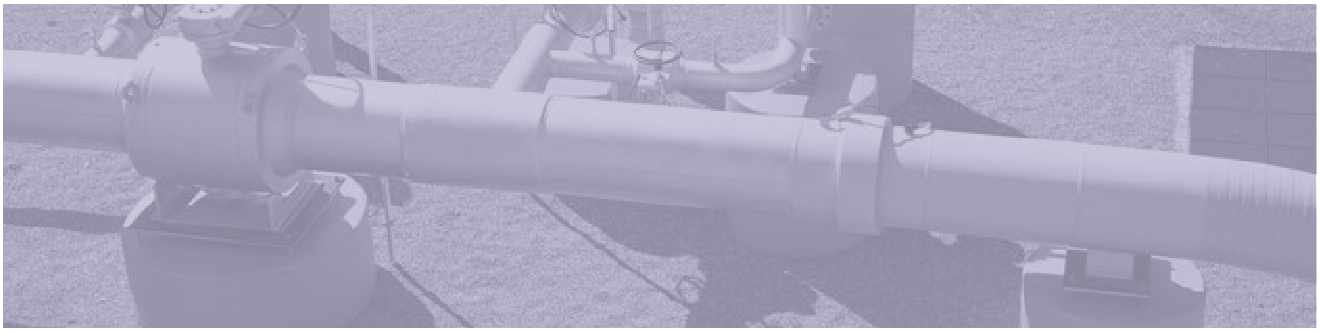
From a technical point of view, the BarMar pipeline differs little from an onshore natural gas pipeline. It is based on proven, well-established technologies, and many hydrogen transmission pipelines are already in operation worldwide. However, they have never been deployed on such a large scale before. Taking these characteristics and this specific environment into account has already made it possible to narrow the project area to a corridor between 1 and 20 km wide (chapter 4).

The company BarMar must now further develop the project and address several key challenges (chapter 5):

- biodiversity, particularly on the seabed;
- economic activities at sea (fishing, power generation, leisure boating, transport, etc.);
- onshore activities arising from the project;
- the project's overall carbon footprint.

The project is also being developed in connection with national hydrogen transmission networks, and within a changing context of supply and demand for renewable hydrogen (chapter 6).

At the present time, commissioning of the BarMar pipeline is envisaged for 2032.



# THE PROJECT DEVELOPERS

### The Joint Development Agreement (JDA) for the development of the BarMar hydrogen infrastructure

In June 2024, Enagás, NaTran and Teréga, in cooperation with the German operator OGE, signed a Joint Development Agreement setting out the terms of their collaboration on the BarMar project. This agreement marked the first step towards the creation of BarMar.

### BarMar, the project company

BarMar SAS is the project company dedicated to the development of the BarMar project. Established on 3 July 2025 through the signing of a shareholders' agreement, it brings together the Spanish and French gas transmission system operators. The shareholding is structured as follows: EIH-Enagás holds 50%, NaTran 33.3%, and Teréga 16.7%. This distribution reflects the balance of the H2med BarMar project, which is shared equally between Spain and France. With Francisco Pablo de la Flor of Enagás appointed Chief Executive Officer, the new entity has also established a binational management team (Chief Operating Officer, Chief Financial Officer, General Secretary).

### BarMar shareholders: Enagás, NaTran and Teréga

**Enagás** is a European transmission system operator (TSO) with 50 years of experience in the development, operation and maintenance of energy infrastructures. With 1,386 employees, the company operates more than 11,000 kilometres of gas pipelines, three underground storage sites and eight regasification facilities. In Spain, it is the technical operator of the gas network and, in accordance with Royal Decree-Law 8/2023, it has been appointed provisional operator of the hydrogen transmission network (HTNO). In line with its commitment to the energy transition, the company has announced its objective of achieving carbon neutrality by 2040, with a strong emphasis on decarbonisation and the promotion of renewable gases, in particular hydrogen.

In 2025, the company recorded earnings after tax (EAT) of €339.1 million and sales of €976.8 million.

To find out more, click here:

***www.enagas.es/en***

**NaTran** (formerly GRTgaz) is Europe's second-largest gas transporter, with 32,618 km of pipelines and 640 TWh of gas transported. NaTran has 3,330 employees and generated sales of €2,090m in 2022. The company defines its purpose as follows: "Together, we enable an energy future that is safe, affordable and climate neutral».

An innovative company undergoing transformation to adapt its network to new environmental and digital challenges, NaTran is committed to achieving a 100% carbon-neutral gas mix in France by 2050. It supports hydrogen and renewable gas value chains (biomethane and gas derived from solid and liquid waste). NaTran performs public service obligations to ensure security of supply for its 879 customers (shippers, distributors, industrial users, power plants and biomethane producers).

To find out more, see:

***www.natrangroupe.com***

Based in south-west France at the crossroads of major European gas flows, **Teréga** has developed recognised expertise over the past 80 years in gas transmission and storage infrastructure, and now designs innovative solutions to address major energy challenges in France and Europe. Teréga has more than 5,000 km of pipelines and two underground storage facilities accounting for 15.6% of the French network and 27% of national storage capacity respectively. The company generated sales of €517m in 2024 and has 647 employees.

Corporate social responsibility is at the heart of Teréga's strategy. The company is committed to the energy transition towards carbon neutrality through its environmental, social and governance (ESG) programmes, the safety of its employees and the security of its infrastructure, sustainable regional development, the Teréga Accélérateur d'Énergies endowment fund, and the reduction of environmental impacts.

For more information, see:

***www.terega.fr***

## Who does what?

- BarMar is responsible for the project.
- The three companies pool their expertise for technical development, supported by specialised engineering consultancies.
- In Spain, BarMar has delegated stakeholder engagement and consultation to Enagás. In France, these responsibilities are delegated to NaTran and Teréga.

# 1. CONTEXT AND DEVELOPMENT OF RENEWABLE HYDROGEN

*The H2med initiative and the BarMar project have been driven by Member States and the European Union in anticipation of the expected increase in demand for renewable hydrogen produced in Europe. This development is essential ...*

FOR THE ENERGY TRANSITION

*To meet the needs of industry (refining, steel, chemicals, sustainable fuels, fertilisers, etc.) by replacing grey hydrogen produced from fossil fuels with renewable hydrogen*

FOR OUR ENERGY SOVEREIGNTY.

*The aim is to produce renewable hydrogen within EU Member States, based on local, decarbonised energy sources, thereby strengthening autonomy*

## First objective:

## TO SUPPORT THE ENERGY TRANSITION AND THE DECARBONISATION OF INDUSTRY

### International and European climate objectives

*From Rio to Paris: the emergence of climate policy*

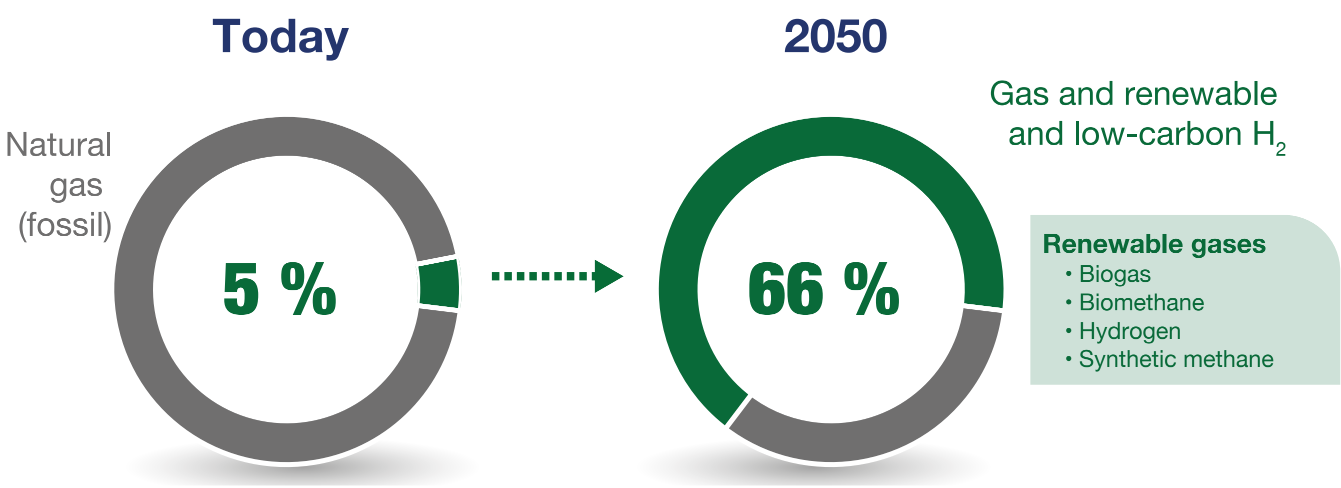
Climate policy began in 1992 with the Rio Earth Summit, with the initial objective of **stabilising greenhouse gas concentrations**. It established the **Conference of the Parties (COP)**, which has progressively encouraged states to set **emission reduction** targets. At global level, it highlights two key levers for achieving carbon neutrality: decarbonised energy and the creation of a global carbon market.

*European Green Deal: an action plan for climate neutrality*

Presented in 2020, the European Green Deal sets out the framework for achieving a **carbon-neutral economy by 2050.** The **European Climate Law** makes this objective binding and sets a target of a **55% reduction in emissions by 2030** (Fit for 55). The Green Deal supports the modernisation of energy systems, the expansion of renewable energy and the deployment of **renewable and low-carbon hydrogen**, which is essential for industrial competitiveness and energy sovereignty.

The European Union also published a new industrial strategy in 2020 (updated in 2021), positioning industry as a driver of the twin green and digital transition. This strategy promotes the resilience of the single market and the **security of supply chains, particularly for hydrogen**, as well as supporting clean technologies such as **zero-carbon steel.**

### Transition to renewable and low-carbon* gas




*The definition of renewable hydrogen is set out in chapter 2.*

The European Green Deal is implemented through an action plan comprising several initiatives **directly linked to the BarMar project**. In this context, the European Union launched the European Clean Hydrogen Alliance in 2020 to support hydrogen production projects. In 2022, it created the European Hydrogen Bank, and in 2023 it introduced the Carbon Border Adjustment Mechanism (CBAM) to protect industries from imports with a high carbon footprint.

## KEY POINTS...

- As of 2024, 95% of hydrogen produced in Europe was fossil-based..
- In order to meet its greenhouse gas reduction targets, Europe has made the decarbonisation of industry a priority. Some industrial sectors are particularly difficult to decarbonise, however. Their processes cannot be electrified or they require hydrogen as an input. These include steelmaking, cement production and chemical processes such as refining and fertiliser production. The European Green Deal identifies hydrogen produced by electrolysis as a key lever for decarbonising these sectors.

## National context and objectives

*In Spain*

The Spanish government has transposed the European energy policy framework into national law. In line with the **European Green Deal**, Spain has had a **strategic framework for energy and climate** in place since February 2019, which serves as the main tool for achieving the decarbonisation of the economy. This provides the regulatory and legal framework for measures to support the transition to a sustainable and competitive economic model that helps mitigate climate change.

The key elements of this framework are the **Climate Change and Energy Transition Act (Act 7/2021), the National Integrated Energy and Climate Plan (NECP), the Long-Term Decarbonisation Strategy 2050, the proposed National Strategy to Combat Energy Poverty (2025-2030), and the Just Transition Strategy**. These elements are underpinned by a series of sectoral strategies and roadmaps, such as the Renewable Hydrogen Roadmap.

The **2023-2030 National Integrated Energy and Climate Plan**, approved by the Council of Ministers in September 2024 following a proposal put forward by the Ministry for the Ecological Transition and the Demographic Challenge (MITECO), provides for a **tripling of the electrolyser capacity for renewable hydrogen production that had been envisaged in the previous 2021 plan, with a target of 12 GW by 2030, and including a reference in the measure 4.12 the Southwest Corridor of Hydrogen as a strategic infrastructure»**.

More broadly, the NECP ambitiously pursues the rollout of renewable energy and raises the target share of hydrogen consumption in Spanish industry to 74% by 2030, compared with the 42% set out in the RED III Directive. Out of consumption of around 650,000 tonnes per year, some 500,000 tonnes per year would be renewable hydrogen.

These targets show that renewable hydrogen is a national priority, giving Spain a historic opportunity to become a European hub producing the most competitive renewable hydrogen, which it could then distribute to the rest of the continent. According to data from the International Energy Agency, Spain produced 2,910 tonnes of hydrogen by electrolysis in 2024 and is developing production capacity equivalent to 880,000 tonnes per year.

The NECP highlights the development of the Spanish hydrogen network and the international H2med corridor as strategic infrastructure.

The Spanish government has approved the “Hydrogen Roadmap: ***a commitment to renewable hydrogen***”. Through this strategy, the government aims to accelerate the deployment of this sustainable energy carrier, which will play a crucial role in ensuring that Spain achieves climate neutrality by 2050 at the latest. Promoting renewable hydrogen will help develop innovative industrial value chains, strengthen technological expertise and generate sustainable jobs, thereby supporting the country’s recovery and its transition to a high-value green economy. **Spain is set to become one of Europe’s leading powers in the production and export of renewable hydrogen**, thanks to its ability to generate low-cost renewable electricity, the availability of land for solar and wind farms, existing gas storage and transport infrastructure, and its geostrategic position. The aim is to meet domestic demand and use production capacity to export to other EU member states, as reflected in particular in measures 47 and 48 of the Hydrogen Roadmap.

### KEY POINTS...

- Spain plays a central role in the European hydrogen strategy. In its Energy and Climate Plan published in 2024, it is targeting electrolysis production capacity of 12 GW by 2030 and sees the H2med corridor as priority strategic infrastructure.
- The Spanish transmission network will play a crucial role by facilitating interconnection with Portugal via H2Med CelZa and with France via H2Med BarMar.
- Around 4 GW of production projects are currently under development and are receiving close to €3 billion in subsidies under national and European programmes.

*In France: renewable and low-carbon hydrogen as a key driver of industrial decarbonisation*

France has placed the decarbonisation of its industry and the development of renewable and low-carbon hydrogen at the heart of its climate and economic strategy. Three frameworks complement one another: the **National Low-Carbon Strategy (SNBC)** sets the climate course, the National Decarbonised Hydrogen Strategy (SNH2) guides the sector, and the France 2030 plan finances its implementation.

In April 2025, the French state updated the national strategy for the development of decarbonised hydrogen, taking into account the European "Fit for 55" climate package and techno-economic developments, including techno-economic maturation, international changes in hydrogen production, and slower-than-expected market rollout. Like the BarMar project, it highlights **the value of connecting hydrogen production and consumption hubs to major storage capacity in order to optimise the energy system**. The document also addresses **the opportunity to develop a European hydrogen transport network** that "*would make it possible to link consumption areas to regions where production costs are lower than those of French production*". This inter-hub network would make it possible to pool production, secure supplies through storage and create an organised hydrogen market on a large scale. It also identifies the industrial sectors "*in which hydrogen will play a major role in meeting decarbonisation targets*": refining, chemicals, fertilisers, steelmaking and heavy transport, especially aviation. The targets it sets for increasing electrolysis capacity are 4.5 GW by 2030 and 8 GW by 2035.

The BarMar project is cited in the updated strategy as a pipeline enabling "*competitive imports*" from the Iberian Peninsula to France.

The **France 2030** investment plan mobilises €9 billion to build a renewable and low-carbon hydrogen sector. This strategy is based on a gradual deployment pathway, which NaTran and Teréga are supporting as gas infrastructure operators.

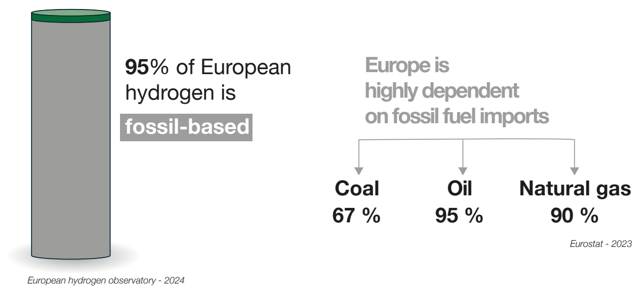

## KEY POINTS...

- In France, the national hydrogen strategy aims to develop production and consumption hubs in the country's main industrial centres.
- It sees national and European transport networks as a means of optimising the operation of these hubs. In practical terms, a project such as BarMar will significantly strengthen the Fos-sur-Mer hub by ensuring an additional supply to cope with peaks in demand and by providing a constant outlet for local renewable hydrogen production whenever it exceeds the needs of the industrial area.

# Second objective: MEETING THE CHALLENGE OF EUROPEAN ENERGY SOVEREIGNTY

## The invasion of Ukraine: a turning point for European energy policy

Russia's invasion of Ukraine in February 2022 profoundly reshaped European Union energy policy. Faced with its **dependence on Russian fossil fuels** – as much as 40% for gas and 30% for oil, and with networks largely designed for east-west flows – Europe is seeking to reduce its strategic vulnerability by investing in renewable electricity generation capacity.




*The site at Lubmin in Germany, where the Nord Stream 1 and 2 pipelines come ashore, stands as a symbol of an energy policy long reliant on Russian gas.*

In response to this rupture, the European institutions refocused their strategy around energy security, diversification of supply and the green transition. Within a matter of months, this new European energy policy led to a historic decoupling from Russia, embodied in the **REPowerEU** plan of May 2022. The need to strengthen Europe's energy autonomy is all the more pressing in a context of uncertainty and geopolitical conflict.

### *The REPowerEU plan: a new doctrine of energy sovereignty*

A true roadmap for energy sovereignty, REPowerEU is backed by funding of **€300 billion**. The plan rests on three pillars: **diversifying energy sources, reducing consumption and accelerating the rollout of renewables**. The EU is now aiming for 42.5% renewables in its energy mix by 2030, compared with 22% in 2022.

REPowerEU reflects Europe's determination to turn the crisis into a driver of **energy sovereignty and accelerated decarbonisation**.

Renewable hydrogen occupies a central place in this strategy. Brussels has doubled its production targets to **10 million tonnes of renewable hydrogen by 2030**, to be complemented by 10 million tonnes of imports. A European Hydrogen Bank, endowed with €3 billion, is supporting the development of this emerging market, notably through production support contracts.

But it is not enough simply to produce hydrogen – the production regions must also be connected to the consumption regions.

# 2. RENEWABLE HYDROGEN : TECHNICAL OVERVIEW AND OUTLOOK

## DEFINITION AND CHARACTERISTICS OF HYDROGEN

Hydrogen is the most abundant chemical element on Earth. It is most commonly found in combination with other elements, such as oxygen, forming water, or carbon, forming organic compounds such as hydrocarbons.

### HYDROGEN ($H_2$)

- Chemical formula: $H_2$
- Number of atoms: 2
- Toxicity: non-toxic
- State: colourless, odourless gas
- Volatility: very high
- Inflammability: *Explosion risk (4 - 75 % in air)*
- Liquefaction temperature: –253 °C
- Density at 1 atm: 0,0899 kg/m³ → *Seven times lighter than air*

- ▸ Very light, easy to transport
- ▸ Must be handled with care!

### HYDROGEN IS ...

**A molecule:** hydrogen is used in a number of industrial processes, as an input to chemical reactions.

**An energy carrier:** it allows energy to be transported and stored. When used as an energy carrier, it has the major advantage of producing no $CO_2$ emissions at the point of use, unlike hydrocarbons.

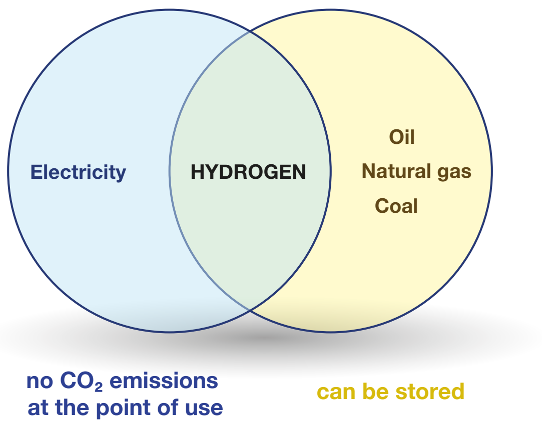
### HYDROGEN IS NOT ...

**A primary energy source:** unlike wind, sun, uranium or oil, it is not an immediately available resource. Hydrogen can be produced using different processes.

It is of particular interest because its use does not generate $CO_2$ emissions and, unlike electricity, it can be stored.

**Depending on how it is produced, however, hydrogen can be more or less carbon-intensive. This is why the energy transition requires a shift towards renewable hydrogen**, which is significantly less carbon-intensive than the "grey" hydrogen that has been used in industry for the past century. If renewable hydrogen is so important, and is central to the European policies described in the previous chapter (the European Green Deal, REPowerEU), it is primarily because of its role in decarbonising key sectors of the economy and Europe's ability to produce it domestically.

Forms of energy



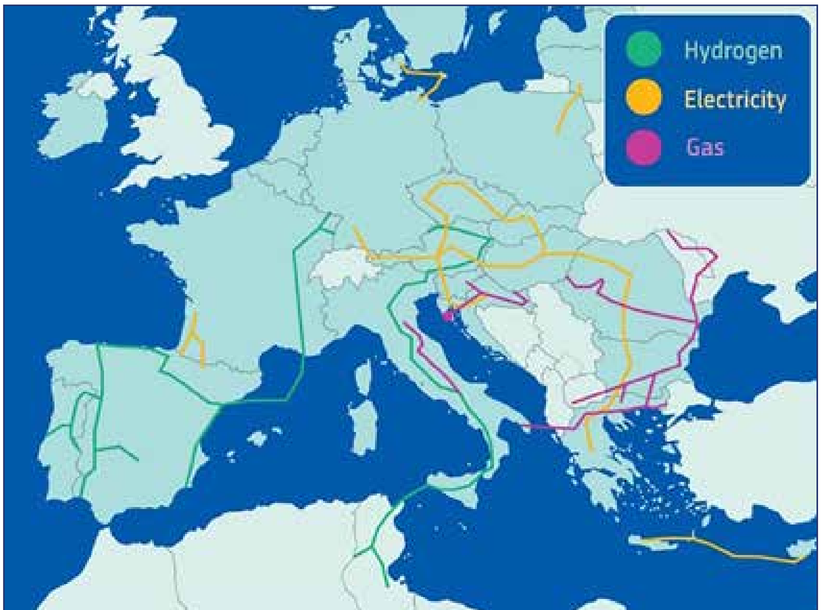
*European energy corridors to interconnect networks*

European energy corridors form the backbone of the transition to a climate-neutral economy. Framed by the revised **TEN-E Regulation (EU 2022/869)**, their development is to ensure security of supply, stabilise prices and accelerate the integration of renewable energy.

The Energy Highways initiative was announced by Commission President Ursula von der Leyen in her State of the Union address on 10 September 2025. It identifies eight priority corridors designed to strengthen Europe's energy infrastructure and accelerate the rollout of renewable energy infrastructure. These corridors build on existing Projects of Common Interest (PCIs) and aim to address urgent bottlenecks, enhance energy security, reduce dependence on fossil fuels, and further integrate renewable energy across all Member States.

H2med has been designated a priority energy highway and recognised by the European Commission as one of the most advanced hydrogen infrastructure projects in Europe, forming the core of the south-western hydrogen corridor. As part of the Energy Highways package, H2med benefits from an accelerated permitting procedure which streamlines administrative processes and enables tangible progress in the short term by simplifying approvals and improving coordination between Member States. An interactive map of Projects of Common Interest and Projects of Mutual Interest is available on the European Union website:

https://ec.europa.eu/energy/infrastructure/transparency_platfor m/map-viewer/main.html




*Energy highways (source: European Union)*

## KEY POINTS...

- The economic and geopolitical value of renewable hydrogen is also significant: each kilogram of renewable hydrogen produced in Europe helps reduce dependence on fossil energy imports, which amounted to €376 billion in 2024.
- The creation of an integrated hydrogen transport network sends a strong signal to investors across the hydrogen ecosystem, whether producers seeking market outlets or industrial users aiming to secure low-carbon supply.

# HYDROGEN TODAY ...

## 95% of hydrogen is produced using a process that emits high levels of $CO_2$.

At present, the main method of hydrogen production relies on fossil fuels such as natural gas, coal and oil. Whatever the process used, it generates greenhouse gas emissions.

| Process | Feedstock | Drawbacks / environmental considerations |
|---|---|---|
| Steam reforming of methane | Natural gas | $CO_2$ emissions if not captured (grey hydrogen); requires high temperatures. |
| Partial oxidation | Natural gas, liquid hydrocarbons | Less efficient than steam reforming; $CO_2$ emissions if not captured. |
| Autothermal reforming | Natural gas, oil | Requires precise control; still generates $CO_2$ if not captured. |
| Methane pyrolysis (Kværner process) | Methane | Less mature technology; involves handling of solid carbon; high temperatures. |
| Coal gasification | Coal | Very high environmental impact; high $CO_2$ emissions; requires carbon capture for blue hydrogen. |

## Hydrogen is already an essential part of our daily lives

In 2024, total hydrogen consumption in Europe (across all production methods) reached around 7.9 million tonnes. The table below shows the main areas of use at European level and specifically in Germany, France and Spain

*(source: European Hydrogen Observatory, 2025)*

| Hydrogen demand in 2024 (kt) | Refining | Ammonia | Other chemical products | Industrial heat | Methanol | Other | Total |
|---|---|---|---|---|---|---|---|
| Total in Europe | 4 544 | 1 977 | 726 | 280 | 162 | 183 | **7 872** |
| of which Germany | 731 | 329 | 141 | 72 | 111 | 101 | **1 485** |
| of which France | 343 | 125 | 29 | 35 | 0 | 23 | **555** |
| of which Spain | 513 | 72 | 17 | 17 | 0 | 0 | **619** |

Use in sectors such as steel and sustainable aviation fuels remains very limited. Yet these industrial uses are essential to the production chains behind many everyday products.

| | | | | | |
|---|---|---|---|---|---|
| **Automotive** (via steel) | **Construction** (via steel) | **Food** (via fertilisers) | **Electronics** (via chemicals and plastics) | **Textiles** (via synthetic fibres) | **Consumer goods** (via chemicals and plastics) |

## HYDROGEN TOMORROW, WITH BARMAR...

### Electrolysis: hydrogen production without direct $CO_2$ emissions

Renewable hydrogen is produced by electrolysis of water in devices known as electrolysers, which use electricity to split water ($H_2O$) into hydrogen ($H_2$) and oxygen ($O_2$).

When electricity comes from renewable sources such as solar or wind power, the hydrogen produced is classified as renewable and has a low carbon footprint. The regulatory definition of renewable hydrogen is set out in Commission Delegated Regulation (EU) 2023/1184.

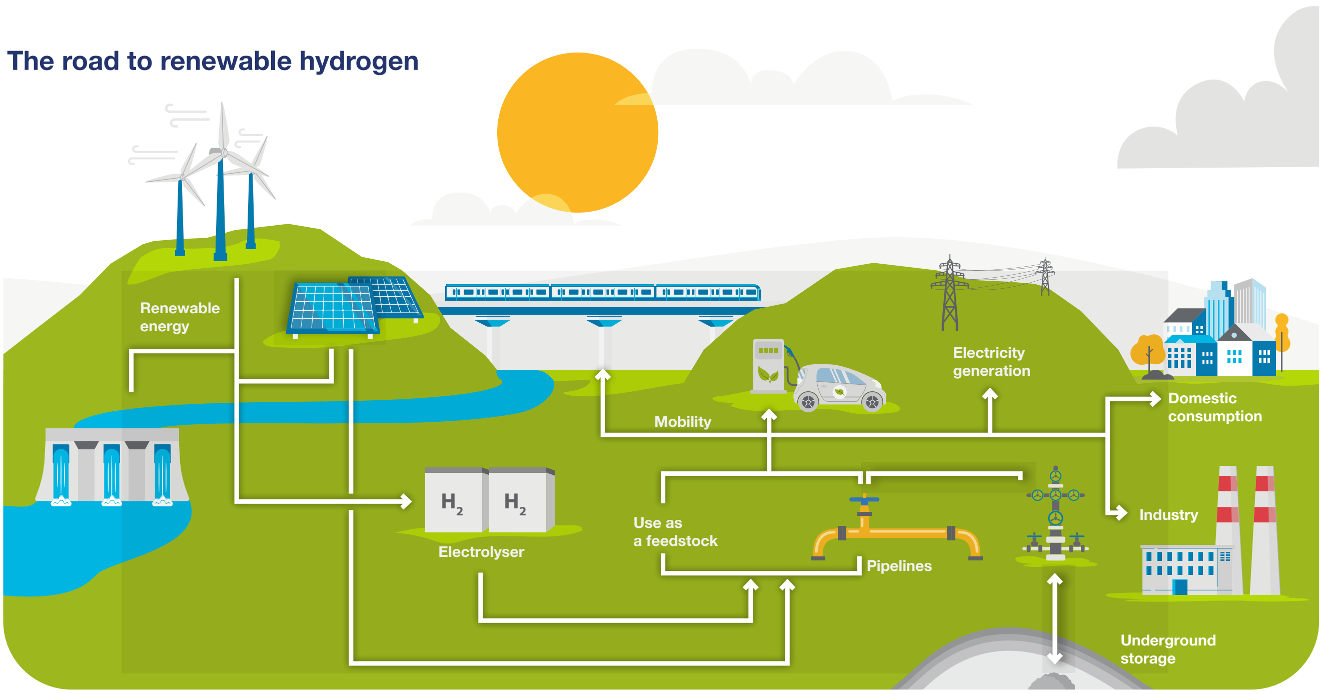
| TWO MAIN ELECTROLYSIS TECHNOLOGIES | |
|---|---|
| **Alkaline electrolysers** | **Proton exchange membrane (PEM) electrolysers** |
| The most widely used industrial process, with around 50 years of operational experience. Currently the most cost-effective electrolysis technology. Best suited to steady, continuous production. | A more recent technology, suitable for smaller installations and capable of high efficiency, including under variable electricity supply conditions (and therefore well suited to renewable energy sources).<br>Its production costs are currently higher. |

Regardless of the technology used, **producing one tonne of renewable hydrogen requires between 50 and 65 MWh of electricity and around 9 tonnes of water.**

**Electrolysis is only as clean as the electricity used to power it!** The key challenge is therefore to ensure access to low-carbon electricity to supply electrolysers – a mature technology that has been in use since the early 19th century. That's why hydrogen production in countries like Spain and France makes so much sense. Their electricity systems are already low in carbon emissions, meaning that hydrogen produced by electrolysis has a low overall carbon footprint.

In Spain, a large share of electricity is generated from renewable sources (wind, solar and hydropower). France, for its part, has one of the lowest-carbon electricity mixes in the world, largely thanks to nuclear energy, supported by renewables. In any case, BarMar is designed to transport only hydrogen produced from renewable energy sources.

### The road to renewable hydrogen



## New opportunities enabled by renewable hydrogen

At present, hydrogen use remains largely limited to processes where it is indispensable, due to its environmental impact and limited availability. With renewable hydrogen, new uses are set to emerge, thereby contributing to the energy transition.

### SUBSTITUTES FOR HYDROCARBONS AND CARBON-INTENSIVE HYDROGEN

**In industry.** Hydrogen is essential in many industrial processes such as chemicals, refining, fertilisers and cement. It is used either as a feedstock or as a fuel for industrial heat. In these sectors, electrification of processes is not possible or is limited; they are considered "hard to decarbonise". In such cases, renewable hydrogen offers significant benefits

***The example of fertilisers:** Fertilisers are produced from ammonia, which is itself made from a combination of nitrogen and hydrogen. Hydrogen is required in very large quantities and is currently produced from imported natural gas.*

**Electricity generation.** In the future, renewable hydrogen could replace natural gas in electricity generation during peak demand periods. This approach is already being pursued in Germany, with the construction of combined-cycle gas power plants that are "H2-ready", meaning they can be converted to run on hydrogen.

### NEW USES FOR RENEWABLE HYDROGEN

**In industry.** Access to abundant and affordable renewable hydrogen could open the way to new industrial processes that significantly reduce the carbon footprint of certain products.

***Steel production** is still largely based on blast furnaces.Renewable hydrogen can be used in steel production to replace coking coal in the reduction of iron ore.*

***The example of sustainable fuels:** Hydrogen is essential for the production of sustainable fuels. Combined with CO2 captured from industrial sites, it enables the production of new fuels without relying on fossil resources.*

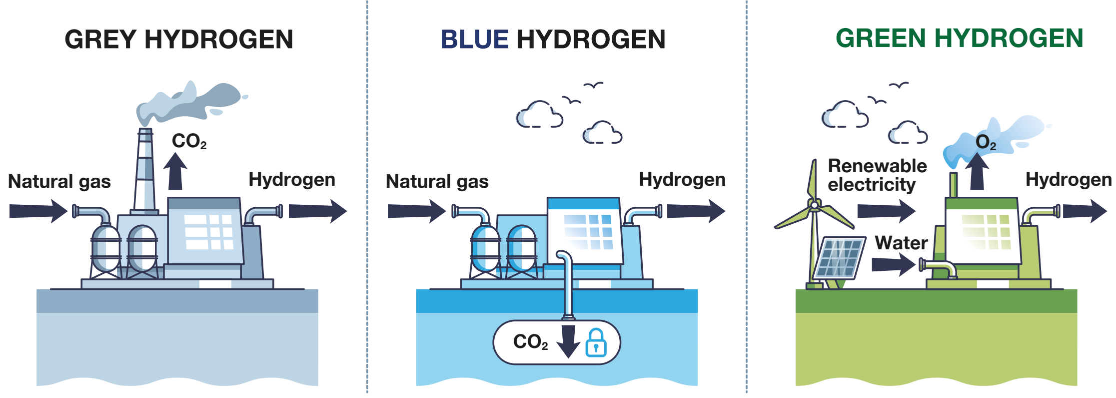
**Mobility.** In aviation, sustainable aviation fuels are essential to achieving a 5% reduction in the sector's CO2 emissions by 2030. Freight transport, mainly by road, accounted for nearly 10% of greenhouse gas emissions in Europe in 2022. A truck powered by a fuel cell or a hydrogen combustion engine produces no CO2 emissions at the exhaust. Air quality would also improve in traffic-heavy areas.

*Hydrogen is essential for the production of sustainable fuels. Combined with CO2 captured from industrial sites, it enables the production of new fuels without relying on fossil resources.*

**Energy.** Renewable hydrogen produced by electrolysis makes it possible to store excess renewable electricity and feed it back into the power system during peak demand periods. It therefore supports the integration of renewable energy such as wind and solar and helps balance the electricity grid.

## KEY POINTS...

- At present, around 95% of hydrogen in Europe is produced from fossil fuels, releasing nearly 100 million tonnes of CO2 into the atmosphere. Hydrogen production by electrolysis can emit up to 20 times less CO2 than conventional fossil-based processes. And that's not all: renewable hydrogen enables new industrial processes to reduce the carbon footprint of steel, fuels, etc.
- Hydrogen plays a role in many industrial processes that are essential to everyday life. These are often sectors that are difficult to decarbonise, where electrification is not an option. Hydrogen is indispensable, but it is both possible and necessary to use hydrogen with a much lower carbon footprint.
- In the future, renewable hydrogen may also be used in heavy transport, such as freight and aviation, as well as in energy storage and electricity generation.
- Hydrogen can be produced by electrolysis from water and electricity, two resources that are readily available in Europe. The key is therefore access to low-carbon or renewable electricity. As such, renewable hydrogen strengthens the competitiveness and sovereignty of European industry.
- Hydrogen can be transported and stored. The BarMar pipeline therefore has a key role to play in transporting renewable hydrogen produced in Europe, particularly on the Iberian Peninsula, to major industrial regions in Germany.



# 3. H2MED'S OBJECTIVE: to link the Iberian Peninsula, France and Germany

*The aim of H2med is to create a European market for renewable hydrogen by linking developing production areas with areas of high demand.*

## HYDROGEN PRODUCTION AND USE IN THE IBERIAN PENINSULA, FRANCE AND GERMANY

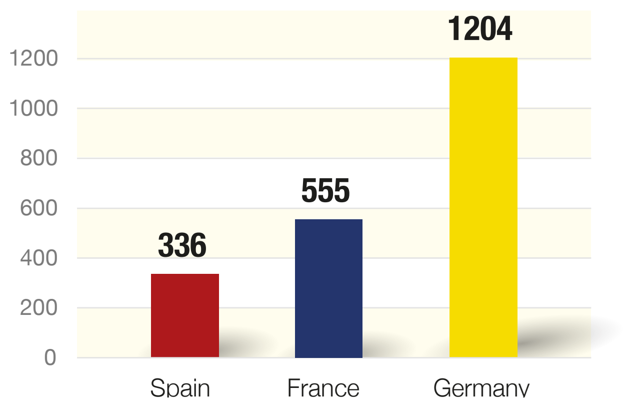
### Countries with complementary profiles

The H2med corridor connects countries with very different industrial histories, geographical characteristics and industrial ambitions, but which are ultimately highly complementary.

Since 2021, **Spanish industry** has managed to maintain its activity, relying on traditional sectors such as agri-food and automotive manufacturing, as well as growing sectors such as pharmaceuticals, electricity generation and batteries. Thanks to its geographical characteristics, including large, sparsely populated windy plains and strong solar irradiation, Spain has pursued an ambitious policy of developing renewable energy. In 2024, renewables accounted for 56% of Spain's electricity mix, up 11% compared with 2023. The expansion of renewable energy is expected to continue, as the National Energy and Climate Plan (NECP, revised version 2023–2030) provides for total installed electricity capacity of 214 GW by 2030, of which 160 GW will be renewable. **In summary, renewable hydrogen production potential is expected to exceed the needs of Spanish industry, making exports particularly relevant.**

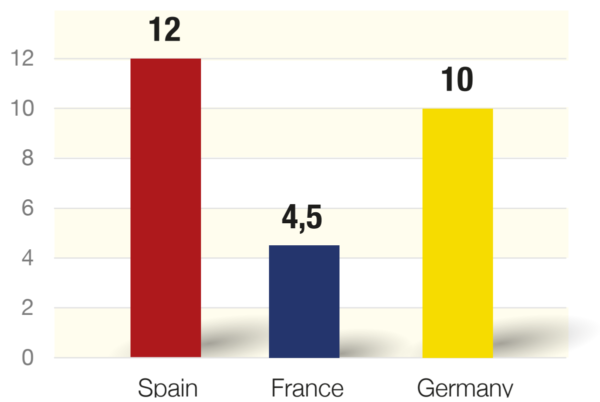
**Value added in industry**

(in billion $, source: World Bank, 2024)




**Electrolysis capacity targets in 2030**

(in GW, source: national strategies)



France's **France 2030** plan aims to reconcile industrial competitiveness with decarbonisation, for example through the creation of low-carbon industrial zones. Its electricity generation has several distinctive features: a low-carbon share reaching 95% of the electricity mix (RTE 2024 data), thanks to its nuclear fleet and the growth of renewable energy (27.6% of generation in 2024), and a strongly positive electricity trade balance, with 89 TWh of exports. This availability of low-carbon electricity is identified as a major advantage in the national hydrogen strategy. **Transporting hydrogen to industrial clusters such as Fos-Berre, Vallée de la Chimie (Lyon's chemical valley), Moselle-Rhine, northern France, the Seine Valley, eastern Paris, the Loire estuary and Lacq requires the development of a high-capacity hydrogen transport network.**

**Germany** is Europe's leading industrial country. It is home to major players in steel production and chemicals, accounting for around a quarter of Europe's crude steel production in 2024. In 2000, Germany took a historic decision to phase out nuclear energy while significantly expanding renewable energy. By 2024, renewables accounted for nearly 60% of electricity production (source: German Embassy). However, this increase has been accompanied by a decline in overall production and a rise in imports, which grew from 9.2 to 26.3 billion kilowatt-hours between 2023 and 2024. **In summary, Germany has high energy demand but currently lacks sufficient domestic production capacity to generate the decarbonised hydrogen required by Europe's largest industrial economy.**

*Industrial site in Duisburg (Germany)*

## Projected hydrogen demand, in figures

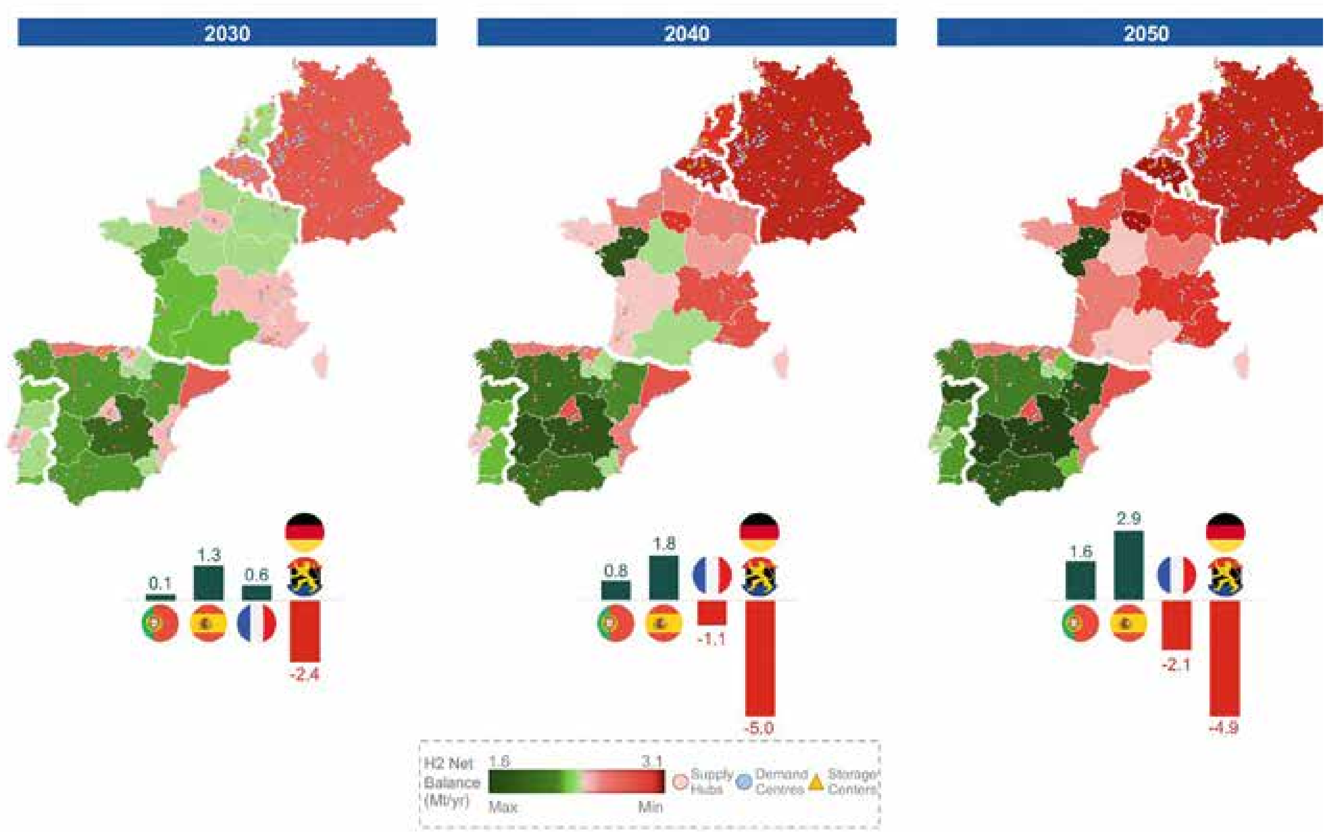
In February 2024, the European Commission commissioned a study from the consultancy BIP entitled “The renewable hydrogen potential of the Iberian Corridor” (available at: *https://op.europa.eu/publication- detail/-/publication/34d76014-1ef7-11ef-a251-01aa75ed71a1*). This study is a key reference document on the hydrogen market in Western Europe and provides baseline data for the regions served by the H2med corridor.

*Potential net balance between hydrogen supply and demand for 2030, 2040 and 2050 by country (in Mt)..*

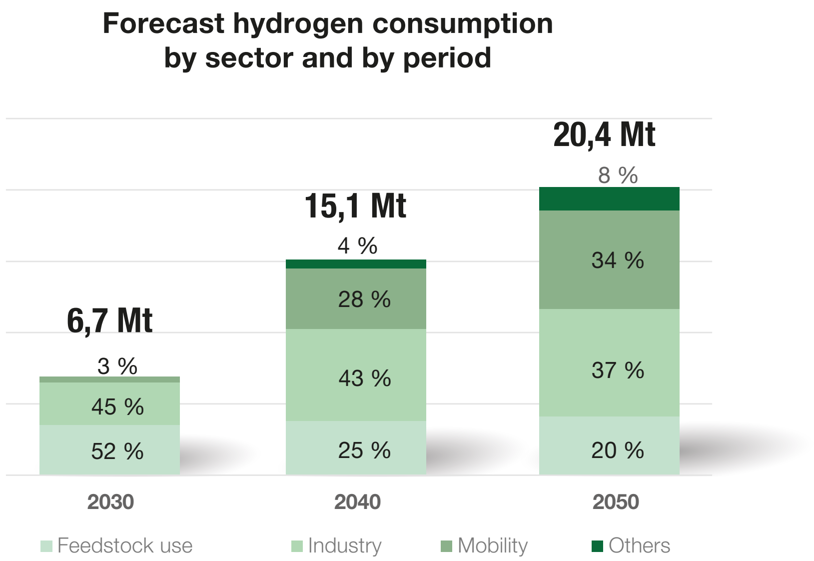
| | 2030 | | | 2040 | | | 2050 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Prod. | Cons. | Net. | Prod. | Cons. | Net. | Prod. | Cons. | Net. |
| Portugal | 0,4 | 0,2 | 0,1 | 1,3 | 0,5 | 0,8 | 2,0 | 0,5 | 1,6 |
| Spain | 2,2 | 0,9 | 1,3 | 4,1 | 2,3 | 1,8 | 5,4 | 2,5 | 2,9 |
| France | 1,5 | 0,9 | 0,6 | 2,1 | 3,2 | -1,1 | 2,8 | 4,9 | -2,1 |
| Benelux & Germany | 2,3 | 4,7 | -2,4 | 4,1 | 9,1 | -5,0 | 7,7 | 12,6 | -4,9 |

**What can be observed?**

- As early as 2030, a clear contrast emerges between high production in the Iberian Peninsula and strong demand in Germany.
- This trend is confirmed in 2040 and 2050, to the point that renewable hydrogen produced in the Iberian Peninsula will be both essential and insufficient to meet demand in Germany and the Benelux.
- From 2040 onwards, the Benelux and Germany could rely heavily on imports from other European hydrogen corridors, or even from North Africa.



*Main sectors consuming renewable hydrogen in Europe*




### What can be observed?

- Demand grows rapidly and steadily.
- Initially, hydrogen demand is driven primarily by its use as a feedstock, for example in steel reduction and refining, and by industrial uses such as process heat.
- From 2040 onwards, demand from the mobility sector becomes very significant.

| **Breakdown** (in millions of tonnes) | FORECAST 2030 | FORECAST 2040 | FORECAST 2050 |
|---|---|---|---|
| **FEEDSTOCKS** | | | |
| Refining | 1.755 | 1.894 | 2.085 |
| Ammonia for chemical use | 1.108 | 1.169 | 1.256 |
| Energy | 0.404 | 0.422 | 0.451 |
| Other chemical products | 0.200 | 0.212 | 0.230 |
| Chemical methanol | 0.099 | 0.096 | 0.098 |
| **CHEMICAL METHANOL** | | | |
| Chemicals and petrochemicals | 1.089 | 2.736 | 3.546 |
| Non-metallic minerals | 0.606 | 1.316 | 1.590 |
| Iron and steel | 0.514 | 0.966 | 1.160 |
| Paper, pulp and printing | 0.530 | 0.935 | 0.915 |
| Non-ferrous metals | 0.249 | 0.443 | 0.429 |
| **NON-FERROUS METALS** | | | |
| Heavy goods vehicles, buses | 0.168 | 4.138 | 6.658 |
| Domestic aviation | | 0.098 | 0.217 |
| Inland navigation | | 0.048 | 0.074 |
| **TOTAL** | **6.7** | **15.05** | **20.4** |

## KEY POINTS...

- The Iberian Peninsula, particularly Spain, is developing the capacity to produce abundant and affordable renewable hydrogen.
- Germany faces a major challenge: decarbonising Europe’s largest industrial economy while remaining a net importer of electricity.
- Projections indicate a broad alignment between Iberian production and demand in Germany and the Benelux.
- In the medium term, France is expected to become an exporter of low-carbon hydrogen, although from 2040 onwards it will also require imports.

# WITH H2MED, EUROPE COMMITS TO A GREEN ENERGY CORRIDOR

## The Salamanca agreement

**On 20 October 2022, the Prime Minister of Spain, Pedro Sánchez, the President of France, Emmanuel Macron, and the Prime Minister of Portugal, António Costa, agreed to prioritise the creation of a green energy corridor linking Spain, Portugal and France to the European Union's hydrogen network. This marked the launch of the H2med initiative.** It is expected to carry around 10% of projected hydrogen consumption in Europe by 2030, equivalent to 2 million tonnes per year.

**A few weeks later, this initiative was formalised through the Alicante agreement, which provides for the construction of two cross-border infrastructures connecting national networks – one between Celorico da Beira in Portugal and Zamora, and the other, offshore, between Barcelona and Marseille in France.**

## The Alicante summit

**On 9 December 2022** in Alicante, the Summit of the Southern Countries of the European Union marked the **official launch of the H2Med corridor and the projects CelZa (Celorico-Zamora) and BarMar (Barcelona- Marseille).**

In their joint declaration, the heads of state emphasised that H2med addresses the three objectives promoted by the European Union: **climate, industrial development and sovereignty.** In view of the difficulties and uncertainties surrounding the other technical options (see chapter 4 for the scenarios considered and discarded), they announced the launch of studies for the implementation of H2Med via a ***"Mediterranean route"*.**

At the same time, these projects were put forward for inclusion on the list of Projects of Common Interest, enabling them to benefit from political and financial support from the European Union.

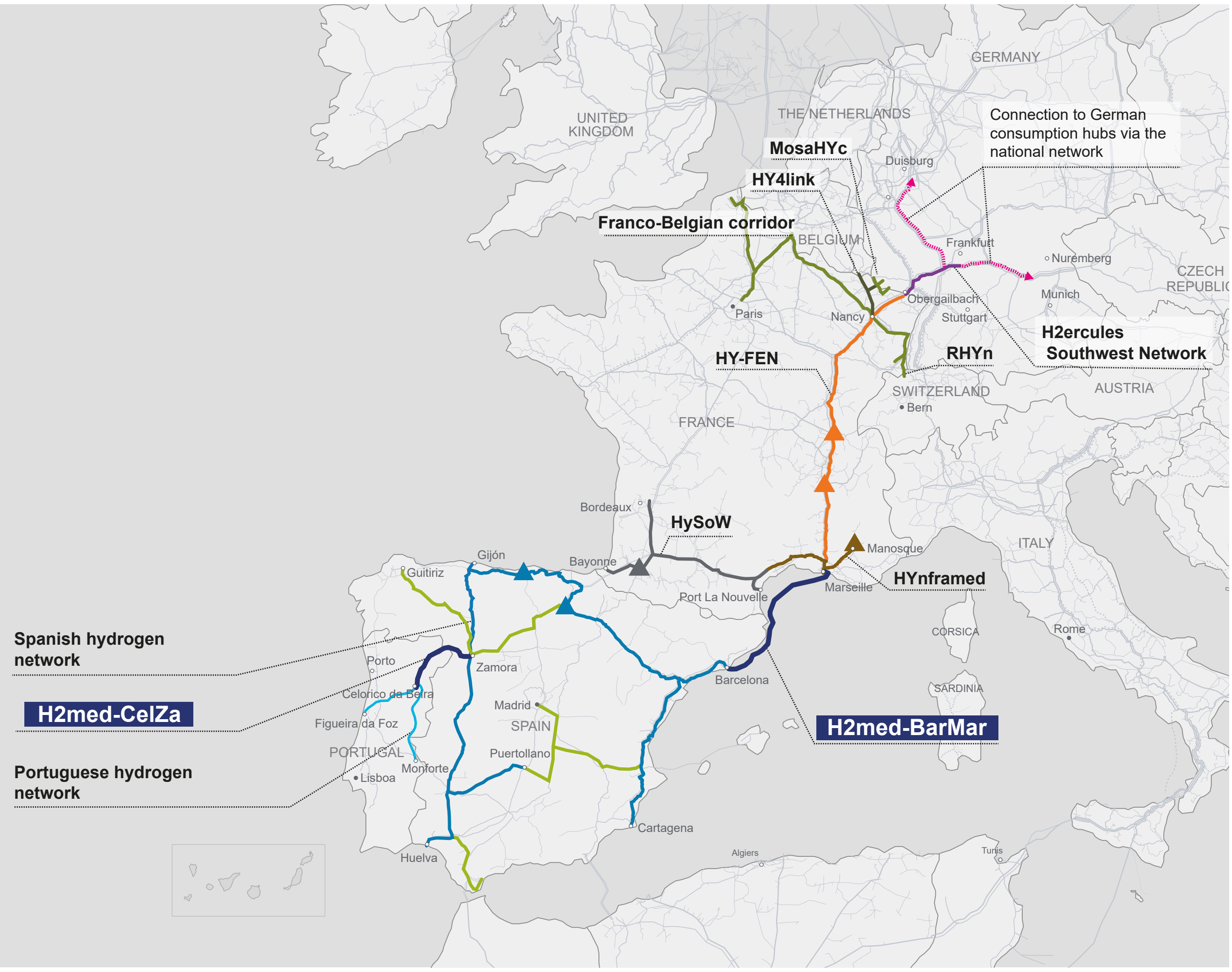
On 8 April 2024, H2med was included on the list of Projects of Common Interest, and in December 2025 the European Commission proposed renewing its PCI status for the second list to be published in 2026. As Project of Common Interest No. 9.1.4, "Hydrogen interconnection Spain–France", within the H2med corridor, BarMar benefits from the advantages associated with this status, including access to EU funding under the Connecting Europe Facility (CEF). The project has received €28.33 million in EU funding for its studies, enabling the completion of the preparatory work required ahead of the investment decision and contributing to the development of a strategic cross-border hydrogen infrastructure in Europe.

### >> WHAT IS A PROJECT OF COMMON INTEREST?

Projects of Common Interest are key infrastructure projects designed to complete the European Union's internal energy market. They aim to ensure energy that is affordable, secure and sustainable for all Europeans.

PCI status provides access to European funding

## The H2med corridor and national hydrogen transport networks




*The H2med corridor and national hydrogen backbones. In dark blue, the CelZa and BarMar interconnections play an essential role in the effective functioning of the national backbone networks.*

## KEY POINTS...

- The heads of state of Portugal, Spain and France, together with the President of the European Commission, have agreed on the importance of a European hydrogen transport corridor to link the Iberian Peninsula to Germany: H2med.
- This corridor will include two interconnections: CelZa between Portugal and Spain, and BarMar between Spain and France.
- For BarMar, studies have focused on a reference scenario involving a subsea pipeline.

## THE 2024 CALL FOR INTEREST

### What did this involve?

On 7 November 2024, the promoters of H2med (REN, Enagás, NaTran, Teréga and OGE) launched a call for interest (CFI) aimed at identifying hydrogen production and consumption needs in regions along the corridor, in particular those linked to the national hydrogen networks being developed by the five project promoters by the early 2030s.

The process closed on 18 December 2024 and gathered input from 168 companies (11 in Portugal, 85 in Spain, 54 in France and 18 in Germany), covering a total of 528 projects and demonstrating very high level of interest.

### What did the CFI reveal?

In Portugal and Spain, export potential could reach 0.38 and 4.6 Mt per year respectively as early as 2035. Spanish consumption is expected to reach 2.6 Mt per year, leaving significant export potential via BarMar.

**In France, the CFI highlights substantial volumes, with both strong market demand and significant production potential along the corridor.** Consumption in the regions concerned could reach 0.2 Mt per year by 2030 and nearly 0.9 Mt per year by 2050, driven mainly by industry and the production of e-fuels for aviation. This underlines the key role of hydrogen in industrial transition and competitiveness.

The figures for consumption and production reflect the data collected along the H2med corridor, suggesting that the total potential in Germany, across 528 projects, points to very strong interest. **The contributions gathered through this CEI, which was open for only a short period, reflect only a fraction of market demand, particularly in France and Germany**.

In practical terms, the aim was to build on an initial assessment of hydrogen production and consumption projects that could benefit from the H2med corridor, in order to put the pipeline's capacity into perspective. This approach will be repeated in future stages of the development of BarMar (see chapter 6).

France's potential could in fact be even higher. Part of France's domestic production could be exported to Germany via HY-FEN.

**In Germany, in the western part of the network – the only area covered by the CFI – demand could reach 1 Mt per year by 2035**, absorbing around half of the corridor's capacity. Estimates by the German government for total national demand are even higher (3.4 Mt per year in 2030, 17–21 Mt per year in 2040 and 30 Mt per year in 2050).

Overall, the levels of interest expressed in terms of both consumption and production are closely aligned, confirming the relevance of the project. In practice, if production exceeds consumption demand, it is the latter that will determine the volume of hydrogen transported via BarMar.

**OVERVIEW OF BARMAR'S POTENTIAL**

| | 2035 | 2040 | 2050 |
|---|---|---|---|
| Annual share of Portuguese and Spanish H2 production likely to transit through BarMar | **2.3 Mt**<br>(Portugal : 0.35 + Spain : 2) | **2.4 Mt**<br>(0.4 + 2) | **2.4 Mt**<br>(0.4 + 2) |
| Annual H2 consumption in France and Germany via the H2med corridor. | **1.4 Mt**<br>(France : 0.4 + Germany : 1) | **2.1 Mt**<br>(0.5 + 1.6) | **2.5 Mt**<br>(0.9 + 1.6) |

### KEY POINTS...

- The H2med project developers surveyed hydrogen producers and consumers through a CFI (late 2024), which demonstrated alignment between industrial expectations and the transport capacity of BarMar.

## SCENARIO 0: WHAT ARE THE CONSEQUENCES IF NO CONNECTION IS ESTABLISHED FOR HYDROGEN TRANSPORT BETWEEN FRANCE AND SPAIN?

***If no connection is established between France and Spain for hydrogen transport, the Iberian hydrogen market will remain separate from the wider European market. This would have several major national and European consequences.***

The absence of this project would deprive Europe of a key lever for strategic autonomy. In an increasingly complex geopolitical context, as highlighted by conflicts such as those in Ukraine and Iran, the continent's energy security depends more than ever on our ability to strengthen the sovereignty of our supply sources.

Hydrogen is essential for many industrial processes. If European hydrogen production and availability are insufficient, European industries will have to rely either on hydrogen produced in other countries or on hydrocarbons (more than 90% of which are produced outside the EU).

The absence of this project would also have an impact on reducing Europe's $CO_2$ emissions. In particular, Germany (Europe's largest industrial economy and by far its largest $CO_2$ emitter) would not have the capacity to produce the decarbonised hydrogen required by its industry. Without the hydrogen transported via BarMar, several million tonnes of $CO_2$ emissions could not be avoided each year.

**At European level,** the absence of this connection would reduce opportunities for integrating the Iberian Peninsula and German hydrogen markets.

By linking substantial production and consumption capacities, H2med BarMar would play a stabilising role in prices. Without BarMar, it would be very difficult to achieve the target of 20 Mt of renewable hydrogen in Europe, especially as the other corridors would not be sufficient to meet German demand.

In addition to these impacts common to all countries, more specific effects can also be highlighted for the countries concerned.

**At national level in France**, the absence of BarMar would make it more difficult to develop hydrogen pipelines connected to Fos-sur-Mer (HySoW, HYnframed, MidHY, HY-FEN) and to Barcelona in Spain. The optimal functioning of the French national hydrogen network depends in part on its connection to the European corridor. The national strategy for decarbonised hydrogen underlines the importance of connecting industrial hubs.

Moreover, BarMar would ensure the availability in France of abundant and affordable decarbonised hydrogen. This is a key factor in supporting the transformation of certain industrial processes and the development of new value chains, including at local level (for example, the production of synthetic aviation fuels). Falling behind in the availability of renewable hydrogen would penalise all industrial sectors undergoing the energy transition and would put tens of thousands of jobs at risk.

Finally, **in the Iberian Peninsula**, the development of renewable hydrogen production capacity would be limited or delayed in the absence of export opportunities. As highlighted by the CFI, the potential for renewable hydrogen production (2 Mt per year in Spain by 2035) could not be fully utilised to decarbonise European industry.

### KEY POINTS...

- Without an interconnection between France and Spain, Europe would be depriving itself of a major lever for energy independence, at a time when the wars in Ukraine and the Middle East underline the urgency of strategic autonomy. The absence of this connection would also call into question the development of electrolysis capacity in Spain, the decarbonisation of industry in Germany, and would significantly slow the emergence of a French decarbonised hydrogen sector.

# 4. THE BARMAR PROJECT and its characteristics

## PROJECT LOCATION

### Stage 1: A broad initial study area to explore all options

When the BarMar project was initiated in 2022 in the form of an offshore pipeline, an initial study area of around 50,000 km² was defined, from Barcelona to Marseille. This very large area made it possible to keep all options open, whether close to the coast or far offshore, in the abyssal plain. Technical and literature-based studies were then carried out.

### Stage 2: Identification of three areas incompatible with the nature of the project

The initial studies led to the identification of three exclusion zones. These areas have **characteristics that are incompatible with an offshore pipeline** project for technical or environmental reasons:

#### CANYONS

The transition zone between the continental shelf (depth up to around 100 m) and the abyssal plain (around 2,600 m) consists of canyons. These areas are highly environmentally sensitive. Canyons also present major technical challenges: steep, unstable slopes, strong currents and sediment movements that can alter seabed morphology. Under such conditions, it is not technically feasible to install and ensure the stability of a pipeline.

#### ABYSSAL PLAIN

Located beyond the canyons, the abyssal plain reaches very great depths of up to 2,600 m. This results in a combination of technical challenges that have never been encountered together on similar projects and are currently impossible to address:

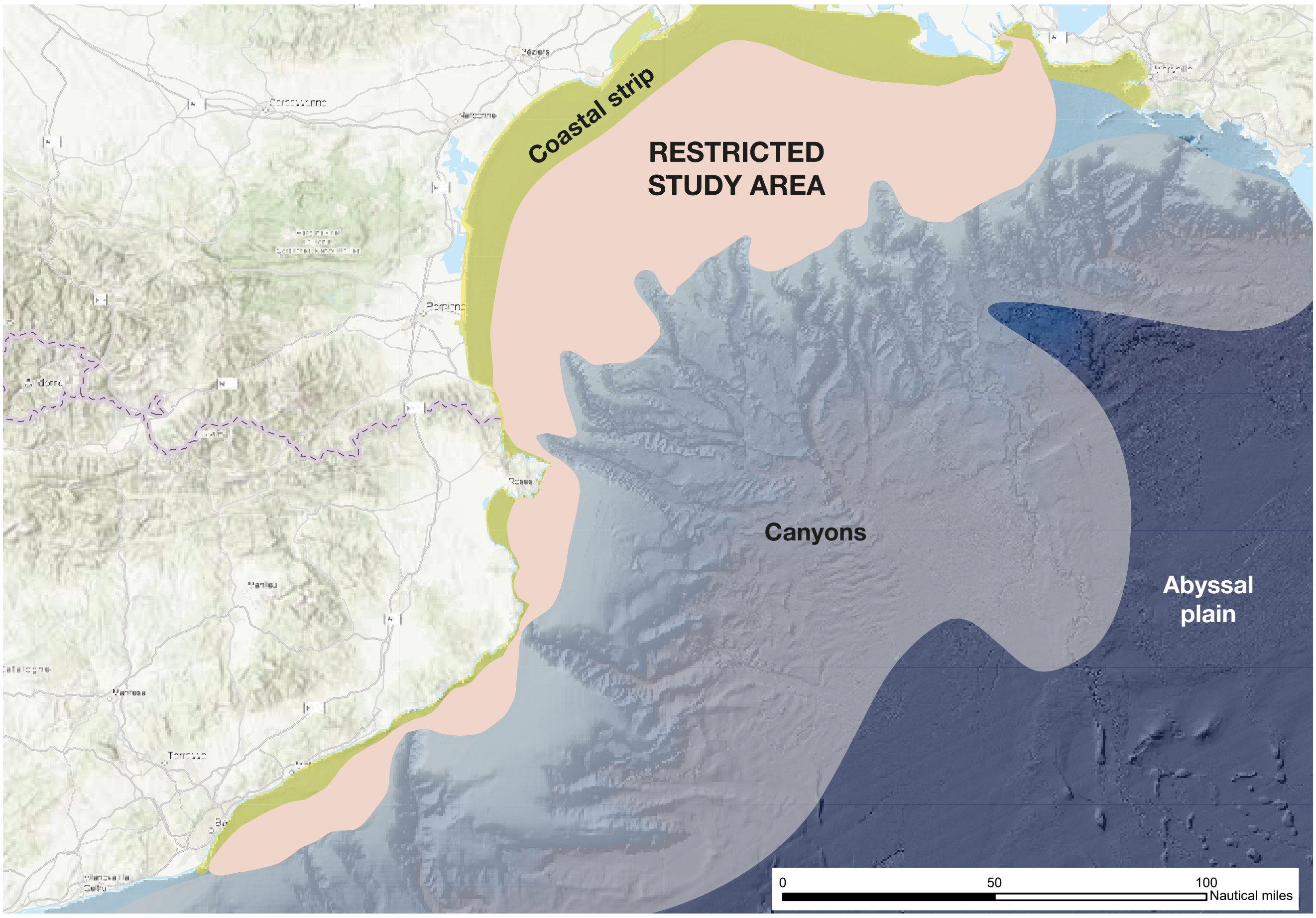
- reduction of pipeline diameter to withstand water pressure, need for hydrogen to be compressed to very high pressure (above 200 bar) to maintain the same transport capacity, thereby significantly increasing both energy consumption and the footprint of the Barcelona compression station;
- significant increase in steel thickness (+15 mm compared to the coastal route), there by posing technological challenges for pipe manufacturing, welding during installation and internal inspection;
- very limited number of vessels capable of installing such a pipeline due to its weight and depth;
- in the event of an incident during installation leading to loss of integrity and water ingress, it would be technically impossible to recover the pipeline due to its weight and depth;
- complexity of monitoring and maintenance operations;
- need to identify a corridor to cross steep-slope areas.

For these reasons, crossing the abyssal plain is not technically feasible.

#### COASTAL STRIP

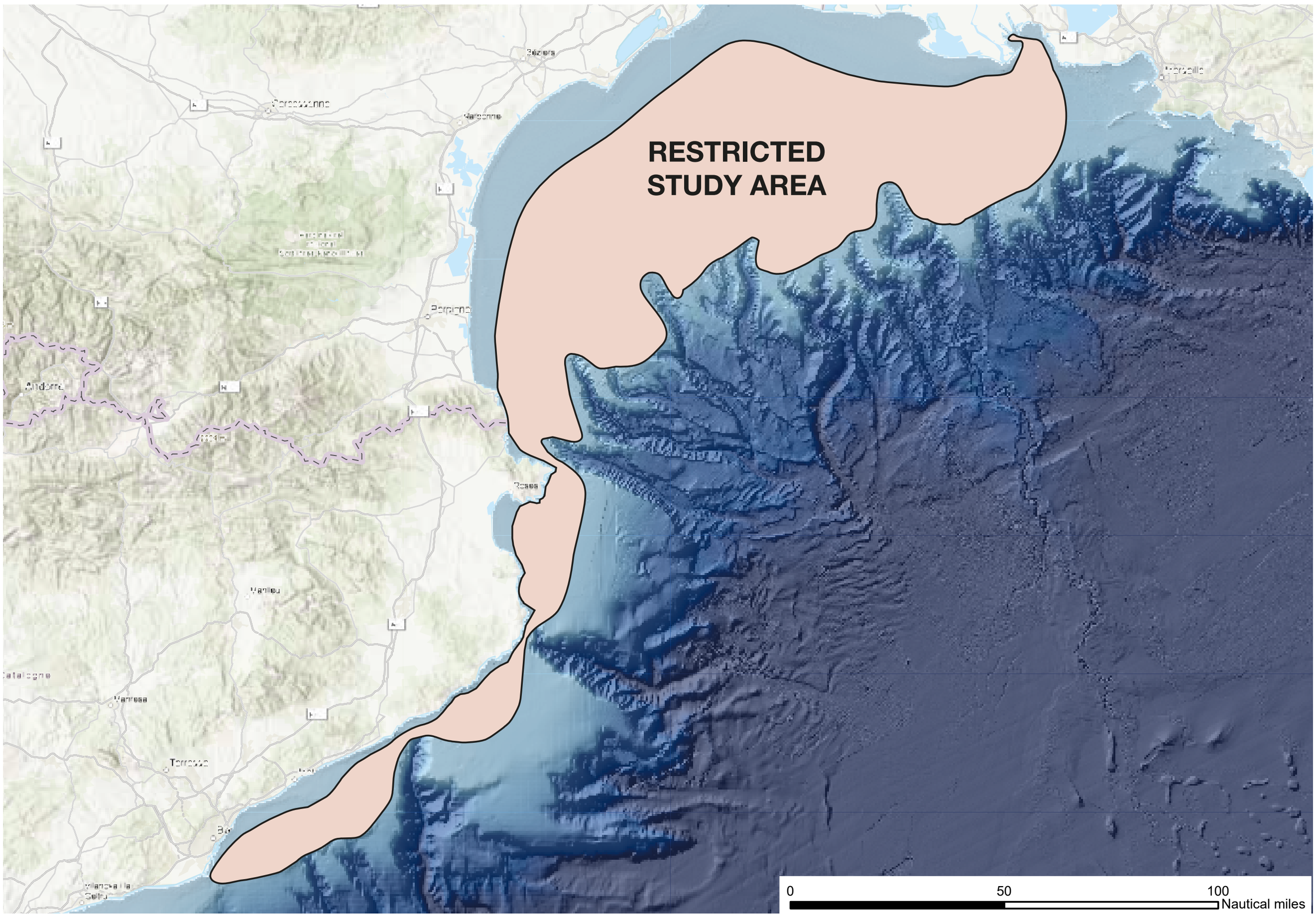
This nearshore zone (depth less than 50 m) includes numerous natural sites and protected habitats. It includes, in particular, seagrass meadows (*Posidonia*) extending to depths of up to 40 m, which provide essential habitats for many species. It also includes key habitats for seabirds and spawning grounds. In addition, this area is characterised by a very high density of fishing, recreational boating and tourism activity.

## INITIAL STUDY AREA: ZONES INCOMPATIBLE WITH PROJECT DEVELOPMENT AND RESTRICTED STUDY AREA




Between the coastal strip and the canyons, an area with water depths of between 50 and 120 m emerges. **This was selected as the restricted study area – an initial step in avoiding key technical, environmental and human constraints**. It should be noted that south of the border area the coastal strip is very narrow, with depths increasing rapidly.

## Stage 3: Characterisation of the restricted study area




*The restricted study area obtained after excluding incompatible zones.*

The restricted study area is a zone in which the project is technically feasible.

In Spain, it is relatively limited in size, as the continental shelf is very narrow. From the coast, the slopes quickly become steep, and some canyons extend very close to the shoreline. The study area already resembles a corridor whose width rarely exceeds 10 km.

In France, this area is much more extensive: 8,186 $km^2$. Before carrying out more detailed and costly offshore surveys, it is therefore appropriate to introduce an additional step to define a corridor (a zone several kilometres wide allowing for multiple routing options).

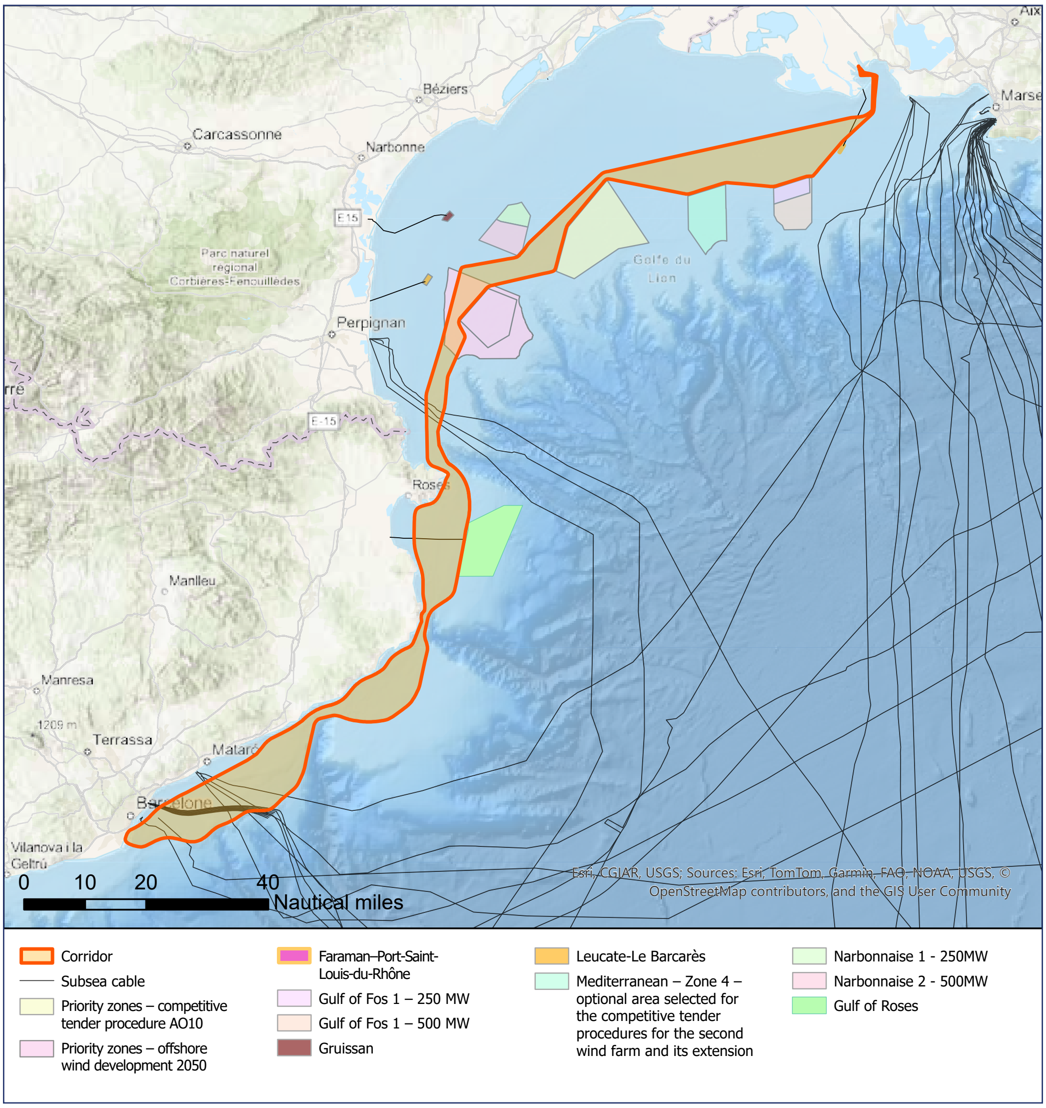
## Stage 4: Taking offshore wind projects into account to define a corridor

While not strictly incompatible with an offshore pipeline, **certain economic activities impose very significant constraints on the construction and operation of a hydrogen pipeline** (see next chapter). This is particularly true of offshore wind farms. Several wind development zones have been identified in France and Spain.

On the French side, preliminary discussions between the BarMar project promoters and the Ministry of the Economy, Finance and Industrial, Energy and Digital Sovereignty, responsible for the development of floating offshore wind farms, and the Directorate General for Energy and Climate (DGEC), highlighted the significant difficulties that would arise from the presence of both a floating wind farm and the pipeline in the same area. The presence of cables and mooring systems, and their extensive footprint, is incompatible with the need for access to the pipeline for monitoring and maintenance during operation. For this reason, the decision was taken to avoid the five wind development zones identified by the French government.

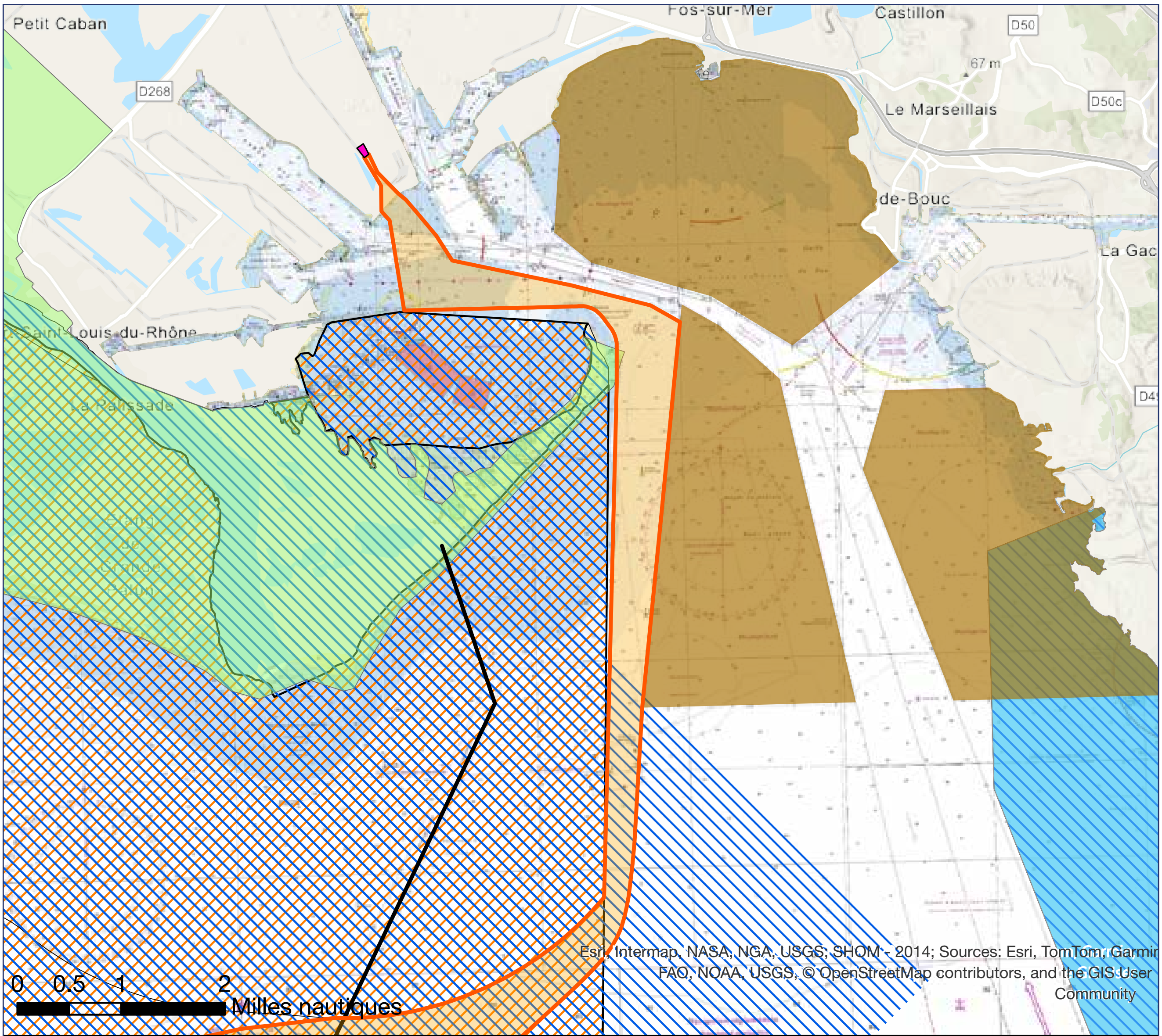
In Spain, only one wind development zone lies within the initial study area. This was already taken into account in the definition of the restricted study area on the Spanish side, so it does not lead to any further reduction of the study area. These aspects are described in detail in the following chapter.

Finally, certain industrial constraints relating to the Grand Port Maritime de Marseille-Fos (Port of Marseille Fos) and the Port of Barcelona were taken into account in order to narrow the corridor at the ends of the project..




*Areas of major constraint and the resulting route corridor obtained by avoiding them.*

## ZOOM IN ON THE STUDY CORRIDOR IN THE GULF OF FOS AND THE LANDFALL AREA

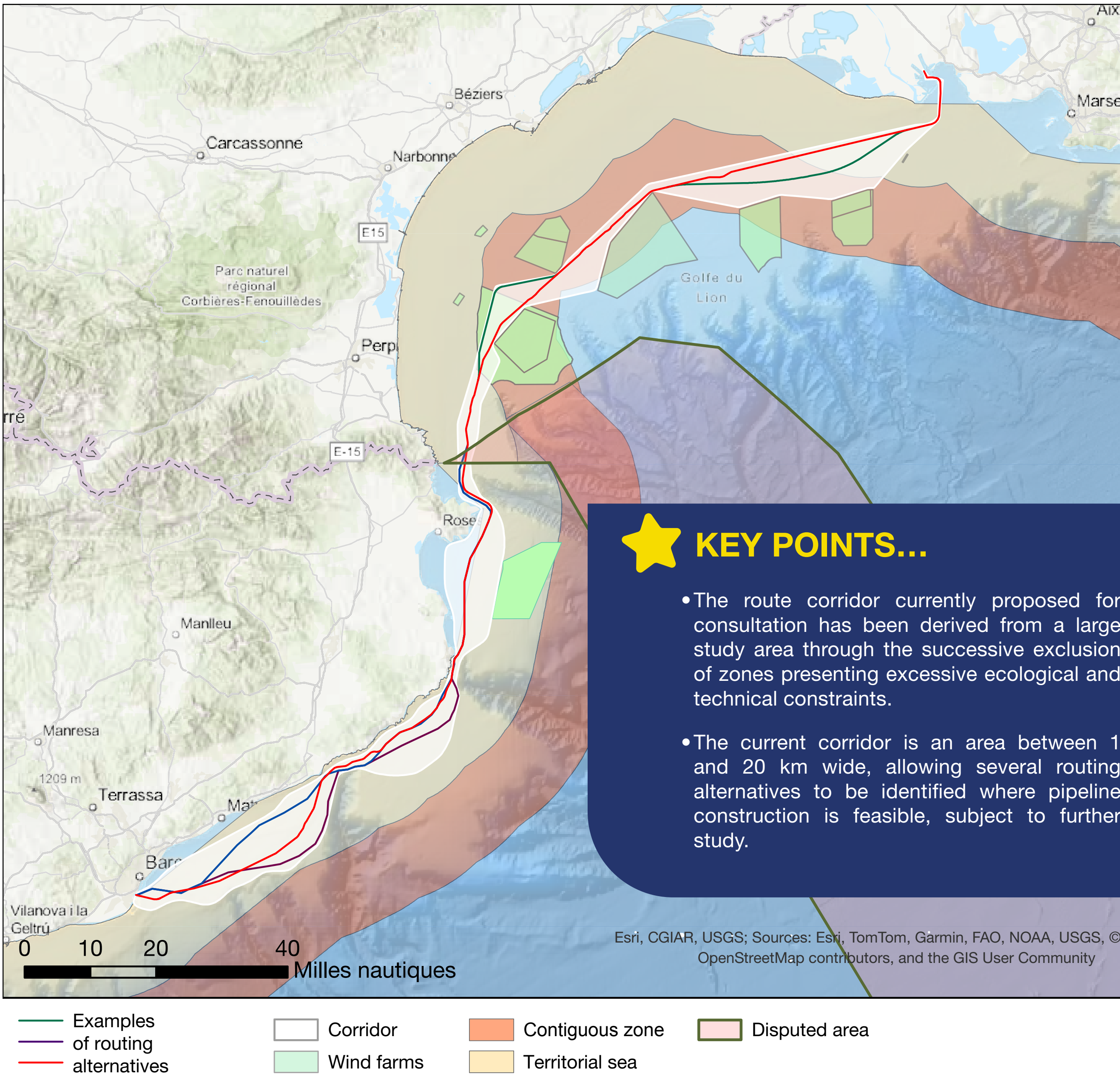



Landfall Interconnection site
Corridor
Anchorage areas
Regional Nature Reserve
Marine Protected Area (MPA)
Wetlands of international importance (Ramsar sites)
Natura 2000 site (Site of Community Importance (SCI), Special Area of Conservation (SAC)) Natura
2000 site (Special Protection Area (SPA))
Specially Protected Areas of Mediterranean Importance (SPAMI)
Shellfish farming area

## Stage 5: The route corridor proposed for consultation and examples of routing alternatives

The resulting route corridor has **widths ranging from 1 to 20 km**. It lies at water depths between around 50 m and almost 120 m (in Spain), excluding the landfall areas.

This route corridor forms the basis for public consultation in each country. It is within this area that offshore studies are carried out and where an increasingly precise route will be defined during the development of the project.




### KEY POINTS...

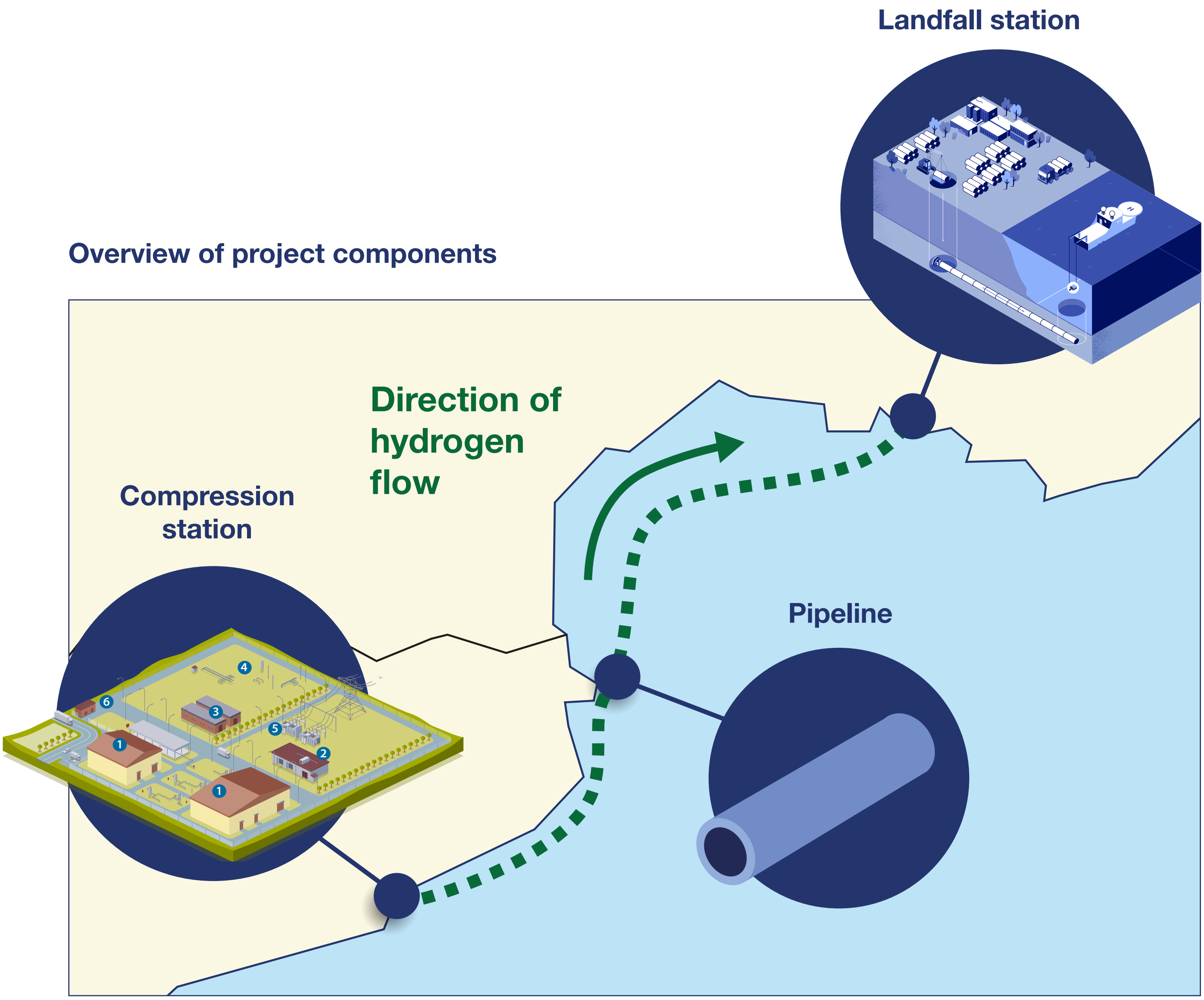
- The route corridor currently proposed for consultation has been derived from a large study area through the successive exclusion of zones presenting excessive ecological and technical constraints.
- The current corridor is an area between 1 and 20 km wide, allowing several routing alternatives to be identified where pipeline construction is feasible, subject to further study.

# TECHNICAL CHARACTERISTICS OF BARMAR

## Key figures

| | |
|---|---|
| **Length** | Approximately 400 km |
| **Diameter** | Approx. 1 m (42 inches) |
| **Maximum depth** | Up to 120 m |
| **Operating pressure** | Approx. 100 bar |
| **Compression station capacity** | Up to 60 MW |
| **Maximum transmission capacity** | 2 million tonnes/year |
| **Budget** | Approximately €2.1 billion |

## Overview of project components




The BarMar project is made up of three components. In Barcelona, the **compression station** is the starting point for the hydrogen flow. It is transported via a subsea **pipeline**. It then reaches Fos-sur-Mer at a **landfall station**, where it connects to the underground onshore network.

## The three components of the project

### The compression station

*Where will it be located?*

The compression station will be located within Enagás facilities at the Port of Barcelona. It is a highly industrialised area (classified as a Seveso site), consisting of reclaimed land (port area) and separated from the sea by a breakwater currently used as a freight/cruise terminal and potentially available for future expansion. A dedicated safety study will define the adaptations required for the installation of the compression station on this site.


*How does it work?*

A compression station is a facility similar to a water pumping station: several compressors driven by electric motors supply energy to the hydrogen by increasing its pressure, so that it can be transported over long distances through pipelines. The compressors can operate simultaneously or individually (to be kept in reserve for maintenance periods or in the event of breakdowns).

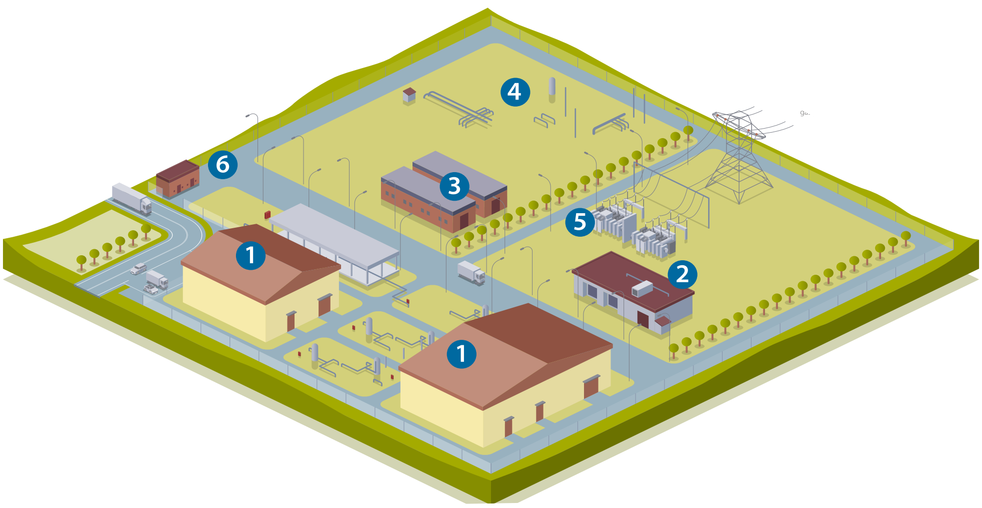
Before passing through the compressors, the hydrogen undergoes a filtration process to remove any particles that could affect the operation and integrity of the main equipment. After filtration, the hydrogen is routed to the compressors and then sent into the subsea pipeline.

The compression phase causes the temperature of the hydrogen to rise. An air-cooling process is therefore required to reduce its temperature before it is injected into the pipeline. For this reason, fans will be installed on site.

All operations at the compression station are carried out automatically by the control system. The main station parameters are configured: suction pressure, discharge pressure, flow rate to be compressed and discharge temperature. The control system activates the appropriate number of machines and regulates their speed.

The installation will be equipped with a hydrogen depressurisation system (vent or flare) for emergencies and for maintenance work, in accordance with national regulations..

**The technical details of the required compression station will be defined in later phases of the project.**



**Compression station**

1 Compressor halls
2 Control building
3 Measurement and/or regulation station*
4 Pigging station**
5 Transformers
6 Access control

* Hydrogen inlet/outlet facilities to/from the transmission system
** Facilities for connection to transmission gas pipelines

## The pipeline

Currently estimated at just under 400 km in length, the pipeline is the main component of BarMar. It consists of an assembly of pipes, each 12 m long – nearly 33,000 pipes in total.

*What are the pipes made of?*

A pipe consists of three layers:

- steel (25 to 30 mm thick), ensuring tightness;
- HDPE plastic (3 mm), providing passive protection against external corrosion;
- concrete (70 to 100 mm), used to weight and stabilise the pipeline on the seabed.

*Where will the pipes come from?*

At this stage, the production location of the pipes has not yet been determined. Given the presence of major market players on the continent, however, they are most likely to be manufactured in Europe. The use of multiple suppliers is also possible. Depending on their origin, the pipes will be transported by sea or by rail to a coastal logistics platform, where they will be stored. The precise arrangements for storage will be defined at a later stage, based on technical and environmental criteria, as well as land and industrial opportunities.

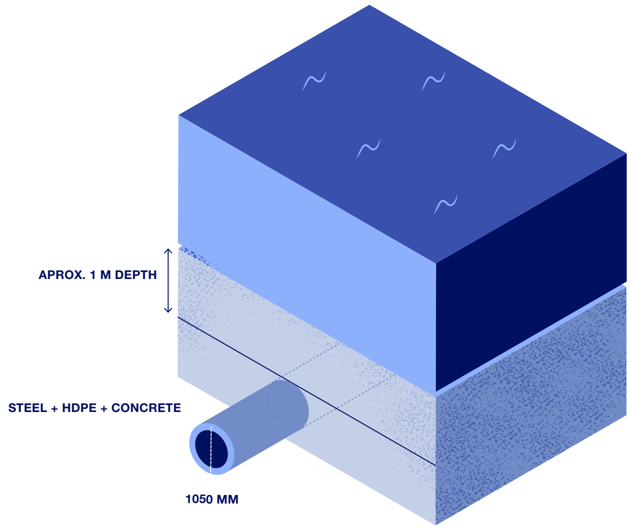
*What distinguishes the BarMar pipeline from an onshore natural gas pipeline?*

Hydrogen is the smallest known molecule. It therefore has the ability to penetrate potential imperfections in the steel. In order to address this, the steel casing is slightly thicker, and quality control requirements during pipe manufacturing and welding are more rigorous. The presence of a concrete coating for ballast is another distinguishing feature. The welding process itself is identical in all respects to that used for an onshore pipeline

*How are strength and tightness ensured?*

During construction, every weld undergoes 100% visual and volumetric inspection (ultrasound or radiography).

In addition, a key stage takes place once the pipeline has been completed: water is injected into the pipeline until a pressure higher than the operating pressure of BarMar is reached. If the integrity of the pipeline is maintained, its strength is immediately confirmed. The tightness test takes longer than the strength test: several days are required to ensure that the pressure is maintained. If the pressure remains stable, the pipeline is considered tight. These tests could require approximately 300,000 m³ of industrial water. Studies to support this are ongoing.

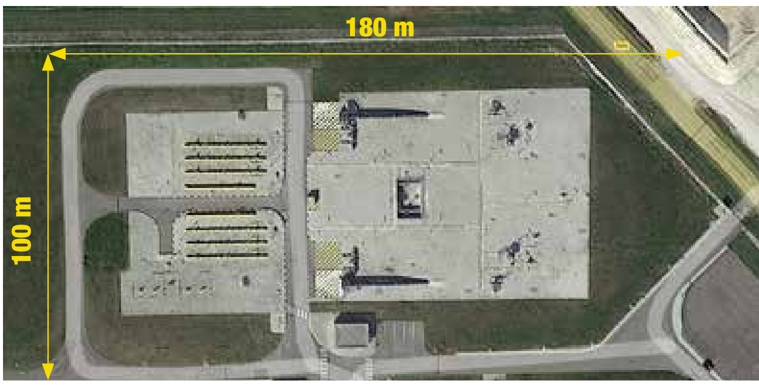



## The receiving station

The onshore receiving station (landfall station) will consist of above-ground and buried piping within a fenced area of approximately 2 hectares, located south of the central bulk terminal at Fos-sur-Mer. Its planned location is shown in the diagram of the pipeline landfall in the Gulf of Fos, in the previous section.

It will include equipment to ensure the maintenance and monitoring of the subsea pipeline:

- pigging station enabling the insertion and retrieval of instrumented pigs equipped with sensors and detectors to monitor the internal integrity of the pipeline;
- metering equipment for measuring transported volumes;
- a regulation unit for controlling flow rate and pressure towards the onshore pipelines.




*Aerial view of a valve, metering and regulation station comparable to the future BarMar receiving station.*

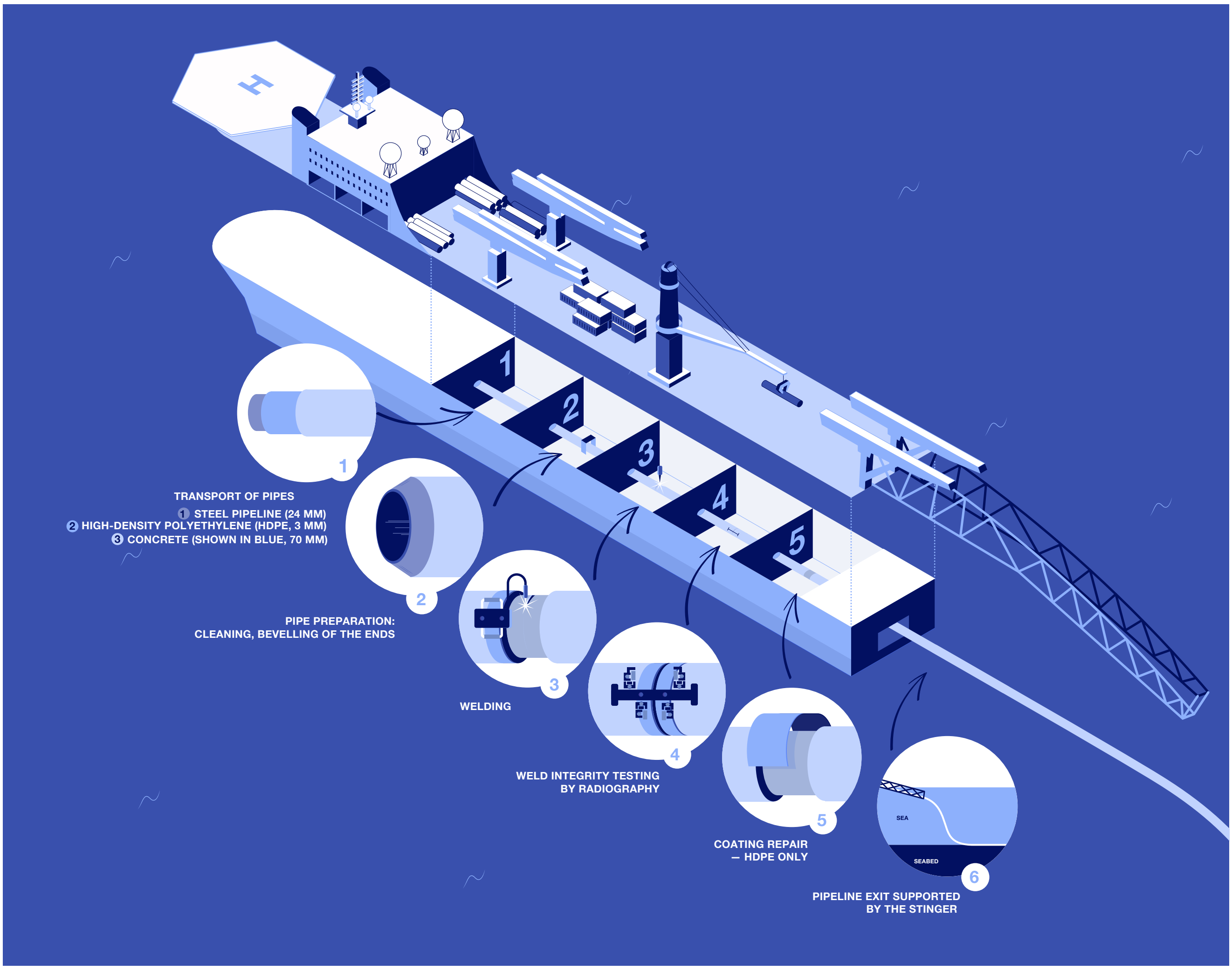
*Planned construction methods*

## Offshore works

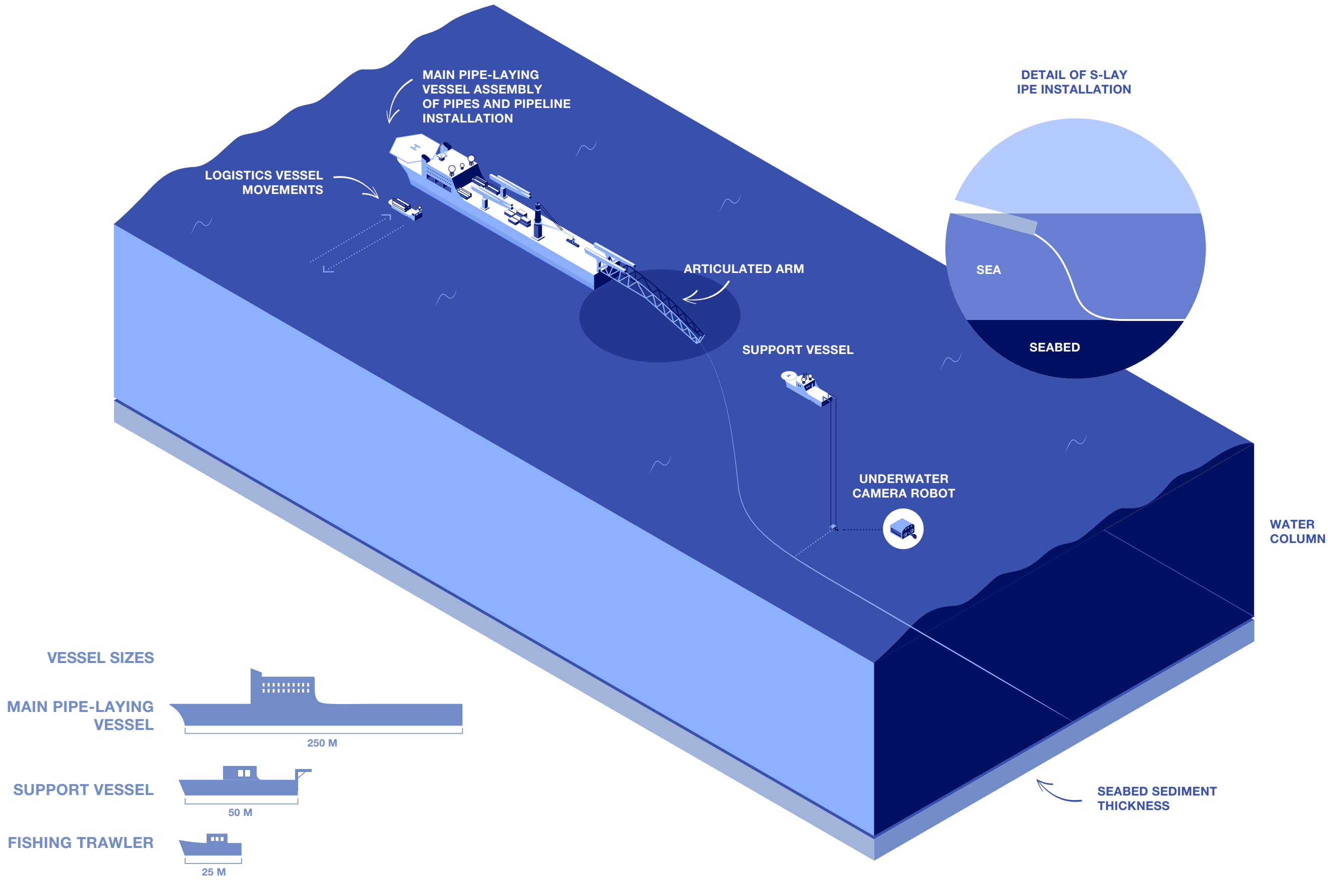
From the logistics platform (location to be determined), pipe carrier vessels will regularly supply the lay vessel as it progresses.

Several successive operations will take place on the lay vessel, with the final objective of assembling a series of pipes into a continuous, tight pipeline. The diagram below illustrates these operations.

The pipeline is gradually lowered into the water using a stinger (curved support structure at the stern of the lay vessel) that supports it during the initial stages of immersion. Weighted by its concrete coating, it then settles onto the seabed. The lay vessel is guided by GPS to follow the selected route. Its accuracy is within approximately two metres. Underwater, a remotely operated camera vehicle deployed from the support vessel monitors the correct installation of the pipeline. **Construction will progress at an average rate of 2 km per day, corresponding to around 200 consecutive days of work (excluding weather-related delays).**



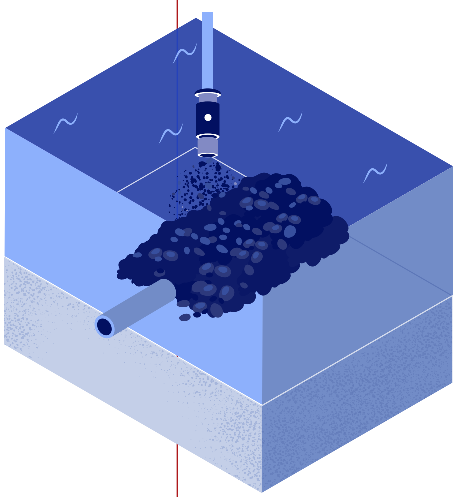

After the pipe-laying vessel has completed its operations, a second pass is carried out by a burial vessel. This vessel tows a plough system used to cut a trench into which the pipeline is lowered (trenching, see illustration below). Marine currents will then gradually cover the pipeline, thereby protecting it. In certain sections, it may be desirable to accelerate this natural covering process; a third pass is then carried out to cover the pipeline with excavated material.

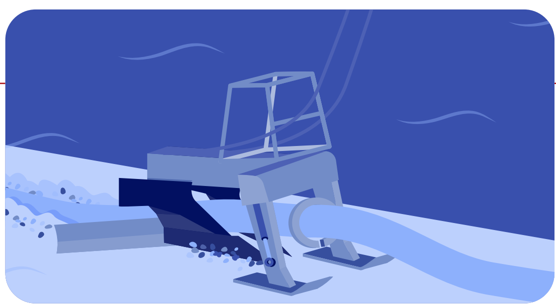



## >> PIPELINE INSTALLATION: A KEY FACTOR IN ROUTE SELECTION

Sandy or clay soils are particularly well suited to burial. This technical option allows full coexistence with other uses. A minimum of 2 m of loose sediment is required to bury the pipeline with 1 m of cover.

In some instances, it is not possible to provide a sufficient thickness of soft sediment or to avoid rocky outcrops. This situation is expected to occur in Spain in particular. Where necessary, the pipeline may then be protected by placing rock (rock dumping) or, where there is no added value (areas with no identified specific risk), simply laid on the seabed.

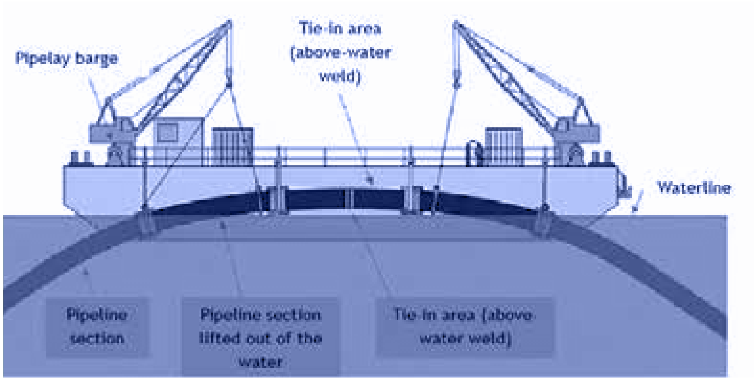




*Burial of the pipeline*

### Works in shallow water

In the Gulf of Fos and its immediate surroundings, pipeline installation follows the same principle of welding and assembling pipes at the surface before immersion. At these depths, however, **the use of a pipe-laying vessel is not possible** due to its size and draught (approximately 20–25 m). Instead, barges will be used.

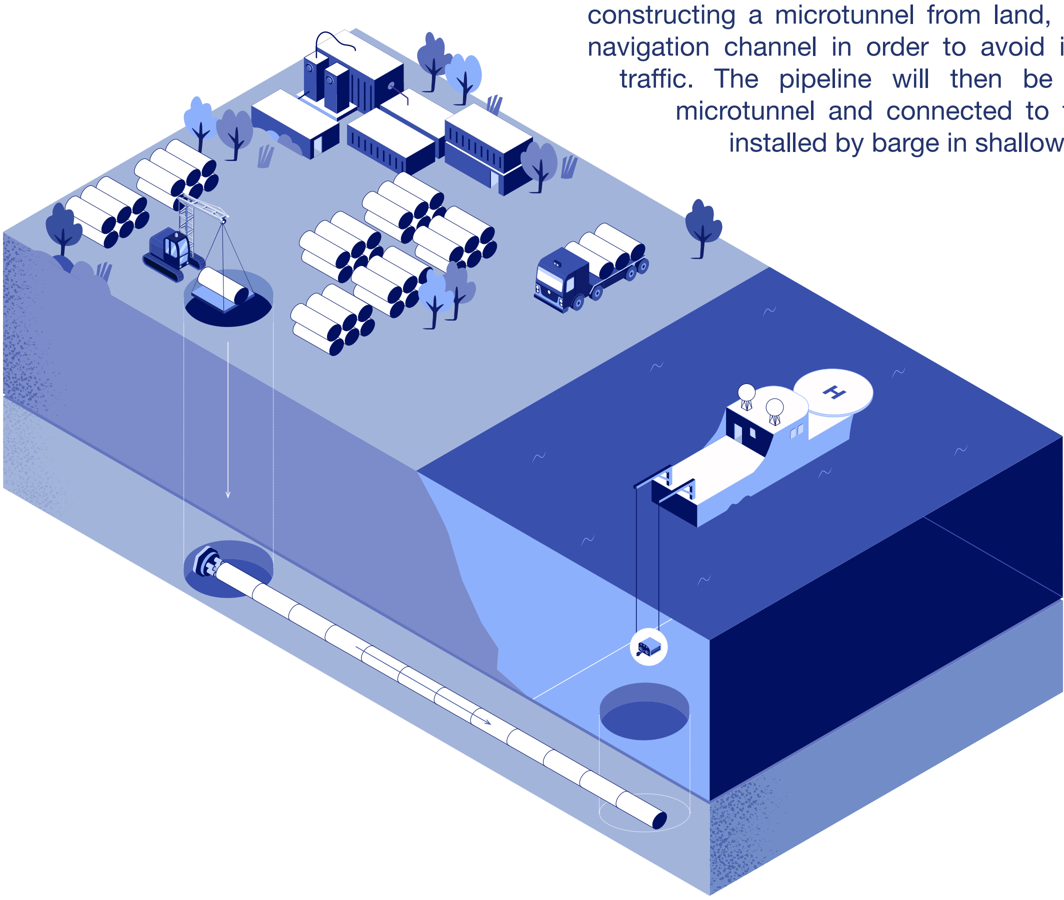



At the interface between deep water and the coastal zone, the two pipeline sections must be connected. To achieve this, their ends are brought to the surface for welding (see opposite example).

### Landfall works

Landfall refers to the area where the **pipeline transitions from sea to land**. This transition requires specific strategies to address environmental and human considerations, in particular avoiding disruption and ensuring the safety of maritime traffic.

For the BarMar project, trenching is considered too impactful and has been ruled out. The preferred technique involves constructing a microtunnel from land, passing beneath the navigation channel in order to avoid impacts on maritime traffic. The pipeline will then be pulled through the microtunnel and connected to the offshore pipeline installed by barge in shallow waters.



**Operating conditions**

The precise operating arrangements are still to be defined, pending key technical decisions. Certain aspects are already known, however:

**Continuous monitoring** of the pipeline will be ensured using various methods. Pressure is monitored continuously; a drop in pressure may indicate a leak.

**Periodic inspections** are also carried out:

- instrumented pigs pass through the pipeline to detect any deterioration.
- Video inspections are conducted using underwater robots travelling above the pipeline to ensure that it remains properly protected.

Corrective maintenance operations on subsea pipelines are very rare. If necessary, these repair operations are carried out by remotely operated vehicles (ROVs) at the depths of the BarMar project. These can install a repair sleeve around the pipeline, for example.

In extreme cases of major failure, replacement of a pipeline section is also possible. Operational continuity depends on the nature of the leak.

### >> HYDROGEN: WHAT RISK MANAGEMENT MEASURES WILL BE IN PLACE?

Hydrogen has been widely used in industry since the early 20th century. Its transport by pipeline is well established: there are already approximately 1,600 km of high-pressure hydrogen networks in Europe.

It can only ignite in the presence of air and an ignition source, which requires a high level of vigilance.

The project will involve a risk assessment to analyse potential incident scenarios. This will define measures to mitigate risks in pipeline design (steel thickness, concrete coating, burial depth, etc.) and during operational monitoring.

Once these measures are in place, the probability of an incident is negligible.

*Aerial view of the landfall area*

## KEY POINTS...

- BarMar consists of a compression station in Barcelona, a pipeline of approximately 400 km, and a receiving station at Fos-sur-Mer.
- All three components are well established in the gas transport industry. The novelty lies in the nature of the gas transported: hydrogen. This requires specific treatment of the pipeline.
- At landfall points, in the Gulf of Fos and in the port of Barcelona, a microtunnel will be constructed.
- Offshore works will mainly be carried out by a pipe-laying vessel. As this is a mobile operation progressing at around 2 km per day, navigation restrictions in any given area will be of limited duration.
- During operation, the pipeline is subject to continuous monitoring to enable rapid response in the event of a leak.
- Subsea maintenance is made possible by underwater robotic systems.

## SOLUTIONS ALTERNATIVES CONSIDERED AND DISCARDED

### Construction of an onshore pipeline

An onshore pipeline could have been considered for the same function as the BarMar subsea pipeline, again between Barcelona and Fos-sur-Mer, identified as hubs of the Spanish and French networks. Under this scenario, the pipeline would have been built in Catalonia, crossing the eastern Pyrenees, then passing through Occitanie and PACA (Provence-Alpes-Côte d'Azur).

### Why was this option discarded?

The option of installing an onshore gas pipeline across the Pyrenees has been studied in the past. Environmental assessments highlighted significant environmental and landscape complexity, particularly in the Albères massif, characterised by a "wild" forest area that is very rich in biodiversity and by "iconic landscapes".

The nature of the impacts differs in the two cases. The non-afforestation easement for onshore infrastructure prohibits, for example, the re-establishment of tall trees directly above the pipeline. At sea there is no equivalent, which means that the vast majority of potential impacts are temporary in nature.

Furthermore, from a societal perspective, hundreds of properties would be crossed in the case of an onshore pipeline, whereas in the Mediterranean only public domain is used. Procedures would also take longer to implement in the case of an onshore option.

Even though the construction cost of an onshore pipeline is lower than that of a subsea pipeline, the density of constraints led the partner states to favour a maritime route.

>> COULD SPAIN AND FRANCE BE LINKED VIA THE WESTERN PYRENEES?

Given the nature of the flows (towards Germany) and industrial uses in Fos-sur-Mer followed by transport up the Rhône Valley, the H2med corridor has been identified as the priority need.

In south-west France, Teréga is developing the HySow project, which has also been recognised as a Project of Common Interest by the European Commission. The primary purpose of this project is to structure the national network. Implementation of a Spain–France hydrogen interconnection via the west would take place from 2040 onwards, as provided for in the European development plan by Teréga, NaTran and Enagás.

**FIND OUT MORE :**
https://www.h2inframap.eu/

## Transport of hydrogen by ship

Transporting hydrogen by ship involves producing hydrogen in a given area (in this case, the Iberian Peninsula), then transporting it by sea to the points of consumption. As hydrogen is a very light and low-density gas, it must be transformed in order to be transported efficiently.

Two solutions exist: liquefying it at very low temperature (–253°C), or converting it into another chemical form, generally ammonia, and then reconverting it on arrival. These transformations enable hydrogen to be stored on board specially designed vessels.

## Do such projects exist?

The first hydrogen transport vessel, Suiso Frontier, was built in 2021 in Japan, with a capacity of only 1,250 $m^3$. In January 2026, Suiso Energy announced the order of a new vessel with a capacity of 40,000 $m^3$, equivalent to around 2,830 tonnes. In Europe, projects are far less advanced and tend instead to focus on the use of liquefied hydrogen for propulsion. The only exception is the HyShip demonstrator in Norway, which aims to establish the feasibility of transporting hydrogen by ship.

Ammonia transport is currently seeing industrial development, for example in Namibia, which is looking to position itself as a major producer of hydrogen. In France, Elengy is developing the Medhyterra project (*www.concertation-medhyterra.fr/*). This involves redeveloping part of the Fos Tonkin LNG terminal site operated by Elengy into a low-carbon ammonia import terminal, with a capacity of 200,000 tonnes per year. However, this project envisages the direct use of ammonia in industry, rather than as a vector for producing hydrogen.

## Why was this solution discarded?

For several reasons, the transport of liquefied hydrogen does not appear to be a mature and suitable technology. The industrial feasibility of maintaining hydrogen at –253°C remains uncertain and has yet to be demonstrated. By way of illustration, around 700 deliveries per year by 40,000 $m^3$ vessels would be required to reach the volumes that BarMar could transport. From a carbon footprint perspective, this approach also raises many questions: liquefaction consumes large amounts of energy, as does transport by ship, whereas the main benefit of renewable hydrogen lies in reducing $CO_2$ emissions.

Ammonia transport is more mature, but it does not address exactly the same challenges, unless it is reconverted into hydrogen on arrival, which significantly increases its carbon footprint.

## Electricity transfers for local hydrogen production

Rather than transporting hydrogen to consumption areas, would it be more appropriate to transport electricity produced from decarbonised sources to major consumption areas and produce the required hydrogen there?

Although electricity is very difficult to store, it can in fact be transmitted, including over long distances, via very high-voltage connections.

## Why was this option discarded?

Electricity presents a storage challenge and therefore leads to intermittency in generation when it is produced from renewable sources. As a result, reliability of supply could not be ensured on a constant basis. By contrast, producing hydrogen in close proximity to renewable electricity sources makes it possible to manage intermittency more effectively and ensure greater flexibility, thereby avoiding congestion on the electricity grid (see chapter 2).

In terms of cost, the Global Hydrogen Review 2024 compares the costs of transport by pipeline and by offshore high-voltage direct current links (in this case, the electricity required to produce one kilogram of hydrogen). The report highlights significantly higher costs for electricity transport. The difference is all the greater for large volumes, as is the case for flows from Spain to France: for an equivalent amount of energy, electricity transport would be more expensive than gas transport.

The environmental impact would be at least as high in the subsea scenario (the works are of a similar nature) and probably much higher in the onshore scenario, with a wide corridor of impact on biodiversity and landscapes.

Finally, Europe has opted for a continental gas pipeline network. There is therefore a clear rationale for prioritising this mode of transport from the Iberian Peninsula.

| To sum up... | BarMar pipeline | Onshore pipeline | Hydrogen transport by ship | Electricity transmission (land) | Electricity transmission (subsea) |
|---|---|---|---|---|---|
| Technical feasibility | + | + | -- | ++ | - |
| Climate impact | ++ | ++ | - | ++ | ++ |
| Biodiversity impact | - | -- | + | -- | -- |
| Landscape impact | ~ | - | ~ | -- | ~ |
| Human impact (land use, health) | ++ | - | + | -- | ++ |
| Capacity and reliability of supply | + | + | -- | ~ | ~ |
| **Cost** | **High** | **Medium to high** | **Unknown** | **High** | **Very high** |

# 5. WHAT CHALLENGES does the study area face?

*In this section, each issue will be described in terms of the current situation, followed by a box in two parts presenting the potential impacts and then the avoidance and mitigation measures.*

## ENVIRONMENTAL ISSUES: CURRENT STATE AND POTENTIAL IMPACTS

### Water quality – current status

**The ecological and chemical status of coastal water bodies is assessed according to standardised criteria**, incorporating in particular biological, physico-chemical and hydromorphological parameters.

**In the Spanish zone, the majority of natural coastal water bodies have an ecological status that meets regulatory objectives.** One exception has been identified at Canyelles, where ecological status is classified as moderate due to identified local pressures.

In the Barcelona area, coastal water bodies are classified as "heavily modified", due to port infrastructure and urban and industrial use. In this context, their ecological status is assessed as moderate, in accordance with the assessment methods applicable to this type of water body.

In the French part of the study area, all coastal water bodies show good biological and chemical status, although the presence of tributyltin has been reported to the east of the Gulf of Fos.

### What are the key points to monitor in connection with the project??

#### THE POTENTIAL EFFECTS OF THE PROJECT ON WATER QUALITY MAINLY RELATE TO THE CONSTRUCTION PHASE

Offshore works may lead to the temporary resuspension of seabed sediments, which may result in the formation of turbidity plumes. This localised increase in turbidity may temporarily alter certain physico-chemical characteristics of the water column, in particular through localised nutrient enrichment.

If contaminated sediments were to be mobilised, the dispersion of contaminants could locally affect biological compartments, in particular through transfer within the food chain.

In order to characterise and anticipate these phenomena, **sediment dispersion studies will be carried out**, combined with physico-chemical analyses of marine sediments along the route. These studies will make it possible to assess the spatial and temporal extent of turbidity plumes and potentially to identify areas requiring specific measures.

**Where necessary, sediment containment and limitation measures may be implemented (for example, limiting work rates, protection using membranes or bubble curtains)**, in particular near areas with identified environmental sensitivities.

The anticipated effects on water quality are considered to be **localised and of limited duration**, given the progressive nature of the works, with pipeline installation advancing at a rate of around 2 to 3 kilometres per day.

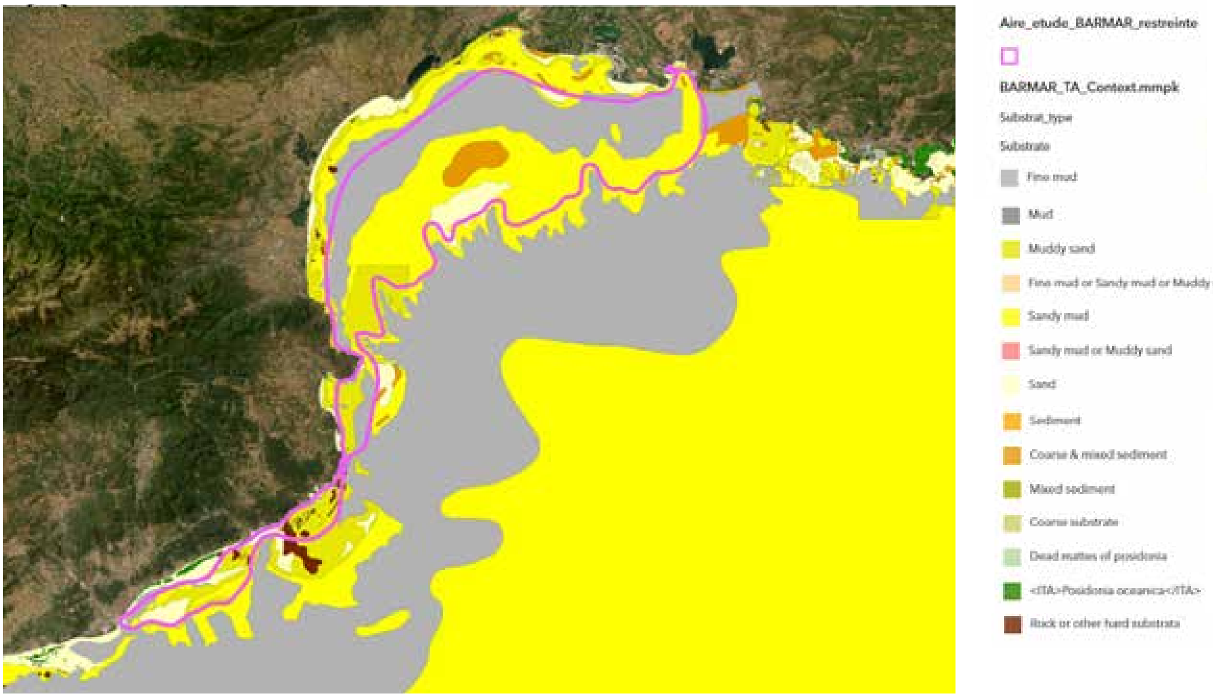
Potential effects on water temperature, particularly in the Barcelona area, will be subject to specific modelling.

Initial operating assumptions indicate that the transported hydrogen has a maximum temperature of around 47°C at the outlet of the facilities, which decreases rapidly along the pipeline. At the depth considered (approximately 1 metre below the seabed), thermal exchanges with the surrounding environment result in a negligible thermal impact, with no expected deterioration in water quality.

## Sedimentation – current status

The area is dominated by unconsolidated sediments (mainly mud and muddy sand), with a predominance of mixed sediments in the port of Barcelona and in the northern part of Cap de Creus. Rocky areas are present at several locations in the Spanish zone (Malgrat de Mar, Blanes, Tossa de Mar, Tamariu, Begur and the northern part of Cap de Creus).

The French continental shelf is wider than the Spanish continental shelf. Several submarine canyons cut across the continental shelf in both countries.




### What are the key points to monitor in connection with the project?

**The potential effects of the project on sedimentation are mainly associated with the construction phase**, in connection with burial and protection works for the pipeline.

In areas with soft substrates where burial is technically feasible, the works may result in the temporary formation of positive or negative micro-relief features on the seabed surface. In this context, **natural seabed resilience is expected**, allowing a gradual return to the initial morphology without the need for specific corrective measures.

In addition, the expected effects on sedimentation are considered to be **localised and temporary**, given the continuous progression of the works, estimated at 2 to 3 kilometres per day.

Where burial is not feasible (for example in rocky contexts), pipeline protection may require the placement of rock. These structures then result in a **localised modification of the nature of the seabed** through the introduction of a hard substrate. These configurations will be avoided wherever possible. Where avoidance is not feasible, specific measures such as gentle slope grading will be implemented in order to limit disruption to sedimentary processes.

## Sensitive habitats – current status

**Several marine habitats present in the study area are recognised for their ecological sensitivity**, due to their rarity, their vulnerability to disturbance or their functional role within marine ecosystems.

These habitats include in particular certain muddy seabeds, rocky outcrops and *Posidonia oceanica* seagrass beds. *Cymodocea nodosa* seagrass beds are also present, mainly on shallow sandy banks that are permanently submerged.

Maerl habitats may be present in certain areas of the Spanish sector. In addition, **benthic habitats (associated with the seabed) of the continental shelf play a structuring role for many marine species**, particularly as feeding, breeding or refuge areas.

Finally, **cold-water coral communities have been identified in submarine canyons**, particularly at Cap de Creus and in the Lacaze-Duthiers canyon.

## What are the key points to monitor in connection with the project?

**The most significant potential impacts on sensitive habitats are associated with the construction phase**, in connection with pipeline installation, burial or protection operations.

These activities may result in direct disturbance to benthic flora and fauna, in particular through crushing, displacement or covering of sessile or low-mobility organisms (maerl, sponges, cnidarians, bivalves).

In order to limit these impacts, **detailed preliminary studies and fine adjustments to the route (micro-routing)** will be carried out, making it possible to avoid areas of high ecological value as far as possible. Pipeline installation will be designed to avoid any direct impact on seagrass beds.

Indirect impacts may also arise from the accumulation of resuspended sediments. In this respect, **sediment dispersion studies will make it possible to identify potentially affected areas**, and sediment retention measures may be implemented if necessary.

During the operational phase, a reef effect may occur in sections of the pipeline that are not buried (where new substrates favour the colonisation of species from other habitats). **Monitoring of benthic communities associated with these new hard substrates is planned**, in order to assess their development and differentiation compared with surrounding natural habitats.

## Seabirds – current status

**he study area supports a significant diversity of seabirds**, including resident, breeding and migratory species, some of which are subject to recognised conservation concerns at regional or Mediterranean level.

In the Gulf of Lion, several pelagic species (in the water column) are present throughout the year, including the Balearic shearwater, the Yelkouan shearwater, the European storm petrel and the European shag, as well as various species of gulls and terns. Certain species breed on the Marseille islands, such as Scopoli's shearwater and the Yelkouan shearwater.

The area also constitutes a **major migratory corridor**, with increased offshore presence during migration periods. During winter, certain species concentrate in the Gulf of Lion, where they are mainly observed during feeding activities at sea.

In Catalonia, seabirds are particularly abundant in the Gulf of Roses and near the Llobregat delta, south of the port of Barcelona. Audouin's gull breeds in particular on the eastern quay of the port of Barcelona.

The archipelagos of the Marseille islands and the lagoon systems extending from the Étang de Berre to the Canet-Saint-Nazaire lagoon complex are major breeding areas for Mediterranean marine avifauna. Although located outside the corridor, the potential interfaces of these areas with the project will be studied.

### What are the key points to monitor in connection with the project?

**The potential impacts of the project on seabirds mainly concern the construction phase.**

Offshore works may lead to temporary disturbance of distribution and feeding areas, particularly in connection with local increases in turbidity and temporary changes in the availability of trophic resources.

In coastal areas, the works may also generate noise disturbance that could temporarily affect resting or nesting areas.

These impacts will be limited **by the short duration of the works**, the implementation of measures to preserve water quality, and appropriate organisation of operations in the most sensitive areas.

Landfall areas are located in port and industrial settings where seabirds are already exposed to regular human presence. **No significant impact is expected during the operational phase**, as the installations do not result in lasting modification of habitats or disruption to the biological cycles of the species concerned.

## Aquatic fauna – current status

**The Mediterranean Sea is characterised by high marine biodiversity, with around 650 recorded fish species, including nearly 80 species of elasmobranchs (sharks and rays). Species richness is particularly high in the coastal areas of the western Mediterranean.**

The Catalan Sea is an important spawning area for several pelagic species, notably anchovy, with peak spawning observed between June and July, particularly near Cap de Creus. Frequently observed species also include sardine, round sardinella, mackerel, horse mackerel and Atlantic bluefin tuna.

Several species of elasmobranchs are present on the Catalan continental shelf, some of which play an important functional role, such as the starry stingray and the small-spotted catshark.

**In the Gulf of Lion, species richness is estimated at more than 350 fish species**. This area constitutes both a nursery and a major spawning ground, for pelagic species (anchovy, sardine, tuna) as well as for benthic and demersal species (hake, sole, red mullet, gurnard). The continental shelf is of particular importance for hake, horse mackerel and Norway lobster. A local anchovy spawning ground is associated in particular with the Rhône estuary.

The Gulf of Lion also acts as a migratory corridor for certain species, such as the European eel. Several elasmobranch species with an unfavourable conservation status are also observed there, including the common skate, the angel shark, the basking shark and the blue shark.

Nearly 26 cetacean species have been recorded in the Mediterranean. Eight of these have resident populations that are partially genetically isolated, including the fin whale, the striped dolphin, the bottlenose dolphin, Risso's dolphin, the long-finned pilot whale, Cuvier's beaked whale and the sperm whale.

The loggerhead turtle is the marine turtle species most associated with the study area. The Gulf of Lion is an important wintering and feeding area for juveniles and subadults, while nesting along the western Mediterranean coasts has been increasing since the early 2010s.

### What are the key points to monitor in connection with the project?

**During the construction phase, the works may temporarily affect aquatic fauna**, in particular through the resuspension of sediments, which may locally modify the availability of food resources and certain physico-chemical characteristics of the water column.

Spawning areas located on the continental shelf may be affected locally. In addition, noise and vibrations generated by construction operations, as well as increased vessel presence, may temporarily disturb cetaceans and marine turtles and locally increase the risk of collision.

These effects are expected to be **localised and short-term**, due to the progressive advancement of the works along the route. No significant impact is anticipated during the operational phase.

In order to limit impacts, **pipe-laying and support vessels will operate at reduced speed**, with active monitoring dedicated to the detection of cetaceans. In the event of an identified collision risk, avoidance manoeuvres will be implemented.

With regard to underwater noise during the works phase, international good practice for noise reduction associated with maritime transport will be applied. If measured noise levels were to exceed thresholds likely to cause temporary auditory effects, **additional mitigation measures would be implemented**. Measures aimed at preserving water quality will also contribute to the protection of habitats and feeding areas for fish, cetaceans and marine turtles.

Once the pipeline has been installed and is in operation, the project will not generate noise or electromagnetic fields. Heat from hydrogen compression (around 47°C) will be dissipated within the first metres of the pipeline underground. No impact on water temperature is expected.

The reef effect (see "Sensitive habitats") will also be monitored.

## Protected areas – current status

In the Spanish part, several protected marine and coastal areas are present, including the Espacio Marino de la Costa Central Catalana, the Espacio Marino de l'Empordà, the Sistema de cañones submarinos occidentales del Golfo de León, the Litoral del Baix Empordà and Cap de Creus Natural Park.

In the French part of the study area, the main sites include the Grands dauphins du Golfe du Lion, the Camargue, the Récifs des canyons Lacaze-Duthiers, Pruvot et Bourcart, the Gulf of Lion Marine Natural Park and the Cap Béar–Cap Cerbère area.

The two landfall areas are located close to protected sites. At Barcelona, these include in particular the Espacio marino del Baix Llobregat-Garraf and the Delta del Llobregat. At Fos-sur-Mer, the areas concerned include the Marais entre Crau et Grand Rhône, the Camargue and the Rhône aval.

### What are the key points to monitor in connection with the project?

**Project-related activities may interact with certain protected areas**, either directly or through indirect effects, particularly during the construction phase.

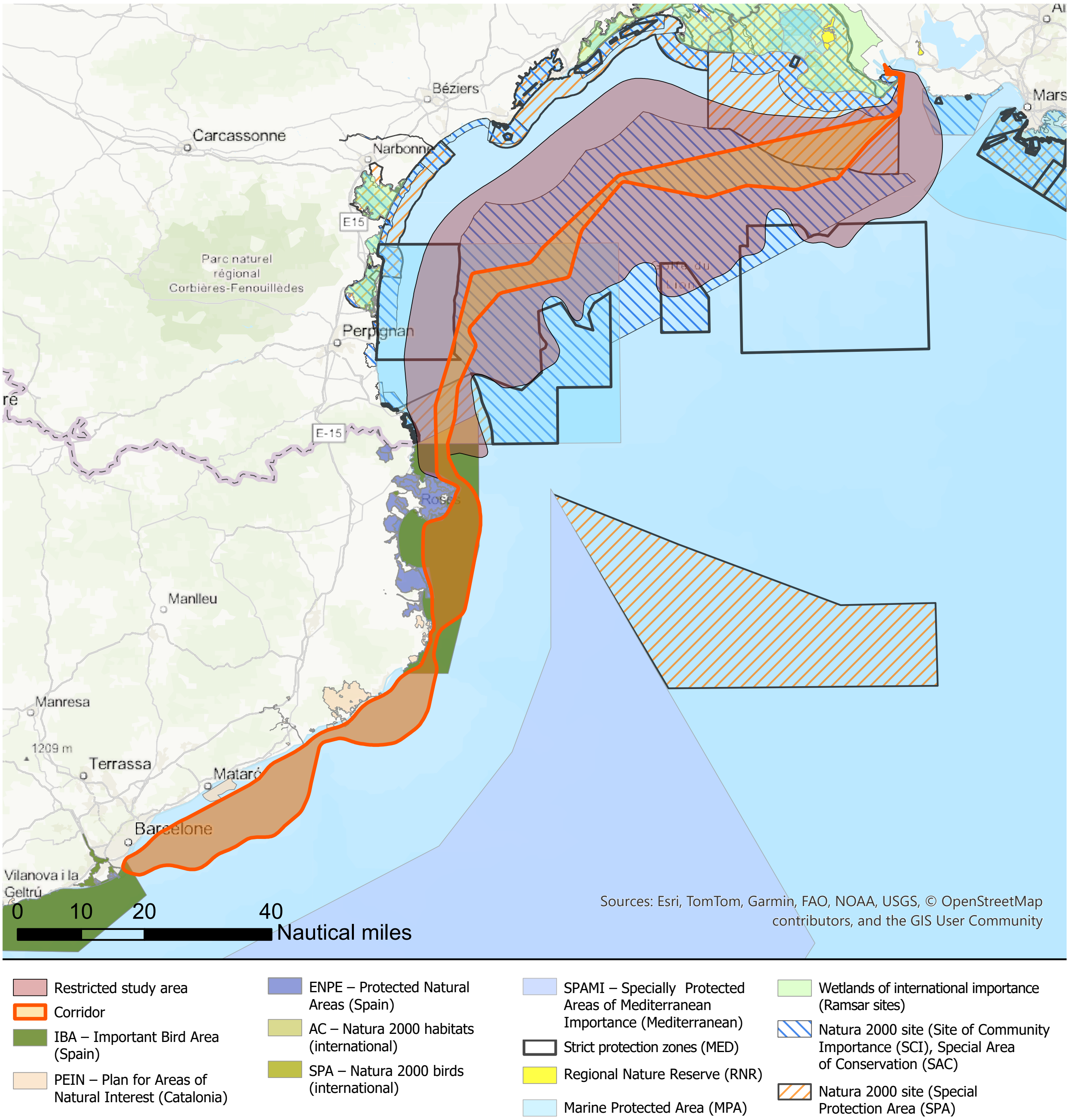
A detailed assessment of the presence, distribution and conservation status of sensitive habitats within the protected areas concerned will be carried out, in addition to a review of the existing literature. This analysis will make it possible to verify the compatibility of the project with the conservation objectives defined for these sites. Specific measures will be implemented to preserve areas of high ecological value and avoid any significant deterioration of habitats or species of community interest.

**Specific studies will be carried out for each of the protected areas concerned** in order to ensure that the ecological integrity of these areas is not compromised. Where appropriate, these studies will identify the need for avoidance, mitigation or, if necessary, compensation measures.

### KEY POINTS...

- Sensitive environmental issues are numerous and diverse within the study area. However, areas of higher sensitivity can be identified, linked to the nature of the seabed: outcrops, seagrass beds, maërls, canyons.
- Project design will seek to avoid these sensitive habitats since this is the best way to limit overall environmental impact.
- The risk of impact is highest during the construction phase. Several mitigation measures will be applied: reduced navigation speed, avoidance manoeuvres. With a progression rate of 2 to 3 km per day, these effects are mostly temporary.
- During the operational phase, the main risk is an alteration of sedimentation processes, generating a reef effect where the pipeline is not buried.

## SUMMARY MAP OF ENVIRONMENTAL ISSUES



# HUMAN ISSUES: CURRENT STATE AND POTENTIAL IMPACTS

## Fishing

**Fishing is a key economic and social activity in the study area** along both the Spanish and French coasts.

In the Spanish part, the study area includes eleven fishing ports with auction halls, among which Palamós and Blanes are among the five most important ports in Catalonia in terms of sales value. In 2024, these two ports recorded revenues of between €8.1 million and €8.3 million. The auction halls of Llançà, Roses, L'Escala and L'Estartit also make a significant contribution to the local economy.

The fishing fleet is particularly dense in the northern part of the study area, with more than 200 vessels, mainly based in Palamós, Arenys de Mar, Blanes and Roses. It consists predominantly of small-scale fishing vessels, complemented by trawlers, purse seiners and longliners. Spanish fishers are also authorised to operate in the waters of the Gulf of Lion beyond the 12-nautical-mile limit. Historical rights also allow them to fish within the 6 to 12 nautical mile zone up to Cap Leucate.

In the French Mediterranean, the fishing fleet comprised around 1,340 vessels in 2020, including 45 trawlers. Activity is mainly concentrated within the three-nautical-mile coastal strip, but also extends beyond this area (see overview map of fishing zones). Four auction halls are located within the study area: Port-la-Nouvelle, Agde, Sète and Le Grau-du-Roi. In 2024, the total value of sales at these auction halls and through direct sales reached approximately €37 million.

The fishing sector also faces several structural challenges, including competition for maritime space, changes in fish stocks in the context of climate change, and the ageing of both the fleet and the fishing workforce. In the Mediterranean, a wide range of fishing methods is used. A distinction is drawn between mobile gear (such as pelagic or bottom trawling) and static gear (such as set nets or pots). Each technique presents specific considerations that must be taken into account during the study, construction and operation of the pipeline.

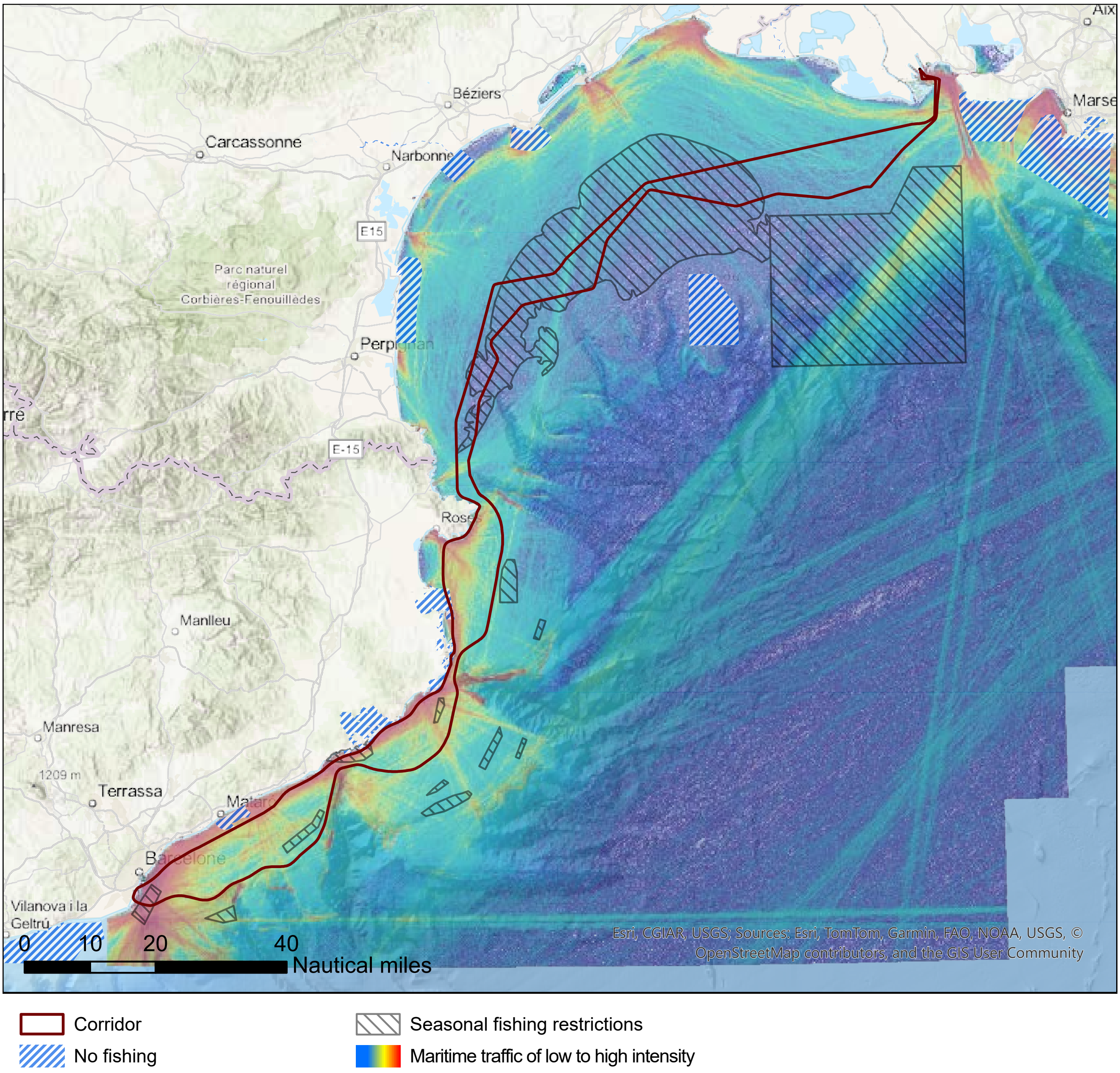
### What are the key points to monitor in connection with the project?

**The main potential impacts of the project on fisheries are associated with the construction phase.**

Temporary access restrictions may be introduced in certain areas and along certain maritime routes, requiring fishers to adapt their practices. These adjustments may result in changes to fishing grounds, target species, or increased fuel consumption.

These situations will be addressed through **dialogue and consultation with fishing stakeholders**, in order to anticipate constraints and to limit or, where appropriate, compensate for socio-economic impacts.

During the operational phase, the project developer aims to protect the pipeline through burial or the installation of rock protection wherever feasible and appropriate, taking into account technical constraints and environmental considerations. **The aim of this approach is to avoid any long-term restrictions on fishing activities.**



Béziers
Carcassonne
Narbonne
Marse
Aix
E15
Parc naturel régional Corbières-Fenouillèdes
Perpignan
E-15
Rose
Manlleu
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1209 m
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Mataró
Barcelone
Vilanova i la Geltrú
0 10 20 40 Nautical miles
Esri, CGIAR, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
Corridor
No fishing
Seasonal fishing restrictions
Maritime traffic of low to high intensity

## Offshore production of electricity

**Offshore production of electricity is an emerging key issue in the study area**, on both the Spanish and French sides, as part of national and European energy transition strategies.

In Spain, the marine spatial planning framework, approved by royal decree on 28 February 2023, identifies an area near the Gulf of Roses as having strong potential for offshore wind development. Several floating wind farm projects have initiated environmental pre-assessment procedures, although commercial projects are still at an early stage. An experimental pilot project is currently undergoing environmental assessment and will be connected to the Spanish electricity grid via a subsea cable crossing the Gulf of Roses.

In France, following the commissioning of the first offshore wind farms along the Atlantic and Channel coasts, offshore wind development is continuing in the Mediterranean, with a focus on floating technology. One pilot farm, Provence Grand Large, is already in operation off Fos-sur-Mer; two others are nearing completion at Gruissan and Leucate.

Following public debates organised under the auspices of the National Commission for Public Debate (CNDDP), several development zones have been defined by ministerial decisions, including priority zones in the short and medium term as well as longer-term zones.

The first two commercial projects were subject to the EOS public consultation held from 12 July to 31 October 2021 and were awarded at the end of 2024. They are scheduled to be commissioned in 2031.

These offshore wind farms will be connected to the French electricity grid via two subsea cables (in each case shared between the AO06 and AO09 projects), with RTE acting as project manager. In December 2024, following technical and environmental studies, two routes with the lowest impact were identified for these connections. Extensive dialogue with local stakeholders has also taken place (notably through the so-called Fontaine consultation process). Route definition studies for grid connections are not yet available for other offshore wind development zones. The overall routing of onshore and offshore connections is currently the subject of further studies, with a view to presentation and submission to a public inquiry at the end of 2026.

### What are the key points to monitor in connection with the project?

**Potential interactions between the BarMar project and offshore electricity generation infrastructure mainly concern the design and construction phases.**

Crossings between the pipeline and existing or planned subsea power cables are technically well established and are standard practice, providing they are carried out using appropriate methods such as rock placement or specific protective measures.

By contrast, routing the pipeline through areas designated for offshore wind development presents significant constraints, particularly in terms of operation and maintenance of both types of infrastructure. In light of this, the **BarMar route has been designed to strictly avoid offshore wind development zones**, in consultation with the relevant authorities.

*Assembly of wind turbines in Port-la-Nouvelle*

## Telecommunications cables

**The study area is a strategic zone for subsea telecommunications networks**, particularly in the Barcelona and Marseille areas.

The Barcelona region has historically been a landing point for cables connecting mainland Spain to the Balearic Islands, as well as to other Mediterranean countries. It is also experiencing rapid growth in digital infrastructure, with the establishment of new data centres and the arrival of several international fibre optic cables.

Marseille is already one of the world's top ten telecommunications hubs. The city serves as a gateway to Europe for many cables linking Africa, the Middle East and Asia. Several major projects are in operation, under deployment or under study: Blue, Medusa, PeaceMed, 2Africa, Medloop. Conversely, some older cables, particularly those from Canet-en-Roussillon or Fos-sur-Mer, are reaching the end of their operational life.

### What are the key points to monitor in connection with the project?

**During the pipeline construction phase, there is a potential risk of interaction with existing telecommunications cables.**

To prevent any damage to the integrity of these infrastructures, all cables present will be precisely identified prior to the start of works. Crossing agreements will be concluded with the relevant operators, and specific protection measures will be implemented.

The Barcelona area is particularly sensitive due to the high density of cables.

Crossings with telecommunications cables are carried out in the same way as for power cables. **This is common practice when carried out using appropriate methods, such as the installation of rock protection or specific protective measures.**

In France, landfall of the pipeline to the east of most existing cables significantly reduces the risk of interference.

## Maritime transport

**Maritime transport is a major use of the study area**, with a high concentration of traffic near major ports.

On the Spanish side, numerous leisure, fishing and commercial ports are present. The ports of Barcelona and Palamós handle most commercial traffic, while Barcelona also hosts major cruise activity at Mediterranean scale.

Navigation density is particularly high near the coast, especially in the area around the port of Barcelona.

On the French side, the area includes three major ports: Marseille-Fos, Port-la-Nouvelle and Sète. The port of Marseille-Fos plays a strategic role in freight traffic and is a major industrial hub engaged in the energy transition, particularly in relation to hydrogen. The BarMar project is located within the access area to the port of Fos-sur-Mer.

Overall, vessel density is much higher near the coast than offshore, particularly near the port of Barcelona.

### What are the key points to monitor in connection with the project?

**Temporary disruption to maritime traffic may occur** during the construction phase, particularly during installation works in Barcelona and at landfall in Fos-sur-Mer.

The presence of construction vessels, specialised equipment and divers may temporarily restrict access for certain vessels to the ports concerned.

A 500-metre safety zone will be established around work areas, prohibiting access to vessels not involved in operations. These measures may lead to temporary increases in manoeuvring times and a reorganisation of port traffic flows.

These effects will be strictly time-limited and will be subject to close coordination with port authorities to ensure navigational safety and continuity of operations.

## Leisure and tourism activities

**Leisure and nautical tourism activities play an important role in the study area**, particularly along the Catalan coast and the French Mediterranean coastline.

The Costa Brava is a major tourist destination, characterised by a high density of marinas and water-based activities. On the French side, numerous certified ports reflect the importance of leisure boating and the quality of associated services.

Activities are diverse, including recreational boating, motorised and non-motorised water sports, as well as scuba diving, supported by the richness of marine habitats.

### What are the key points to monitor in connection with the project?

The construction phase may lead to temporary disruption of leisure activities due to the establishment of safety zones around work areas.

These access restrictions will be limited in both space and time, given the continuous progression of the works. They may be more noticeable in areas where the pipeline approaches the coast, particularly due to the presence of submarine canyons.

Coordination with tourism and leisure stakeholders will be implemented to anticipate constraints and minimise impacts on visitor numbers and activities.

## KEY POINTS...

- Fishing activities will be subject to temporary access restrictions of short duration during the construction phase. Burial of the pipeline is an objective of the project developer, with the aim of avoiding any restrictions during operation wherever possible.
- Several offshore wind farms are under development, particularly in France. Routing the pipeline through a development zone has been ruled out for maintenance reasons. However, crossings between electrical connections and the pipeline do not present any major constraints.
- Barcelona and Fos-Marseille are major ports. Avoidance of navigation channels and anchorage areas, together with burial of the pipeline, removes navigational constraints. These are expected to apply only during certain exceptional construction phases.

### >> WHAT CUMULATIVE EFFECTS ARE EXPECTED IN THE STUDY AREA?

Cumulative effects in the study area may arise due to the coexistence of BarMar and several infrastructure projects, such as offshore wind farms and telecommunications cables.

Cumulative impacts relating to the installation phase can only occur when the works of two or more projects take place simultaneously. The overlap in the installation of different infrastructures cannot be ruled out at this stage. This could lead to an increase in regulated areas for navigation and fishing and a displacement of maritime activities. At the same time, it may lead to greater disturbance of marine biodiversity and maritime traffic.

The presence of multiple projects also implies a higher spatial density of infrastructure, with more complex routing, an increased risk of crossings and greater disturbance of seabeds and benthic habitats. The presence of other assets may also complicate repair works and monitoring activities, increasing the time required for such operations.

The significance of cumulative impacts will depend on the spatial distribution of the different infrastructures, as most cumulative effects decrease with distance between projects.

## INDUSTRIAL AND TECHNICAL ISSUES

### Industrial implications of pipeline manufacturing

Manufacture of the pipeline pipes will be the main industrial challenge facing the project. It will require significant advance planning to produce nearly 33,000 pipes (approximately 300,000 tonnes of steel and nearly 200,000 tonnes of concrete), and may involve several suppliers. Pipe production is subject to international standards to ensure the highest level of reliability.

At this stage, the production location of the pipes has not yet been determined. However, it is likely to be in Europe, given the presence of the main market players on the continent. Pipe production will be one of the main cost items of the BarMar project. Supplier selection will be based on several criteria, including the reliability of the supply chain.

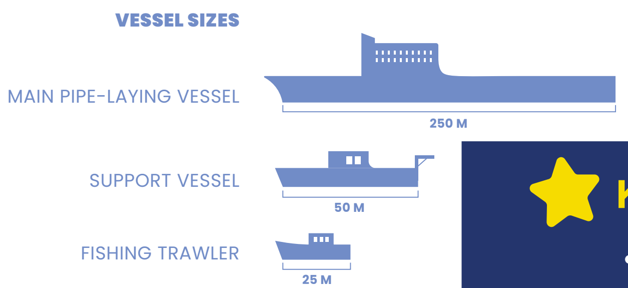
Transport of the pipes to the logistics platform is also a major challenge. Given the quantities involved, road transport is unlikely; rail, maritime and/or inland waterway solutions are expected to be preferred. This process is expected to take place over approximately six months.

### BarMar construction logistics

Construction of the pipeline will require the simultaneous deployment of several vessels (see chapter 4), some of which may come from French and Spanish local fleets:

*An example of a pipe-laying vessel*

- 1 main pipe-laying vessel: dedicated to the assembly and laying of pipes; this is a very large vessel. There are just over one hundred worldwide, operated by fewer than ten companies.
- 1 support vessel, responsible for monitoring operations and in particular guiding remotely operated equipment;
- pipe-lay barges in coastal areas near Barcelona and Fos-sur-Mer;
- pipe carrier vessels shuttling between the logistics platform and the pipe-laying vessel to supply it with pipes;
- logistics vessels to provide support to the crew;
- guard vessels patrolling around work areas to prevent navigation risks.




### KEY POINTS...

- Pipe manufacturing and pipeline installation are highly specialised activities that can only be carried out by a limited number of European and global industrial players.
- The construction phase will require significant logistical support, which is expected to draw on the local economy (security, pipe transport, etc.).
- The detailed industrial implications will only be known once contractors have been selected.

## BARMAR LIFE CYCLE ANALYSIS (CARBON FOOTPRINT)

In 2025, BarMar commissioned the engineering consultancies Egis and Tecnoambiente to carry out a carbon footprint assessment of the project. Finalised in February 2026, it is summarised here.

It should be noted that, for emission sources, the analysis was carried out based on the project in its current state. Certain assumptions therefore had to be made, for example regarding the origin of the steel and leakage rates. Overall, conservative (i.e. unfavourable) assumptions were adopted.

The reduction mechanisms are based on the use of the pipeline's nominal capacity of two million tonnes of renewable hydrogen per year, replacing carbon-based energy sources.

Two key methodological elements should be taken into account.

- On the emissions side, the analysis was carried out based on the project in its current state. Certain assumptions therefore had to be made, for example regarding the origin of the steel and leakage rates. Overall, conservative (i.e. unfavourable) assumptions were adopted.
- On the reduction side, gains were assessed at the scale of the H2med corridor. This is the scale that justifies the project and enables a realistic carbon footprint assessment.

*Note: Throughout the analysis, the reference unit is tonnes of $CO_2$ equivalent (t $CO_2$e).*

### Which emission sources and reduction mechanisms were taken into account?

| Emission sources | Emissions reduction measures |
|---|---|
| Emission sources are analysed across the entire life cycle: design, construction (manufacture and transport of materials), operation and decommissioning.<br><br>The construction phase accounts for two thirds of the project's carbon footprint. The main source of emissions during this phase is the production of steel for the pipeline, with more than 1,000,000 t $CO_2$e emitted.<br><br>The operational phase accounts for nearly one third of total emissions, at around 600,000 t $CO_2$e over the lifetime of the asset (40 years). | Avoidance mechanisms are based on the substitution of fossil fuels (grey hydrogen, coke, natural gas, aviation fuel) with green hydrogen in industry (chemicals, refining, steelmaking, etc.) and transport (particularly aviation).<br><br>Avoided emissions from this substitution are estimated under several scenarios for the use of green hydrogen. The quantities of hydrogen transported by BarMar have been incorporated progressively into the assessment to reflect the gradual development of the market. |

### WHAT IS THE CALCULATION METHODOLOGY?

The study follows a **Life Cycle Assessment** (LCA) approach over a 40-year period (2032–2072). It complies with the most widely recognised international carbon accounting frameworks.

Calculations are based on **official national reference databases** in France (ADEME carbon footprint methodology), Spain (MITERD) and the United Kingdom (DEFRA) to ensure the reliability of $CO_2$ emission factors.

### RESULTS

The following table presents the assessment subject to the most conservative assumptions:

| | Values (t CO2e) |
|---|---|
| Total emissions of the BarMar project (design + construction + operation + decommissioning) | **+ 2,249,720** |
| Emissions avoided through substitution of fossil fuels (scenario 2) | **- 1 to 2 billion** |
| RELATIVE EMISSIONS BALANCE OVER 40 YEARS | **- 1 to 2 billion** |

**Based on the assumptions outlined above, the carbon footprint of the BarMar project appears highly favourable. The project's emissions (mainly from construction and operation) thus account for only 0.1 to 0.2% of the carbon savings it delivers over 40 years.**

# 6. OUTLOOK
# for the implementation of BarMar

## INDICATIVE TIMELINE AND PROJECT STATUS

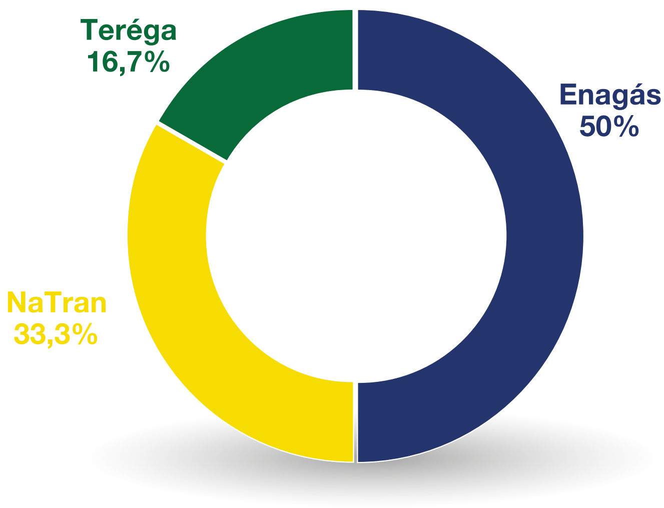
- **December 2022:** Alicante Summit, announcement of the H2med project.
- **January 2024:** Designation by the Spanish Parliament of Enagás as the provisional national hydrogen transmission operator.
- **April 2024:** Inclusion of the project in the final list of Projects of Common Interest (PCI): PCI 9.1.4 – Spain-France hydrogen interconnection (H2Med BarMar).
- **July 2024:** Authorisation by the Spanish Council of Ministers for Enagás to develop PCIs.
- **2024-2027:** offshore survey campaigns.
- **January 2025:** Award of Connecting Europe Facility (CEF) funding for the study phases of the project: PCI 9.1.4 – Spain-France hydrogen interconnection (H2Med BarMar).
- **June 2025:** Establishment of the project company SPV BarMar and signing of the shareholders' agreement.
- **September 2025:** H2med, recognized as a flagship project at the Franco-German Council of Ministers.
- **2025-2026:** Baseline environmental studies and impact assessments in Spain and France.
- **April-July 2026:** Public consultations in Spain and France.
- **2024–2027:** Engineering development and permit applications.
- **2027-2028:** Review of permit applications, including public inquiry.
- **2028**: Application for CEF Energy funding for construction.
- **2029:** Final investment decision.
- **2029-2032:** Contracts for the supply of equipment, construction and commissioning.

## PROJECT ECONOMICS

### What is the estimated cost of the project?

he cost of the BarMar project is estimated at **approximately €2.1 billion**, broken down as follows: one third for equipment (pipes, compressors, etc.), one third for construction works (onshore and offshore), and one third for other items (engineering, offshore studies, project management, etc.). This estimate will be refined following studies aimed at defining the route and construction methodology in greater detail.

Operating costs will be linked to energy expenditure (for the compression station), staffing costs and various taxes.




### How would the project be financed?

Enagás, NaTran and Teréga are the three shareholders of BarMar SAS, with the following shareholding structure.

The project company was established on 3 July 2025 by the three shareholders. German operator OGE has the status of associated partner.

In January 2025, the European Union awarded **a grant of €28.3 million to the H2med BarMar** consortium to finance 50% of the engineering studies, including marine and environmental survey campaigns. This grant was awarded under the Connecting Europe Facility (CEF) Energy 2024 call, which supports the entire H2med corridor.

**Project of Common Interest status also opens up the possibility of European funding for construction of the project**. The amount and allocation arrangements for this funding are not yet known. It could take the form of a direct grant, a loan from the European Investment Bank, or a combination of the two. At present, European regulations allow support of up to 50% of the total investment.

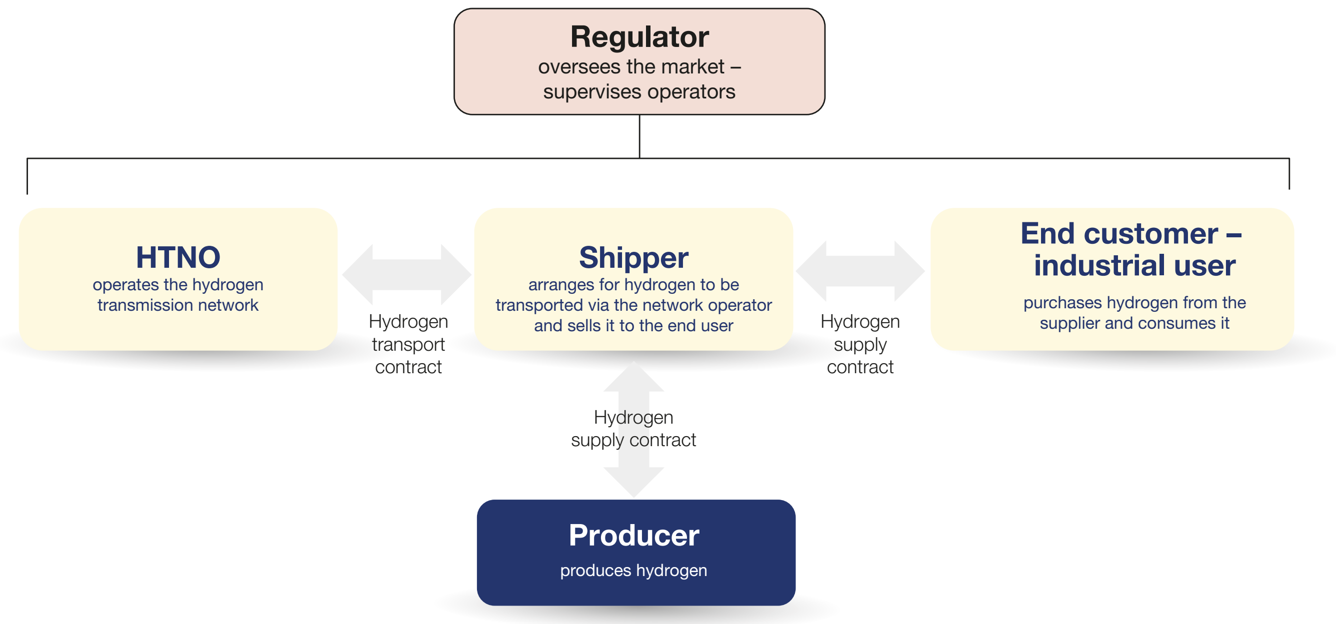
This European funding would complement the funds provided by the three shareholders.

Co-funded by the European Union

## What would be the economic model of BarMar?

### FOUR STAKEHOLDERS

- Hydrogen Transmission Network Operators (HTNOs);
- customers connected to the transmission network:
  - end users, generally industrial sites consuming hydrogen for their production processes;
  - producers;
- shippers purchase hydrogen from producers, pay transmission tariffs to the HTNOs and sell the hydrogen to end users;
- regulatory authorities for gas and electricity infrastructure, and future regulators for hydrogen transport, storage and import/export terminals. In France, this is the Commission de régulation de l'énergie (CRE), and in Spain the Comisión Nacional de los Mercados y la Competencia (CNMC).

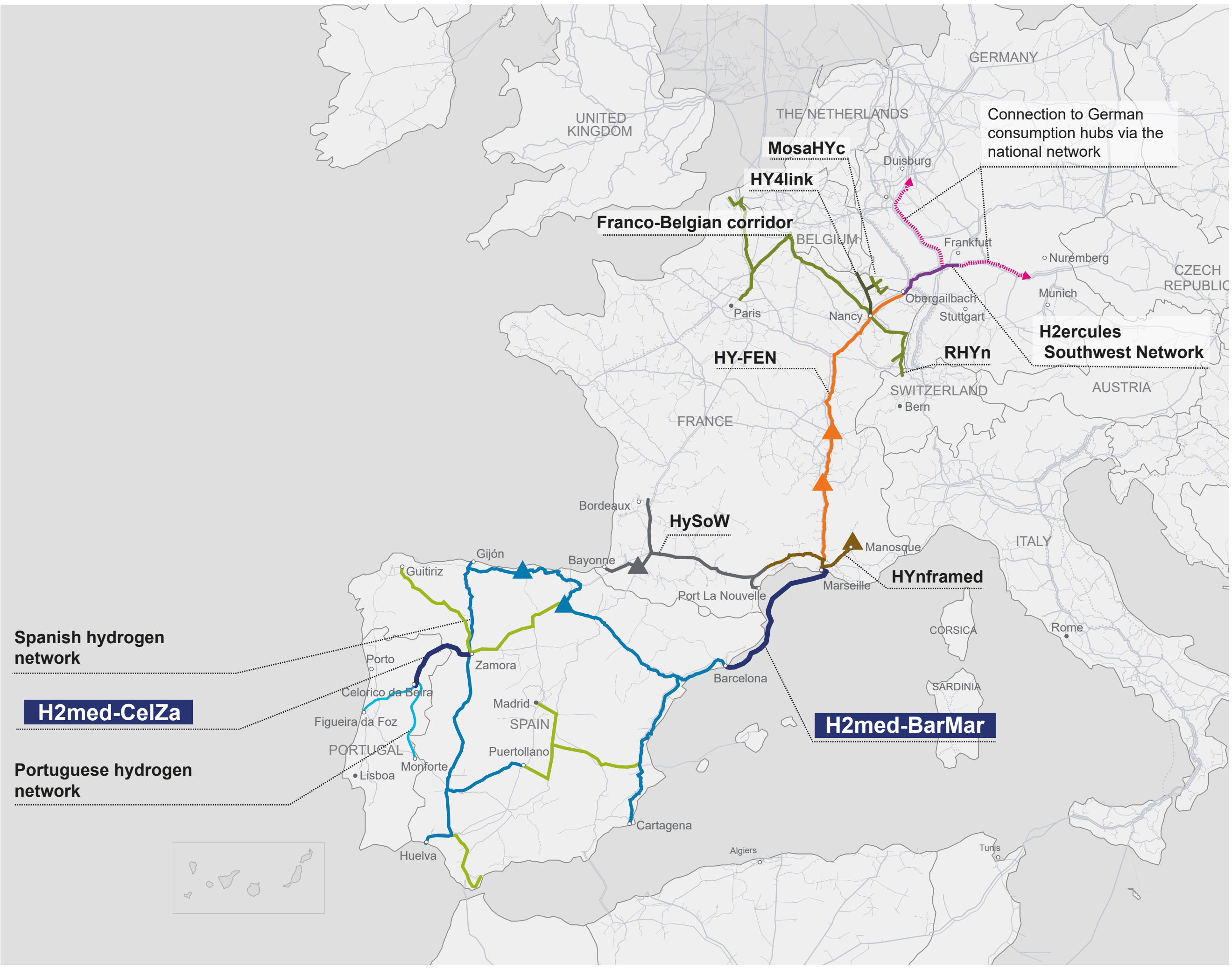


## Specific safeguards for an emerging market

Ongoing market monitoring is essential, all the more so for an emerging market such as renewable hydrogen. This will involve continuously tracking, with increasing precision, the balance of supply and demand for renewable hydrogen in the regions connected by H2med.

In particular, this monitoring could take the form of a new CFI prior to the final investment decision. Unlike the call issued at the end of 2024, this one will be binding (and contractual) with regard to the booking of transport capacity.

**Investment will only be launched once there is sufficient certainty that adequate volumes will be transported.**




*The H2med corridor and national hydrogen transmission networks*

## What would be the economic impact of BarMar?

**The main economic contribution of BarMar lies at the European level.** The project would be a major asset to sectors such as chemicals, steel, low-carbon fuels and fertilisers, which together employ tens of thousands of people. It could therefore generate significant value for the economy, particularly in industrial regions (in Germany, France and Spain), through the various Projects of Common Interest that will be connected to BarMar, such as HY-FEN. Given the intense international competition across all industrial sectors, providing companies with decarbonised, abundant and affordable hydrogen is a major factor in maintaining competitiveness. The gradual shift of industrial processes towards renewable hydrogen will make users less exposed to fluctuations in raw material prices (gas, oil) and to the expected increases in the price of $CO_2$. The recognition of BarMar as a Project of Common Interest shows that the European Union has assessed its cost–benefit balance positively.

In France, Spain and Germany, hydrogen infrastructure networks and international interconnections will stimulate multiple sectors of the national economies and are likely to create new business opportunities with a significant positive economic impact:

- Favourable conditions for industrial and technological development, encouraging in all three countries the creation of a hydrogen industry and the emergence of an innovative business ecosystem around renewable hydrogen production and its uses
- Stimulus for regional growth and competitiveness

At a more local level, the project will generate added value, employment and economic benefits; these are difficult to quantify at this stage, however. The project developer will engage international companies, which in turn will engage national and local firms to support delivery.

### KEY POINTS…

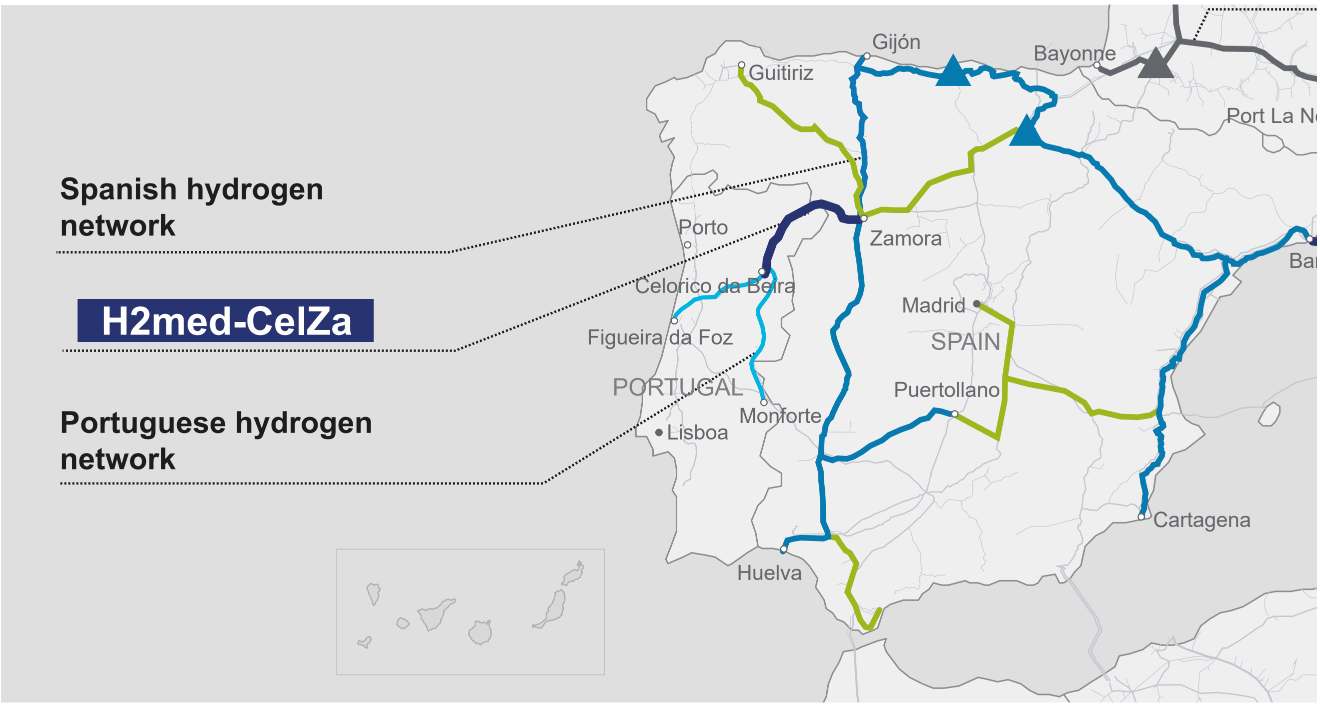
- Commissioning of the project is planned for 2032.
- At this stage, its cost has been estimated at €2.1 billion.
- Project funding is shared between Enagás (50%), NaTran (33.3%) and Teréga (16.7%). BarMar also benefits from European funding.
- Before the final investment decision, the project developer will need to have obtained all necessary approvals and ensured that market conditions are adequate in terms of renewable hydrogen production and consumption in what remains an emerging market.
- Commercial access to the BarMar pipeline is expected to follow principles similar to those of natural gas and electricity networks, in particular with a regulated tariff set by the relevant authorities.
- BarMar will provide abundant and affordable renewable hydrogen – a key advantage for industrial sectors that support thousands of jobs across Europe.

# INTERFACE BETWEEN BARMAR AND THE NATIONAL NETWORKS

## Connections to the Spanish national network

The BarMar project connects the Spanish national hydrogen transmission network to the French network. The Spanish national network (also selected as Project of Common Interest No. 9.1.3, Spanish Hydrogen Backbone) is led by Enagás and aims to establish a national hydrogen pipeline network, enabling geographically dispersed industrial producers and consumers to access this renewable gas network. It could extend to approximately 2,600 km, of which around 2,000 km will consist of newly built hydrogen pipelines. Commissioning of these pipelines and the associated compression stations is scheduled by 2030.

This infrastructure will contribute to achieving decarbonisation targets while minimising overall system costs. In addition, the network will support the growth of a renewable hydrogen industry in Spain, ensuring the production of surplus volumes that can be exported to other European Union countries via international interconnections.



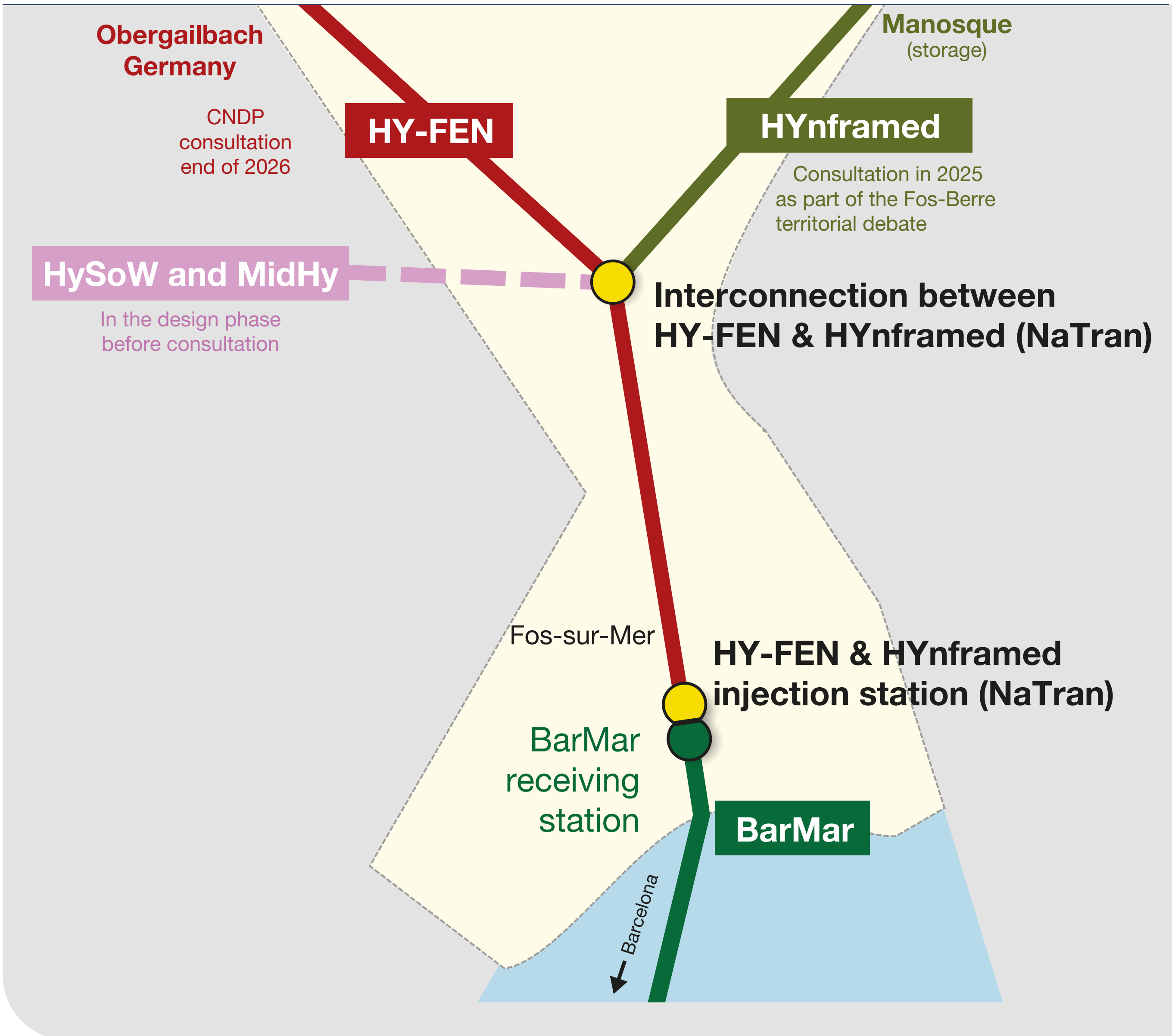

*The Spanish hydrogen transmission network is structured around two main corridors. The first includes the Cantabrian coast corridor, the Ebro Valley corridor and the Levante corridor. The second includes the Vía de la Plata corridor, connected to the Puertollano hydrogen valley.*

## Connections to the French national network

In France, the Fos-sur-Mer area will be one of the hubs of the hydrogen transmission network, in line with the national strategy for decarbonised hydrogen. From the BarMar landing station at Fos-sur-Mer, the onshore pipelines of the Hy-FEN and HYnframed projects developed by NaTran (see diagram below) will extend northwards and eastwards. As both BarMar and Hy-FEN are interconnected with the HYnframed network, their integration with it has naturally been addressed within the framework of the overall public debate "Fos Berre Provence, an industrial future under discussion", enabling a coherent and coordinated territorial approach to hydrogen infrastructure in this strategic industrial basin.

In parallel, NaTran and Teréga are also considering connecting the Fos-sur-Mer hub to the hydrogen network in south-west France through the MidHy and HySoW projects.

| The HY-FEN project | The HYnframed project |
| --- | --- |
| HY-FEN aims to develop hydrogen transmission infrastructure from southern France to the German border, extending the BarMar project and linking the Iberian Peninsula, France and Germany via local hydrogen ecosystems along its route in the Rhône Valley, also including major hydrogen storage projects.<br>HY-FEN is included in the 2025 list of Projects of Common Interest, alongside BarMar.<br>The project will be subject to a prior public consultation under the auspices of the CNDP in 2026.<br>**More information on the Hy-FEN project:**<br>**https://www.natrangroupe.com/notre-transition-energetique/transport-hydrogene/hyfen** | HYnframed is a hydrogen network project covering the Fos-sur-Mer region near Marseille and extending to Manosque. It will connect producers and consumers to storage capacities, thereby ensuring security of supply for the many industrial users in the region.<br>The project is funded under the France 2030 programme.<br>It formed part of the projects addressed in the overall public debate on decarbonisation and reindustrialisation projects in the Gulf of Fos industrial area, the Étang de Berre and surrounding territories.<br>**More information on the HYnframed project:**<br>**https://www.natrangroupe.com/notre-transition-energetique/transport-hydrogene/hynframed** |
| **The MidHy project** | **The HySoW project** |
| The MidHy project, led by NaTran, would connect HySoW to the HY-FEN project. With a length of around 200 km, it would link production, import and consumption centres in Occitanie to the H2med hydrogen transit corridor between the Iberian Peninsula and northern Europe.<br>As such it forms part of the hydrogen corridor extending from the Atlantic to the Mediterranean.<br>**More information on the HYnframed project:**<br>**https://www.natrangroupe.com/medias/communiques-de-presse/midhy-hysow-projet-interet-commun-decembre2025** | The HySoW project, led by Teréga, is an infrastructure of 650 kilometres of pipelines capable of transporting 16 TWh/year of decarbonised hydrogen across the entire south-west region.<br>This infrastructure would enable bidirectional hydrogen flows east–west and west–east between Marseille and Bordeaux, while supplying the greater Toulouse area, the Lacq industrial hub, and the ports of Bayonne and Port-la-Nouvelle.<br>In addition to these pipelines, the project includes hydrogen storage facilities in salt caverns located in Nouvelle-Aquitaine, with a capacity of around 500 GWh (HHV) by 2030 and 1 TWh (HHV) by 2050.<br>**More information on the HySoW project:**<br>**https://www.terega.fr/nos-activites/hydrogene/hysow-un-projet-dinfrastructures-de-transport-et-de-stockage-dhydrogene/** |




*At Fos-sur-Mer, NaTran will operate a HY-FEN injection station – on a separate site from the BarMar receiving station – with its own above-ground installations. These will include the equipment required for the maintenance of the onshore pipelines. The HYnframed network can also be connected at the HY-FEN level.*

## KEY POINTS...

- BarMar will interconnect the French and Spanish national hydrogen networks.
- Barcelona on one side and Fos-sur-Mer on the other will act as hubs where the branches of the national networks converge, also connecting BarMar to storage infrastructure.

# 7. PROCEDURES APPLICABLE to the project

*At European level, the BarMar project has been included in the list of Projects of Common Interest following a selection process based on the criteria set out in the TEN-E Regulation. PCI status recognises the project's strategic importance at European level and allows for coordinated and – where appropriate – accelerated administrative procedures, as well as potential access to European funding, without exempting the project from compliance with applicable national law (cf. chapter 8.2). Accordingly, the project must obtain all required authorisations in both France and Spain.*

## ENVIRONMENTAL IMPACT ASSESSMENT AND AUTHORISATION PROCEDURE IN SPAIN

Once the consultation process provided for under the TEN-E Regulation has been completed, the corresponding regulatory authorisation procedures will be carried out in Spain in accordance with the applicable sectoral legislation, in particular Law 21/2013 of 9 December on environmental impact assessment. At the same time, pending the adoption of specific administrative procedures for hydrogen transmission infrastructure, the provisions applicable to gas infrastructure will apply.

As a Project of Common Interest, BarMar will follow the authorisation framework established by Regulation (EU) No 869/2022 (TEN-E Regulation).

BarMar will be subject to the following main procedures before the competent authorities:

- Environmental Impact Assessment (EIA),
- administrative authorisation and approval of the detailed design,
- Declaration of Public Utility (DUP).

Responsibility for the main administrative authorisation lies with the Directorate-General for Energy Policy and Mines (DGPEM) of the Spanish Ministry for the Ecological Transition and the Demographic Challenge (MITECO) as the national competent authority under the TEN-E Regulation. These authorisation procedures are conducted in coordination with the competent authorities of the relevant provinces and administrations, in accordance with applicable legislation.

Responsibility for the environmental procedure lies with the environmental authority of MITECO, which is responsible for processing the environmental impact assessment in accordance with Law 21/2013.

To submit these applications, BarMar must prepare the technical and environmental documentation required under the applicable regulatory framework, in particular:

- technical project documentation for administrative authorisation and approval of the detailed design,
- the environmental impact assessment, prepared in accordance with Law 21/2013 and, where applicable, the scoping document issued by the environmental authority.

Submission of this documentation will be subject to the public information and consultation procedures provided for under the applicable legislation.

This information will be made available to:

- the competent public authorities and the authorities involved in the project,
- the administrations, bodies and entities responsible for assets or services likely to be affected by the installation, and
- the public, through the public information procedures provided for by law.

At the end of this process, the DGPEM is responsible for granting administrative authorisation and approving the detailed design, in accordance with the applicable provisions.

# ENVIRONMENTAL IMPACT ASSESSMENT AND AUTHORISATION PROCEDURE IN FRANCE

Various procedures will be initiated in France following the conclusion of the prior public consultation. They differ both in subject matter and in scope, and they are presented here according to their scope.

## Procedures covering the project as a whole

| Procedure | | Scope | Responsible authority (*) | Competent authority |
|---|---|---|---|---|
| **Application for authorisation to construct and operate, constituting authorisation / non-opposition under the IOTA regime (installations, works, activities), including in particular:** | Environmental assessment (including water and Natura 2000 aspects) | Project (excluding EEZ) | IGEDD | **Coordinating Prefect** |
| | Hazard study | Fos (onshore section) + offshore pipeline | DREAL | |
| **Derogation for protected species and habitats** | | Project | DREAL/CSRPN/ CNPN | **Ministry for Nature Conservation and Minister for Fisheries** |
| **Preventive archaeology** | | Project | DRAC<br>DRASSM | **Regional Prefect**<br>**Maritime Prefect** |

*(*) The abbreviations are below after the tables.*

## Procedures specific to the maritime sector

| Procedure | Scope | Responsible authority | Competent authority |
|---|---|---|---|
| **Route approval application** | Offshore pipeline in the EEZ | Maritime Prefecture | **Maritime Prefecture** |
| **Concession for use of the maritime public domain outside ports (Articles R2124-1 to R2124-12 CG3P)** | Territorial waters | Maritime public domain management department (DDTM) | **Coordinating Prefect** |
| **Special authorisations for nature reserves (where applicable)** | Offshore pipeline | | **Regional council for regional nature reserves,**<br>**or Prefect**<br>**or the minister responsible for nature protection for national nature reserves** |

## Procedures specific to landfall

| Procedure | Scope | Responsible authority | Competent authority |
|---|---|---|---|
| **Application for a declaration of public utility, granting the right to occupy the public domain and, where applicable, providing for the amendment of planning documents.** | Fos (onshore section) | DREAL / DDTM13 | **Prefect of Bouches-du-Rhône** |
| **Application for clearance authorisation (where applicable)** | Fos landfall | DDTM 13 | **Prefect of Bouches-du-Rhône** |
| **Concession for occupation of the port domain on land and at sea** | Fos (onshore section) | GPMM | **GPMM** |
| **Planning permission application** | Fos landfall | Town planning department of Fos-sur-Mer | **Municipal authorities of Fos-sur-Mer** |

**EEZ:** Exclusive Economic Zone

**DREAL:** Direction régionale de l'Environnement, de l'Aménagement et du Logement Provence-Alpes-Côte d'Azur [Regional Directorate for the Environment, Planning and Housing (Provence-Alpes-Côte d'Azur]

**DDTM13:** Direction départementale des territoires et de la mer des Bouches-du-Rhône [Departmental Directorate for Territories and the Sea of the Bouches-du-Rhône]

**DRASSM:** Département des recherches archéologiques subaquatiques et sous-marines [Department of Underwater and Submarine Archaeological Research]

**DRAC:** Direction régionale des Affaires culturelles Provence-Alpes-Côte d'Azur [Regional Directorate for Cultural Affairs Provence-Alpes-Côte d'Azur]

**IGEDD:** Inspection générale de l'Environnement et du Développement durable [General Inspectorate for the Environment and Sustainable Development]

**CNPN:** Conseil national de protection de la nature [National Council for Nature Protection]

**GPMM:** Grand port maritime de Marseille [Port of Marseille Fos]

### KEY POINTS RELATING TO THE BARMAR PROJECT

- In both France and Spain, the BarMar project will be subject to a large number of authorisation procedures, most of which will be handled by public authorities.
- While some procedures apply to the project as a whole on one side or the other of the border, others relate specifically to the offshore or onshore components.

# 8. PUBLIC CONSULTATION

*BarMar is a cross-border energy infrastructure project, forming part of a European drive towards decarbonisation and network interconnection. Given its environmental, industrial and territorial implications, it is essential to involve the public in its development, whether maritime stakeholders, local authorities, economic actors or residents, in both France and Spain.*

*As a cross-border Project of Common Interest, BarMar is subject to consultation procedures at European, Spanish and French levels..*

## GENERAL PRINCIPLES OF PUBLIC CONSULTATION

### Objectives

- Integrate environmental and social considerations from the earliest stages of the project.
- Incorporate public views into decision-making processes and maintain continuous participation by adapting it to the progress of the project.
- Justify the choices made (route, technology, etc.) and describe how public contributions have been integrated into the decision-making process, and if they have not been, for what reason.
- Facilitate public access to relevant, clear and understandable information.
- Inform the public of their right to participate and how to exercise that right.
- Establish direct communication channels for collecting public contributions and responding to questions about this highly complex project.
- Ensure that a diversity of views can be expressed through varied and complementary formats.
- Ensure traceability of contributions and explain how they are taken into account.

## Stakeholders

| BarMar – the company | The public |
| --- | --- |
| As project developer, the company BarMar designs the consultation arrangements, organises them and covers the associated costs.<br>It informs participants about the substance of the project, shares the results of the studies and, in return, gathers public contributions. Its teams run the process, listen to the views and comments expressed and answer questions raised by the public. In this way, consultation enriches the project, opens up new options and improves understanding of its relevance.<br>On this basis, BarMar will decide on the future stages of the project: abandonment, modification or continuation of the project, and any further studies, particularly in the light of lessons learned from the dialogue. | Anyone with an interest in the project has the opportunity to obtain information and express their views throughout the consultation period. This applies to any citizen, regardless of their expertise or responsibilities.<br>In this way, the public may question the project and its relevance, but also contribute their knowledge of the areas concerned, propose adjustments to the project or put forward alternative proposals, and be involved in its development. |

### >> NATIONAL CONSULTATIONS SERVING AS CONSULTATION UNDER THE PROJECTS OF COMMON INTEREST FRAMEWORK

As a cross-border project with Project of Common Interest status, BarMar must be subject to public participation in accordance with Regulation (EU) No 2022/869.

In order to meet these obligations while ensuring proper alignment with national arrangements, consultations are being organised in Spain and France.

These consultations incorporate both European requirements and the legal frameworks specific to each country (see below).

## PUBLIC PARTICIPATION UNDER THE PROJECTS OF COMMON INTEREST REGULATORY FRAMEWORK

The rules applicable to Projects of Common Interest are set out in Regulation 869/2022 of the European Parliament and of the Council. Annex VI sets out in more detail the guidelines to be followed in relation to transparency and public participation.

In practical terms, application of Regulation 869/2022 gives rise to the following features common to consultations in both Spain and France:

| The public participation concept | The project website |
|---|---|
| BarMar has developed an approach to public participation, referred to in European terminology as the Public Participation Plan, setting out the objectives and consultation arrangements in each country. These documents were submitted to the national authorities, which approved their guiding principles before preparation of the consultation. | The website www.h2medproject.com was created specifically for the H2med initiative and is regularly updated. It includes dedicated pages for the CelZa and BarMar interconnections. Available in Portuguese, Spanish, French, German and English, the website is updated regularly.<br>It also provides access to the websites dedicated to the consultation process in each country. |
| **Non-technical summary** | **The information brochure** |
| The non-technical summary presents all the characteristics of the project and its current state of progress.<br>This is the first version of the consultation document. It will then be updated regularly as the project progresses, clearly indicating the changes made compared with previous versions. | A single project information brochure is produced and translated into Spanish, Catalan, French and English.<br>This presents the key elements of the project in a shorter format than the non-technical summary. It can be accessed on the website www.h2medproject.com. |

**Simultaneous consultation**

In order to engage people in each country at equivalent stages of progress, the national consultations must take place less than two months apart. This principle is to be applied to BarMar:

- the Spanish consultation will be deployed from  May  to July, while
- the French consultation will run from 6 May to 12 July 2026.

In addition, the consultation document was prepared jointly in Spain and France in order to provide the same information structure. Enagás, NaTran and Teréga will take part reciprocally in several consultation meetings on either side of the border, in order to inform each public about progress on the BarMar project on the other side of the border.

## PUBLIC CONSULTATION IN SPAIN

In accordance with the resolution adopted by the Council of Ministers on 30 July 2024, Enagás has initiated the formal procedure for obtaining the authorisations applicable to Project of Common Interest (PCI) 9.1.4 – Spain–France hydrogen interconnection (H2Med BarMar), in accordance with Regulation (EU) 2022/869 and the Authorisation Procedure Manual for Energy PCIs in Spain, published by the Ministry for the Ecological Transition and the Demographic Challenge (MITECO) in October 2023.

This process requires a preliminary phase of public participation to be carried out.

In addition to the organisation of public participatory meetings for citizens, as well as the establishment of information points within the municipalities through which the pipeline route will run, the implementation of the public consultancy process shall include the holding of specific meetings with trade associations, regional authorities and municipal administrations. During such meetings, the alternative corridor routing options shall be presented and discussed for the purpose of obtaining their proposals and observations, with a view to ensuring that the Project is appropriately aligned with the local context and the specific characteristics of the surrounding environment.

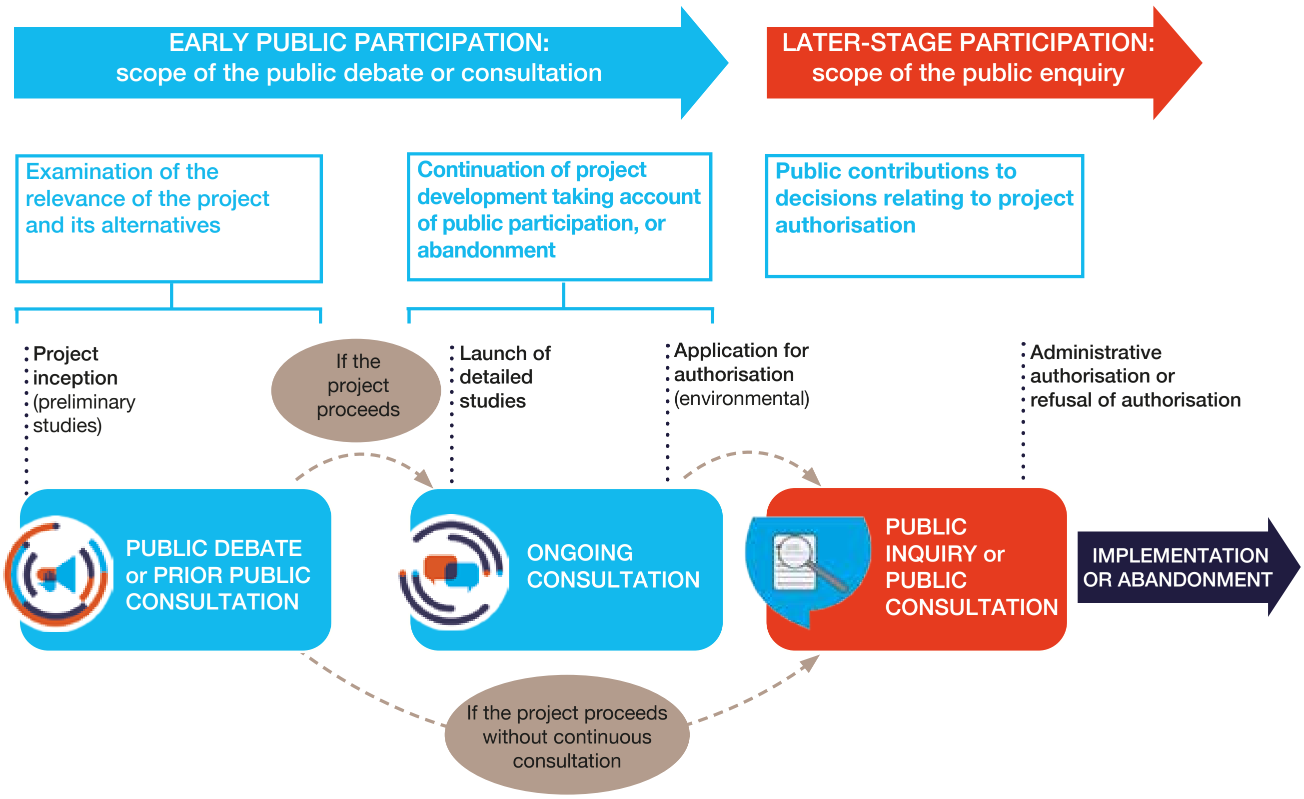
# PUBLIC CONSULTATION IN FRANCE

## The prior public consultation procedure

### WHAT IS PRIOR CONSULTATION?

The ordinances published in 2016 strengthened the prior public consultation procedure provided for in the Environmental Code. This procedure applies to projects, plans and programmes with major socio-economic implications or significant impacts on the environment and spatial planning.

Prior public consultation differs from a public inquiry in that it takes place in advance of the project. It therefore makes it possible to discuss the relevance, objectives and main characteristics of a project, as well as alternative solutions – including non-implementation. It takes place before any application for administrative authorisation is submitted.




### WHY THIS PROCESS, AND WHY NOW?

The prior public consultation must enable BarMar to take public contributions and views into account before a decision is made. This is because it takes place at a stage when several technical and territorial options remain open.

The organisation of a prior public consultation was decided by the National Commission for Public Debate (CNDP) on 23 July 2025, in response to the referral submitted by the project developers on 9 July 2025, the CNDP appointed three independent overseers: Mathias BOURRISSOUX, Corinne LARRUE and Audrey RICHARD-FERROUDJI. The CNDP decision and the independent overseers' terms of reference can be viewed on the CNDP website on the page dedicated to BarMar.

## THE ROLE OF THE INDEPENDENT OVERSEERS

Appointed by the National Commission for Public Debate, **three independent individuals oversee the fairness and proper conduct of the consultation**, ensuring that the public is well informed and able to participate. During the consultation, participants may contact these neutral and independent overseers directly.

The independent overseers will take part in the entire prior public consultation, from 6 May to 12 July 2026. They carried out a context study by meeting the various stakeholders involved, enabling a detailed analysis of the area, the project's issues and the relevant audiences, in order to provide recommendations to BarMar on the consultation arrangements and on the content of this consultation document.

**One month after the close of the prior public consultation period, the independent overseers prepare a report that is accessible to all** and can be consulted on the project developer's website as well as on the CNDP website.

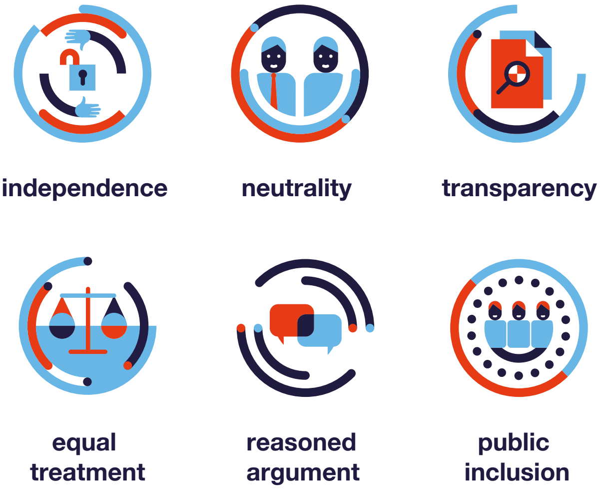
## THE CONSULTATION FILE – A REFERENCE DOCUMENT

The consultation document enables the public to find out about the project on the basis of objective information. It presents the project as a whole and summarises the studies produced to date. On this basis, everyone may submit their observations and proposals.

Designed and drafted by the company BarMar, its preparation was supervised by the CNDP independent overseers, who ensured the quality and clarity of its content. Before the launch of the prior public consultation, the document is submitted for validation to the National Commission for Public Debate, as provided for under Article R121-8 of the Environmental Code.

This is the **reference document** for the prior public consultation: on this basis, everyone may express their views on the project by submitting contributions. As such, it is the reference document for discussions, helping to inform the project owner's decision. The figure below summarises the main points addressed.

## THE VALUES OF THE CNDP




These principles ensure that the consultation takes place within an impartial, transparent framework open to all reasoned views.

The consultation process is based on complementary formats so that everyone can express themselves in the format that suits them: public meetings, thematic debates, small group discussions, written submissions, site visits and mobile consultation arrangements.

*To find out more, see **www.debatpublic.fr***

## KEY POINTS RELATING TO THE BARMAR PROJECT

- In both France and Spain, the project is subject to consultation procedures that also serve as consultation specific to Projects of Common Interest.
- These consultations will take place over the same period in order to ensure that the public in each country has access to consistent information.
- In both Spain and France, these consultation procedures are designed to give a voice to a diverse range of audiences.
- The website h2medproject.com/barmar brings together all the information and provides access to the consultation processes in each country.
- In France, the consultation is organised under the auspices of the National Commission for Public Debate (CNDP), which has appointed two independent individuals to oversee the process and produce a report on the consultation.

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H2med BarMar

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