



European  
Commission

# Waterborne transport for a green future

A SYNERGY INFO PACK  
BY CORDIS

*Research and  
Innovation*





# Editorial

Waterborne transport is vital to Europe's economy. More than 75 % of European external trade and 35 % of all trade between EU Member States is transported by sea, river, canal or lake. In addition, 350 million passengers alight or disembark from Europe's ports annually.

With demand for shipping forecast to grow significantly in the coming years, these numbers are likely to increase. While that's good news for the economy, it's bad news for the environment, as it could mean a 20-50 % increase in the emissions of a sector that has already proved difficult to decarbonise.

If Europe is to achieve its goal of becoming the world's first climate-neutral continent by 2050, it must reduce waterborne transport's environmental footprint. Doing so means overcoming a range of issues, including low public awareness, a lack of transparency and coordination, infrastructure-related bottlenecks, a need for new solutions, and an ageing – and often inefficient – fleet of vessels. Moreover, the competitiveness of EU manufacturing and operating companies in waterborne transport relies on leading the green and digital transition of such a globally-exposed sector.

These challenges are being addressed through EU-funded research, innovation, implementation and infrastructure projects. In this CORDIS Synergy Info Pack you'll find a collection of projects managed by CINEA, the European Climate, Infrastructure and Environment Executive Agency. They are drawn from a variety of funding programmes, including Horizon Europe, the European Maritime, Fisheries and Aquaculture Fund (EMFAF), LIFE, the Innovation Fund and the Connecting Europe Facility (CEF).

Established by the European Commission under the motto 'Funding a Green Future for Europe', CINEA contributes to the European Green Deal by implementing parts of EU funding programmes for transport, energy, climate action, environment, and maritime fisheries and aquaculture.

The Agency manages over EUR 60 billion in funding, with EUR 4.6 billion being allocated to 350 projects running within the waterborne transport sector. The synergies between its programmes form a pipeline that takes innovation from low Technology Readiness Level research to full market deployment, benefiting industry and citizens alike.

The 13 projects presented in this Pack reflect a range of ways in which research, innovation, and deployment of vessels and infrastructure are helping make the sector greener and more efficient. You'll hear about projects working to power cargo ships using renewable wind energy, electricity, green hydrogen, synthetic methanol and bio-LNG. You'll learn what's being done to protect whales and dolphins from colliding with ships, and discover a number of efforts to clean up Europe's ports and waterways.

Each of the featured CINEA-supported projects, which come from different sectors, countries and funding programmes, is doing its part to make waterborne transport more sustainable, more efficient and more competitive. Together, this work underscores waterborne transport as a sustainable choice for moving people and goods – putting the EU on course to climate neutrality and cleantech industrial leadership.

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## Chapter 1

# Energy-saving technologies

## Waterborne transport sets sail towards net zero

Europe's waterborne transport sector plays a vital role in our economic well-being. In fact, 77 % of European external trade and 35 % of all trade between EU Member States is transported by water.

But these numbers come with a price.

According to figures from the European Environment Agency and the European Maritime Safety Agency, ships produce 14 % of all transport-related greenhouse gas emissions, equivalent to more than 130 million tonnes of CO<sub>2</sub>. Although this represents a smaller share than what is produced by the road transport and aviation sectors (71 % and 15 % respectively), it remains a substantial carbon footprint.

With demand for shipping forecast to grow significantly in the coming years, there's a real risk that emissions from this sector could increase by up to 50 % by 2050. CINEA is committed to supporting the development of technologies and solutions that can mitigate this increase.

## A cleaner path with renewable power

A key approach for reducing shipping emissions is to find more efficient ways to get from A to B. The **CO<sub>2</sub>NTROL** project developed an intuitive platform for planning, managing and tracking shipments in a way that minimises an operator's environmental impact. The platform is already being used by container shipping companies to optimise their routes.

The industry is also creating commercially viable technologies capable of reducing – if not eliminating – shipping-related carbon emissions. The **Orcelle** and **SustainSea** projects are both working to harness the wind to power large cargo ships. To do so, the projects are using vertical sails installed on a cargo ship's deck to harness wind energy when suitable.

By replacing fossil fuels with renewable wind energy, the sails have the potential to reduce carbon emissions of a freighter by up to 90 %.

Through innovation and technological prowess, each of these projects is helping waterborne transport decrease its primary use of energy and, in doing so, decrease carbon emissions.





© Oceanbird

## Wind gives you wings

**The answer to decarbonising waterborne transport could be blowing in the wind – which is why the Orcele project is advancing a new approach to ship propulsion.**

With the goal of building the world's first wind-powered car and truck carrier, Orcele designed wind-harnessing vertical sails known as wings. The wings are being installed on two physical demonstrators, a one-wing retrofit of an existing cargo ship and a newbuild multi-wing vessel. The project is confident that its innovative wind propulsion systems will achieve an energy efficiency gain of more than 50 %, and even as much as 100 % in ideal sailing conditions.

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### Orcele

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#### Project name

Wind as main propulsion by ORCELLE

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#### Funded under

Horizon Europe – Climate, Energy and Mobility

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#### Coordinated by

Wallenius Wilhelmsen Ocean in Norway

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#### Duration

1 January 2023 – 31 December 2027

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#### Find out more

[orcelle.eu](https://orcelle.eu)

# Sailing with the wind

**Fossil fuels come with a rising cost – both financial and environmental. Harnessing renewable energy can help.**

To help the sector reduce its environmental footprint and reduce costs, the SustainSea project is integrating an innovative suction sail system into maritime transport. Developed by bound4blue, the eSAIL® wind propulsion system allows a wide variety of vessels to sail using wind as complementary propulsion, providing fuel savings. Five vessels will receive 22 metre high eSAILs®, aiming to cut more than 14 000 tonnes of CO<sub>2</sub> emissions the first three years, and more than 46 000 tonnes over 10 years.

## SustainSea

### Project name

Reducing maritime transport CO<sub>2</sub> emissions using wind

### Funded under

Innovation Fund

### Coordinated by

Bound 4 Blue in Spain

### Duration

1 July 2023 – 31 December 2027

### Find out more

[sustainsea.eu](https://sustainsea.eu)





# Calculating and decreasing cargo's carbon footprint

**Cutting transport emissions starts with understanding the environmental impact of the journey, which is easier said than done.**

Fuel, vessel type, speed, load, route – all these parameters make it extremely difficult for container shipping companies to accurately calculate and ultimately reduce CO<sub>2</sub> emissions. But this could soon change thanks to the work of the CO<sub>2</sub>NTROL project. The project developed a fully integrated end-to-end solution for planning, managing and tracking shipments, to opt for the journeys with minimal impact on the environment. Not only will the solution help ship operators calculate their carbon footprint using accurate data, it will also provide them with an optimal route in terms of CO<sub>2</sub> emissions from pickup to delivery.

## CO<sub>2</sub>NTROL

### Project name

Collaborative platform for shipping container operations to take control of CO<sub>2</sub> emissions by route optimisation

### Funded under

EMFF – Blue Economy

### Coordinated by

BuyCo in France

### Duration

1 August 2021 – 31 October 2023

### Find out more

[buyco.co/co2ntrol](https://buyco.co/co2ntrol)



## Chapter 2

# Alternative fuels for shipping

## Helping take alternative fuels mainstream

Unlike cars and trains, ships – especially large cargo ships – aren't easily electrified. Most large ships rely on heavy fuel oil, which is cheap but environmentally contentious. To meet the goals of the European Green Deal, the waterborne transport sector must look for alternative ways to decarbonise – including alternative fuels.

Alternative fuels developed from sustainable sources and renewable energy have the potential to help the shipping industry decrease greenhouse gas emissions and other pollutants. The bad news is that it is difficult to find cost-effective, widely available alternatives to the fossil fuels used by waterborne transport.

But this is starting to change, thanks in large part to initiatives such as Horizon 2020 project **HySeas III**. The project is turning electricity generated by the winds, waves and tides that define Scotland's Orkney Islands into hydrogen which can then be used in newly developed marine fuel cells providing electric power for engines on board zero-emission vessels and ferries.

Another alternative fuel with big potential for shipping is bio-liquefied natural gas, or bio-LNG. The **FirstBio2Shipping** project is developing an industrial plant capable of converting biogas into renewable, low-carbon fuel that will be made available to waterborne transport.

## From trash to treasure

Also recycling waste into a valuable commodity is the **FReSMe** project, this time with CO<sub>2</sub>. The project created an innovative process for capturing emissions from steel plants, recycling the CO<sub>2</sub> into liquid methanol fuel that can be used to power cargo ships.

The **POSEIDON** project is also developing new technologies and solutions to valorise CO<sub>2</sub> from waste streams to produce synthetic methanol and deliver it across the shipping value chain. Following testing, the project hopes to roll its system out at key EU ports.

While decarbonising waterborne transport may be challenging, it is not impossible. By giving shipping an alternative to heavy fuel oil, each of these projects is helping decrease the industry's dependence on fossil fuels and clearing a path towards an emission-free future.



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## H<sub>2</sub> = 0 emissions

**Powering ships with hydrogen that is produced from local renewable energy sources – it's not a blue dream. It's HySeas III.**

Building on the work of two previous projects, HySeas III looked to show how fuel cells, along with hydrogen storage and bunkering components, can be integrated into a marine electric drive system. The project aimed to convert the energy of the winds, waves and tides around Scotland's Orkney Islands into stored hydrogen. The project has designed, constructed and tested a modular 1 MW class zero-emissions drivetrain employing hydrogen fuel cells and Li-ion battery modules. As a result of the project, marinised fuel cells of 100 kW are now being sold on the market.

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### HySeas III

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#### Project name

Realising the world's first sea-going hydrogen-powered RoPax ferry and a business model for European islands

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#### Funded under

Horizon 2020 – TRANSPORT

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#### Coordinated by

University of St Andrews in the United Kingdom

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#### Duration

1 July 2018 – 30 June 2022

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#### Find out more

[hyseas3.eu](https://hyseas3.eu)



# From steel pollution to sustainable fuel for ships

**Shipping and steel are two hard to abate industries, with the former accounting for nearly 3 % of human activity-related emissions and the latter for 7 % of global carbon dioxide emissions.**

If you could turn steel's waste into a sustainable fuel for shipping, you could make a serious dent in emissions – which is exactly what the FReSMe project has done. The project's solution starts by capturing the CO<sub>2</sub> being emitted at a steel plant. Then, using an emissions-to-liquids methanol production process, this captured carbon is recycled into a sustainably produced methanol fuel that can be used to power ships, including a cargo ship currently operating between Sweden and Germany.



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## FReSMe

### Project name

From residual steel gases to methanol

### Funded under

Horizon 2020 – ENERGY

### Coordinated by

I-Deals Innovation & Technology  
Venturing Services in Spain

### Duration

1 November 2016 – 30 June 2021

# Bringing synthetic methanol to EU ports

**Synthetic methanol, produced via the catalytic reaction of carbon dioxide and hydrogen, has the potential to significantly slash emissions.**

However, delivering on this potential requires both new production technologies and innovative solutions for implementing its use in shipping. The POSEIDON project has caught the shipping industry's attention with plans to deliver both. It is developing and testing solutions that will create new value chains – from feedstock to ship engines. In addition to assessing two complementary routes to valorise CO<sub>2</sub> from waste streams (wastewater treatment and lime production plants), the project is developing a power-to-synthetic technology for producing a synthetic methanol. Following testing, the system could be implemented at key EU ports.

## POSEIDON

### Project name

Propulsion Of Ships with E-Methanol  
In favour of the Decarbonisation  
Of Naval transport

### Funded under

Horizon Europe – Climate,  
Energy and Mobility

### Coordinated by

Eifer European Institute for Energy  
Research in Germany

### Duration

1 September 2023 – 31 August 2027

### Find out more

[bit.ly/poseidon\\_eu](https://bit.ly/poseidon_eu)







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# Decarbonising waterborne transport with bio-LNG

**Unlike cars and trains, ships cannot be easily electrified – making decarbonising the waterborne transport sector particularly challenging.**

For the FirstBio2Shipping project, bio-based liquefied natural gas (bio-LNG) offers a way forward. The project is developing the first industrial plant capable of converting biogas into renewable, low-carbon bio-LNG at scale and in an energy-efficient way. The bio-LNG can be used by LNG-compatible vessels without the need for any adaptations. Used as an alternative to heavy fuel oil, the bio-LNG produced by the project can reduce net emissions by 92 %, 87 500 tonnes of CO<sub>2</sub> equivalent for the first 10 years of project's operation.

## FirstBio2Shipping

### Project name

First Bio-LNG production plant for marine shipping

### Funded under

Innovation Fund

### Coordinated by

Attero in the Netherlands

### Duration

1 January 2022 – 31 March 2027

### Find out more

[nordsol.com/cases/wilp](https://nordsol.com/cases/wilp)

## Chapter 3

# Environmental protection

### Reducing impact on the environment – and those living in it

Waterborne transport's environmental impact involves more than just carbon emissions. The sector also produces high levels of nitrogen oxides (NO<sub>x</sub>) and sulphur dioxide (SO<sub>2</sub>), along with other air pollution such as particulate matter.

Because many ports are located either in or nearby major urban areas, this pollution can have a direct impact on the health and well-being of citizens. It can also damage trees and plants, inhibit plant growth and damage sensitive ecosystems and waterways.

Helping address shipping's pollution problem is **CLINSH**. The project is using a combination of technology, alternative fuels and onshore power supply to make Europe's existing inland water fleet cleaner – and greener.

According to the project, its solutions can reduce a vessel's NO<sub>x</sub> and particulate matter emissions by 25 % and 69 % respectively.

### Tackling impacts above and below the surface

Waterborne transport's environmental impact isn't only felt above the water, we also need to consider what happens below the surface. The European Environment Agency estimates that the sector is responsible for half of all non-indigenous species introduced into European seas since 1949. Furthermore, every year thousands of cetaceans, including whales and dolphins, die from lethal collisions with cargo ships and other vessels.

Working to reduce this risk is **SEADETECT**. The project has developed an on-board system that allows a ship to detect large cetaceans within a 1 km radius – giving the vessel plenty of time to change course and avoid a collision. The system is expected to save at least 100 whales and dolphins a year.

### An emission-free high-speed ferry

Initiatives working to reduce the carbon footprint of waterborne transport can also draw on blueprints for zero-emissions ships shared by the **TrAM** project. Having built a fully electric, emission-free fast passenger ferry serving commuters in Norway, the project has now made the modular production toolkit available, allowing others in the industry to cut engineering costs by as much as 70 %.

By helping the sector shrink carbon emissions, particulate pollution and impact on sea life, projects such as these can further enhance the sector's environmental credentials.

# A breath of fresh air for inland water transport

**Often using outdated vessels, inland waterway transport produces disproportionately high levels of NO<sub>x</sub> emissions and other air pollution such as particulate matter.**

Because many inland ports and canals are located either in or nearby major urban areas, this pollution can have a direct impact on the health and well-being of citizens. Helping inland waterway transport clean up its act is CLINSH. The project explored how various emission-reduction technologies, along with the use of alternative fuels and onshore power supply, can reduce air pollutants. It also demonstrated how these approaches can be applied to Europe's existing inland water fleet. When vessels adopted the project's emission-reducing solutions, NO<sub>x</sub> and particulate matter emissions decreased by 25 % and 69 % respectively.



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## CLINSH

### Project name

Clean INland SHipping

### Funded under

LIFE

### Coordinated by

South Holland Province in the Netherlands

### Duration

1 September 2016 – 28 February 2022

### Find out more

[clinsh.eu](http://clinsh.eu)



# Protecting sea life from ships

**Every year, thousands of whales and dolphins are hit by ships, causing serious injury if not death. With global shipping continuing to increase, so too will the risk of collision.**

Working to reduce this risk is SEADETECT. The project developed several technologies capable of detecting a cetacean within a 1 km radius – giving a ship enough time to change course. Using multiple high-sensitive sensors and artificial intelligence, the innovative on-board system enables a vessel to self-detect a cetacean. The system also uses a network of passive acoustic monitoring buoys that can detect and triangulate a creature’s position in real time. The project says its system will save at least 100 cetaceans a year.

## SEADETECT

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### Project name

Marine automated DETECTION and anti-collision system with cetaceans

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### Funded under

LIFE

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### Coordinated by

Naval Group in France

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### Duration

1 September 2022 – 31 August 2026

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### Find out more

[life-seadetect.eu](http://life-seadetect.eu)







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## Fully electric and emission-free

**The TrAM project is writing the blueprint for low-cost, zero-emission inshore vessels, combining advanced modular production principles with ship design and construction.**

The project has provided the industry with a toolkit for building sustainable ships. On top of bringing emissions to zero, these methods can cut production costs by a quarter and engineering costs by as much as 70 %.

The project built its own fully electric, emission-free fast passenger ferry, which is currently serving a multi-stop commuter route in Norway, and later adapted this design for the River Thames in London and the canals of Belgium, opening the floodgates for environmentally friendly ships across Europe.

### TrAM

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#### Project name

Transport: Advanced and Modular

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#### Funded under

Horizon 2020-TRANSPORT

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#### Coordinated by

Rogaland County Municipality in Norway

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#### Duration

1 September 2018 – 28 February 2023

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#### Find out more

[tramproject.eu](http://tramproject.eu)

## Chapter 4

# Efficient and green infrastructure

### Three elements of sustainable waterborne transport

When it comes to making waterborne transport more sustainable, ships are only half of the equation. The other half is infrastructure. In 2022, Europe's ports played host to visits from 2.2 million vessels, handling nearly 3.5 billion tonnes of freight, including 96 million containers.

Handling these kinds of numbers requires a lot of energy. When that energy is produced using fossil fuels, it results in a substantial amount of carbon emissions and pollution. Ships calling at European ports generated around 130 million tonnes of CO<sub>2</sub> emissions in 2018, nearly a fifth of all CO<sub>2</sub> emissions generated by maritime transport worldwide that year.

The path towards more efficient and greener waterborne transport must include its supporting infrastructure.

### More efficient, environmentally friendly ports

Bilbao in Spain, Rostock in Germany and Hanko in Finland are all making progress to cut their environmental impact. With the support of the **BilbOPS** project, the Bilbao Port Authority is taking steps to electrify much of its infrastructure. Leveraging onshore power supply, ships will soon be able to turn off their engines and plug into the port's electric grid, thus eliminating emissions during berthing.

Likewise, both the **Rostock and Hanko ports** are investing in their water- and land-based infrastructure. By adapting berths to accommodate larger vessels and improving cargo handling services, the ports are securing a long-lasting modal shift to waterborne transport and therefore improving the overall transport chain efficiency and environmental performance.

### Updating Europe's waterway network

Between the ships and the ports is a complex waterway network, which in Europe includes rivers, canals and lakes. When it comes to transporting goods, these waterways have the potential to serve as a sustainable alternative to roads. In fact, it is estimated that every tonne of freight transferred from road to water results in a four to fivefold reduction in emissions.

To tap into this potential and boost inland waterway freight transport, the **Seine-Escaut** project makes large investments to connect and modernise a network of 1 100 km of inland waterways suitable for large vessels between France and Belgium.

In the near future, these more efficient waterways will accommodate more traffic and lower-emission vessels as they make their way to and from cleaner ports – a three-pronged approach to reducing the transport sector's environmental impact.

# Creating Europe's first high-capacity navigable waterway network, modernising inland waterways

**When it comes to transporting goods, Europe's inland waterways have the potential to serve as a sustainable alternative to roads.**

Seine-Escaut is an ambitious project that will create a network covering 1 100 km of high-capacity waterways linking major seaports and numerous multimodal platforms in two countries, France and Belgium. The project includes the construction of the Seine-Nord Europe Canal linking the Seine basin with the Escaut basin, and beyond that, other major European river basins. This, combined with the modernisation and regeneration of existing canals, will increase river traffic and boost a modal shift from road transport, and play a key role in the North Sea-Rhine-Mediterranean transport corridor.



© JC Hecquet

## Seine-Escaut

### Project name

Developing the largest inland waterway network in the heart of the EU

### Funded under

Connecting Europe Facility (CEF) – Transport

### Coordinated by

Ministry of Ecological Transition and Territorial Cohesion in France

### Duration

1 January 2014 – 31 December 2027

### Find out more

[seine-scheldt.eu](http://seine-scheldt.eu)



# Shifting freight from road to sea

**Facing increasing demand for cargo shipping, the Rostock-Hanko maritime route running between Finland and Germany opted to upgrade.**

To increase capacity, the two ports invested in both their water- and land-based infrastructure. In Germany, the Port of Rostock adapted two roll-on/roll-off berths to accommodate longer vessels. It also created additional terminal space for handling and storing freight, and improved the port's IT services. In Finland, the Port of Hanko gave its terminal area a complete makeover, enlarged its pier and improved its cargo handling services. Having improved efficiency, productivity, safety and environmental performance, this important maritime route will reinforce a modal shift from road to waterborne transport, reducing energy use and pollution.

## Motorway of the Seas Rostock-Hanko

### Project name

Development of port capacity for integrated Baltic MoS link(s) on Rostock-Hanko

### Funded under

Connecting Europe Facility (CEF) – Transport

### Coordinated by

Rostock Port in Germany

### Duration

February 2017 – September 2020

### Find out more

[rostock-port.de](http://rostock-port.de)







© Port Authority of Bilbao

## Bilbao Port goes electric

**With the goal of reducing carbon emissions, Bilbao Port in Spain decided to go electric, allowing vessels to plug in while docked.**

With the support of the BilbOPS project, the port is working to electrify its container, ro-ro, ro-pax and cruise docks. Using onshore power supply (OPS), ships will be able to switch off their engines and plug into the port's onshore electrical grid, thus eliminating emissions during berthing. The project is also looking to create a green energy hub to produce electricity using local renewable resources such as hydrogen, wind, solar and waves. The port aims to be able to cover at least 90 % of a ship's power demand by 2030.

### BilbOPS

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#### Project name

Bilbao Port Net-Zero Green Onshore Power System for Comprehensive Support & Core TEN-T Cold Ironing Capabilities Expansion in the Atlantic Corridor

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#### Funded under

Connecting Europe Facility (CEF) – Transport

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#### Coordinated by

Port Authority of Bilbao in Spain

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#### Duration

31 January 2022 – 30 January 2026

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#### Find out more

[bilbops.bilbaoport.eus/bilbops-ingles](https://bilbops.bilbaoport.eus/bilbops-ingles)



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CINEA provides technical and financial management services at all stages of the programme and project life cycle – from the calls for proposals, evaluation of projects and the award of financial support, to the follow-up of project implementation and control of the use of funds allocated.

CINEA provides visibility for EU funding opportunities and project results – and supports potential applicants and beneficiaries, allowing them to benefit from the Agency's long-standing experience of programme implementation with a high level of performance, and seeks to promote synergies between the programmes in order to benefit EU citizens and promote economic growth.

### More details can be found on CINEA's website at:

[cinea.ec.europa.eu/index\\_en](https://cinea.ec.europa.eu/index_en)



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