# EU $CO_2$ INFRASTRUCTURE IN BLOOM: PCI/ PMI CANDIDATES SPREAD SOUTH AND EAST, BECOME MULTIMODAL, CROSS-BORDER, AND STORAGE-CENTRED

On the 21st of December, the European Commission published the 1st list of Union candidate projects in the thematic area of cross-border Carbon Dioxide transport and storage networks applying for Project of Common Interest (PCI) or Project of Mutual Interest (PMI) status. Stakeholders have until the 16th of March to answer the open consultation. **We encourage CCS stakeholders to answer the open consultation** for which we at Bellona offer our overview of and take on the candidate projects and their potential to contribute towards the rapid upscale of CCS deployment and by extension industrial decarbonisation.

Acquiring PCI/PMI status would accelerate the implementation of these projects through reduced administrative hurdles and faster permitting procedures, increasing the speed of industrial decarbonisation in Europe and getting EU countries closer to the 2050 net-zero target. PCI and PMI projects are also eligible to apply for funding from the Connecting Europe Facility under the TEN-E Regulation aiming to modernise and expand cross-border energy infrastructure in Europe.

The recent inclusion of $CO_2$ storage infrastructure in the list of thematic areas supported by the TEN-E Regulation has a positive signalling effect assuring emitters that with the EU's recognition and support the necessary infrastructure will be available to transport process $CO_2$ thereby incentivising investment into capture installations on hard-to-abate industries. We encourage the European Commission to further recognise and support multimodal $CO_2$ transport in order to enable emitters and TSOs to explore all transport options as pipeline transport does not in all cases fit the needs of remote and single emitters, often located in landlocked areas with far proximity from coastal areas.

Furthermore, the TEN-E Regulation's recognition and support of $CO_2$ storage makes it clear for emitters and TSOs that permanent storage of $CO_2$ is the utmost priority as the credible way to ensure that the captured $CO_2$ does not re-enter the atmosphere safeguarding the long-term climate benefit of CCS technologies.

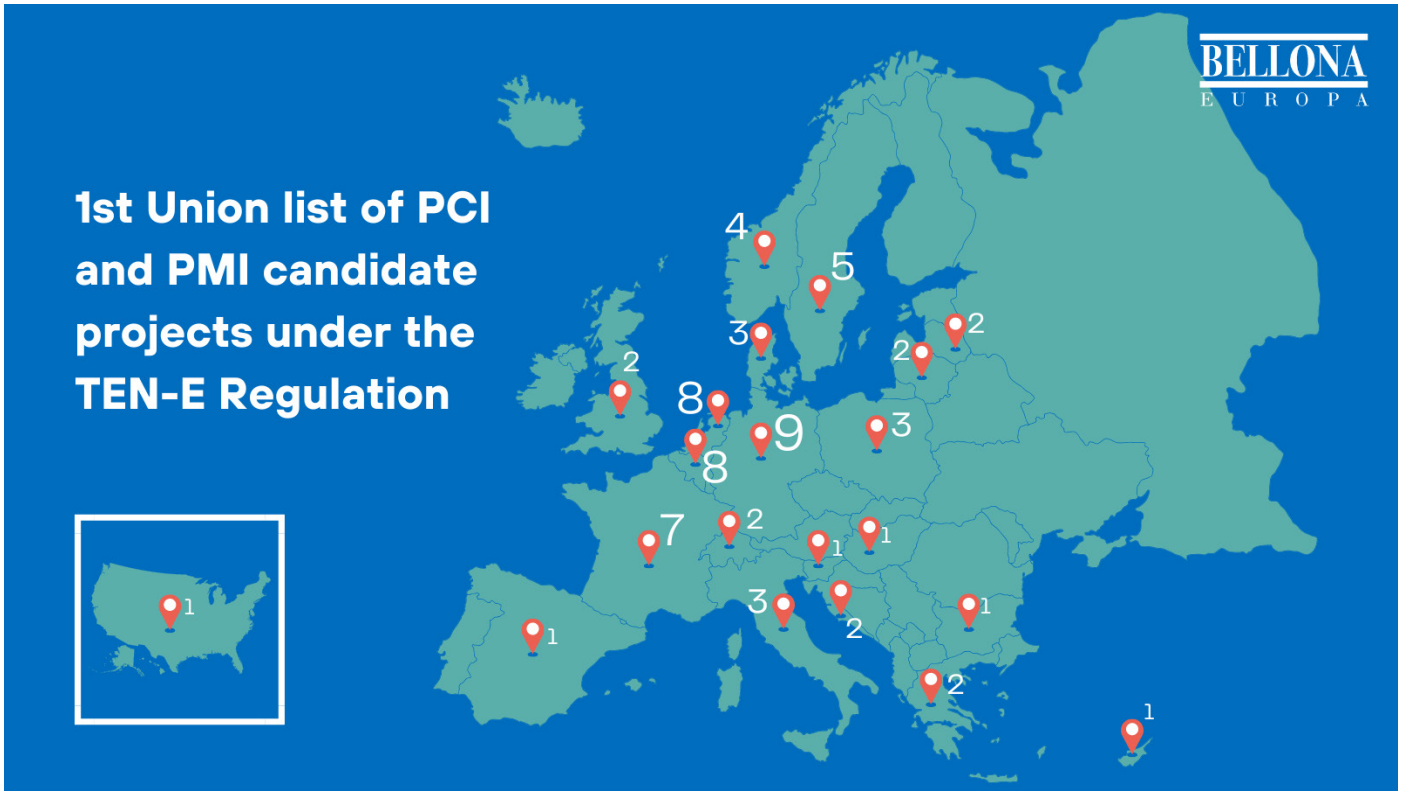
A total of **18 cross-border $CO_2$ transport and storage infrastructure projects applied for the status covering 17 EU Member States and 4 non-EU countries.** These projects collectively show tremendous potential for making CO2 transport and storage network a reality enabling large-scale European industrial decarbonisation. Putting into place the necessary infrastructure to transport and permanently store industrial emissions is an important step in ensuring Europe's

competitiveness on CCS in light of the U.S. Inflation Reduction Act and its $369 billion green industry subsidy. However, more efforts are still needed to fully decarbonise European industries in line with the EU's 2050 net-zero target.

Nevertheless, there are a number of projects on the list that miss the mark or lack ambition when it comes to climate benefit. Bellona Europa does not support the use of public funding intended for CCU projects unless the project proves to be significantly reducing emissions according to GHG methodologies which consider the entire lifecycle of a CCU product. Additionally, in the case of projects involving $H_2$ production/utilisation/transport, the sustainability of the entire hydrogen lifecycle, as well as their impact on the rest of the power sector, remain to be assessed to determine the overall climate impact of each project.

Some of the PCI/PMI candidate projects build on already ongoing first-mover projects, like Northern Lights in Norway, and Porthos in the Netherlands. They aim to establish and expand the $CO_2$ pipeline infrastructure across the North-West European region and part of France connecting industrial clusters and single emitters with $CO_2$ export terminals already under planning in Antwerp and Rotterdam.

Industry giant Germany with its recent positive signalling toward CCS technologies is involved in the most projects applying for PCI/PMI status, closely followed by the Netherlands, Belgium, and France. But the list also includes CCS newcomers across the EU; many in the Central-Eastern European and Southern European regions. A number of CCS projects (such as GO4ECOPLANET in Poland) have been awarded Innovation Fund large-scale funding in July 2022. We welcome the growing momentum for CCS deployment in these regions as Bellona has already been working toward this goal for several years.




*Number of candidate projects each country is involved in.*

## NEW INTEGRATED $CO_2$ INFRASTRUCTURE FOR WESTERN EUROPEAN INDUSTRIES

Bellona has long been working to create a channel for cooperation between CCS stakeholders in the Netherlands, Belgium, and the industry-heavy North-Rhine-Westphalia (NRW) region of Germany to enable the deployment of integrated $CO_2$ capture, transport and storage chains in the region. We welcome and support the 9 candidate projects that, if completed, will certainly contribute towards that development and increase the possibility of infrastructure sharing in the region.

- **$CO_2$TransPorts** is a collaboration between the ports of Rotterdam, Antwerp and the North Sea Port in Ghent and two pipeline developers (Fluxys and Gasunie) to develop onshore cross-border pipelines providing interconnection between industrial clusters and $CO_2$ terminals as well as offshore pipelines linking $CO_2$ terminals to storage sites on the Dutch Continental Shelf.
- **N-LiTES**, as the continuation of the Northern Lights project, will establish CCS infrastructure including but not limited to $CO_2$ pipeline networks in Belgium, Germany, France, Sweden, and the Netherlands, export terminals, as well as injection facilities.
- **ARAMIS** will construct a new high-capacity pipeline to transport $CO_2$ from the port of Rotterdam to storage sites in the Dutch Continental Shelf.
- **EU2NSEA** will install $CO_2$ capture facilities on industrial plants in 8 EU member states including Belgium, Germany and the Netherlands. It will establish $CO_2$ hubs and build the necessary pipeline infrastructure and fixed infrastructure facilities for transporting industrial $CO_2$ emissions to the North Sea.
- **DELTA RHYNE CORRIDOR** will develop a pipeline network connecting Germany's industrial base in NRW $CO_2$ terminals in Rotterdam currently under construction. This project includes a parallel pipeline to transport hydrogen from the port towards the industrial cluster, where it can be used to decarbonise sectors with no alternative decarbonisation pathways. However, Bellona stresses that the sustainability of the production of such hydrogen remains to be assessed to determine the final climate impact of this project.
- **GERMAN CARBON TRANSPORT GRID** will implement a broad $CO_2$ pipeline network in Germany connecting industrial emitters to hubs and to $CO_2$ export terminals intended for permanent storage in the North Sea.
- **NOORDKAAP** will connect emitter clusters and single emitters along the North Sea coast to cross-border storage locations.

## GROWING STORAGE CAPACITY

Following the revision of the TEN-E Regulation in 2022, $CO_2$ storage infrastructure projects are now eligible to apply for PCI/PMI status.

The 1st Union list that includes $CO_2$ storage projects suggests a growing potential of up to 67,54 million tonnes per annum by 2030-32. These new storage sites could supplement and provide alternatives to the Northern Lights site currently being built off the coast of Bergen on the Norwegian Continental Shelf. While Bellona welcomes the development of new storage sites across Europe, ambitions must be multiplied in order to meet harder-to-abate industries' demand for storing captured process emissions.

Expanding the available storage potential in Europe not only gives confidence to industrial emitters and investors to consider CCS as a viable decarbonisation option but can also reduce the emissions associated with the $CO_2$ value chain from capture to storage in light of the shorter distances of transport, thereby increasing the net benefit of CCS as a decarbonisation tool. An increasing number of

storage sites will also contribute to developing a growing $CO_2$ storage market on the long run creating economies of scale thereby reducing costs related to geological $CO_2$ storage for emitters making CCS a more attractive decarbonisation tool in the long term.

Project **NORNE**, for instance, will develop 2,3 Mtpa storage capacity in Denmark and Sweden within the next three years with an expansion of up to 18,7 Mtpa by 2030 while the **BIFROST** project promises a capacity of up to 10 Mtpa by 2030-32 in the Danish North Sea. These two projects will provide Denmark and surrounding countries with alternative storage sites to Northern Lights in closer proximity to several industrial emitters.

Meanwhile **N-LiTES**, the continuation of the Northern Lights project will increase storage capacities in the 2nd phase of the project by 3,7 Mtpa on top of the 1,5 Mtpa capacity implemented in the 1st phase. However, the project coordinator, Northern Lights JV, warns that current capacities still fall behind the capture potential of initiatives linked to the project. **EU2NSEA** operating in 10 countries across Europe forecasts the development of another 25 Mtpa storage capacity in Norway at the Smeaheia and Luna storage sites.

At the same time, $CO_2$ storage opportunities will be developed on the Mediterranean Sea, by the coast of Greece implemented as part of the **PRINOS $CO_2$ STORAGE** project predicting to store up to 2 million tonnes of $CO_2$ per annum. Another 1,04 Mtpa onshore $CO_2$ storage capacity in Northern Croatia will also become available as a result of the **GEOTHERMAL CCS CROATIA** project. Onshore storage projects (e.g., **GEOTHERMAL CCS CROATIA** and **PYCASSO**) are proposed in addition to offshore sites representing a needed development to accommodate some of the land-locked industrial emitters. Finally, another storage

*Red targets indicate PMI projects; green targets indicate PCI projects.*

site will be developed near Ravenna, Italy as part of the **CALLISTO** project aiming for 5,6 Mtpa $CO_2$ storage capacity.

## GROWING NUMBER OF PROJECTS TO ESTABLISH MULTIMODAL $CO_2$ TRANSPORT

A great number of projects are to establish alternative methods to $CO_2$ pipeline transport as part of cross-border infrastructure projects. Setting up the necessary infrastructure to transport $CO_2$ by road, rail, inland barges and/or maritime shipping is essential to respond to immediate $CO_2$ transportation needs as well as to account for unique geographical properties of regions where industrial plants and/or storage sites are located.

Multimodal transport of $CO_2$, with the exception of fixed facilities enabling transport by road, rail and barges, such as compression, and on- and off-load facilities, are not recognised and supported in the revised TEN-E Regulation and as a result are not eligible for CEF funding. As part of the #TENTTuesdays campaign, Bellona has long been advocating for multiple transport modalities to gain recognition and support from the EU through the TEN-T Regulation currently under revision. Due to the considerable lead time of $CO_2$ pipeline projects, multimodal $CO_2$ transport demonstrates potential for accelerating CCS deployment. $CO_2$ transport by road, rail and ships could complete the CCS value chain thus speeding up industrial decarbonisation in Europe. This is confirmed by several projects on the first list of candidate projects for PCI and PMIs, since the revision of the TEN-E Regulation.

The **$CO_2$TransPorts**, **ARAMIS**, **NORNE**, **NOORDKAAP**, **NAUTILUS**, **E$CO_2$CEE**, and **AUGUSTA** projects each foresee $CO_2$ transport by ships to their respective storage sites. Cape Omega AS, the NOORDKAAP project's lead coordinator, highlights that shipping will be used in instances where it is the most cost effective, fastest, and logistically most efficient solution for $CO_2$ transportation. In some cases, however, multimodal transport is seen as a temporary solution until the time when a comprehensive $CO_2$ pipeline network becomes available. In short, multimodal transport is applied where it is the primary or earliest $CO_2$ transport mode.

The French **NAUTILUS** project anticipates trucks, trains, and barges to be the primary methods of transport between emitters and liquefaction facilities/$CO_2$ export terminals in Le Havre, Dunkirk, and Rotterdam to then be further transported by ships to storage sites in the North Sea. Another French project, **PYCASSO**, foresees supplementing the primary transport method of pipelines with $CO_2$ transport by railway and ships.

Expecting multimodal transport to play an important and persisting solution to $CO_2$ transport in the region, the Polish **E$CO_2$CEE** project (formerly Poland – EU CCS Interconnector) and the Lithuanian **CCS BALTIC CONSORTIUM** project are both developing $CO_2$ export terminals accessible for all $CO_2$ transport modes, including road and rail.

## MOMENTUM FOR CCS SPREADING TO SOUTHERN AND CENTRAL-EASTERN EUROPE

A good indication of a spreading CCS momentum from North-Western Europe towards the Southern and Central-Eastern European regions is the emergence of several promising integrated CCS value chain projects. As part of the CCS4CEE project, currently under implementation, Bellona has been actively advocating for CCS deployment in the Central and Eastern European region.

### Poland and the Baltics

- **E$CO_2$CEE** is building an open access multimodal liquid $CO_2$ import-export terminal in Gdansk as well as related $CO_2$ transport infrastructure from Polish and Lithuanian emitters to permanently store industrial $CO_2$ emissions in the North Sea

basin.

- **CCS BALTIC CONSORTIUM** will establish a $CO_2$ terminal in Klaipeda providing connectivity for $CO_2$ transported from Lithuanian and Latvian industrial installations operating in harder-to-abate sectors to the terminal via multiple modes of transport (rail, road and ships) to ship to accessible storage sites in North and Baltic Seas.

### The Balkans

- **GEOTHERMAL CCS CROATIA** will implement a full value chain CCS project capturing $CO_2$ from Hungarian and Croatian cement plants, transporting it by pipelines and storing it permanently in onshore depleted oil and gas fields off the coast of Croatia as well as saline aquifers.
- **PRINOS $CO_2$ STORAGE** will build an offshore $CO_2$ storage site in the North of Greece for the purpose of storing emissions of hard-to-abate domestic industries as well as industrial emissions of surrounding countries such as Bulgaria, Italy, Croatia, Cyprus and Slovenia. The project also involves $CO_2$ capture installations on Greek hard-to-abate industries and offshore pipeline infrastructure to the injection well.
- **AUGUSTA-C2** will contribute to decarbonising Southern Italian cement production, transporting and storing $CO_2$ emissions off the shore of Greece.

### Southern Europe

- **CALLISTO** will contribute to reduce emissions by enabling the transport and geological storage of captured $CO_2$ from industrial emission points Southern France and Northern Italy to an offshore storage site.
- **PYCASSO** will transport (primarily by pipelines) industrial $CO_2$ emissions from southwestern French and northern Spanish industry regions and permanently store it in onshore depleted gas reservoirs in France.

## PROJECTS COUNTERPRODUCTIVE TO CLIMATE ACTION

There are, however, a few projects that do not hit the mark in terms of contributing to reducing emissions, and as a result Bellona does not support the granting of PCI or PMI statuses as they do not carry properties of overriding public interest.

The **WH2V** project involving Belgium, Germany, the Netherlands/Switzerland and the USA infers a large level of energy inefficiency without a considerable climate benefit. The project uses captured industrial $CO_2$ emissions and green hydrogen to create synthetic methane which can later be used to provide energy for businesses in Europe as green electricity, green hydrogen or as green synthetic methane. The project has several problematic elements:

1. Without the existence of abundant additional renewable energy generation in Europe, the production of electrolytic hydrogen threatens to cannibalise scarce RE resources that could be used directly to power European businesses, which is what the project intends to do.
2. Generating electricity from green hydrogen to power European businesses is a highly inefficient use of the molecule: the electricity used to produce the hydrogen should instead be used directly.
3. The project likely comes with considerable inefficiencies and energy losses stemming from transporting green hydrogen (with captured carbon molecules acting

as a carrier) from the USA (or UAE) to Europe as well as cross-border transportation within Europe.

4. In addition to the clear inefficient uses of energy suggested in this project, the accounting of the emissions as suggested by the project description seem problematic: when used, synthetic methane based on carbon captured from industrial emissions produces delayed emissions which need to be accounted for. The same applies to electricity produced from combusting this synthetic methane. And finally, converting hydrogen to methane, and then converting it back to hydrogen is likely to also generate substantial (direct and indirect) emissions.

In short, the operation of the project likely comes with larger emissions than what is reduced as a result of the process.

Two other projects, the **AUGUSTA-C2** project in Italy, and the **BIFROST** project in Denmark are leaving the door open for $CO_2$ utilisation of part of the captured $CO_2$. Bellona Europa does not support the use of public funding intended for climate mitigation for CCU projects unless the project proves to be significantly reducing emissions according to GHG methodologies which consider the entire lifecycle of a CCU product.

Finally, the NOORDKAAP project includes emissions from a biomass/coal power plant and should be approached with caution, in light of potential removal claims that need to be correctly assessed. Bellona is actively working to ensure that the certification of removals is done in a manner that reflects correct accounting of carbon.

## SUMMARY

Overall, 17 of the 18 PCI/PMI candidate projects form a sound basis for significant emission reductions in European industries. If the Longship project and Porthos put CCS on the map in Europe, awarding these new projects the PCI/PMI status would likely ingrain CCS in European decarbonisation discussions.

The implementation of the projects can provide credibility and confidence for investors and emitters that CCS is indeed a viable tool for decarbonisation and is an important piece of the decarbonisation puzzle. They also demonstrate the need for large-scale deployment of the technology in order to enable the full decarbonisation of industries that significantly contribute to realising the green transition in Europe.

We encourage the European Commission to prioritise the publishing of the official Communication on the CCUS Strategic Vision thereby unmistakably setting the direction for CCS deployment in Europe and kickstarting the establishment of a common regulatory framework CCS projects need.

**CONTACT**
**Hanna Biro**
**Policy Analyst**
**Bellona Europa**

**Phone**
Mobile: +32 (0) 467 754 344

**Online**
Email: hanna@bellona.org
Website: www.bellona.org

Bellona Europa is an independent, non-profit organisation that meets environmental and climate challenges head-on. We are result-oriented and have a comprehensive and cross-sectoral approach to assess the economics, climate impacts and technical feasibility of necessary climate solutions. To do this, we work with civil society, academia, governments and polluting industries.