CLEAN AIR TASK FORCE

Common Concerns Raised About Carbon Capture and Storage Technology

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Uses of Carbon Capture in Europe

What is carbon capture and storage a solution for?

Carbon capture, removal, and storage has an essential role in capturing emissions from key EU industries that have inherent CO_2 emissions in their production and few other mitigation options.
These include, but are not limited to:

STEEL & IRON PRODUCTION | CHEMICAL PRODUCTION | WASTE DISPOSAL | CEMENT PRODUCTION = 20% OF EUROPEAN EMISSIONS

These are key industries that have few to no alternative options than carbon capture and storage technologies. And since these **industries account for roughly 20% of European emissions and around a quarter to one-fifth of global CO_2 emissions,** focus on carbon capture is important.

Why is CCS a solution for these industries?

Emissions from certain industrial processes require extremely high heat, which electricity cannot currently supply. **CO_2 emissions can also arise not from the fuel used, but from the inherent chemistry of making the product.**

For example, about 60% of the emissions from cement have nothing to do with the fuel. They result from heating the limestone, and that process releases CO_2. So, even if you could provide heat with solar, 60% of the emissions will remain.

This is also true for certain steel and iron production. For steel the most challenging source to decarbonise is an integrated steel mill, owing to the many different sources of CO_2 throughout the plant.

Are Europe's industries located in areas where they can store CO_2?

Europe has a very compelling case for carbon capture and storage due to the fact that around 50% of the CO_2 emissions from power and energy-intensive industries are within 50 km of potential CO_2 storage locations, and 68% of emissions are within 100 km.

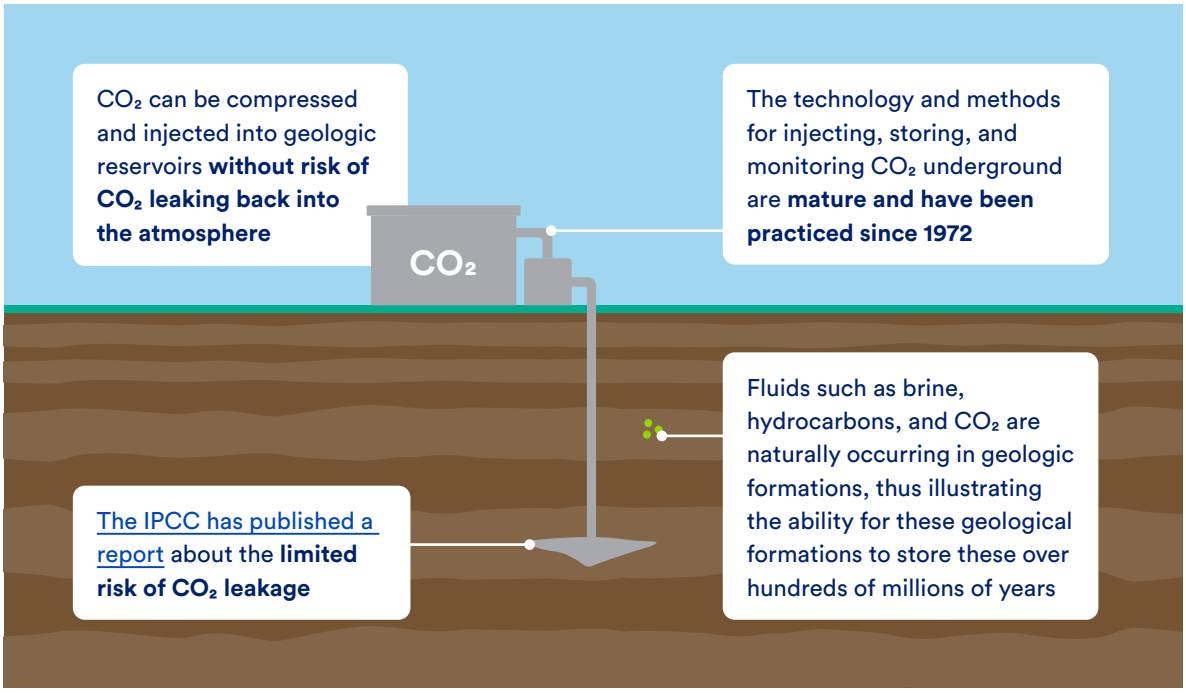
Understanding the Underlying Technology

Is the technology proven?

Yes, carbon capture and storage technology has been working safely and effectively for almost 50 years. There are **more than 20 commercial-scale carbon capture facilities** operating globally, permanently **capturing and storing around 40 Mt of CO_2 annually,** showing that this technology works. There are many more projects in planning globally, enabled by government investment.

Governments are supporting and incentivizing carbon capture and storage technology as a carbon reduction method as they are charting out their path towards net-zero emissions. Learn more on CATF's round-up of carbon capture and storage projects, also check our Europe and U.S. Carbon Capture Map.

How does the storage part work? Is it safe to put CO_2 into rocks?



What is CO_2 Utilisation?

CO_2 can be repurposed for other potential applications. While many are experimental and not yet at scale, there are **ways to transform captured CO_2 into fuels, cement, plastics, carbon fiber, and other materials.**

However, we need to ensure that CO_2 utilisation delivers permanent emissions reductions. Moreover, **utilisation cannot replace the need for geologic storage of CO_2.** The International Energy Agency has shown that 95% of CO_2 will need to be stored in permanent geologic storage to reach climate goals.

Is there enough space to store CO_2?

- There is abundant underground storage capacity available around the world to do this.
- For Europe, there is sufficient **storage capacity for more than 100 years of current emissions.**
- The total CO_2 storage capacity available in Europe is estimated to be **482 Gt** according to CO_2StoP.
- **Interconnected CO_2 systems** are the most efficient way to store CO_2 by collecting CO_2 from multiple capture sources, compressing it, and delivering it to sites where it can be utilized or stored. This allows us to harvest economies of scale.

How much does it cost to deploy carbon capture and storage? Who should pay for carbon capture deployment?

- **There are plenty of blueprints for how we have commercialised other clean energy technologies.** For example, how Denmark commercialised offshore wind and how Germany used feed-in-tariffs to reduce the cost of solar. Deployment incentives that reduce cost, enable learning-by-doing, and support infrastructure are now needed for the next generation of clean energy technologies.
- According to the IEA, 70% of energy-related investment will be driven by governments, and hence how the energy transition will pan out depends on governments. Historically, governments have driven large infrastructure investments.
- To achieve efficient risk allocation, the government needs to support innovation, that is supporting the deployment of new technologies, to **reduce their costs and deploy at scale.** Governments also need to reduce risk through implementing robust **legal and regulatory frameworks**, so private companies are comfortable investing.
- The European Commission's official advisor, the Zero Emission Platform, highlights that the cost of reaching the EU's CO_2 reduction targets for power increases by at least **€1 trillion** when carbon capture and storage is not part of the portfolio.

What are international organisations saying about the need for carbon capture and storage deployment?

- The UN's Intergovernmental Panel on Climate Change states carbon capture, transport, removal, and storage is **critical for achieving economy-wide net-zero emissions by mid-century,** with up to ~350 Gt CO_2 stored by 2050 in a high overshoot scenario.
- The International Energy Agency says it is "impossible" to reach climate goals without carbon capture and that it is 'vital' to reaching our climate goals.
- Based on the goals of the Paris Agreement, the IEA's Sustainable Development Scenario reaches **5.2 Gt CO_2 captured and stored** annually by 2050, **contributing 7% of total carbon mitigation.**
- The more ambitious 'Net-zero by 2050 (1.5°C)' scenario shows around **7.1 Gt CO_2 captured and stored in 2050** (1.4 times the SDS), 40% of which will be from the industrial sector and 20% in the power sector

Is CO_2 underground pollution?

When it's in the atmosphere, CO_2 is a pollutant because it actively damages the environment through global warming. When it's in the deep subsurface, CO_2 does not damage the environment, because geologic reservoir targets are either already filled with highly saline water, or had originally held hydrocarbons and CO_2 in the first place. Moreover, CO_2 also naturally occurs underground and has been mined for decades by the oil and gas industry.

Carbon capture and storage avoids pollution in the first place.

Common Misconceptions

Carbon capture and storage has not been proven at scale; how will it be part of the solution?

- Carbon capture and storage is **technically proven and in operation at various scales** around the world.
- Experience and detailed studies from many regions have shown that scaling carbon capture generally has **no insurmountable technical barriers to large-scale industrial deployment.**
- Our systems transitions are unprecedented in terms of scale, and the planned pathways rely on scaling proven technologies to new scales not yet seen but are **required to meet emissions targets.**
- In terms of speed and the deep emissions reduction need across all sectors, **a wide portfolio of mitigation options and a significant upscaling of investments in all technology options is necessary.**

Isn't carbon capture used to keep coal-fired power plants open? Why are you promoting it?

Carbon capture is needed for energy intensive industries to reduce emissions and deliver on our climate goals. **It is a versatile pollution control technology capable of eliminating 99% of the CO_2 emissions from both existing and new industrial and power plants.** It can be applied to a wide range of sources such as steel, cement, waste-to-energy, ethanol, hydrogen, ammonia, and power plants.

As each regional economy is different, **diverse technologies are needed to deliver on regional structural economic and decarbonisation needs.**

Does carbon capture continue reliance on fossils fuels?

The International Energy Agency has said that **we need to commercialize carbon management technologies in the near term,** even in a world where there is no additional fossil fuel development and we are reducing our fossil fuel consumption drastically. **Commercialization needs to happen because of the crucial contribution to decarbonizing energy-intensive and industrial processes,** like cement and steel, and removing historical emissions.

As carbon capture and storage technologies add cost to an industrial plant, it will not keep unproductive assets in service. The average age of a European fossil-based power plant is 28 years (33 for coal-fired plants and 17 for natural gas plants) with an average technical lifetime of 50 years. The total emission of CO_2 from European industrial plants could amount to 10 Gt over the next 30 years.

Does carbon capture and storage technology mean industry can rely on it, rather than taking meaningful structural action?

- **Carbon capture and storage is an industrial transformation** as it enables the permanent decarbonisation of industry and thus future-proofing it for a carbon-constrained world.
- We need to enable carbon reduction methods applicable to the sector and region as **there is no Europe-wide solution for decarbonisation.**
- This is not replacing or diverting resources away from other decarbonisation solutions, **it is part of the diverse approach necessary to reduce emissions to zero by mid-century.**
- Retrofitting what we have already created is key to reducing emissions at the speed necessary.
- **The world is not on track to reach net-zero emissions by 2050.** In fact, total annual emissions are expected to rise at their second-fastest pace ever this year.

Does CCS preserve current emission-intensive energy systems?

- Europe's abundant industrial facilities in many cases have **long lifespans.**
- **Existing facilities need retrofitting** to reduce emissions during their remaining lifetimes - it is important we bring a requirement into policy as carbon capture and storage is the only technology capable of reducing large-scale emissions from industrial sources, particularly steel and cement.
- Moreover, leveraging existing assets enables the pace of change needed to **meet our environmental goals and also avoids losing billions of Euros in legacy assets** in the transition to a clean energy future.
- Without deploying carbon capture technologies, industrial facilities will emit some 600 GT tonnes of carbon dioxide into the atmosphere over the next 50 years, according to the International Energy Agency (IEA).

Challenges & Opportunities for Deployment

Is carbon capture and storage important for jobs and the economy?

The cement sector alone represents in the EU about 61.000 direct jobs, about 365.000 jobs related to cement production, and over 305.000 employed in the production of concrete. The steel sector supports 2.5 million jobs in the EU.

Carbon capture and storage technologies can help these industries to stay productive in a carbon-constrained world, thereby **safeguarding current jobs and creating new ones** in the decarbonisation industries of the future.

If we plan to electrify, why do we need carbon capture and storage technology?

The IPCC has shown that we cannot afford to take any solutions off the table at this point in time. **Carbon capture and storage is not about replacing renewables or electrification** – it complements other sources of clean energy and delivers additional reductions in areas where renewables cannot be realistically deployed.

Electrification has limited efficacy for emissions reduction in some energy-intensive industries (steel, iron, cement and chemical production and waste disposal). These industries are crucial parts of the European economy and have few other mitigation options to abate emissions in the time frame we have.

Would it not be better to spend financial resources on reducing emissions at source, rather than capture CO_2?

According to the latest IEA report on net-zero emissions, **clean energy investment worldwide will need to more than triple by 2030** to around $4 trillion to achieve full decarbonisation by mid-century. This includes investment in all technologies, including infrastructure.

Carbon capture and storage and renewables are partner technologies working towards the same objective: decarbonisation. The climate debate should no longer pit technologies against each other, but recognise that **all mitigation solutions need to be deployed as soon as possible.**

There is no 'silver bullet' to the net-zero challenge. **We need diverse strategies to drive system-wide decarbonisation.** Carbon capture and storage technology is important alongside other solutions, such as renewable energy, energy storage, hydrogen, and upstream methane mitigation. Moreover, a portfolio of technologies reduces the risks from one other technology failing.

Europe's abundance of existing assets requires carbon capture to **curb emissions while we transition.** This enables the necessary pace of CO_2 reduction and **safeguards billions of Euros in productive assets.**

Is spending on carbon capture uneconomical?

- The monetary value of these technologies comes from **improved air quality and climate benefits.**
- **Government subsidies** are needed to see a decline in the cost of technologies.
- Several reports, including from the Energy Transition Commission and the IEA, have concluded that **achieving net-zero emissions in industry without carbon capture and storage could become significantly more expensive, if not improbable.**

Do any governments support carbon capture, transport, removal, and storage?

European Union

Under the EU Green Deal, the European Commission announced €135 million in funding to progress six CO_2 transport and storage network projects in five European countries.

The EU Taxonomy recognises carbon capture and storage as a sustainable activity in any sector or activity where it enables that primary activity to operate in compliance with the threshold - for example, steel, cement or electricity production.

Norway

Government committed $2 billion in funding for the Northern Lights shared CO_2 transport and storage project in the North Sea and associated industrial CO_2 capture projects.

Australia

Government is funding and leading development of a shared CO_2 transport and storage hub.

United Kingdom

The UK established an £800 million CCS infrastructure fund to support the development of CO_2 transport and storage hubs. Multiple hubs are under development.

Netherlands

Government recently committed up to €2.2 billion in funding for the Porthos shared CO_2 transport and storage project in the North Sea and associated industrial CO_2 capture projects.

Canada

Alberta Carbon Trunk Line completed in 2020. Shared CO_2 transport system with significant excess capacity, enabled by $550 million from the Canadian and Alberta governments.

Does the EU have financial instruments supporting carbon capture, transport, removal, and storage?

- The EU Innovation Fund.
- The Connecting Europe Facility (CEF) which has **funded six CO_2 infrastructure projects.** Most notably the Porthos project which secured up to 102 million euros in funding.
- Under the EU Taxonomy, **carbon capture and storage can be eligible in any sector or activity** if it enables that primary activity to operate in compliance with the threshold - for example, steel, cement or electricity production.

What are CO_2 networks and why do we need them?

- Interconnected CO_2 transport systems can collect CO_2 from multiple sources and deliver it to shared geologic storage hubs in suitable regions. **This reduces cost by achieving economies of scale.**
- Not all EU countries have suitable geology for storage, so CO_2 must be transported to regions that do, in order to **enable equal access to carbon capture as a decarbonisation option.**
- **Carbon capture and storage deployment in Europe is very compelling,** as around 50% of the CO_2 emissions from power and energy-intensive industries are located within 50 km of potential CO_2 storage locations, and 68% of emissions within 100 km.
- Infrastructure to transport captured industrial CO_2, and access to geologic storage opens **opportunities for all countries to store CO_2 emissions.**
- Check out our CO_2 Networks Primer and #TenETuesday brief.

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