

ARGUMENT MAP CO₂ CAPTURE AND STORAGE (CCS*)

What are the arguments for and against CO₂ capture and storage (CCS*) for the Netherlands?

CLIMATE

- for**
 - CCS is good for the climate**
 - Together with renewable energy and energy saving, CCS reduces CO₂ emissions fast enough to avoid dangerous climate change.
 - CCS can be applied in industries that have no alternative methods of CO₂ emission reduction.
 - CCS can capture CO₂ with energy generation from biomass, and so even extract CO₂ from the atmosphere.
 - CCS can make large scale hydrogen production and electric transport CO₂-neutral.
 - CCS makes international climate agreements (more) feasible**
 - CCS buys the time necessary for efficient, large-scale implementation of renewable energy.
 - If the Netherlands sets the example, countries with many coal-fired power stations like China are more likely to follow.
 - With CCS, the public needs to change its lifestyle less to achieve climate objectives.
- against**
 - CCS is unnecessary for the climate problem**
 - The consequences of the climate problem can be dealt with through adaptation.
 - The climate problem can be resolved with energy saving, renewable energy and nuclear energy.
 - The climate problem can be resolved in other sectors such as forestry and agriculture.
 - CCS is bad for the climate**
 - Power stations using fossil fuels will continue to emit CO₂, even with CCS.
 - CCS can make us lose sight of the urgent need for energy saving and renewable energy.
 - CCS legitimises new coal and gas-fired power stations that, without mandatory CCS, continue to emit CO₂.
 - It is unsure whether the CO₂ will remain underground long enough to avoid dangerous climate change.

ENERGY

- for**
 - CCS keeps fossil fuel reserves accessible**
 - Without CCS, the large and cheaply extractable coal supply is practically unusable due to the climatic consequences.
 - CCS contributes to the successful implementation of sustainable energy**
 - Mandatory CCS increases the price of electricity, which means that renewable energy becomes profitable sooner.
 - Power stations with CCS are a stable addition to the fluctuating energy supply from sun and wind.
- against**
 - CCS costs extra energy**
 - CCS costs ten to forty percent additional energy; that exhausts coal and gas supplies faster.
 - CCS retards the development of sustainable energy**
 - Investment in CCS is made at the expense of investment in sustainable energy.
 - CCS demands investment in coal-fired power stations, which means they will stay in use longer.

ENVIRONMENT

- for**
 - CCS is good for the environment**
 - Compared to solar and wind energy, CCS is efficient in terms of space and materials.
- against**
 - CCS is bad for the environment**
 - With CO₂ capture, large quantities of chemical waste, such as amines, are produced.
 - Due to extra energy consumption, CCS leads to more air-polluting emissions (acidification and particulates).
 - Increased use of coal due to CCS is harmful to mineworkers and the environment around coalmines.

ETHICS

- for**
 - The Netherlands is obliged to store CO₂**
 - CO₂ is a residual product of electricity generation which should not be discharged into the atmosphere.
- against**
 - CCS is not sustainable**
 - The Netherlands should not put a residual product in the ground forever, that is deferring the problem.
 - CCS keeps a non-sustainable system going.
 - A solution that has little public support is not acceptable.

SAFETY

- for**
 - Parts of the CCS chain have proven to be safe**
 - The capture, transport and underground storage of CO₂ have separately already been safely applied.
 - Injecting CO₂ into oilfields is a proven technique for increasing oil yields.
 - Gas fields have proven to be gas-tight; after all, they contained natural gas for millions of years.
 - CO₂ storage demonstration projects have been conducted without safety problems.
 - CCS has a positive effect on other safety problems**
 - CCS partly restores the pressure balance after gas extraction, which limits land subsidence.
 - CCS reduces the need for nuclear energy, which is often regarded as unsafe.
 - Geopolitical security increases because coal consumption reduces dependency on gas suppliers.
- against**
 - The consequences of CCS are unpredictable**
 - CCS is new and has never been used on a large scale, therefore the risks are not fully known.
 - For the public, information on CCS is complex and sometimes contradictory, and people do not trust the experts.
 - Geopolitical security can decline if extra energy consumption increases dependency on suppliers.
 - CCS is unsafe for humans and the environment**
 - If CO₂ escapes at a low pressure during transport and storage, it can cause suffocation when there is little wind.
 - If stored CO₂ escapes up into shallow underground reservoirs, this can acidify the groundwater.
 - CO₂ storage leads to the risk of small earth tremors, comparable with those from gas extraction.
 - Post-combustion CO₂ capture can cause emission of carcinogenic substances.

ECONOMICS

- for**
 - CCS is good for business and for the creation of skilled employment**
 - The private sector can (internationally) market knowledge, technology and storage capacity.
 - CCS increases business continuity of existing coal and gas power stations.
 - Capture technology generates knowledge that can be used for the production of hydrogen.
 - With CCS, climate objectives are economically feasible**
 - Electricity from power stations with CCS is cheaper in the medium term than electricity from sun and wind.
 - Mandatory CCS makes the polluter pay (via his energy bill).
 - Compared to other countries, the Netherlands has a competitive lead in the use of CCS**
 - The Netherlands has suitable gas fields with a large storage capacity close to power stations.
 - Thanks to its gas infrastructure, the Netherlands has an advantage in the development of CCS technology.
- against**
 - CCS costs Dutch business money**
 - It is unsure whether the high initial investments in technology and infrastructure will pay off.
 - It is unsure whether the high operating costs can be included in the price of electricity.
 - By the time that CCS is possible on a large scale, alternative methods of CO₂ reduction will already be more attractive.
 - CCS costs Dutch citizens money**
 - The government (tax payers) finances the development phase of CCS in the form of subsidies.
 - The government (tax payers) pays - forever - for supervision of storage and the liability for it.
 - As long as it is controversial, CCS could have a negative effect on local house prices.
 - With CCS, valuable time and resources are wasted on a temporary solution.
 - Electricity bills rise because of CCS.

* CCS stands for Carbon Capture and Storage: the capture, transport and storage of CO₂, popularly referred to as 'CO₂ storage'. The arguments relate to all parts of the chain, which is why the term CCS is used here. There are different ways to capture and store CO₂. We have based this Argument map on the situation envisaged in the Netherlands. Capture would take place at coal-fired power stations, and also at gas fired stations and in industry. The captured CO₂ is stored in empty gas fields (not in aquifers). The Argument map assumes the existence of a climate problem. The arguments partly relate to climate objectives (agreements), for example that CO₂ emissions must be eighty percent lower by 2050 than they were in 1990. This Argument map was produced on the basis of literature research and expert discussions. We thank the experts for their contributions.