French roadmap on CCS/CCU

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FRENCH-NORWEGIAN DECARBONIZATION FORUM

“Club CO_2”, the French team for CCUS

1. **An association founded in 2002 which brings together the French actors involved in CCUS**

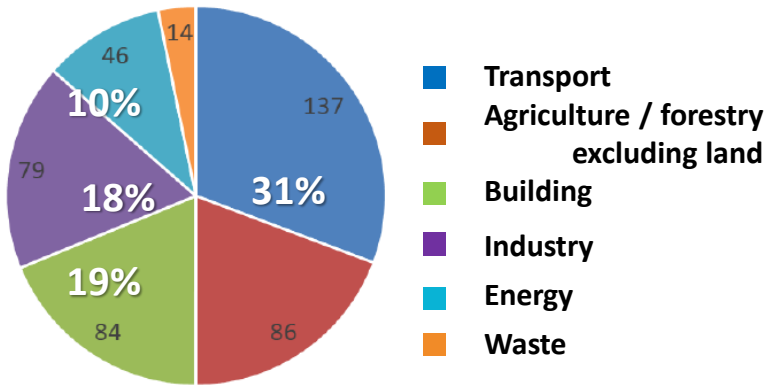
2. **A forum for exchanges of information and initiatives between industrial, research and institutional players**

3. **A key element for French actions in the field of CCUS promoting national cooperation between public and private sectors**

CO_2 emissions: where are we today in France?

@ 2018

- **445 Mt CO_2eq**: France's territorial emissions



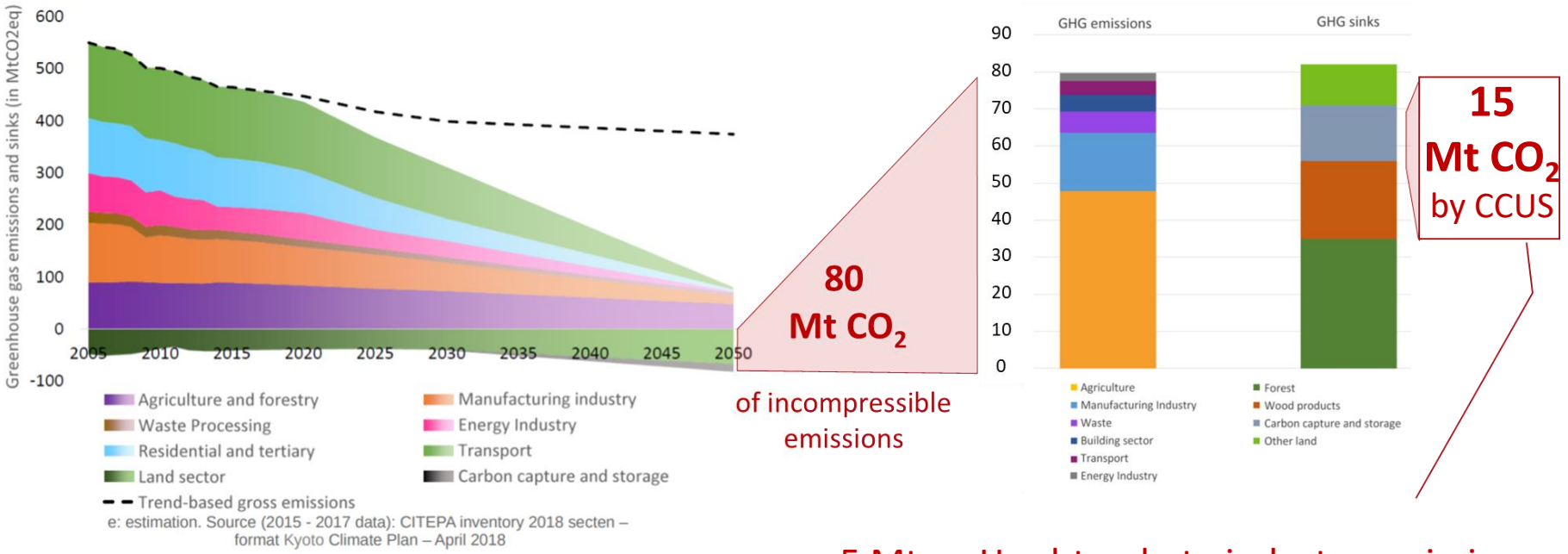
- **750 Mt CO_2eq**: France's carbon footprint:
  - 11.2 t CO_2eq/capita

Source: SNBC2, 2020

2015 August	**National Low-Carbon Strategy (SNBC)** ➢ France's policymaking road map in terms of climate change mitigation
2015 December	Adoption of the **Paris Agreement**
2017 July	**Climate Plan** ➢ Target of achieving carbon neutrality for France by 2050 *at least a six-fold reduction in GHG emissions compared to 1990*
2020 April	**Second edition of the SNBC** ➢ Target of achieving carbon neutrality by 2050 within French territories ➢ 40% reduction in GHG by 2030 compared to 1990

How does France plans to achieve carbon neutrality by 2050?

- Fully decarbonise energy production
- Significantly reduce energy consumption in all sectors
- Reduce non-energy-related emissions
- Increase carbon sinks (natural and technological)



- 5 Mt → Hard-to-abate industry emissions
- 10 Mt → Negative emissions (biomass energy production plants)

Stratégie nationale bas-carbone

La transition écologique et solidaire vers la neutralité carbone

Source: SNBC2, 2020

CO_2 valorisation (CCU)

~ 0.8 Mt/y of CO_2 currently used

- 70% by the food industry (soft drinks, conservation food...)
- Other uses: agricultural crops, cold chain, water treatment, industrial processes…

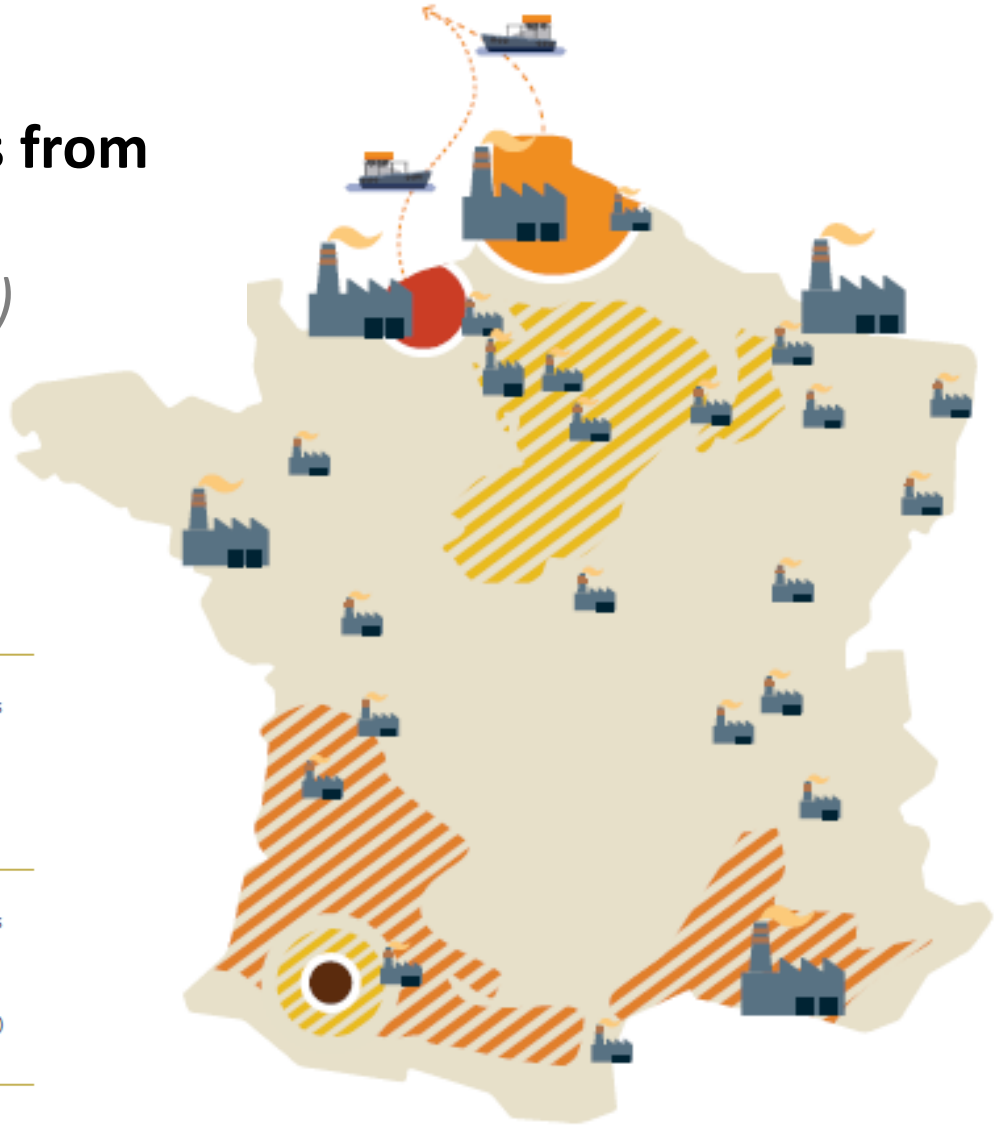
➔ **Relatively low**

Expected benefits

- CO_2 recycling to reduce the extraction of fossil resources
- Valuing the CO_2 emitted and captured by industry
- Sustainably storing CO_2 in materials

Which role for CCS in France?

3 specific French territories
where CCS could reduce emissions from industrial sites
as identified by ADEME (2020)



Identified areas

Proven storage areas

Hypothetical storage areas

Emitters > 100,000 tonnes of CO_2/year

Hauts-de-France (Dunkirk) **15 $MtCO_2$/year**

⊕ Possibility of offshore storage (North Sea)
Large volumes of CO_2 for setting up CO_2 transport infrastructure

⊖ Regulatory obstacle to be removed on the possibility of exporting CO_2 emissions outside the country and by boat
Estimated minimum cost of €100/t CO_2

Normandy (Le Havre-Rouen) **6 $MtCO_2$/year**

⊕ Interconnection with the Dunkirk CO_2 hub for offshore storage (in the North Sea)
Large volumes of CO_2 for setting up CO_2 transport infrastructure

⊖ Regulatory obstacle to be removed on the possibility of exporting CO_2 emissions outside of the country and by boat
Estimated minimum cost of €125/t CO_2
Durability of sites (industrial sectors that will be impacted by the energy transition)

Nouvelle-Aquitaine (Lacq) **3 $MtCO_2$/year**

⊕ Existing infrastructure (former gas reservoir)
Estimated minimum cost of €88/t CO_2

⊖ Low volume of CO_2
Onshore storage area

https://librairie.ademe.fr/changement-climatique-et-energie/81-captage-et-stockage-geologique-de-co2-csc-en-france.html

On-going CO_2 capture projects with potential storage in the North sea

The Port of Dunkirk is preparing to become a future European CO_2 hub

CO_2 capture at a steel plant in Dunkirk

Industrial demonstrator supported by the H2020 programme and ADEME

ArcelorMittal | IFP Energies nouvelles | TotalEnergies | Axens

CO_2 capture at a cement plant in Lumbres

1st French CCS project supported by the European Innovation Fund

EQIOM | Air Liquide

CO_2 capture at a cement and lime production plant in Réty

2nd French CCUS project supported by the European Innovation Fund

Lhoist | Air Liquide

Le Havre and the Normandy regions are identifying options for implementing CCS

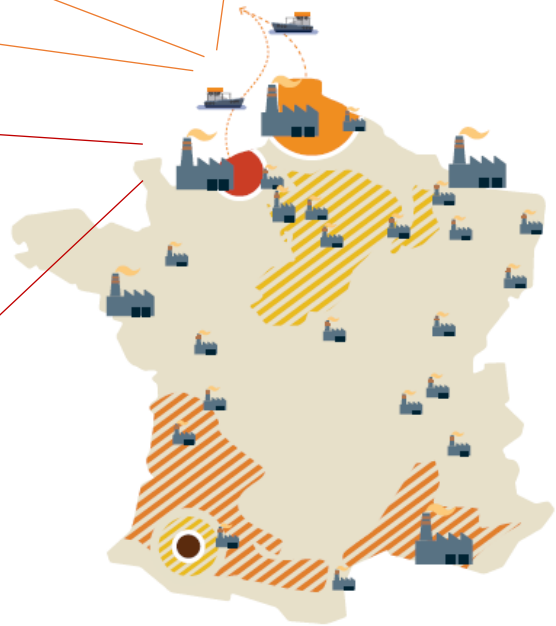
CO_2 capture plant in Port-Jerôme

Industrial scale (100 kt CO_2/y) at a steam methane reforming unit

Air Liquide

Feasibility study for the implementation of a CO_2 hub in Le Havre

Supported by Région Normandie and ADEME



Way forward

CCUS is a **necessity**

- To capture residual non-energy emissions from industrial processes
- To enable negative emissions when associated with biomass combustion

French industry is on track

- To develop concrete CCUS projects in France before 2030 and after…
- In connection with the deployment of CCUS in Europe
- To continue exporting know-how and experience worldwide

CCUS deployment should be

- **Tailored to specificities of each territory**
- **Elaborated with local stakeholders**

The deployment of European CCS networks is key for the deployment of CCS

- **Make smaller projects benefit from economies of scale**
- **Open the way for French industries to have access to already identified storage capacities, in particular in the North Sea**

This is critical to make first implementations of CCS on an industrial scale in France possible between 2025 and 2030

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