

Sectoral Transition Plans

GLASS



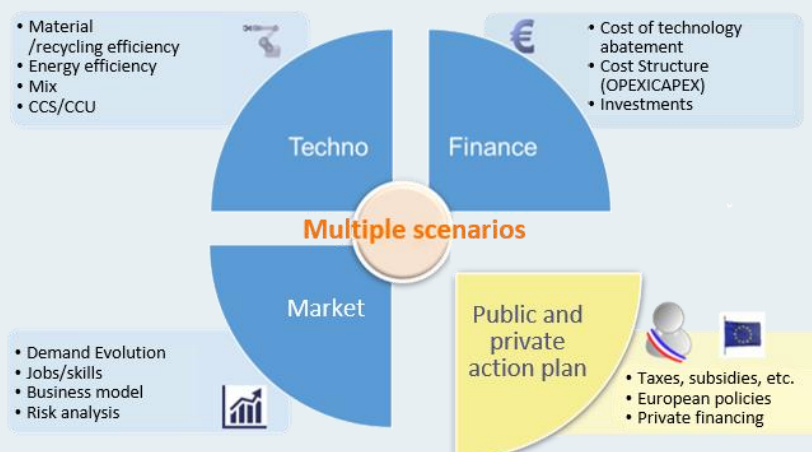
What is a Sectoral Transition Plan?

The “Sectoral Transition Plans”, led by ADEME, constitute one of the actions of the LIFE Finance ClimAct project.

Objective:

Promote investment in the transition of the French energy-intensive industry to aim for its decarbonisation by 2050, taking into account the specificities of each sector

The Sector Transition Plan (STP) is a work in progress drawing up tools to support forward-looking dialogue in 9 industrial sectors, in cooperation with sector players (manufacturers and federations). Carried out over a period of 12 to 18 months, an STP builds decarbonisation scenarios aimed at achieving France's energy-climate objectives by 2050 (-81% of emissions compared to 2015 for industry), quantifies the impacts on production costs, assesses climate investment needs and analyses job changes. Finally, the Sectoral Transition Plan offers public and private actions that allow to create the socio-economic conditions necessary for the decarbonisation of the sector.



360° vision to inform the transition of the sector towards carbon neutrality.

This document is the first deliverable of the STP Glass. Its objective is to present the key issues of the sector’s decarbonisation to a wide audience in order to initiate dialog pertaining to the action plan. It was carried according to a bibliographic research and to the first discussions with industry key players. These results and proposals will be further developed during the next stages of the project.

Key Figures - GLASS



Many sites but production is mainly carried out by a few international stakeholders

- Nearly 700 sites linked to glass production and processing.
- Around 50 glass production sites.**
- 30 sites cover ~75% of emissions.**
- Glass production ~**5 Mt** fluctuating little since 2012.
- France is the second largest European glass producer.
- 14 cullet preparation sites located near glassworks.



Glass production sites

Container glass	33
Flat glass	6
Fibers/glass wool	7
Technical glasses	6



Customer sectors depending on the type of glass

- Many types of glasses for specific uses.
- Packaging (hollow glass) and building (flat glass and fiber) represent 85% of the demand.



Direct GHG emissions: 2.7 MtCO₂ in 2019 including glass processing (0.3 MtCO₂)

- 3% of industry GHG emissions and 0.6% of French GHG emissions
- 3% of thermal energy and 2% of electrical energy in the industry in 2017

Source: CITEPA, FedéGlass, CERENINSEE



A glassmaking capital sector resulting in high debt

- €8.5 Bn** turnover in 2017 of which ~€ 100 Bn related to recycling

- A **5%** rate of return
- A debt ratio of **103%**

Data INSEE NAF 23.1, Federec, 2019
average over 2013-2017, Debt ratio = debt/equity

Industry
€1,000 billion
8%
55%



Factories and jobs in the territory, close to common uses

- 35,000 direct jobs in the glass sector, of which ~70% for glass production in 2019
- 52% hollow, 34% flat and 14% other
- 35 sites account for 50% of jobs
- 1,900 jobs in glass collection and recycling

Source: URSAFF FédéVerre, ADEME

Industry
1 Mn direct jobs
3 Mn indirect jobs



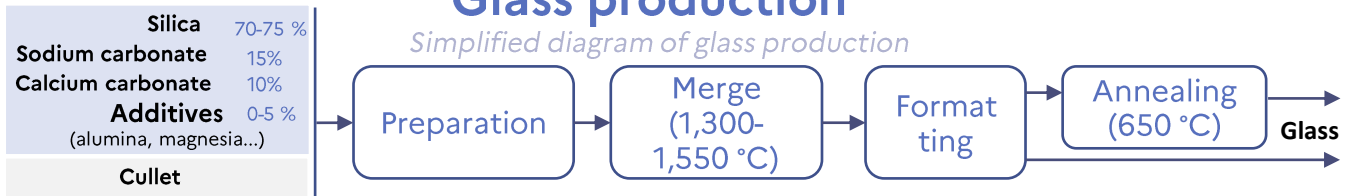
An internationally oriented sector downstream from the value chain

- About 40% of companies' turnover in the sector is generated by exports.
- Some glass products are significantly associated with exporting sectors, particularly the wine and spirits, perfume and cosmetics sectors.
- However, some products, such as food packaging, are generally sold or packaged within 300 km.
- The cullet, recycled raw material of the glass, is seldom exchanged.



Decarbonisation Issues

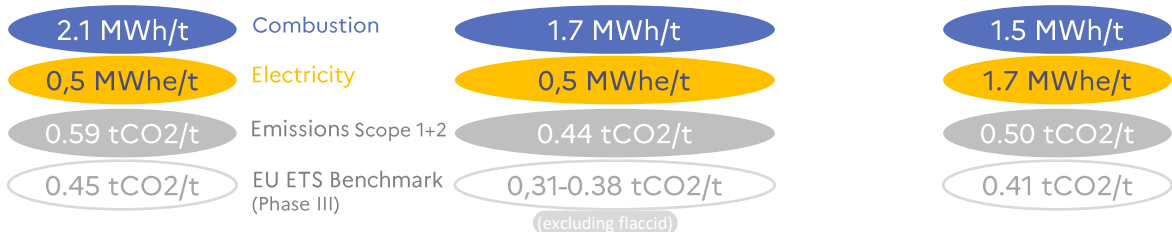
Glass production



The **flat glass** is cast on a molten tin surface. This is called "floating glass". It is then transformed, combined and coated according to needs.

The **hollow glass** is formed by pressing, blowing or combination of both techniques.

After melting, the **glass fibres** are obtained by centrifuging a glass net either as a spool or as a dry or wet cut yarn.



❖ Glass production requires a high heat input to be maintained without interruption

Glass is made by melting sand, soda and limestone in furnaces with very different characteristics depending on the product: from a few tonnes to several hundred tonnes, lasting between 2 and 20 years. A glass oven works continuously throughout its lifetime.

Glass fusion accounts for 87% of energy consumption for flat glass and about 80% for other types of glass. The addition of sodium carbonate as a "fondant" reduces the melting temperature (by 1,750 °C for silica alone).

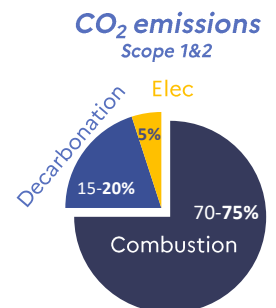
In the park as a whole, 85% of the thermal energy required for fusion comes from natural gas and 10% from electricity. Some residual fuel consumption will disappear quickly. Electric furnaces are used for the manufacture of hollow glass but are of low capacity and incorporate little cullet.

❖ 20% of emissions independent of energy consumption

CO₂ accounts for 95% of greenhouse gas emissions from the glass sector. It is mainly released during the combustion of natural gas but also by **decarbonation of carbonated raw materials**:

- Sodium carbonate, which lowers the melting temperature of silica (a melting role).
- Calcium carbonate, produced from limestone and dolomite, improves the chemical resistance of sodium glasses by decreasing their solubility.

In 2019, EU ETS allowances covered 85% of reported emissions. Without these quotas, the cost of production would increase by ~5 % to EUR 25/tCO₂.



❖ Recycling: a committed decarbonisation lever and a material profit

The cullet, sorted glass for recycling, melts at 1,000 °C: 10% cullet reduces the energy consumption of the oven by 2.5-3% (BATs) and by 10% process emissions. **1 ton of cullet replaces 1.2 tons of minerals and saves 0.3 tCO₂ in production and 0.2 tCO₂ in extraction.** Some glass ovens incorporate 90% cullet.

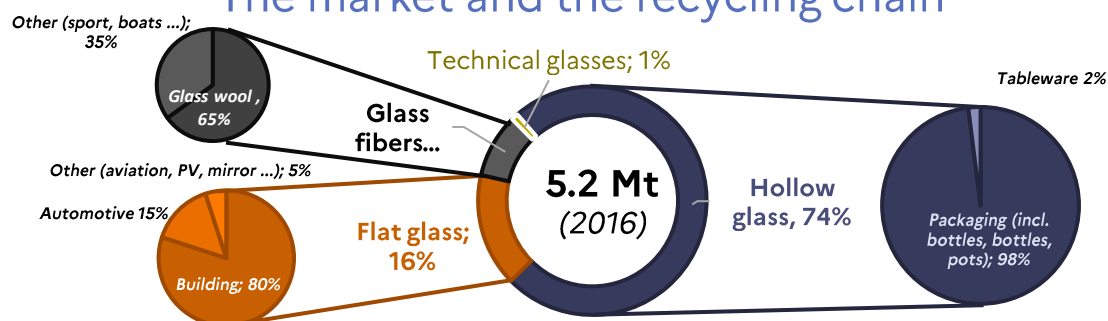
The different compositions and colours are a challenge for recycling: for example, it is impossible to produce white glass from coloured glass.

In 2017, glass recycling helped prevent 1.3 Mt of CO₂



Decarbonisation Issues

The market and the recycling chain



❖ Downstream markets in quest of optimisation: reducing CO2 emissions in the value chain

Packing glass is highly dependent on the drinks market (79% of the use of packing glass) and its exports: wines and spirits = 2nd surplus item in the French trade balance. The sector is making efforts to eco-design and lighten packaging. Perfumes and cosmetics are also sectors that push their glass suppliers to limit their environmental footprint.

Flat glass: emissions from the production of insulating windows are offset in less than a year by energy savings in housing (Europe average).

Demand for **glass wool** is growing strongly, driven by the insulation of buildings and energy efficiency requirements (around EUR 14 billion in public investment support and EUR 5 billion in energy saving certificates directly used to finance energy renovation work).




❖ Continued growth in recycling for packaging and ramping up for other glass

Packaging glass is collected and sorted in a mature way throughout the country. **Flat glass and glass wool are seldom collected.** The waste is mainly crushed and recovered in concrete or embankments. A drive to recycle glass in the construction industry was launched in 2017, via a Green Growth Commitment (GGC), with targets for collection, sorting and reincorporation.

On average glass travels 230 km to be collected and recycled

Low foreign trade in cullet: in 2017, imports and exports represent less than 8% of the collection.

From collection to cullet: 3 % loss in cullet production

			
% glass mass by key sector	3%	2%	22%
Main type of glass	Flat glass	Flat and fiber	Hollow
Product Lifespan	12 years	30 years	Mainly once
Existence of an RPS (Extended producer responsibility)	Yes (HHV)	Ongoing (building materials)	Yes (household pack.)
Date of implementation	2006	2022 (Law EC 2020)	1993
Recent Collection Rate (=collection-deposit; resource ratio)	4% of glass	3% flat glass n.d. glass fiber	85% (household pack.) 78% (all packages)
Year	2013	2018	2017
Objective		40% in 2025 (flat glass)	75% in 2030 (EU)
Recent RRM (=cullet/mat ratio. virgins)	56% in 2017		
	Cullet incorporation rate was 65% for hollow glass in 2017, but around 20% for flat glass (mainly production falls) and 40% for glass wool.		

❖ Towards more re-use of household packaging

In 2017, 227 kt of glass packaging was reused in France: 220 kt by F&B sectors and 7 kt by households (ADEME). After a decline in the 1980s, local deposit initiatives are being set up, proving an economic business and environmental benefits in certain circumstances (eco-design of bottles, number of reuses, proximity and performance of washing centres).

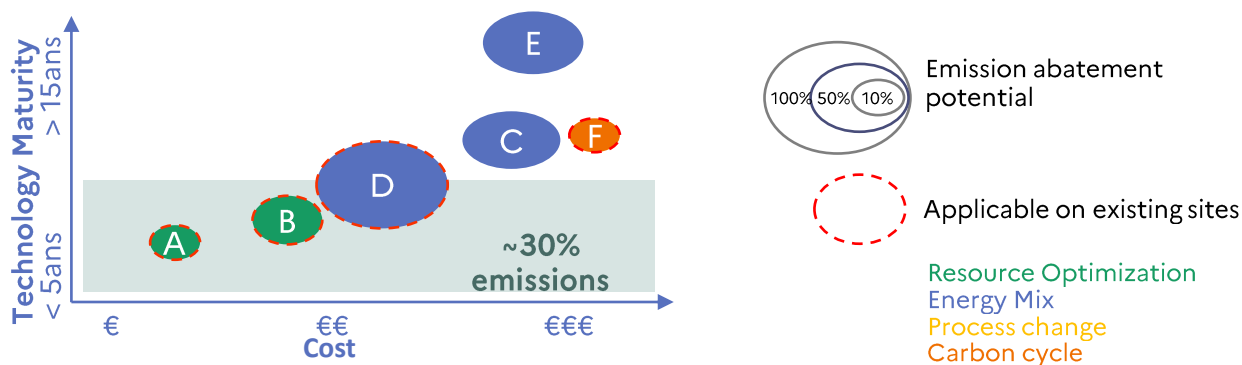


Decarbonisation levers

The main challenges of the sector are **to decarbonise the energy input** required for glass production and **reduce emissions from raw materials**. R&D and pilot projects are under development in Europe to use hydrogen, biomass and decarbonised electricity vectors. Most technologies can only be implemented when the melting furnace is renewed, long-term planning is essential.

Key technological levers and their technological and economic trends

Details/Barriers identified		
A	Improved recycling	A lever that is widely deployed for certain uses and is emerging for others - for example, construction, requiring the structure of the sector.
B	Energy savings	Load preheating, fatal heat recovery, efficient furnace change and refractories, oxy-combustion technology etc... Not all of these levers can be combined.
C	Electrification of large capacity furnaces	Technology not yet deployed for large capacity furnaces (>200 t/day). "Furnace of the Future" - A European project bringing together leading producers of packaging glass to reduce CO ₂ emissions by 50%. (The European Container Glass Federation) To monitor: compatibility with cullet input, lifespan.
D	Substitution of fossil fuel with biogas	Additional costs, origin and availability of biogas (the glass industry consumed 10 TWh in 2016 while 0.2 TWh of biomethane was injected into the network).
E	Hydrogen substitution of fossil fuel	Replacement of furnaces required: the current furnaces would only be able to replace 20% of natural gas with hydrogen: the thermal and radiation properties are different. To monitor: Nox emissions, lifespan.
F	Carbon Capture	Around 10% of the sites are believed to be well located for geological storage. For others, the use of carbon will be preferred.



Preliminary visualization of decarbonization levers, which will be further developed during the construction of the Glass Sector Transition Plan with the sector's stakeholders

Examples of actions to create a favorable investment environment

Best practices	Regulation	Financial Support
Transparency in the carbon content of products and incentives for the optimal use of glass in its uses	Regulation requiring a better integration of circular economy concepts and a strengthening of producers' expanded responsibilities	Development of infrastructure (CO ₂ , H ₂ , electricity, biogas)
Ecodesign to promote decommissioning and reuse before recycling	A High Carbon Price Coupled with a Mechanism Against Carbon Leakage	Carbon price visibility mechanism (e.g. Carbon Contract for Difference) and energy
	Clarity on the carbon content of alternative fuel (guarantee of origin etc.)	Support for innovation from R&D to industrial deployment across the value chain
	Regulation promoting innovation and industrial testing	