

Sectoral Transition Plans

STEEL



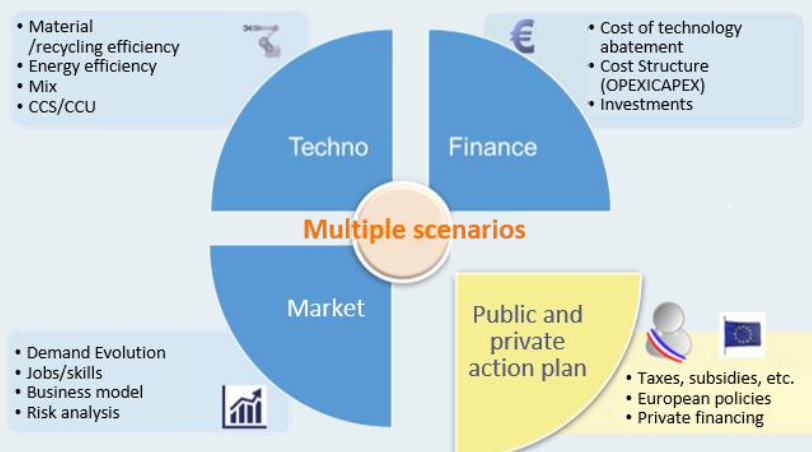
What is a Sectoral Transition Plan?

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 Steel STP. Its objective is to present the key issues of the sector’s decarbonisation to a large audience in order to initiate dialog pertaining 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 - STEEL

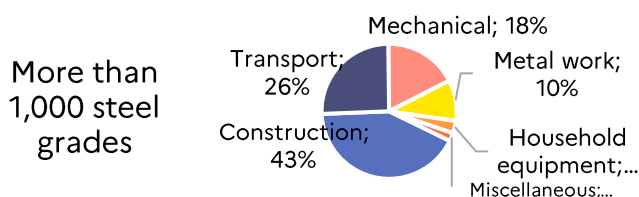


A dual sector, mainly owned by foreign groups

- Average annual production of **15 Mt** of steel: **70% flat steel** mainly from the blast furnace chain and **30% of long steels** from the electric chain.
- There are three blast furnace sites in France, 2 are owned by ArcelorMittal and one by St. Gobain PAM, which produces cast iron.
- Some **20 electric steel mills recycling scrap metal** owned by large groups.



Flat or long, low or high alloyed steels for use in many sectors



The steel industry, the most emitting industrial sector in France

- **22% of industry GHG emissions** and **4% of French GHG emissions**
- 18% of the industry's thermal energy (including coal used as a carbon input) and 9% of the electricity

Source: ETS EU, SNBC, Citepa, CEREN, INSEE



An indebted sector with strong pressure on margins

- **€12.6bn** turnover in 2017
- A rate of return of **1 %**
- A debt ratio of **139%**
- A highly restructured sector

INSEE data NAF 24.1, Avg. data available in 2013-2017. Debt ratio = debt/equity

Industry

€1000 billion
8%
55%



Jobs focused on blast furnaces but diffuse on the electricity sector

- **38,000** direct jobs in 2017 of which ~40% by ArcelorMittal
- **80%** of jobs are concentrated in **5 main locations**

Source: A3M, Senate

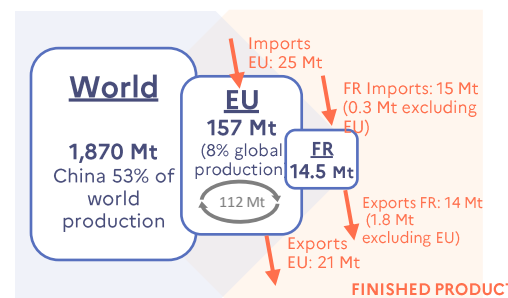
Industry

1 Mn direct jobs
3 Mn indirect jobs

A European market overwhelmed by border production

- France accounts for **1% of world production** and **70%** of companies in the sector **generate more than half of their turnover in exports**.
- A highly connected European market with a **negative trade balance since 2016**.
- An international market with overcapacity is driving prices down, with high production capacity on the EU's doorstep. The EU introduced steel import quotas from 2019 to 2021 to protect the European steel industry.

Source: A3M, World Steel Association



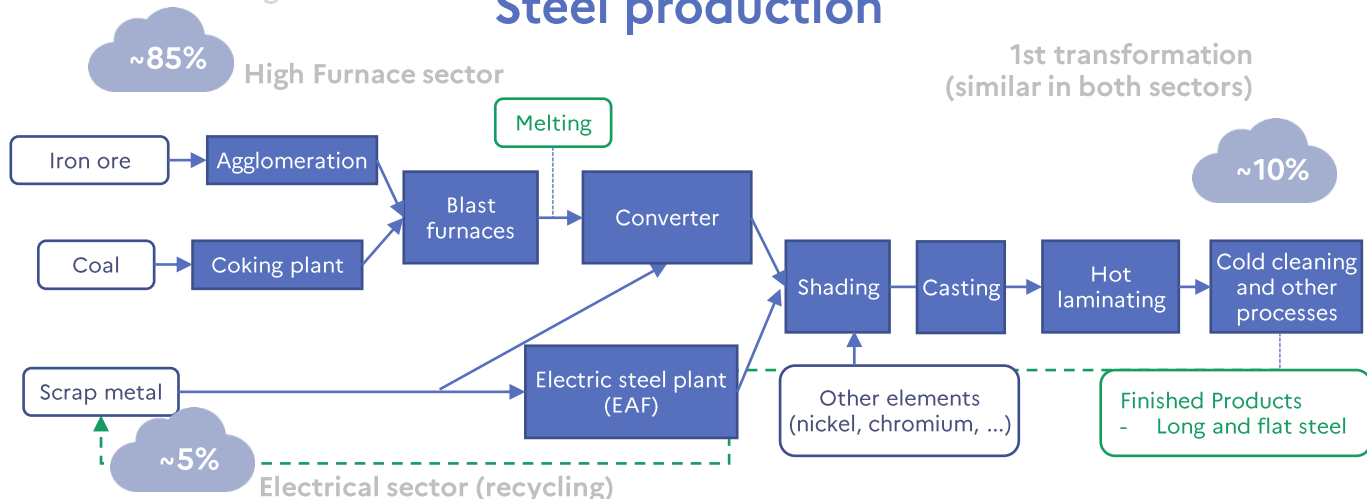
World steel production
(Eurofer, WSA)



Decarbonisation Issues

Greenhouse gases emissions

Steel production



Blast furnaces sector

- ❖ **An efficient historical process that requires coal and generates process emissions**

Iron ore is processed into cast iron in the blast furnace. Coal coke is used **as a gearbox agent and fuel**. The cast iron is decarbonized with oxygen in the steel plant converter, which also incorporates between 10 and 15% scrap metal.

~2.0 tCO₂ emitted and ~5-6 MWh per ton of cast iron

Carbon reduction generates emissions that are already highly energy efficient and cannot be reduced.

- ❖ **A productive tool that requires strong investment in innovation**

Transforming the primary steel production process while upgrading production sites is a challenge across Europe. Projects under development include investments of EUR 2 billion in R&D from 2021 to 2027 and EUR 9 billion for deployment from 2020 to 2034. **EUROFER**.

In France, 50% of R&D spending in the sector is related to the environment. (**A3M**).

Electrical sector (recycling)

- ❖ **The decarbonisation of the electric sector, dependent on decarbonised electricity...**

Electric steelworks recycle steel scrap by heating it at more than 1,500°C per electric arc. This process requires **0.5-0.8 MWh of electricity/ton of melted steel (BREF)**, with highly alloy steels generally requiring higher thermal input.

With the French electric mix, recycling a ton of scrap metal avoids **75%-80% of emissions**.

- ❖ **... and the scrap collection circuit**

In France, 12.8 million tons of scrap metal were collected in 2017 (FEDEREC)

The supply of scrap metal represents **65% of the production costs of the sector**, and its price, correlated with iron ore, is very volatile. The availability of quality scrap depends on a recycling process that needs to be refined: today, **half of the scrap collected is recovered for export** (mainly to Europe).

- ❖ **A partitioning of uses by production process in France**

In France, the blast furnace industry produces flat steels (sheet, plates) while the electrical industry produces mainly long steels (rails, marbles, wire, etc.) and alloys. In other countries, such as the United States, the electricity industry has been largely engaged in flat products. The need for investment in a new rolling mill, the contamination of scrap with residual elements and the lack of economic competitiveness are obstacles to increasing the market share of the recycling industry.



Decarbonisation Issues

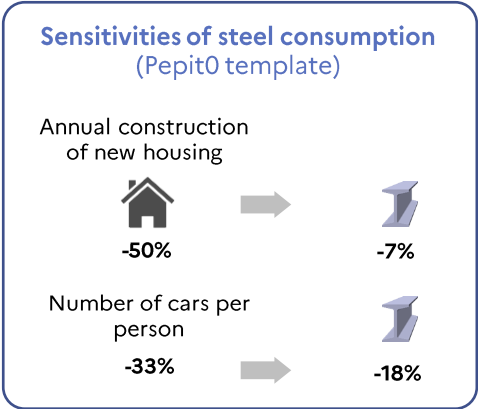
The market: both a lever and a hindrance to investment

❖ **Downstream sectors also in transition, pushing steel to decarbonise**

Regulation, environmental commitment and cost visibility in a context of rising carbon prices are all factors that push downstream sectors to look for materials with a controlled environmental impact while remaining competitive.

For example, the structure of a building may be designed to limit steel usage. The automotive industry is considering replacing some of the steel in cars with aluminum. Competition between these two materials is also high in the packaging sector (cans).

In other sectors, such as mechanics and construction, steel remains a preferred material that must necessarily be decarbonised.



❖ **Uncertainty over the sustainability of steel demand in Europe**

The demand for steel is highly cyclical, which hinders investment decisions.

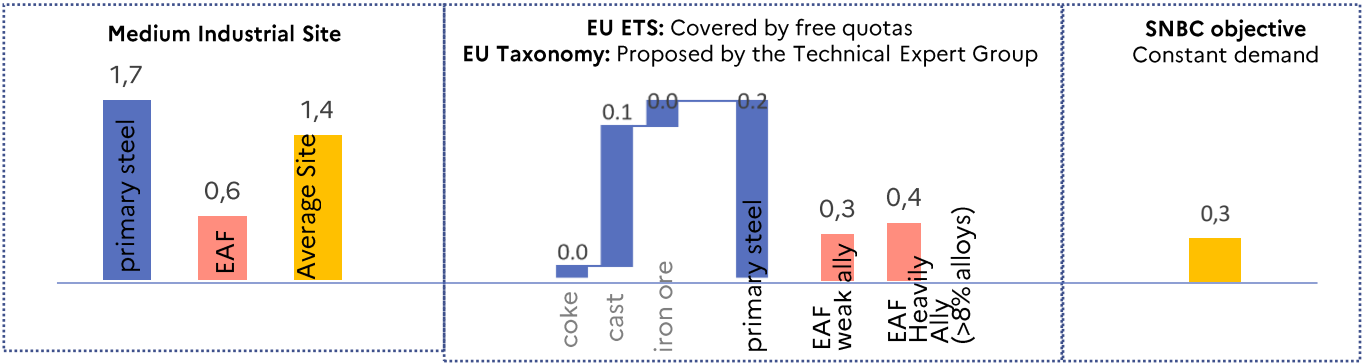
In addition, mitigation measures on products from steel consuming sectors are needed to achieve the 2050 greenhouse gas emission reduction targets. Housing construction and the car industry are particularly affected.

❖ **The carbon price in the EU ETS market, a long-term decarbonisation lever for the sector but which requires protection against international competition**

The price of carbon on the EU ETS market, a long-term decarbonisation lever for the sector but which requires protection against the risk of carbon leakage. Innovative steel projects will only lead to industrial deployment in a context of high carbon prices, ensuring a reasonable return on investment.

Free quotas for certain sectors, including the steel industry, are intended to protect European manufacturers from losing competitiveness against third-country competitors who are not subject to the cost of carbon. Partial and degressive, this protection is set to disappear, encouraging industrialists to decarbonise. The start of phase 4 of the European carbon market (2021-2030) marks an acceleration of the annual reduction in the total quantity of allowances issued each year in the European Union.

Carbon intensity, regulation and targets (tCO₂/LiquidSteel)



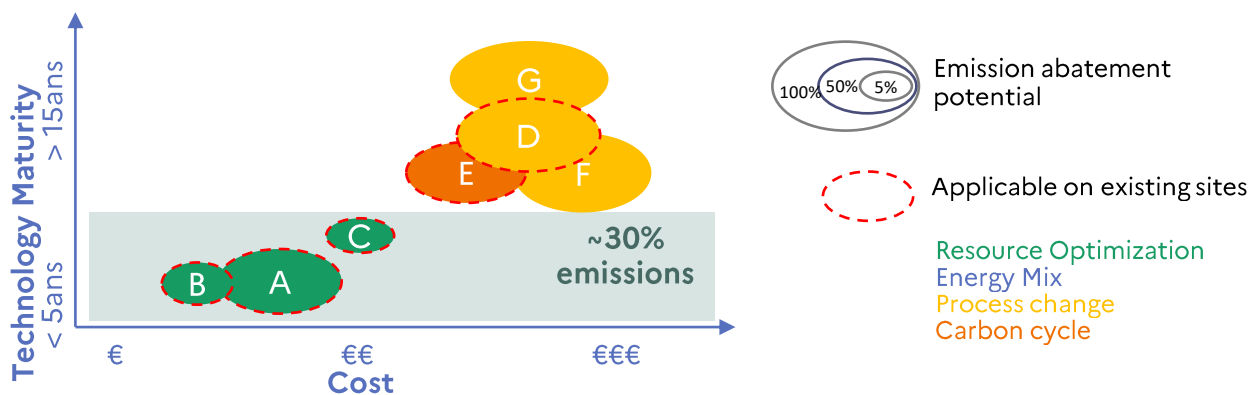
Decarbonisation levers

The production of decarbonated steel requires **important investments throughout the value chain, in particular in R&D**, which will be driven by the end of life of current equipment.. It is also **dependent on the deployment of strategic infrastructure** (decarbonated electricity mix, carbon storage, green hydrogen production). **Regulation must create a favourable economic context** for such investments and long-term visibility.

Key technological levers and their technological and economic trends

Increase the share of recycled steel in steel production and consumption.		
A	Increase the share of the electrical sector by enhancing eco-design and the recycling sector to ensure the quality of scrap metal	Identified barriers Availability of quality scrap at competitive price, today widely exported Technical constraints, availability of quality scrap
B	Increase the proportion of scrap injected into the oxygen converter in the blast furnace chain and energy efficiency efforts	
A blast furnace industry committed to investing and innovating to decarbonise.		
C	Recirculation of gas from blast furnace to reduce the amount of coke (IGAR project)	Investment, demonstration
D	Injection of hydrogen from renewable sources or gaseous biomass as a gearbox agent instead of coke in the blast furnace	R&D, access to a large quantity of renewable H2
E	Carbon capture from the blast furnace for storage (3D project) or use to make organic products (Carbalyst project)	R&D, Opex, Capex
European R&D projects and pilots to deploy new decarbonated production routes.		
F	Production of pre-reduced ore (DRI) with hydrogen from renewable sources + electric furnace	R&D, investments, access to a large quantity of renewable H2 50kg H2/tDRI R&D, decarbonised electricity
G	Example: Iron electrolysis (SIDERWIN project)	
The use of hydrogen and electrification shall be applied to the heating furnaces of the rolling mills.		

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Examples of actions to create a favorable investment environment

Best practices	Regulation	Financial Support
<ul style="list-style-type: none">Increased demand for lower climate impact steelTransparency in the carbon content of products and incentives for the optimal use of steel in its applications	<ul style="list-style-type: none">Regulation requiring better integration of circular economy concepts from product design and limiting scrap metal exportsA high carbon price combined with instruments to fight carbon leakageIncentive to create a carbon market through public procurement	<ul style="list-style-type: none">Visibility mechanism on carbon price (e.g. Carbon Contract for Difference (ETS))R&D innovation support for industrial deployment across the value chainInfrastructure development (CO₂, H₂, renewable energies) and price visibility