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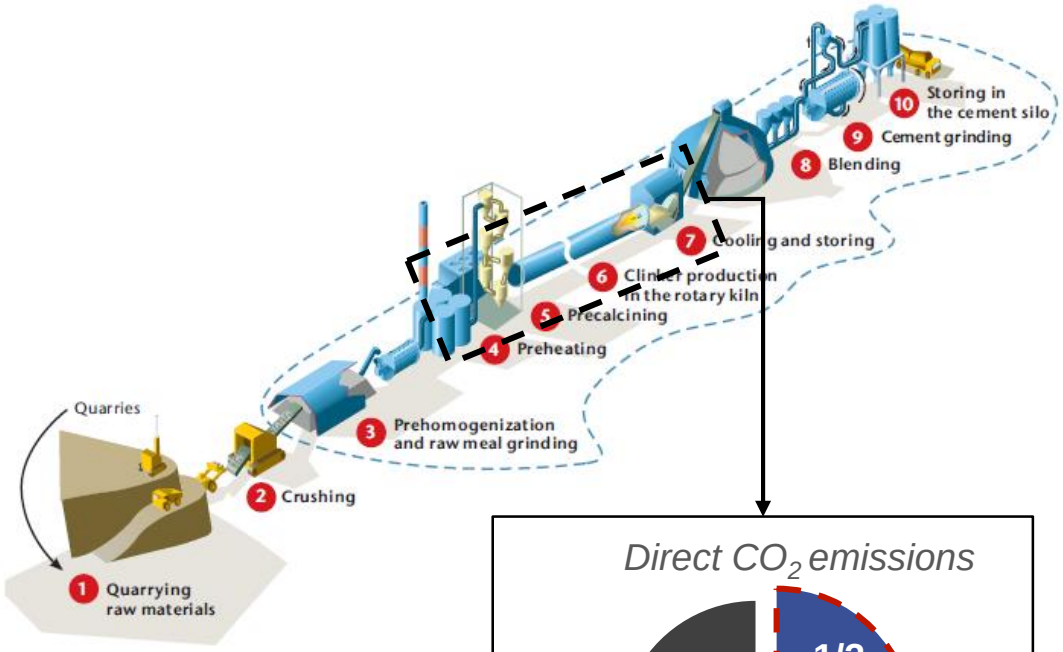
The role of bioenergy in the decarbonization of the French cement industry

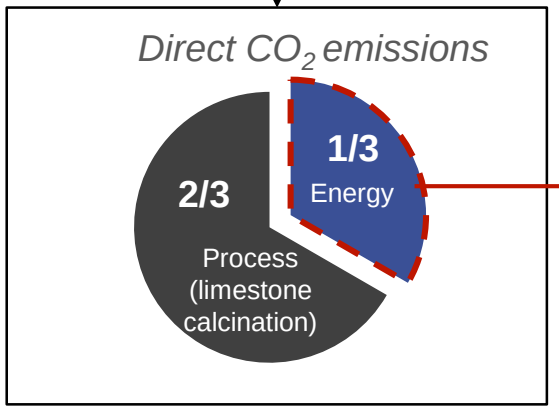
IEA Bioenergy e-Workshop

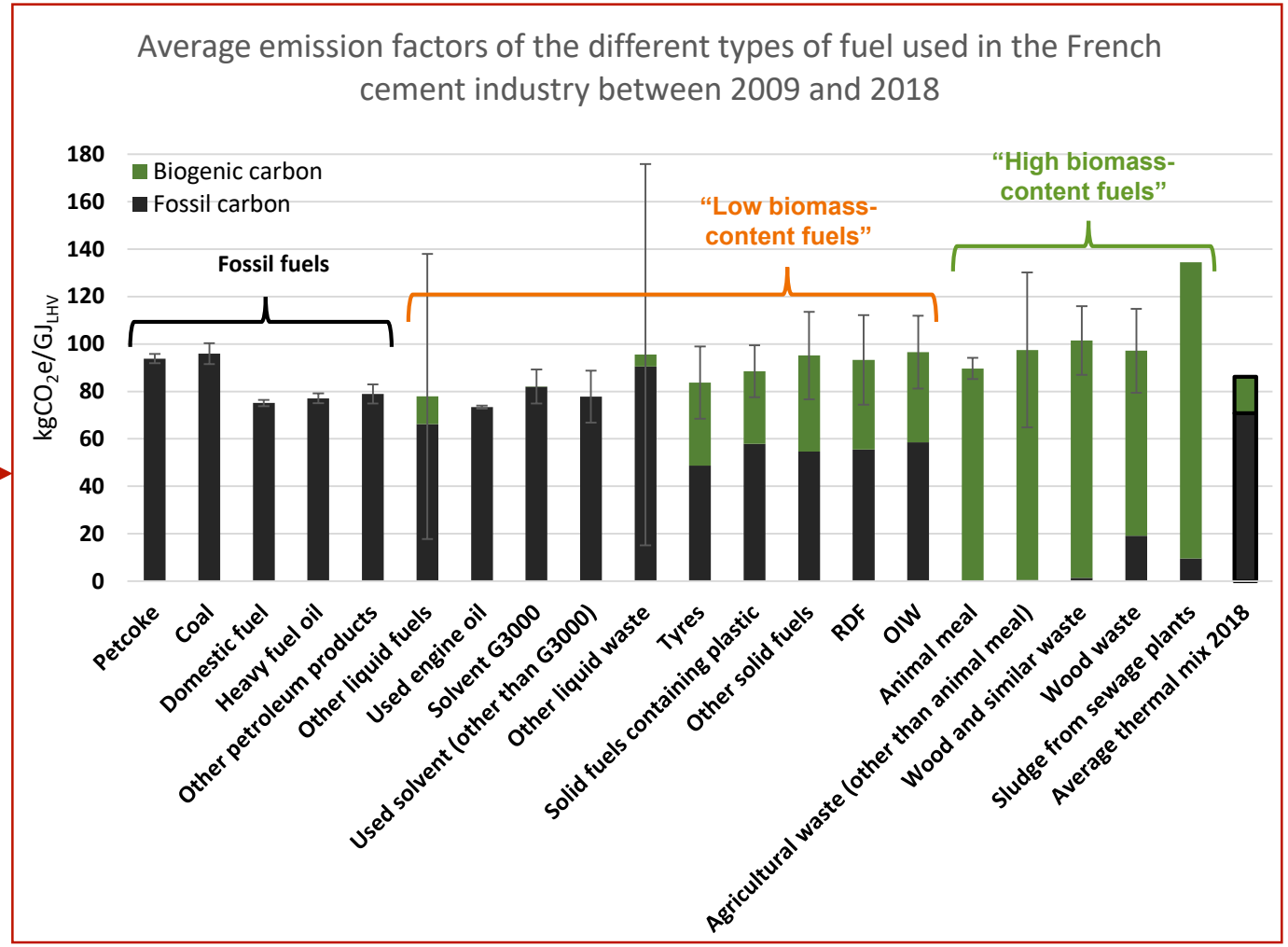
IEA Bioenergy
Technology Collaboration Programme

The use of biomass in the cement production process



Source: IEA (2018), Technology Roadmap - Low-Carbon Transition in the Cement Industry





RDF = Refused Derived Fuel
OIW = Ordinary Industrial Waste

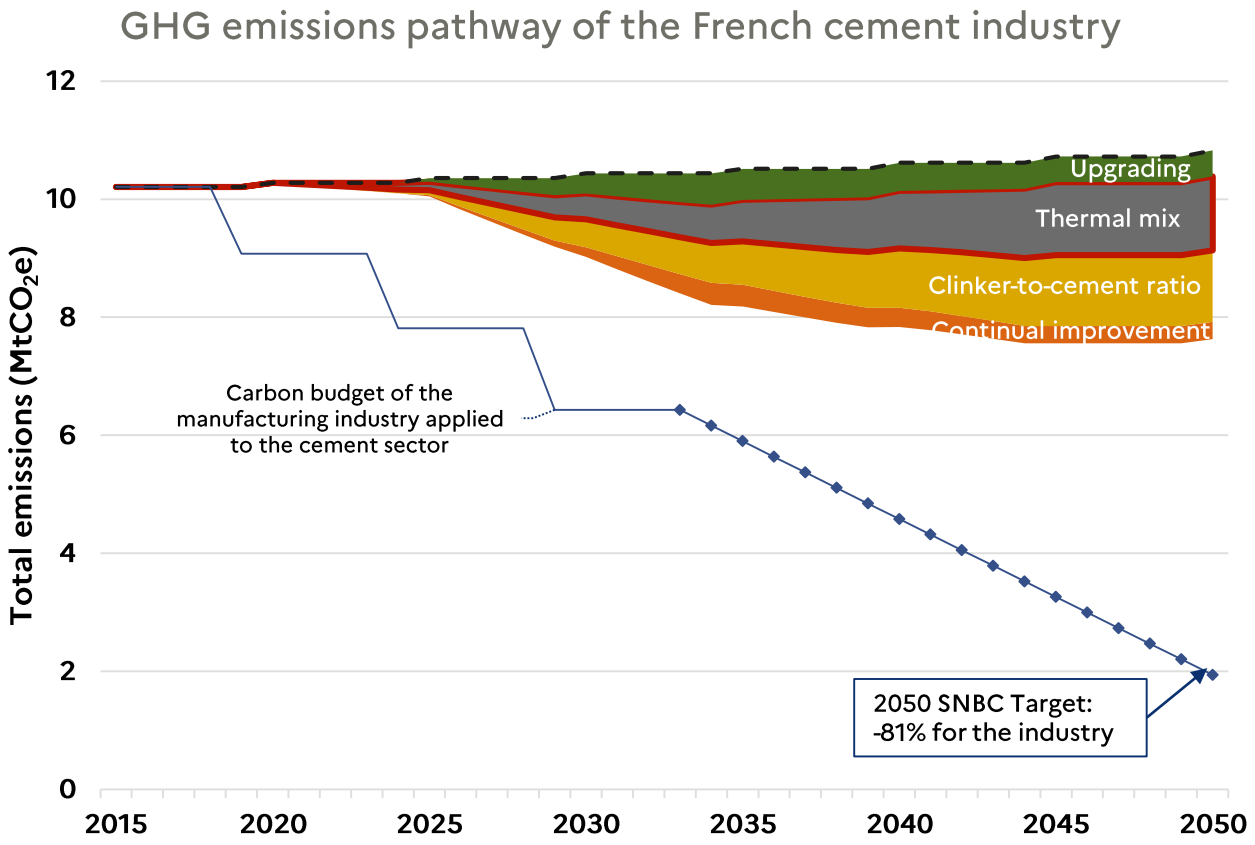
Switching to substitution fuels can be part of the decarbonisation strategy but far from enough

Modelling of the SFIC (French cement association) targets: substitution rate of 95% by 2050 of which 45% of biogenic carbon

Maximum emissions reduction ≈ -15%

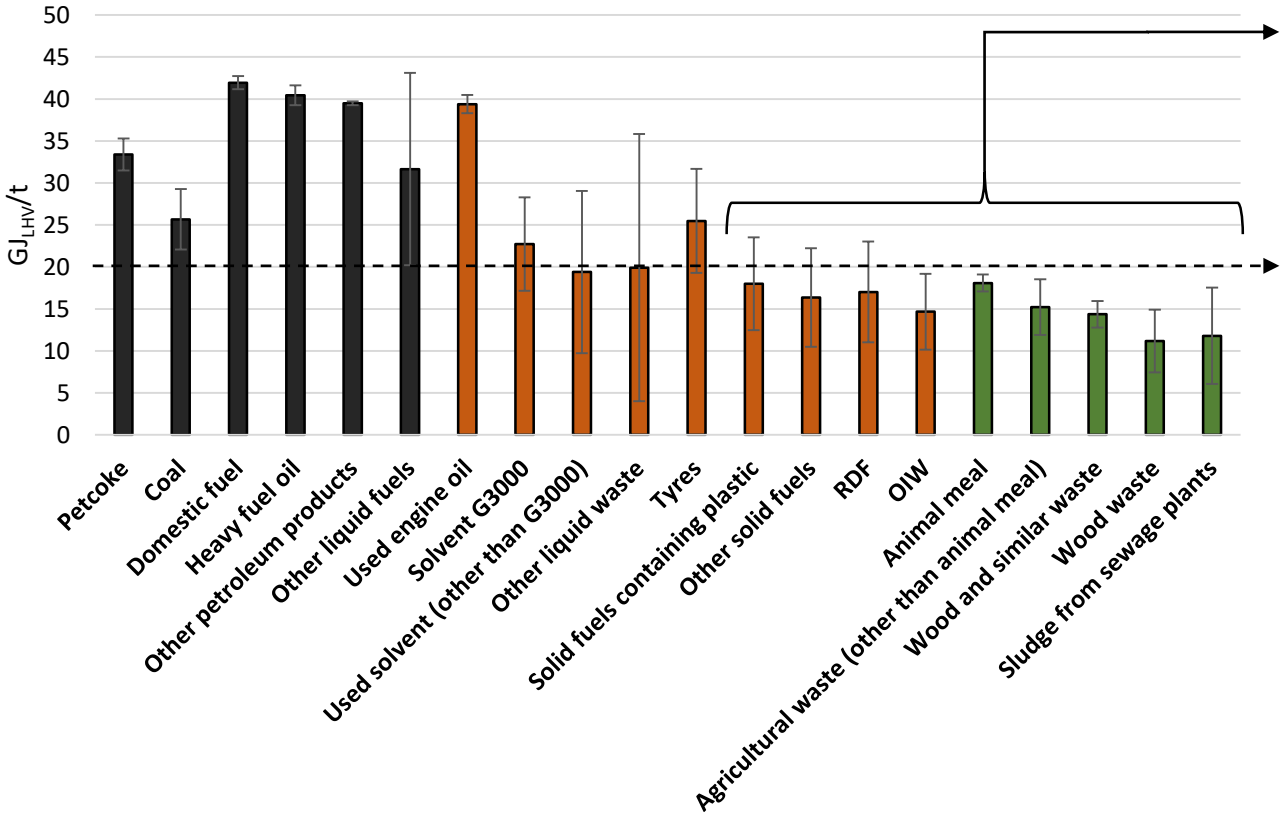
Two main reasons for that:

- Energy-related emissions represent only 1/3 of the emissions from the cement industry
- Alternative fuels still contain a high fraction of fossil carbon



What constrains the use of substitution fuels?

Average Low Heating Value (LHV) of the main fuels used in the French cement industry between 2009 and 2018



- Most substitution fuels are of poorer quality than traditional fuels and require additional preparation steps.
- Certain types of waste contain chlorine, sulphur and alkalis that can cause coating formation and damage the kiln and the preheater in the long term if not filtered.

Example of fuels


Petcoke

Refused Derived Fuel

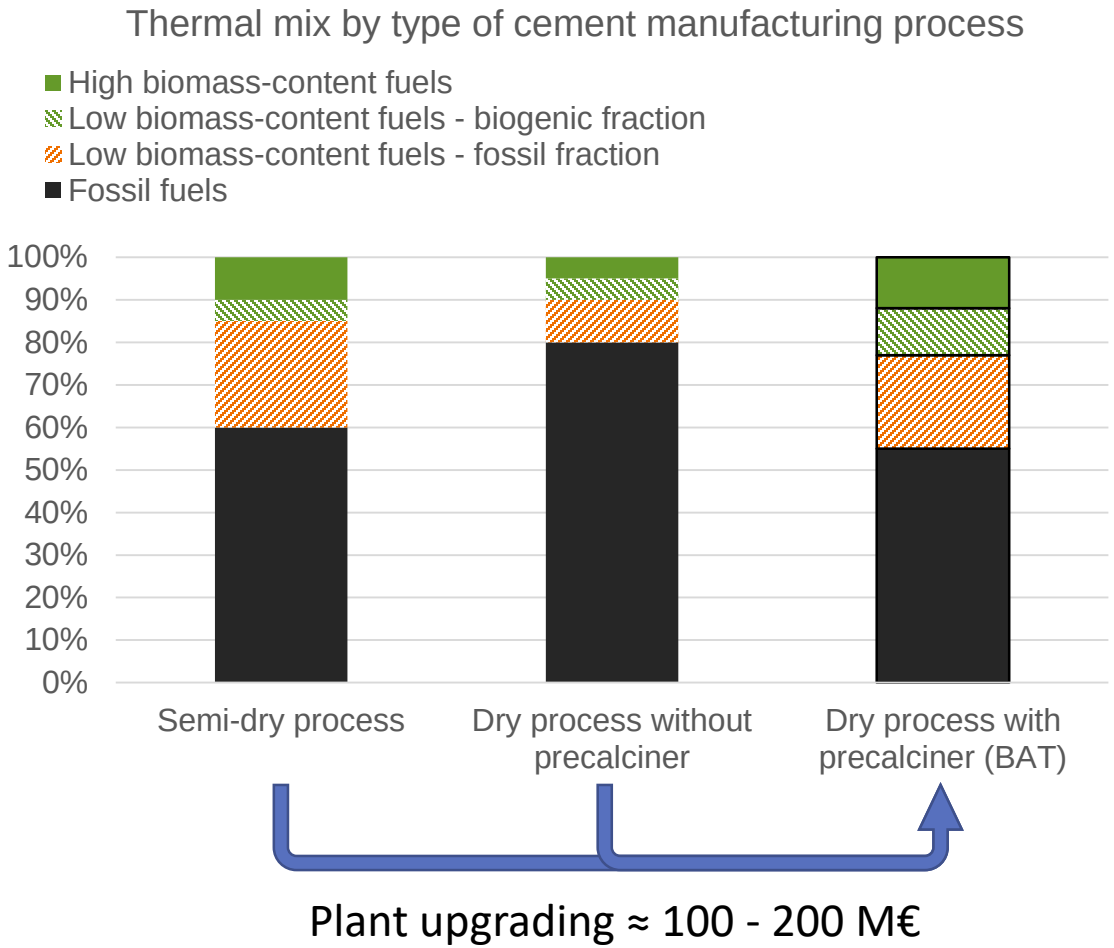

Wood waste

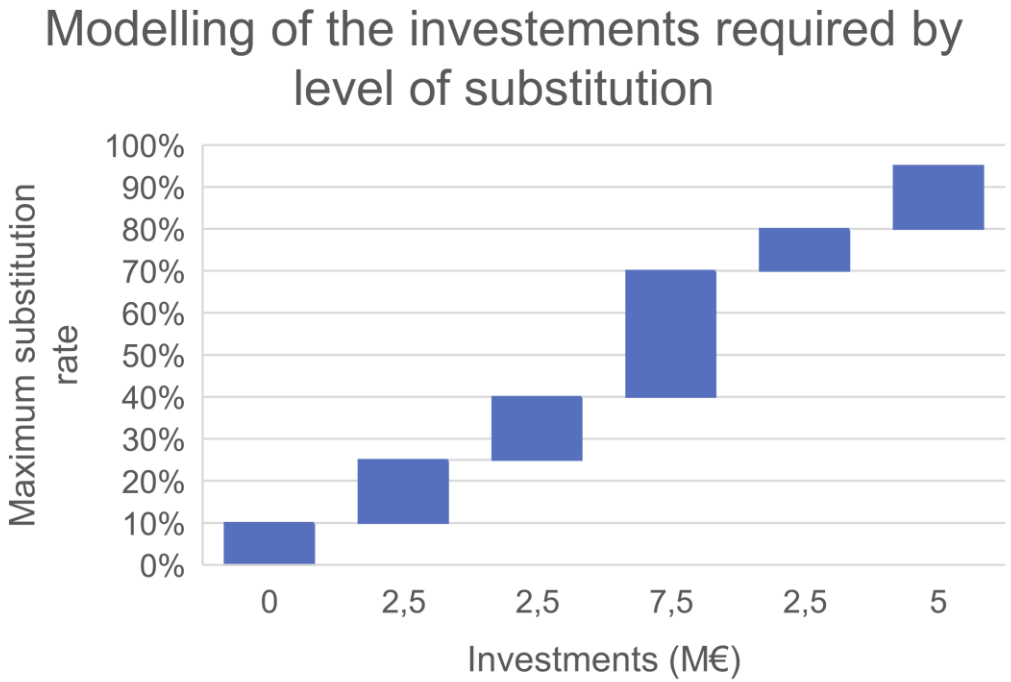

Coal


Shredded tyres


Animal meal

Investments needed to increase the substitution rate

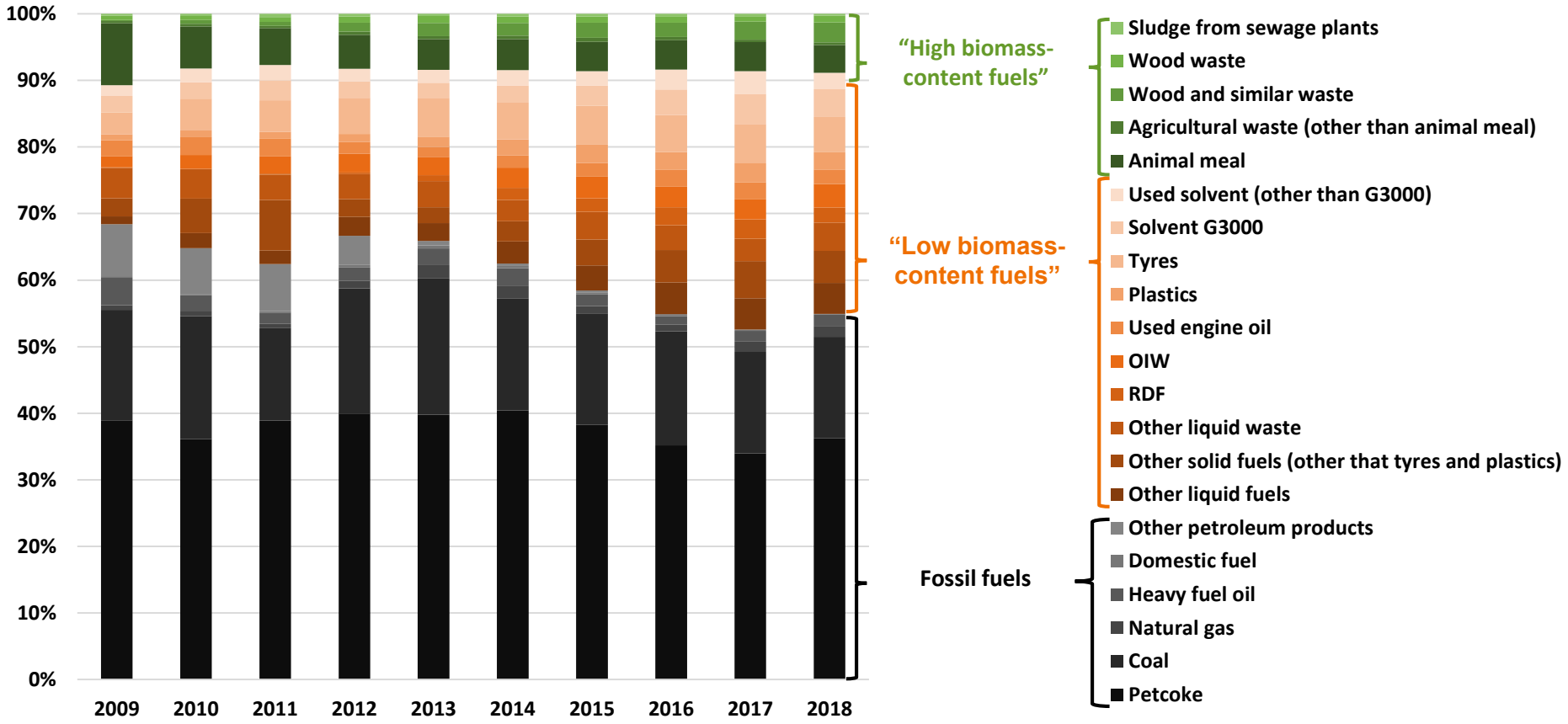




- Only the dry process with precalciner can integrate a very high share of substitution fuels → most important CAPEX
- Example of new equipment needed: storage silos, sorting systems, pneumatic conveyor, hopper, chlorine by-pass …

Thermal mix evolution: a trend illustrating a competitive advantage

Thermal mix of the French cement fleet – Evolution (2009 to 2018)



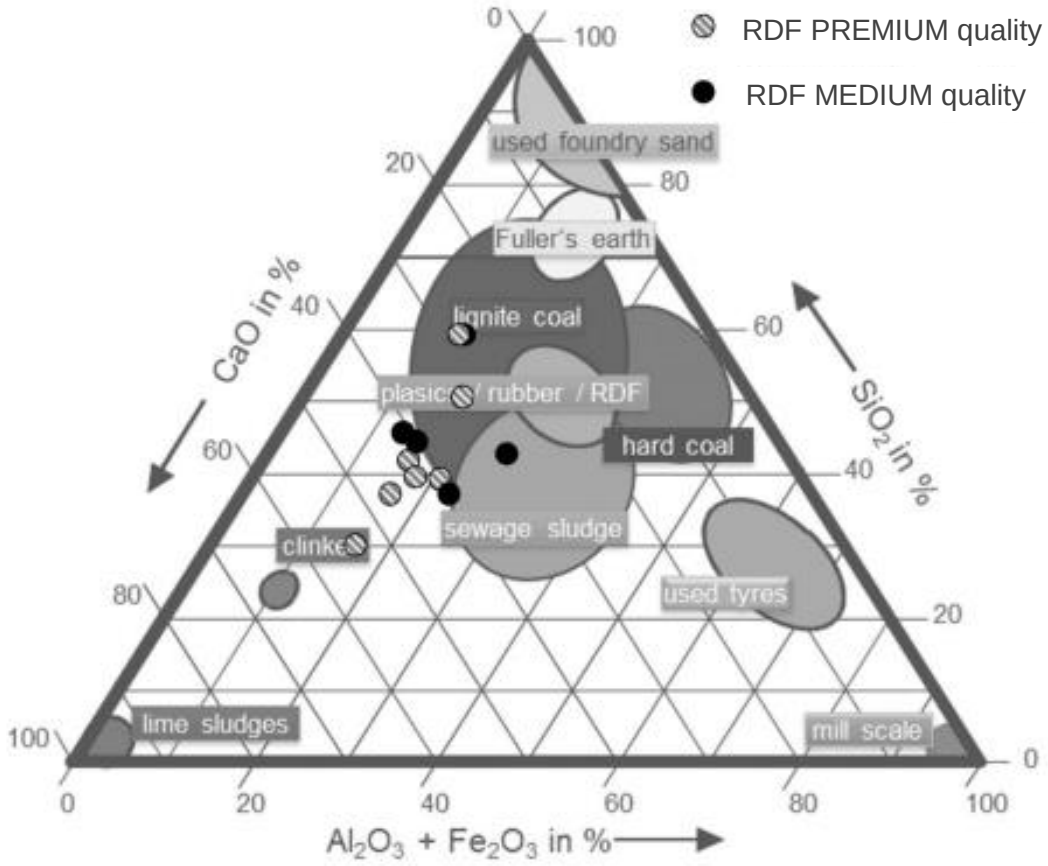
Good-quality fuels with a high share of biomass are hard to find or uneconomical for the cement industry

The use of low biomass-content fuels has been steadily increasing over the past 10 years unlike high biomass-content fuels which has remained flat

An option for high-temperature waste treatment

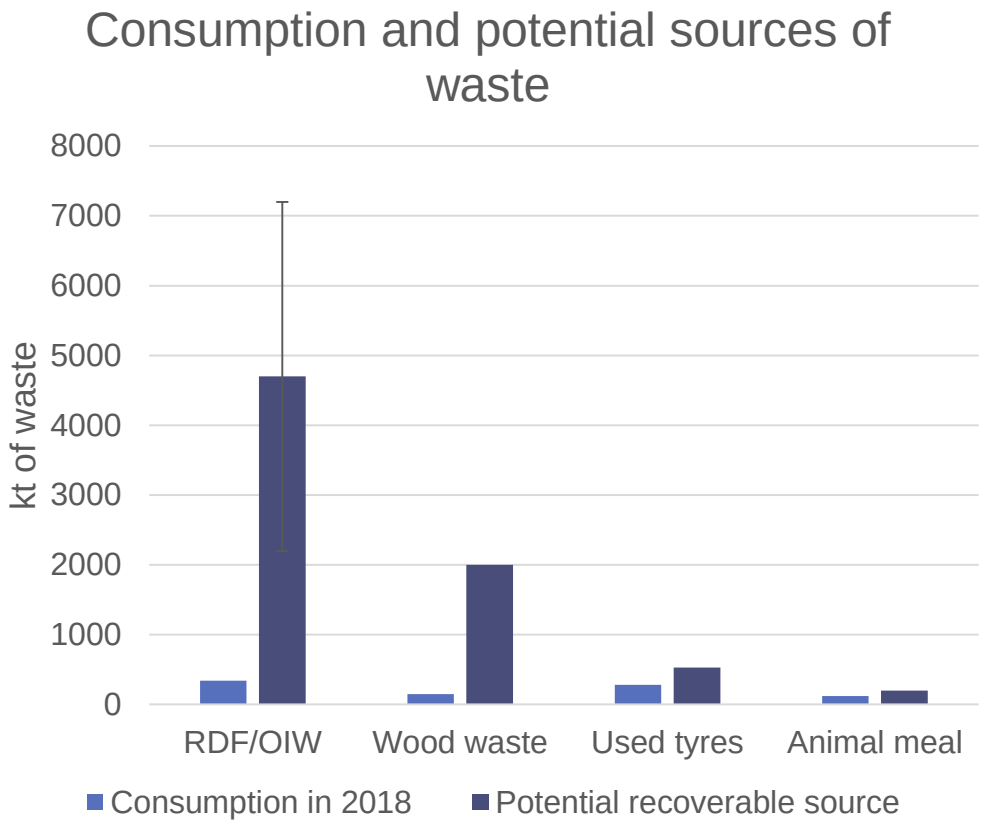
The cement production process has perfect features for processing all types of waste (even hazardous waste):

- High temperature (flame of 2000°C)
- Long exposure and retention time in the kiln
- Most ashes and residues are recycled into the raw meal and incorporated into the clinker matrix



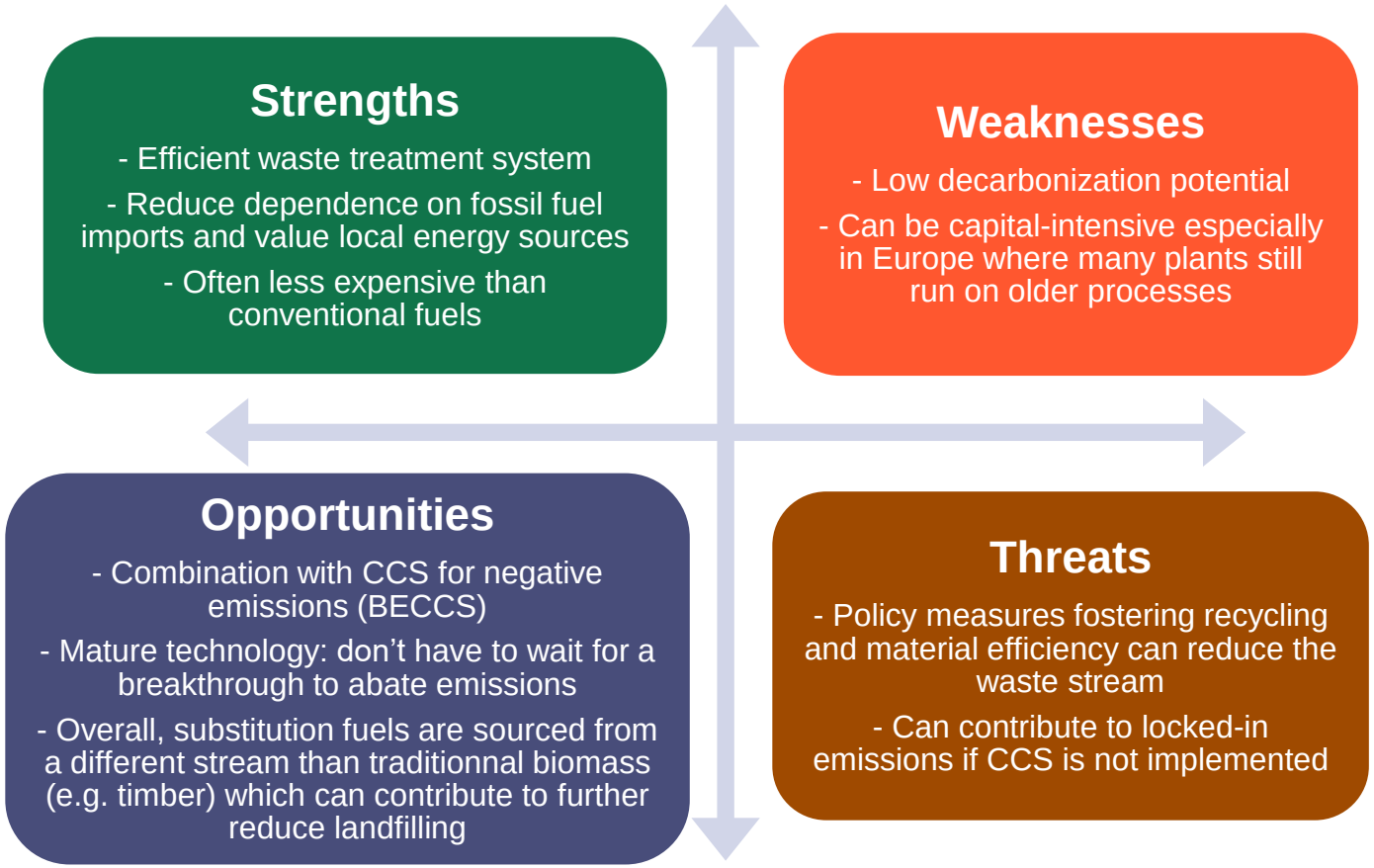
Source: S.A. Viczek & al. (2019) – Analytical determination of recycling quota through SRF co-processing in the cement industry

Potential sources of waste for the cement industry



- **RDF (Refused Derived Fuels):** around 25% of the non-mineral and non-hazardous waste is still landfilled)
- **Wood waste from deconstruction** has an under-exploited potential.
- **Used tyres :**→ 90 – 100% of the used tyres are collected and processed.
- **Animal meal :** cement industry (~60%), other energy usage (~20%) and for the production of fertilizers (~20%)

Summary regarding the use of substitution fuels in the cement industry



Recommendations

- **Long-term planning**: conduct an extensive industry roadmapping analysis to see how substitution fuels can fit in a broader national industry strategy.
- **Mitigate the risk of locked-in emissions and supply shortages:** investigate other low-carbon options for providing heat to the cement production process such as kiln electrification.

Thank you for your time and attention!

For further information:

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