



# Providing metals and minerals for carbon neutrality

The example of the steel value chain

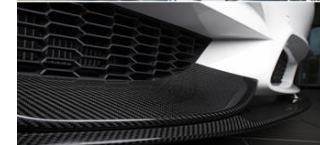
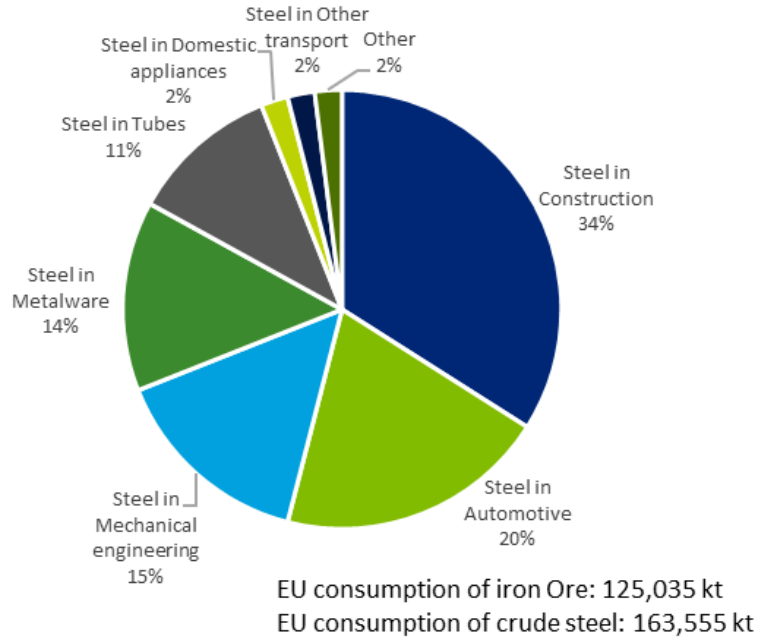
## Greening of: The European mineral raw materials sector continuously reduces the emissions of its activities



### Measures to reduce the mining-related emissions

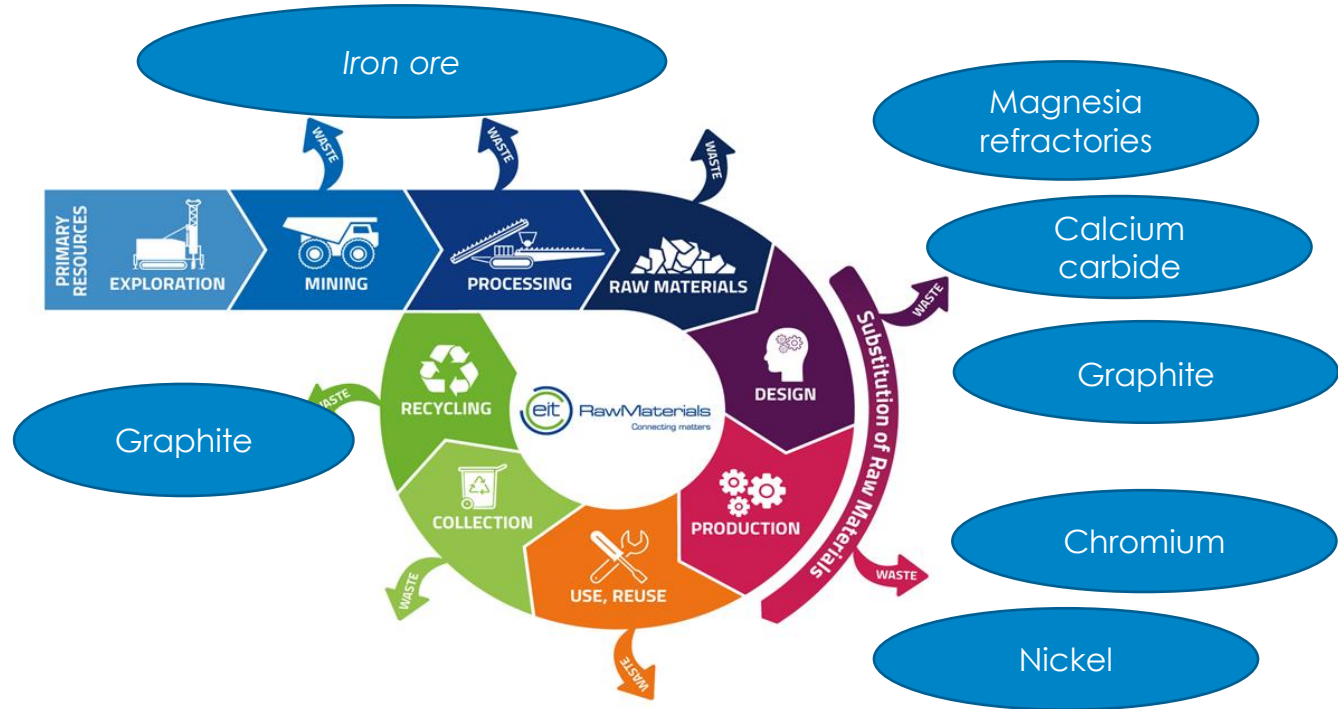
- ≡ Investments in own alternative electricity generation or switch to 100% renewable energy
- ≡ Investments in electrification and remote management
- ≡ Use of both conventional and technological innovations to improve recovery per unit of energy used
- ≡ Implementation of energy saving programs and Energy Management Systems,
- ≡ together with the downstream industry, the mining industry is investing in new and further research in developing raw material feeds that will allow reduction in carbon emissions in further processing.

# End uses of steel in 2018



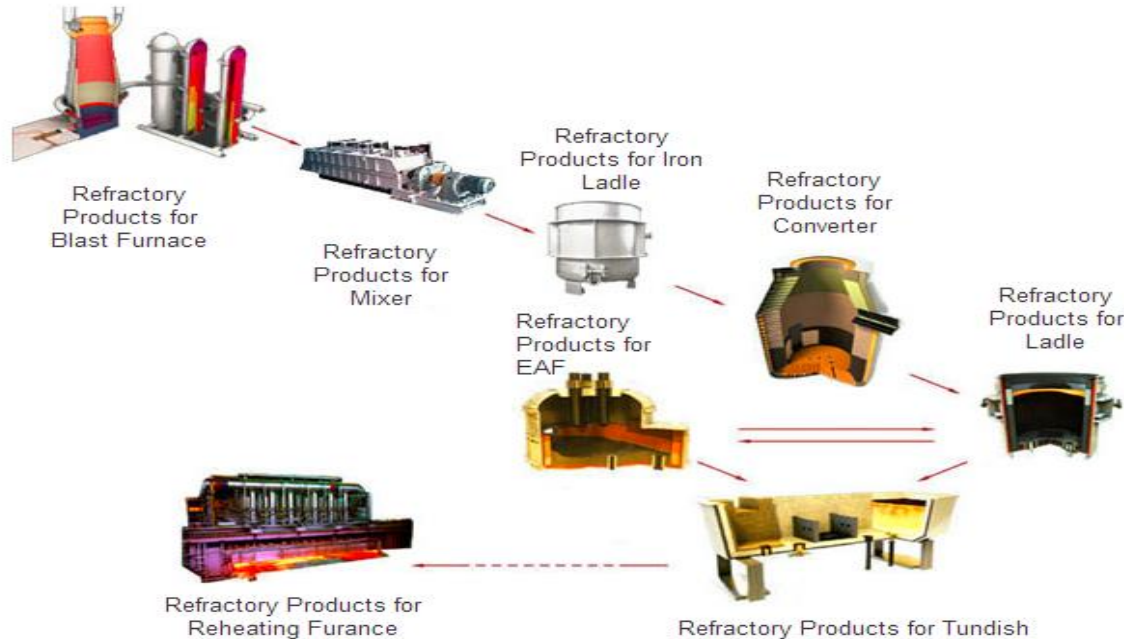
# All of the raw material and auxiliary supplies are energy intensive in their production

Supply industries require higher energy due to electrification and high temperature processing



# Steel furnace technology

## Steel-making Process



Most refractory products are carbon based and in their process will release CO<sub>2</sub> as a result of the chemical reaction of the naturally occurring mineral.





# Achievements in improving energy efficiency



- Decrease of the thermal energy consumption supported either by the installation of heat exchangers or through the use of pure O<sub>2</sub>, which had allowed to use a lower amount of natural gas
- Reduction of electric energy intensity with at least 20% since 2001 (in kW/t production)
- Optimization of the raw material pre-heater in rotary kilns
- Implementation of a predictive control system for rotary kilns
- Recovering at least 10% of the thermal energy waste
- Reduction in specific fuel consumption in rotary kilns
  - ○ Shaft kilns by at least 20% since 1995, 10 % since 2001
  - ○ Rotary kilns by at least 15% since 1995, 5 % since 2001
  - ○ Calcination unit and shaft kiln by at least 40% since 2001

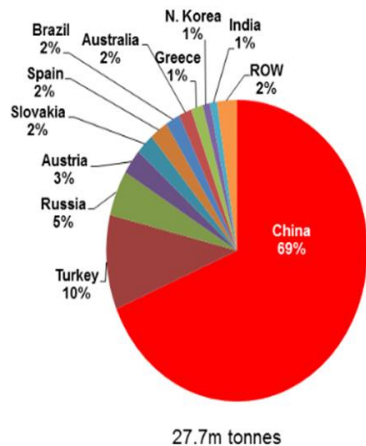
# Europe's magnesite

## The competition

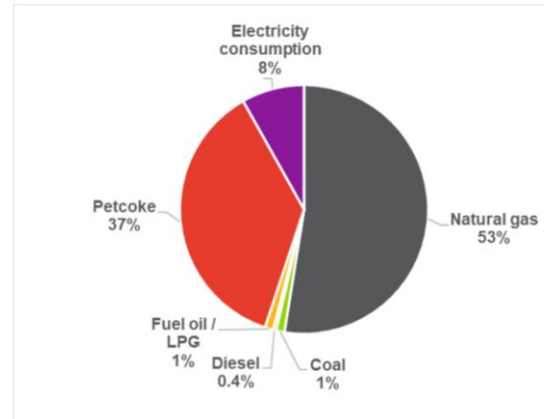
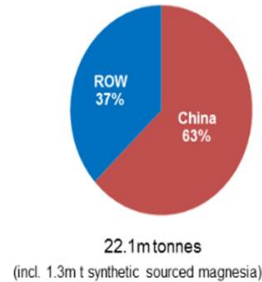
2014 - 2016 average  
fuel mix for EU magnesite  
companies

Horizon 2020  
and Horizon  
Europe :  
Research in  
Carbon  
Capture  
needed!

Magnesite world production 2016



Magnesia production

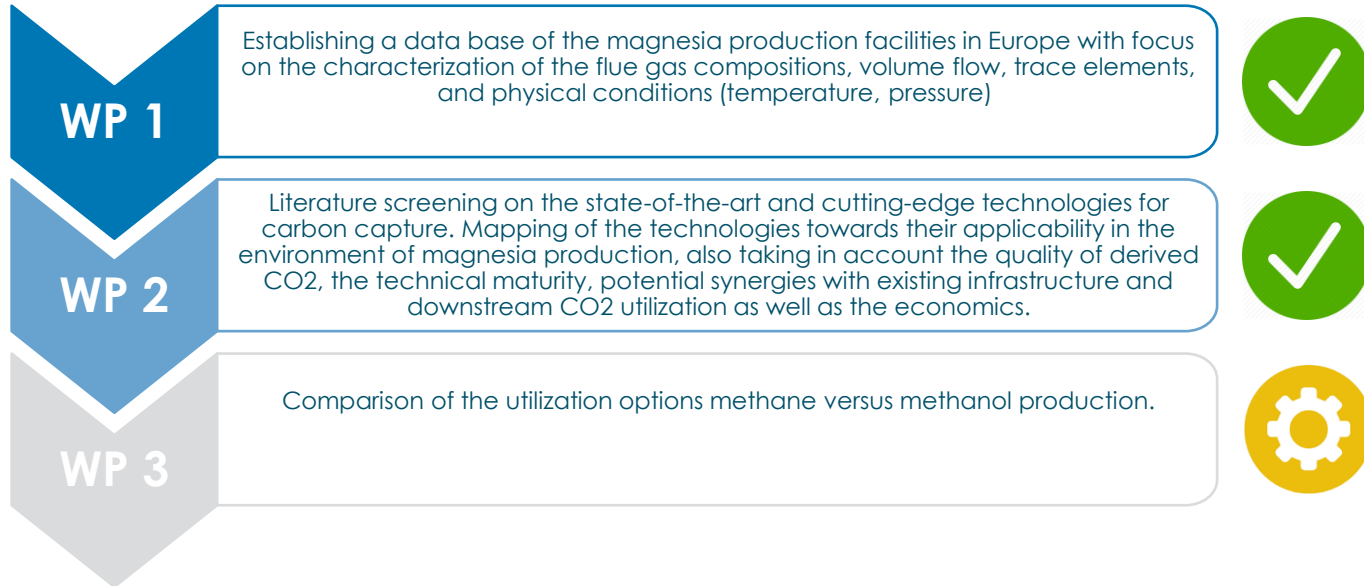




# Research Project – Carbon Capture Tailored for Magnesia Production



**Aim:** identify, further develop and demonstrate the techno-economically most feasible technique for CO<sub>2</sub> capture under the specific boundary conditions of magnesia production



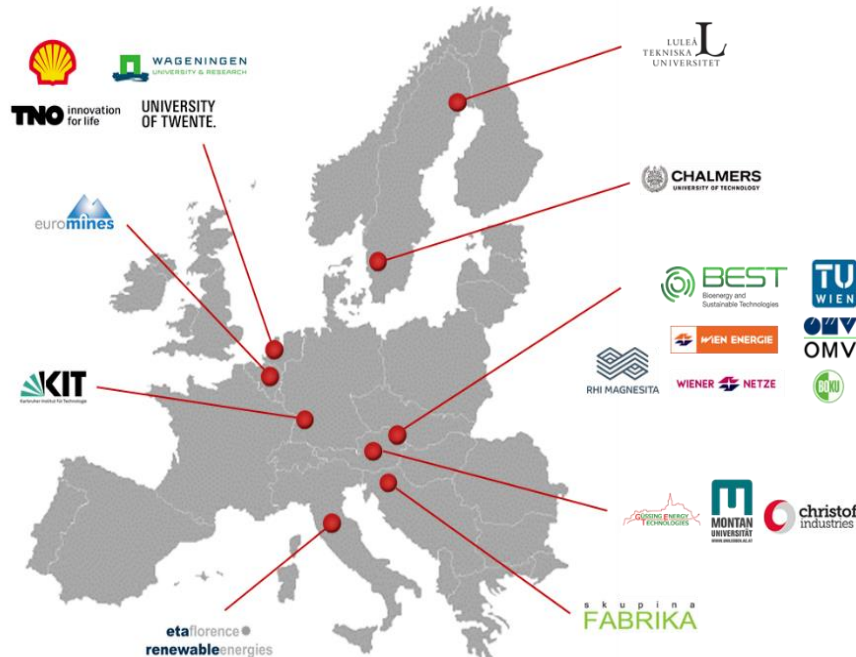
# Horizon 2020 Research Project – CarbonUpCycle

## Aim:

The overall objective of the proposed project is the demonstration of a full process chain from CO<sub>2</sub> capturing via CO<sub>2</sub> conversion until utilisation of the captured CO<sub>2</sub> for generation of two high grade products at TRL 6-7.

## Consortium Partners:

**RHI Magnesita and Euromines** (representing Grecian Magnesite, Magnesitas Navarras, Magnesitas de Rubián, SMZ Jelsava, Slovmag) + **19 other consortium partners**



# Research Project - CarbonUpCycle



## Key points of the proposal

- ❑ CO<sub>2</sub>-capture demonstration at an industrial incinerator
  - Showing also relevance for other industries/technologies (high CO<sub>2</sub>-emitters)
- ❑ CO<sub>2</sub>-upgrading to syngas: DFB gasification
- ❑ Synthesis into liquid and gaseous products
- ❑ Combination with (additional) external H<sub>2</sub>
- ❑ Socio-economics and politics: Focus in implementation



We must shape the future of  
our industry in Europe!  
We need to resolve  
the carbon dioxide issue worldwide!

But we also need to make sure  
that in the course of this  
the price we pay is not  
losing our industry!

Thank you

