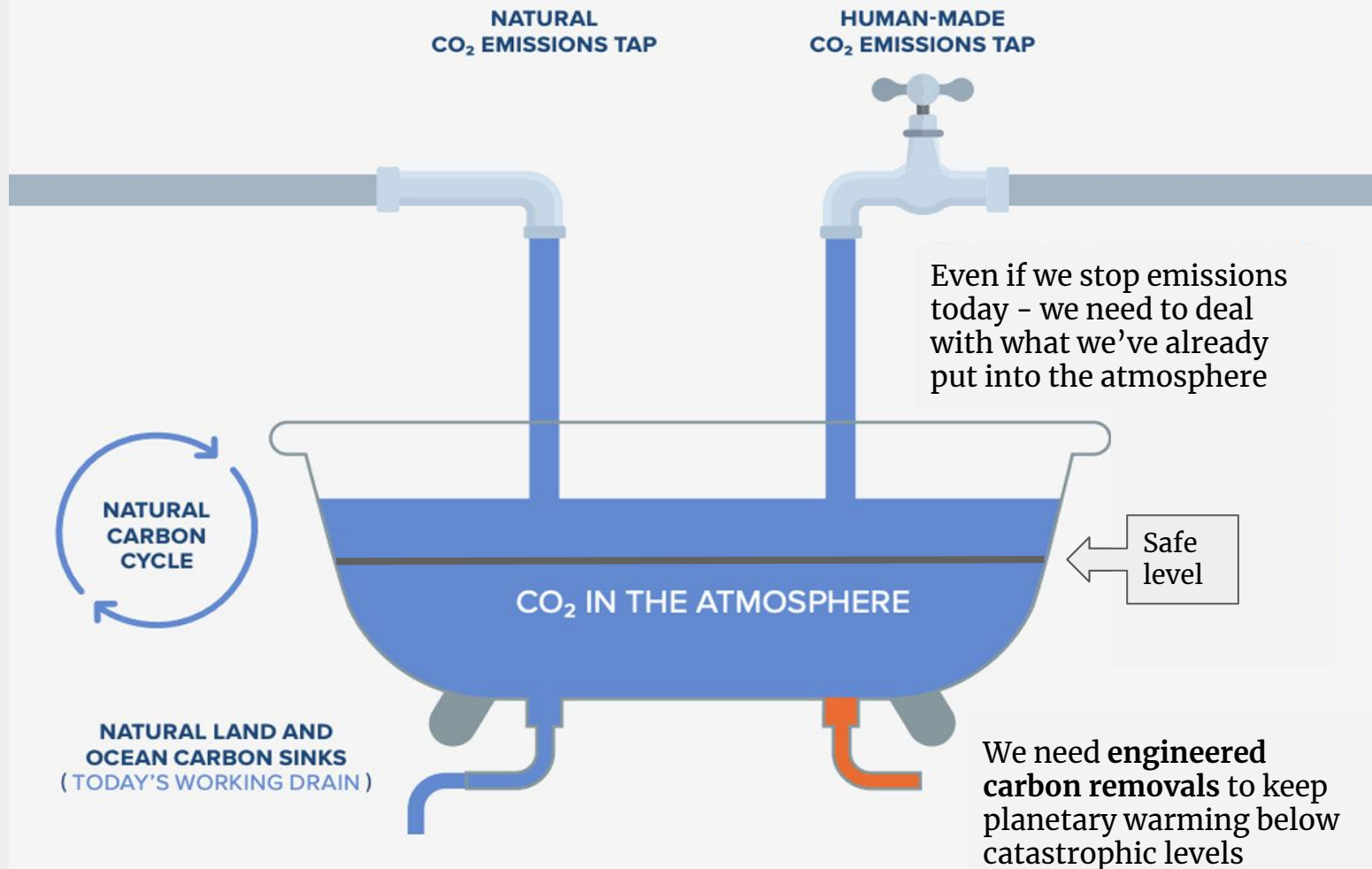




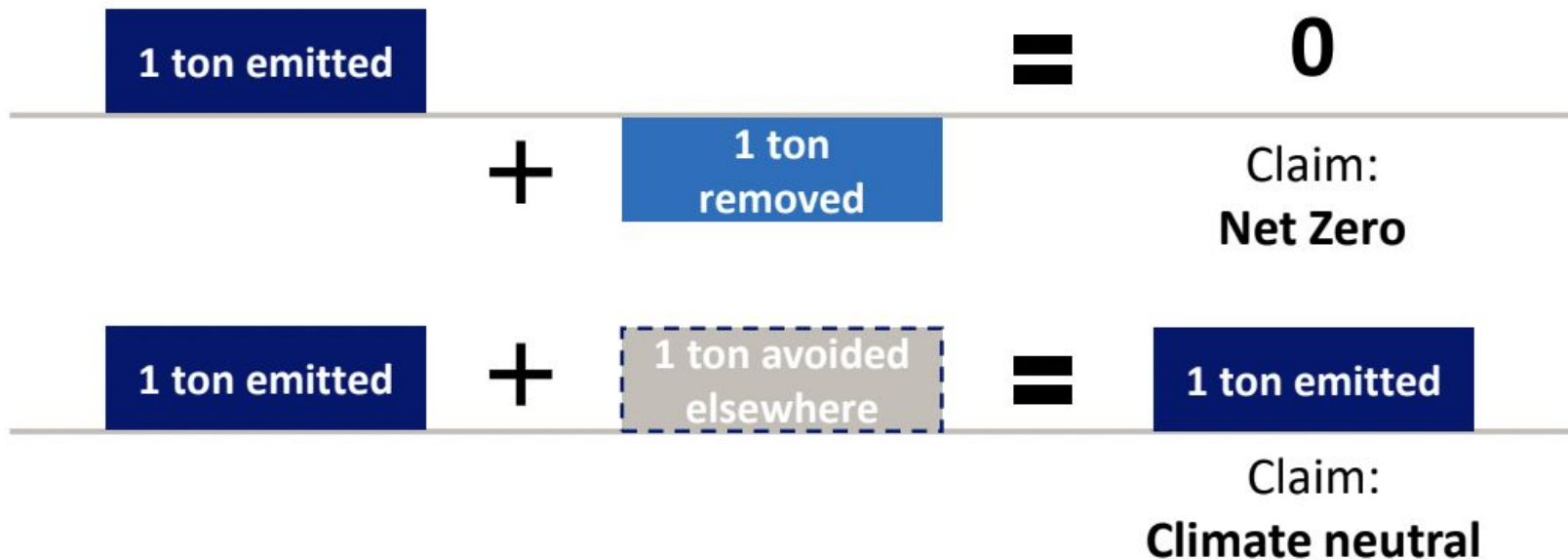
# Charm Industrial

Putting Oil Back Underground & Carbon  
Negative Iron





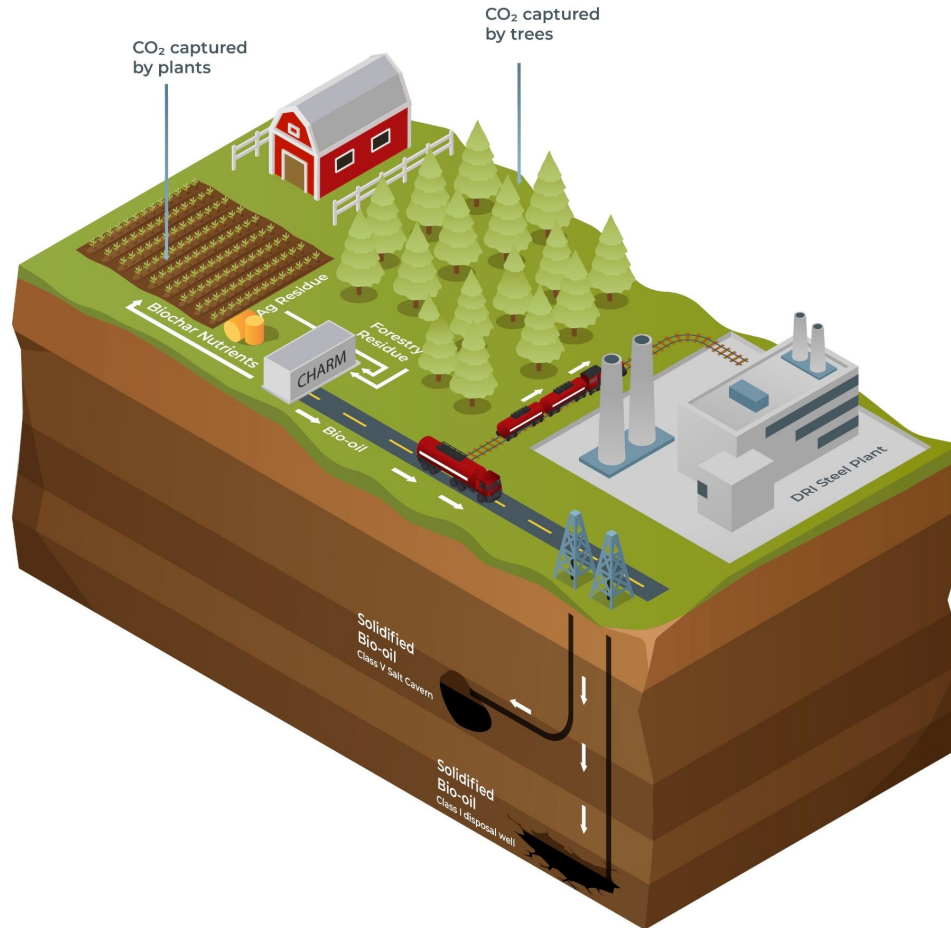
# ✿ What is true net zero?



Sources: World Economic Forum (2021): On the critical role of carbon removal and how companies can use it smartly (<https://bit.ly/3DgvY3j>)



# Bio-oil Sequestration





**CHARM**  
INDUSTRIAL

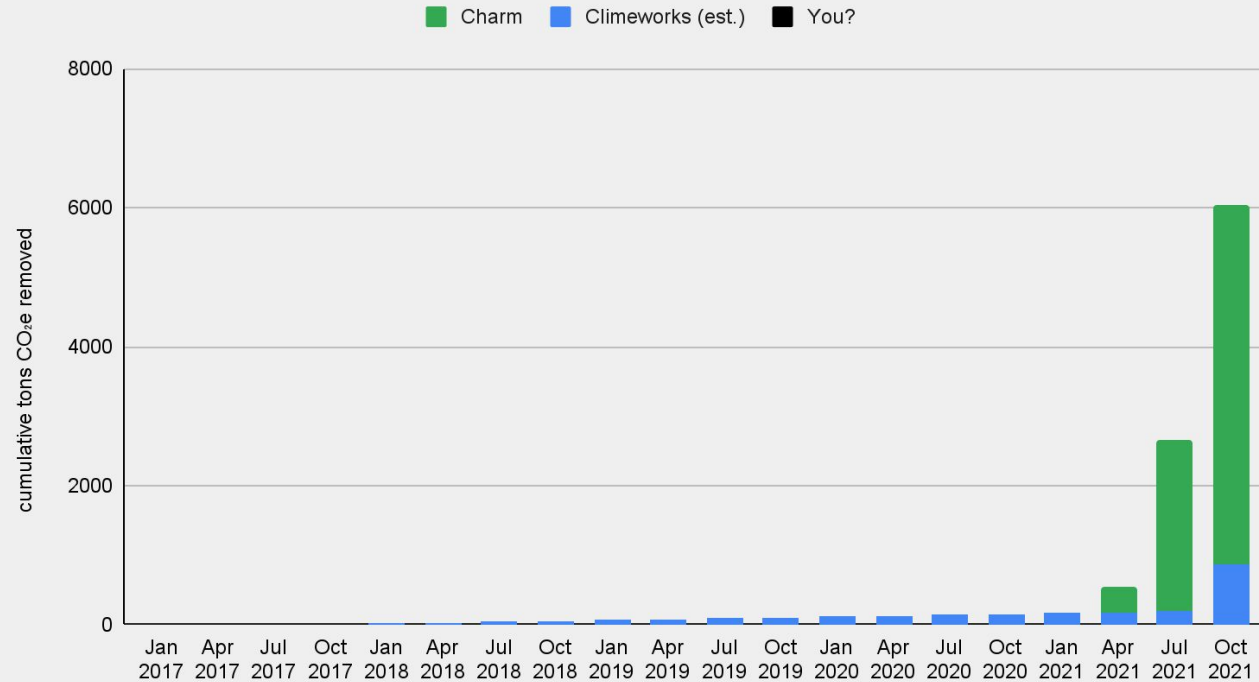




# Charm is scaling >10x faster

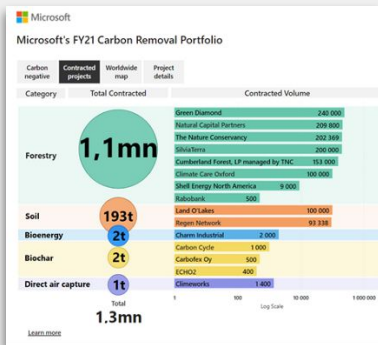
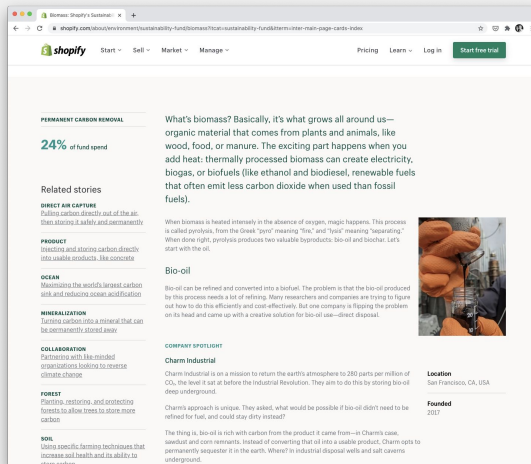
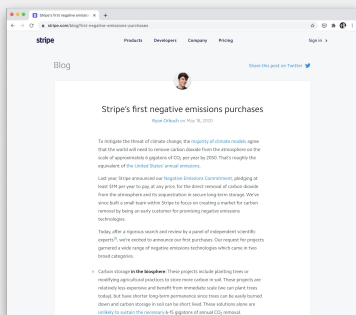
Over 5,500 tons CO<sub>2</sub>e removed to date, more than 10x DAC all-time

Cumulative Industry-wide Carbon Removal Tonnage Delivered





# Rigorous Scientific Validation



## Bio-oil Sequestration

Prototype Protocol for Measurement, Reporting, & Verification

### Overview

This prototype protocol is intended for use within voluntary carbon markets. Bio-oil sequestration involves the conversion of waste biomass to bio-oil via processes such as fast pyrolysis, followed by injection of the bio-oil into deep geological formations for permanent storage. "Bio-oil" is intended here to broadly encompass fast pyrolysis oil, biochar, slurries containing biochar, and other organic compounds derived from biomass.

Over 100 Gt CO<sub>2</sub> is exchanged between the atmosphere and biosphere annually via photosynthesis, respiration, decomposition, and combustion. Through appropriate selection of biomass residue feedstocks that would otherwise decompose or combust, the conversion of biomass to bio-oil and the permanent geological storage of the embodied carbon is a net removal from the atmosphere.

**NATURAL STATE**

**BIO-OIL SEQUESTRATION**

1 Fast Pyrolysis is a method of heating organic material to high temperatures in the presence of little or no oxygen to produce syngas, bio-oil and biochar. Other processes...

<https://www.carbon-direct.com/insights/a-new-prototo-protocol-for-bio-oil-sequestration>

# Climate Justice & Environmental Co Benefits



Investment in Agricultural  
and Rural Communities



A Just Transition For Energy  
Communities



Taming Wildfires



Fixing Abandoned Wells



Improving Air  
Quality

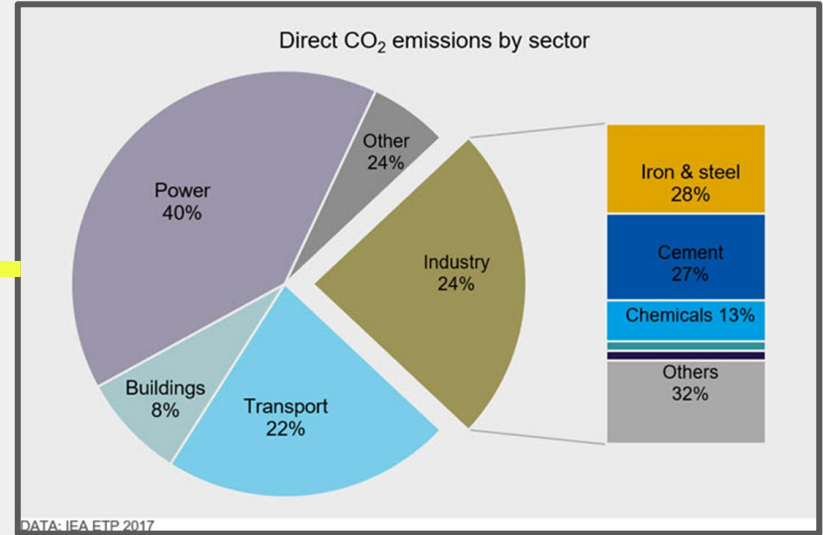
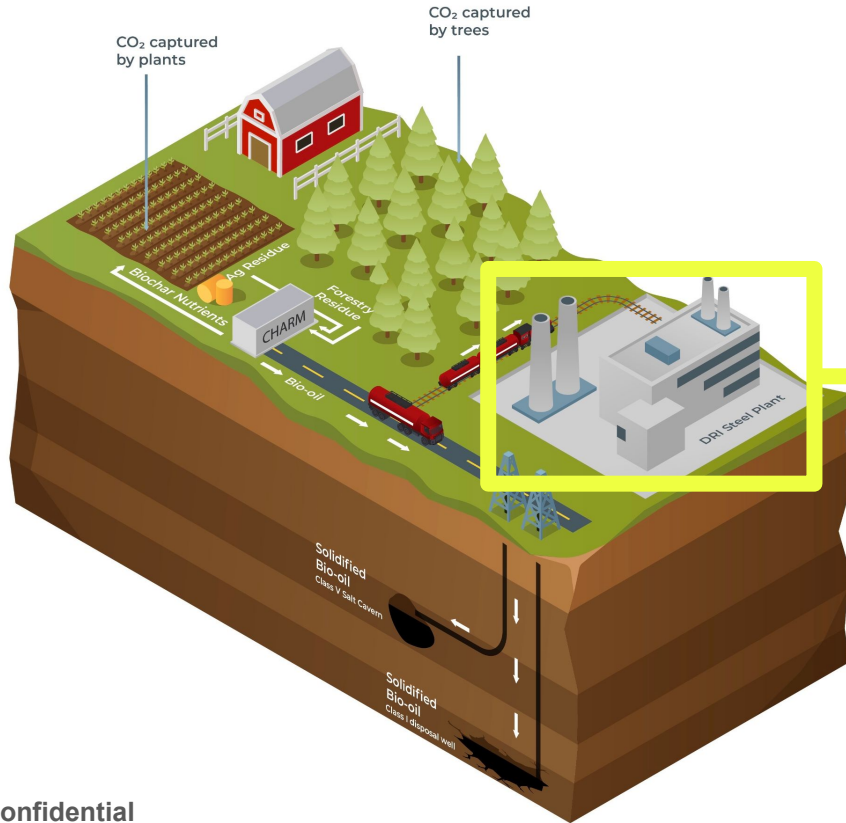
# Carbon Negative Iron





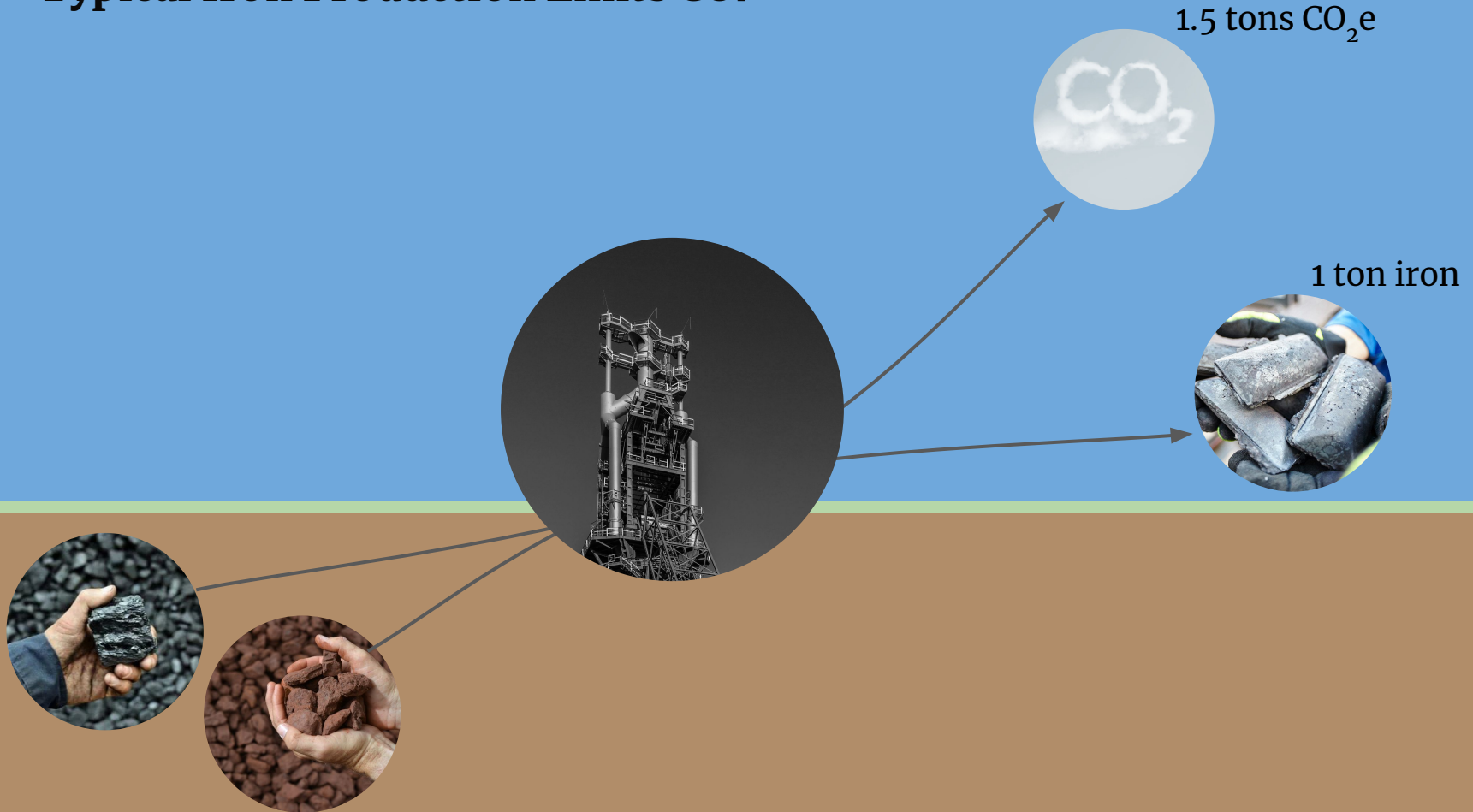
# Charm's Carbon Negative Iron Amplifies Impact

The global steel market is \$850B/yr and represents 6% of annual global emissions (2x aviation)



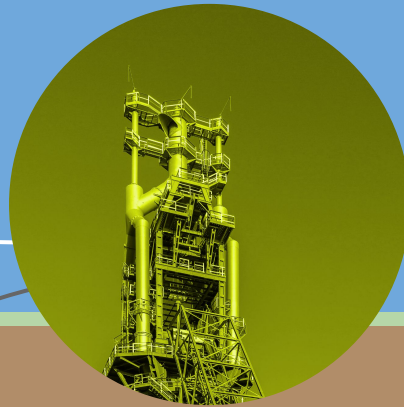


# Typical Iron Production Emits CO<sub>2</sub>





# Charm's Iron Removes CO<sub>2</sub>



1 ton iron



-1.5 tons CO<sub>2</sub>e



-1.2 tons CO<sub>2</sub>e



# Thank You!



McKinsey  
& Company

Alphabet

 Meta

stripe



*shopify*

 Swiss Re

 Microsoft



 BOSTON  
CONSULTING  
GROUP

**\$1.3 billion committed to purchasing permanent  
carbon removals by 2030**