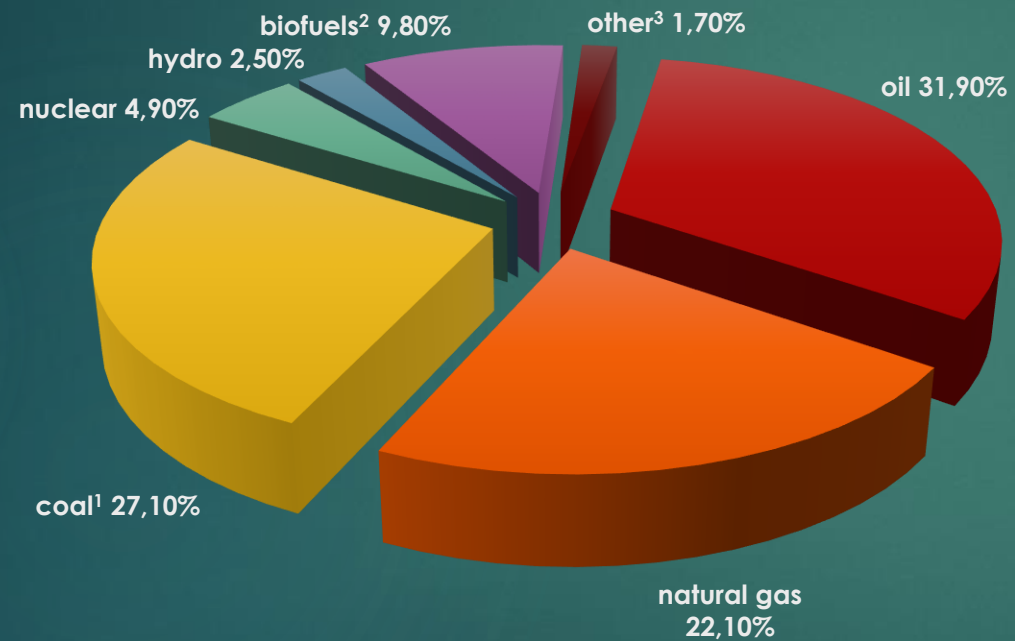




carbon issue and EOR

carbon issue

world energy matrix: 2018



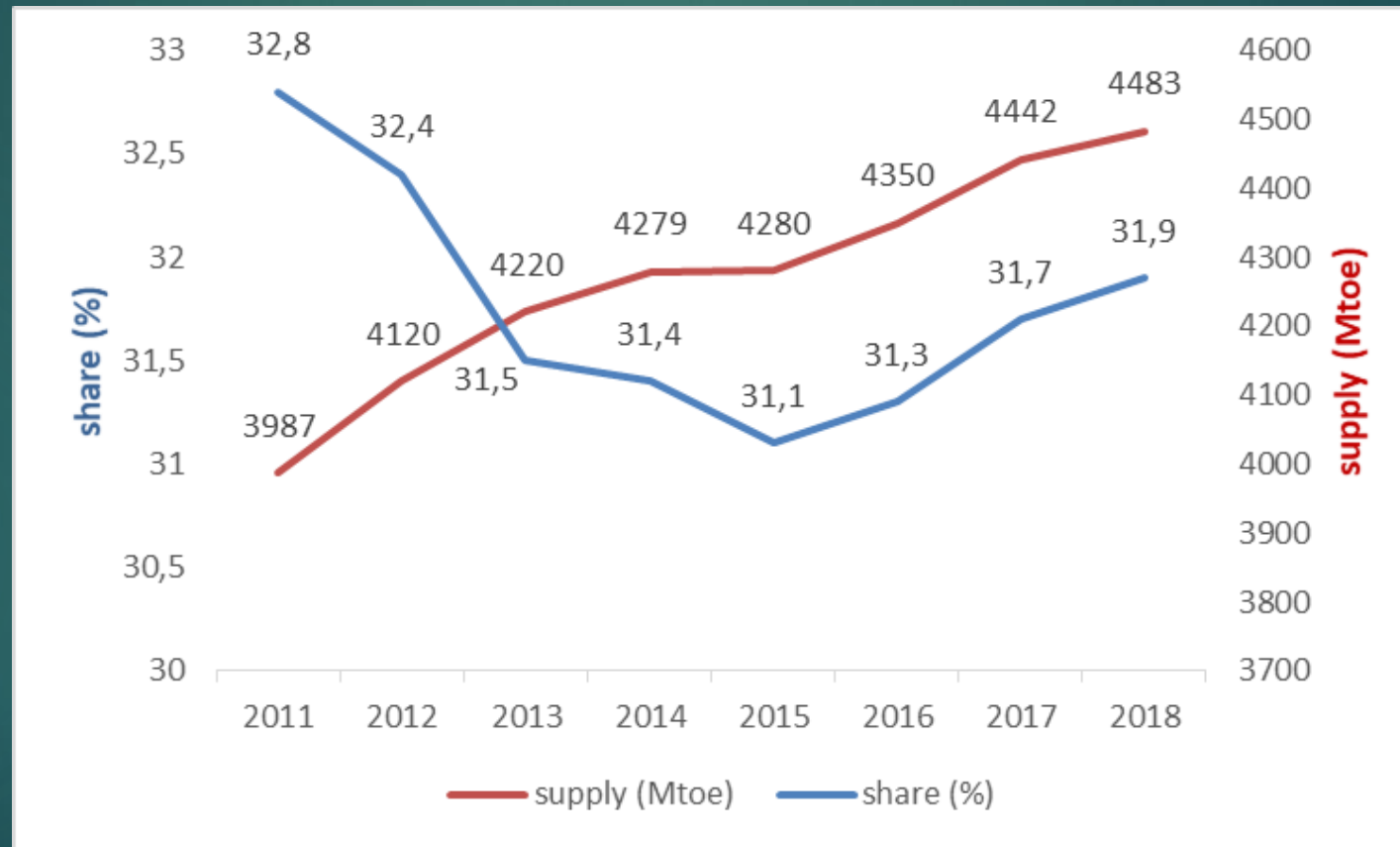
¹ together with coal are aggregated peat and oil shale

² biofuels include waste

³ includes geothermal, solar, wind, tide/wave/ocean, heat and other

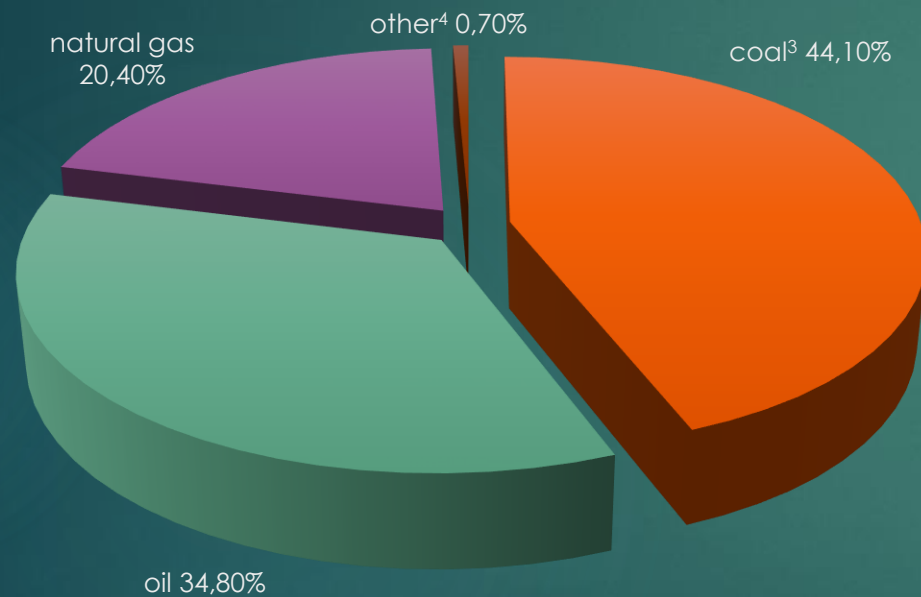
carbon issue

world oil share and supply behaviours



carbon issue

world¹ fuel shares of CO₂ emissions – fuel combustion²: 2018



¹world includes international aviation and marine bunkers

²CO₂ emissions from fuel combustion are based on the IEA energy balances and on the IPCC guidelines, and exclude emissions from non-energy uses

³together with coal are aggregated emissions from peat and oil shale

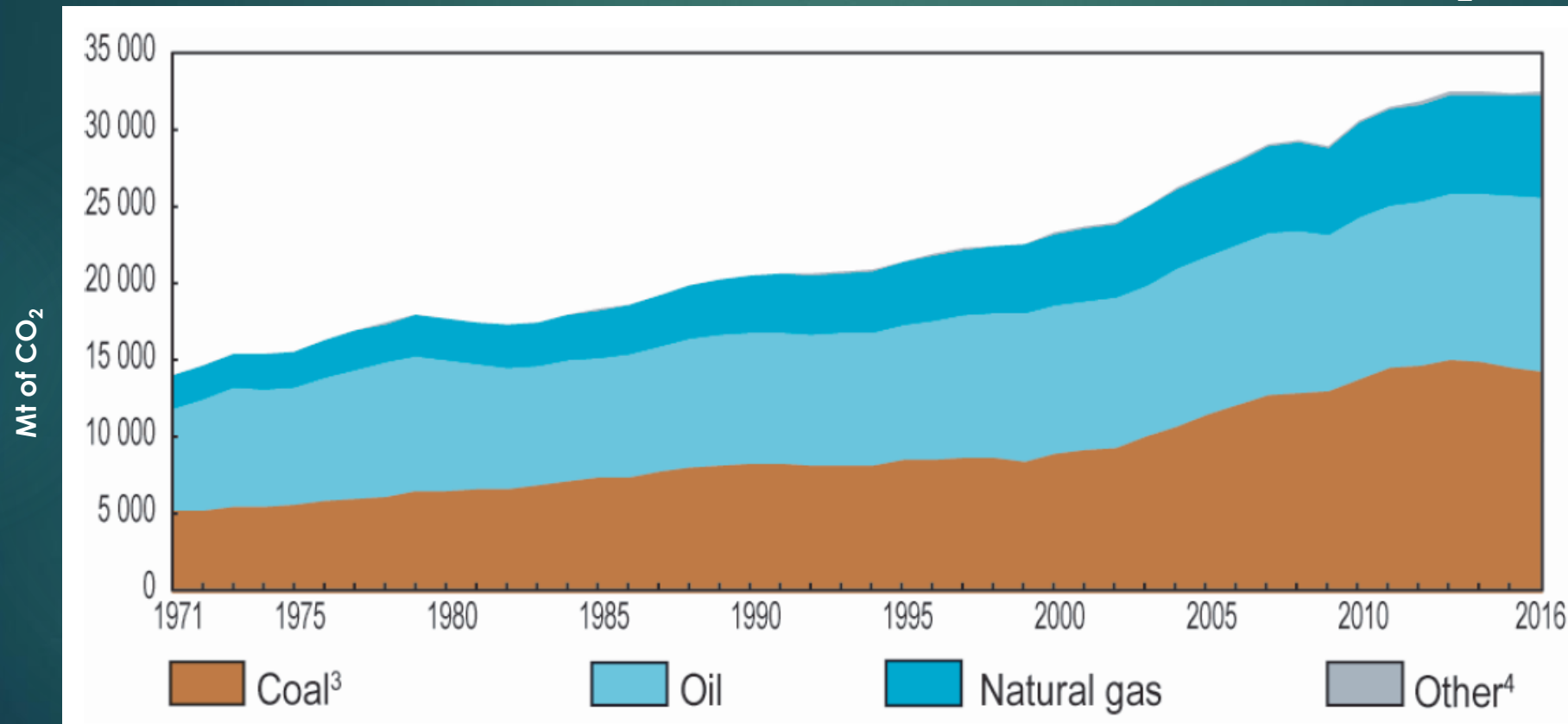
⁴includes industrial and non-renewable municipal wastes

world emissions: 32.316 Mt CO₂

carbon issue

world CO₂ emissions by fuel combustion: 1971-2016

32.316 Mt CO₂/year



carbon issue

world CO₂ emissions by year: fuel combustion and industry

fuel combustion = 32.316 Mt CO₂

fuel combustion + industry > 37.000 Mt CO₂

oil and gas climate initiative (OGCI)

carbon issue

CCS

carbon capture and storage (CCS) is a package of technologies, involving separation, capture, transport, storage (geologic storage) and in situ leakage surveillance. CCS can reduce atmospheric emissions from industrial sectors such as power generation, iron and steel, petroleum extraction, refining, petrochemical, cement manufacturing and others.

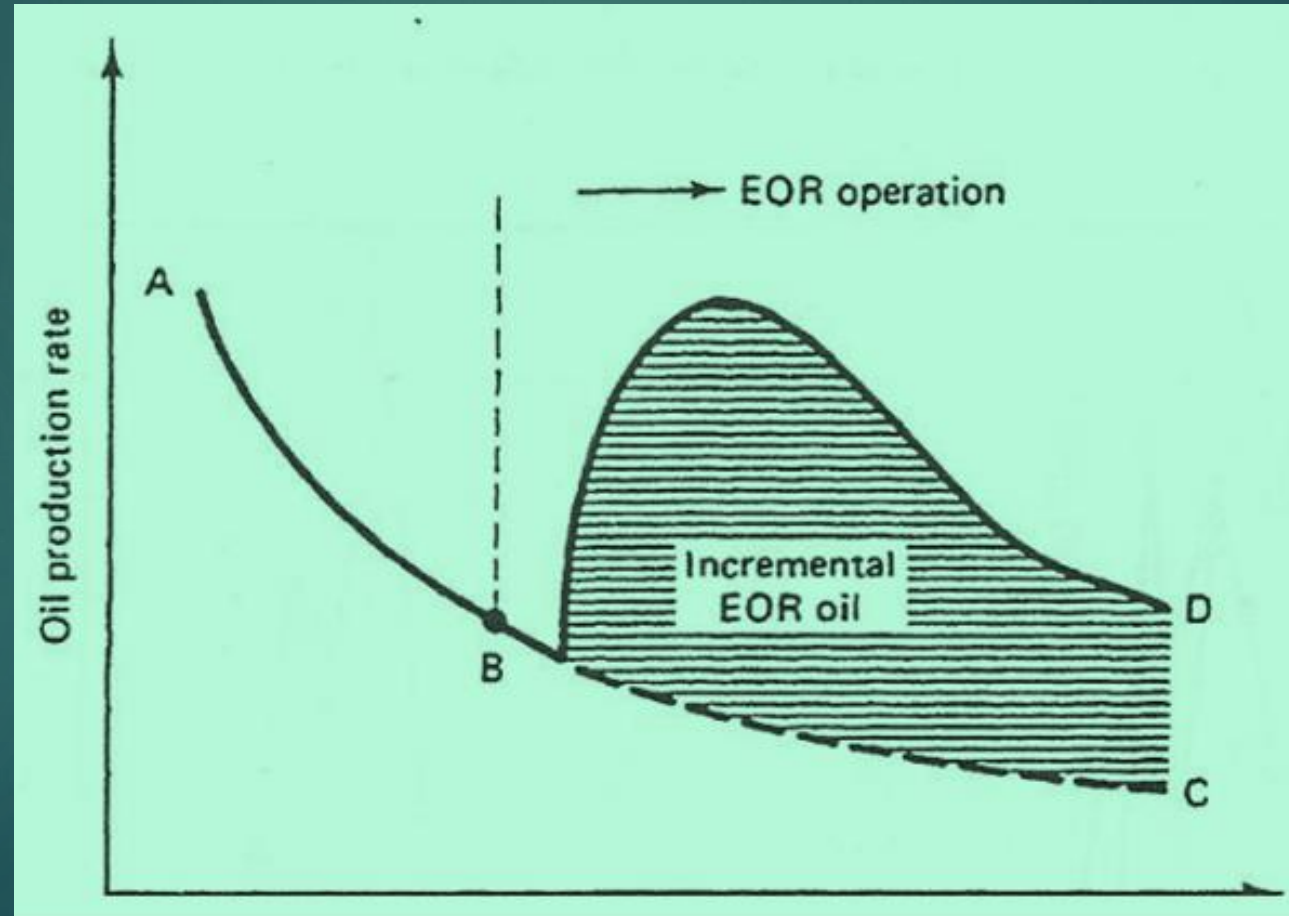
carbon issue

CCUS

carbon capture, utilisation and storage (CCUS) is a package of technologies to capture CO₂ and recycle it into products or store it safely; their complete processes create a circular economy for the CO₂. Its use also constitutes a significant emissions reduction of CO₂ by those mentioned industrial sectors. To invest in CCUS corresponds to generate new technologies and added value inside a considered industry. Where applied, CO₂-EOR is a very interesting and profitable CCUS method; it combines CO₂ storage and extraction of additional oil barrels

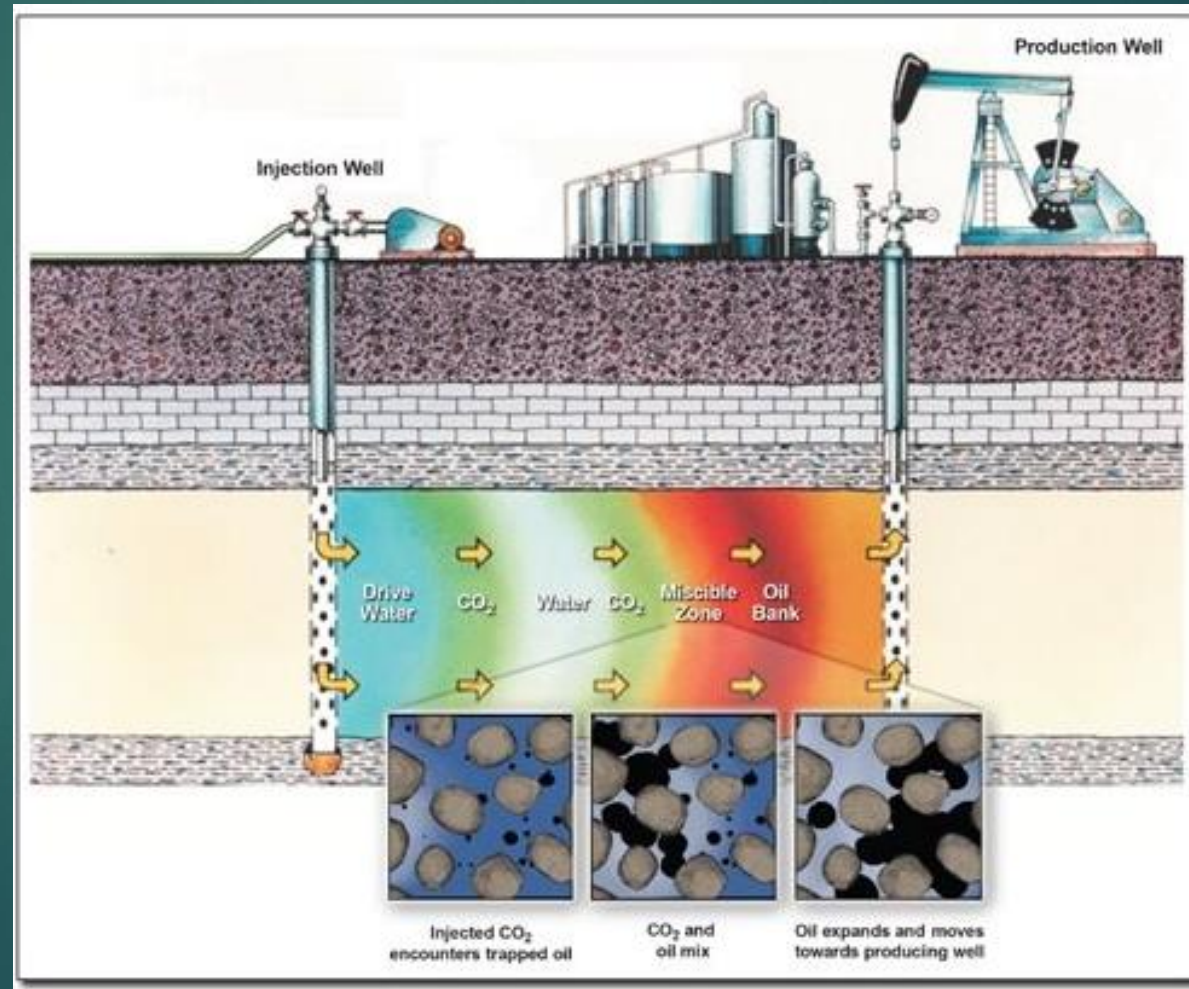
EOR operation

typical EOR response: incremental oil recovery



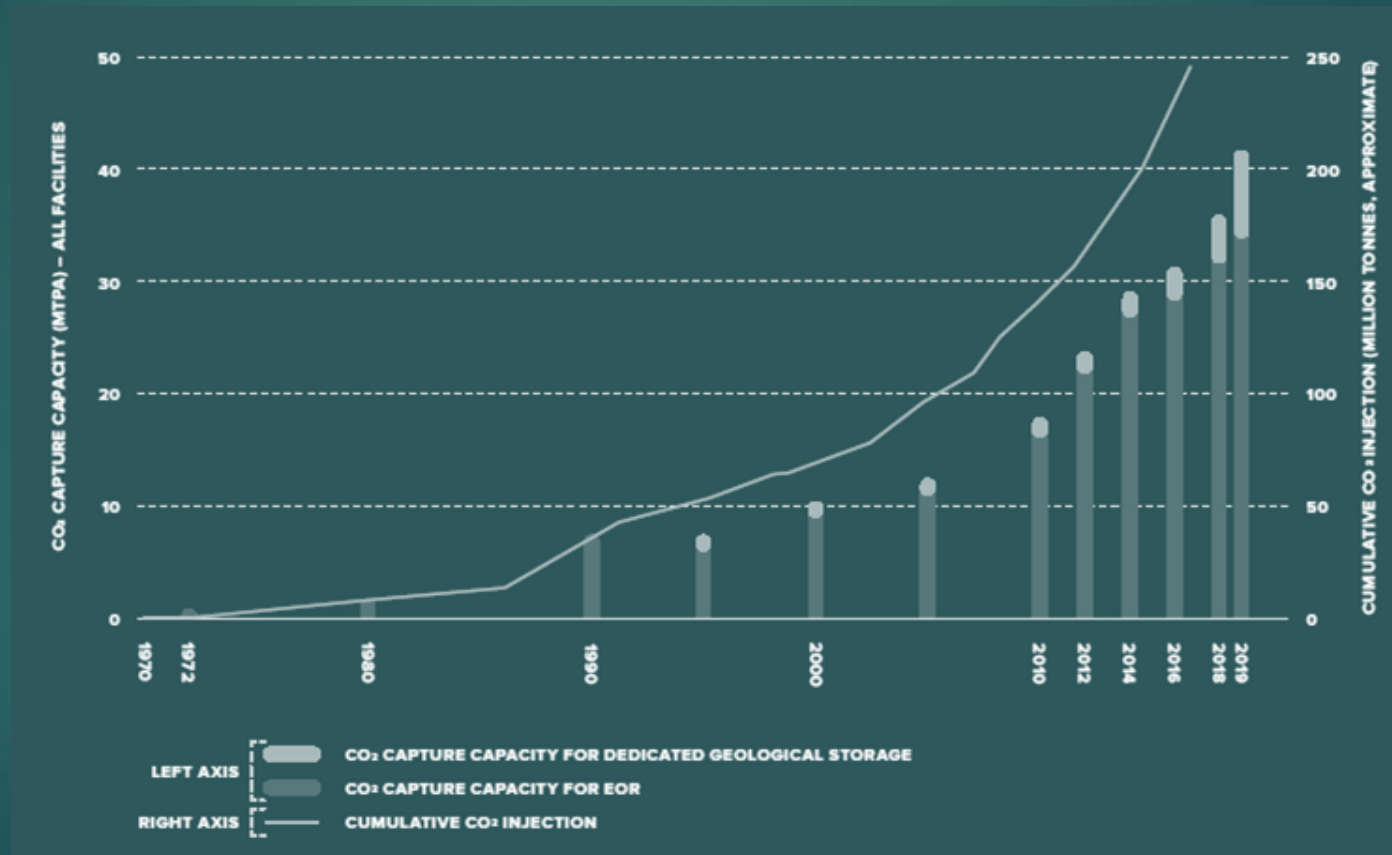
CO₂-EOR

main recovery mechanisms



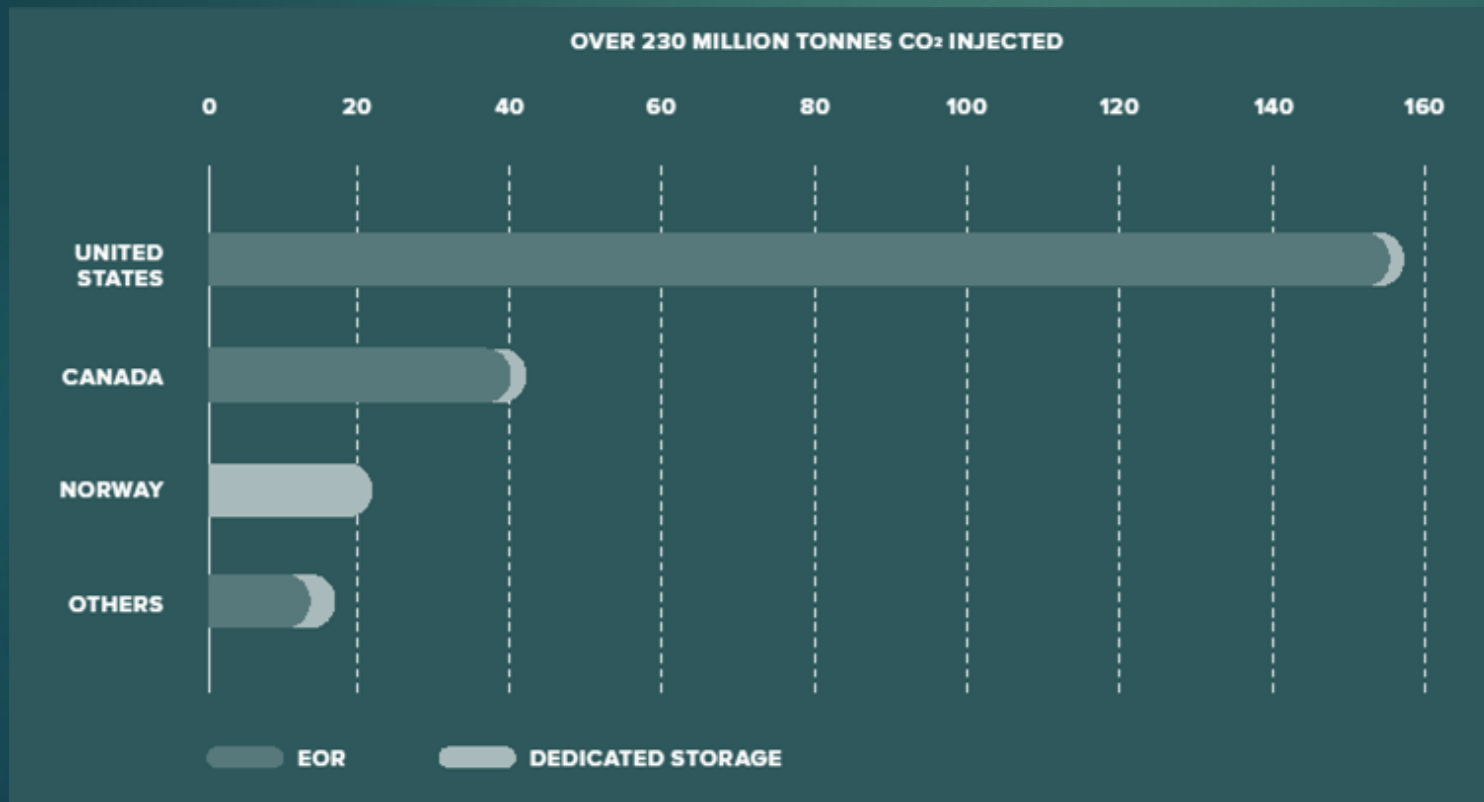
carbon issue

CO₂ capture capacity and cumulative injection



carbon issue

cumulative CO₂ injection: major countries



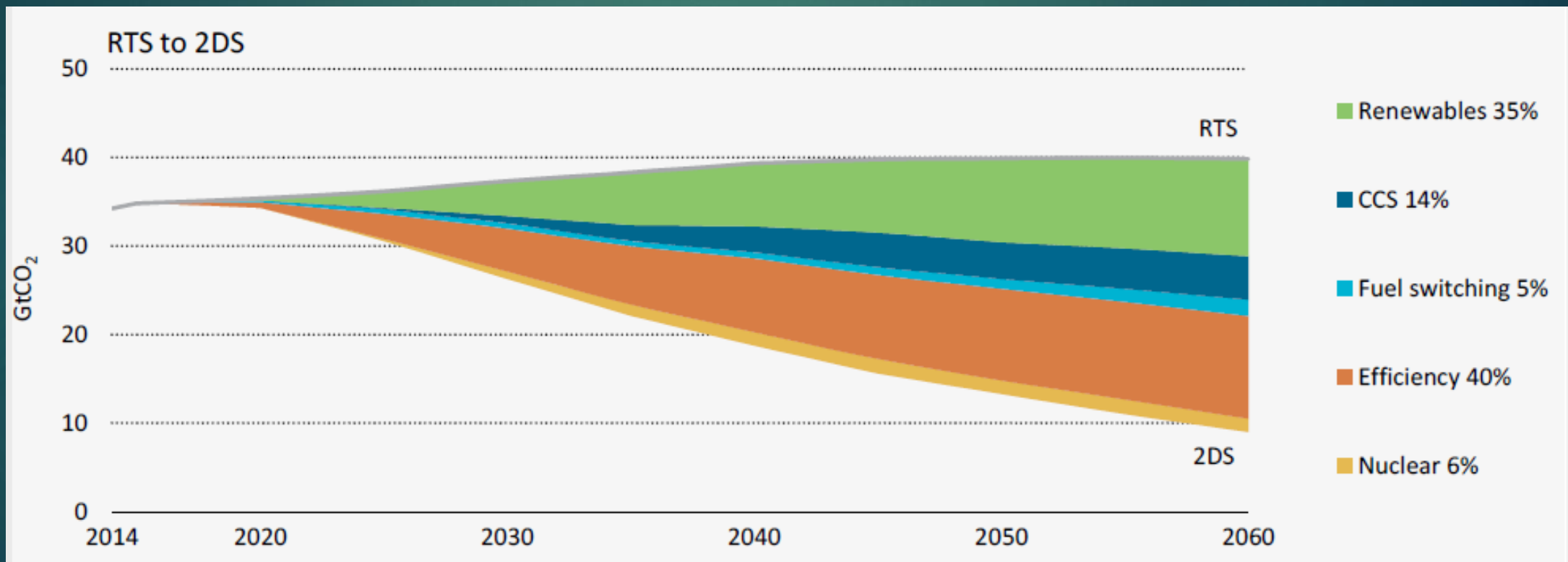
others: include Algeria, Brazil, China, Saudi Arabia, UAE, Australia, Germany, France

carbon issue

sector contribution to emissions reduction

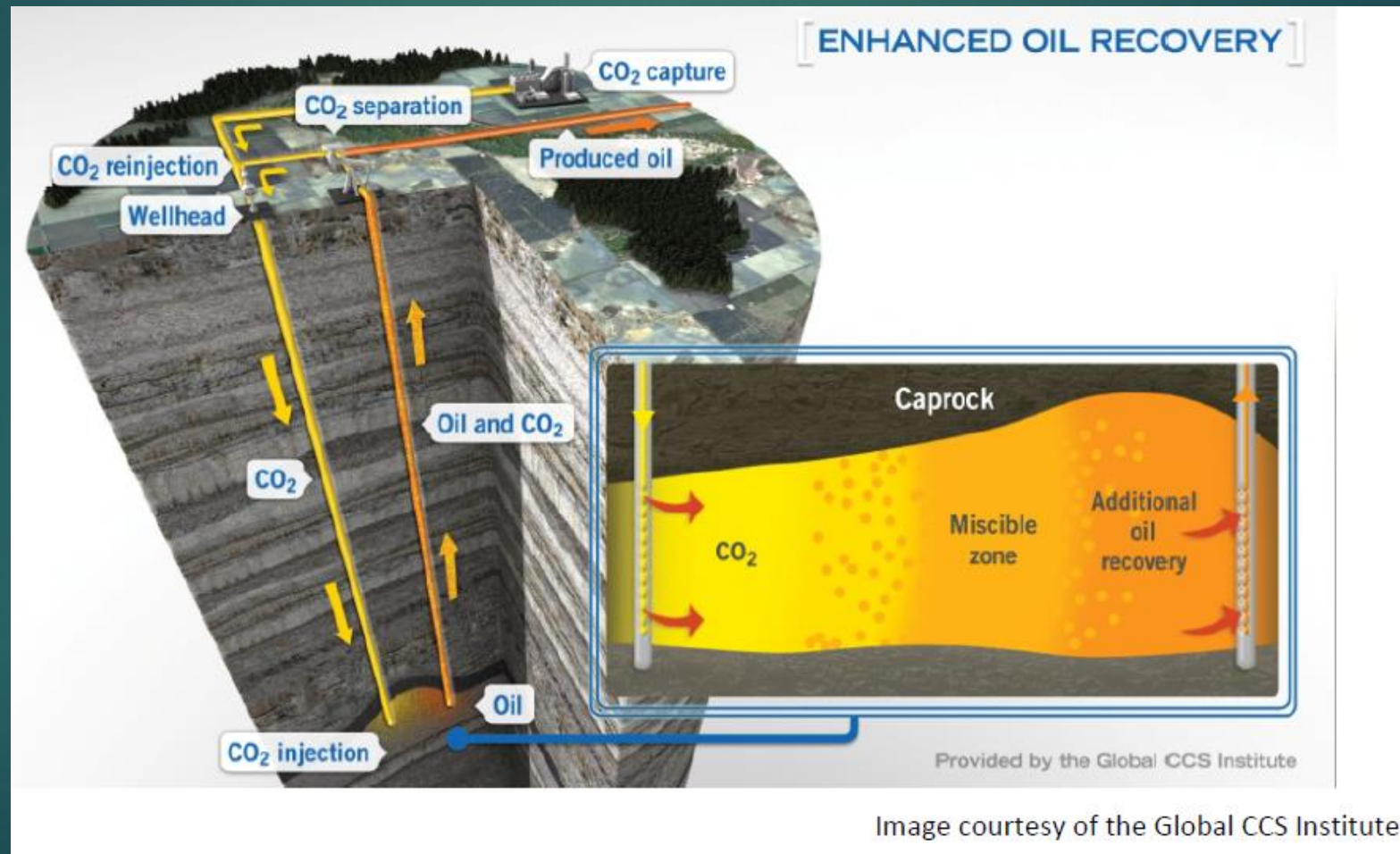
reference technology scenario (RTS)

2°C scenario (2DS)



CO₂-EOR

CO₂ supply and geosequestration



CO₂-EOR

CO₂ geosequestration mechanisms

