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Carbon Markets in a <2 °C World.

Will There Be Room for International Carbon Trading in 2050?

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Research Question

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If we take the Paris Agreement seriously and implement it accordingly (well below 2 °C / efforts for 1.5 °C):

Will there be room left for international transfer of mitigation results among Parties in 2050?

- Focus of the study is on trading among parties.
- Study does not look into how to get onto the 1.5 / 2 °C pathway, but simply assumes we are there in 2050.

Conditions for Carbon Trading

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Two necessary conditions apply:

- **Physical Condition:**
  There is still untapped mitigation potential available in 2050
- **Economic Condition:**
  There are significant mitigation cost differentials across the globe

Methods and Material

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- We have assessed both conditions based on a comparative scenario assessment of 4 detailed long-term scenarios
- Results were cross-checked with data from the IPCC Scenario Database
- A series of sectoral roadmaps were consulted to fill in the gaps

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Overview and comparison of the four scenarios considered

	2DS	2°C	Energy [R]evolution	Advanced Energy [R]evolution
Publisher	International Energy Agency (IEA)	Joint Research Centre (JRC)	Greenpeace et al.	Greenpeace et al.
Model used	ETP model	POLES	Mesap/PlaNet	Mesap/PlaNet
Regional Resolution	28 to 39 countries and world regions	39 countries and world regions	10 countries and world regions	10 countries and world regions
GHG emissions covered	Energy- and process-related CO_2	All GHG	Energy-related CO_2	Energy-related CO_2
Timeframe considered	2013-2050	2010-2050	2012-2050	2012-2050
Change in energy- and process-related global emissions in 2050 (vs. 1990)	-35% (energy and process emissions, CO_2)	-54% (energy and process emissions, GHG) / -61% (energy emissions, CO_2)	-79% (energy emissions, CO_2)	-100% (energy emissions, CO_2)

Hermwille and Samadi (2016)

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Situation in 2050 according to the four scenarios:

- Power sector has phased out CO_2 emissions in the 2°C scenario (EC/JRC), but still emits in both the other two scenarios.
- Industry emissions are dominated by cement, chemicals and steel.
- The largest share of the remaining emissions in 2050 as projected for the transport sector.

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- **No detailed data on mitigation costs available for 2050**

- **For analysis we had to revert to circumstancial evidence:**
  - strong differences in regional emissions (absolute and per capita)
  - still prevailing differences in per capita GDP
  - differences in technology diffusion

Results
Economic Condition:
Differences in regional emissions

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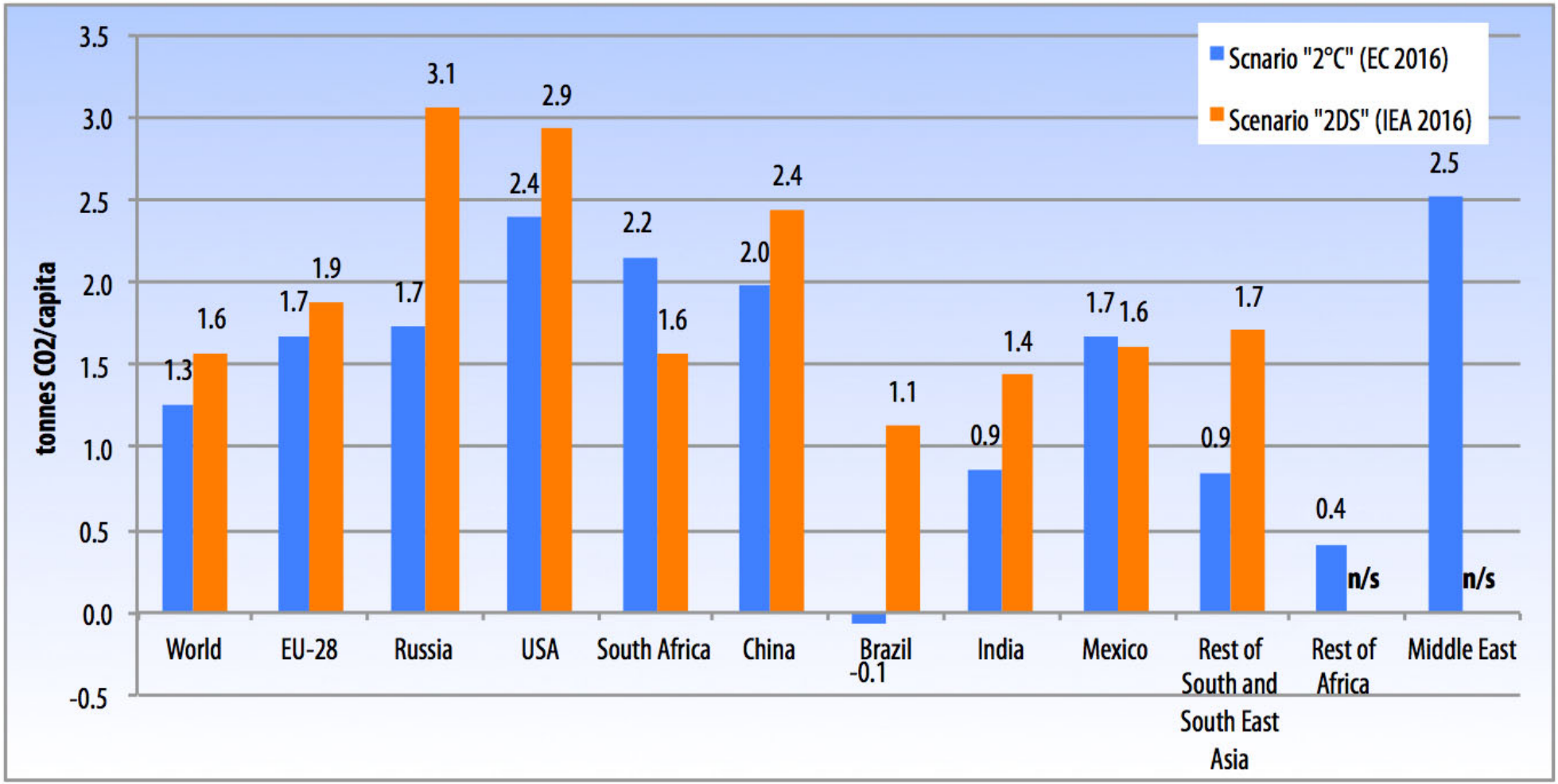
Per capita emissions in 2050 in selected world regions

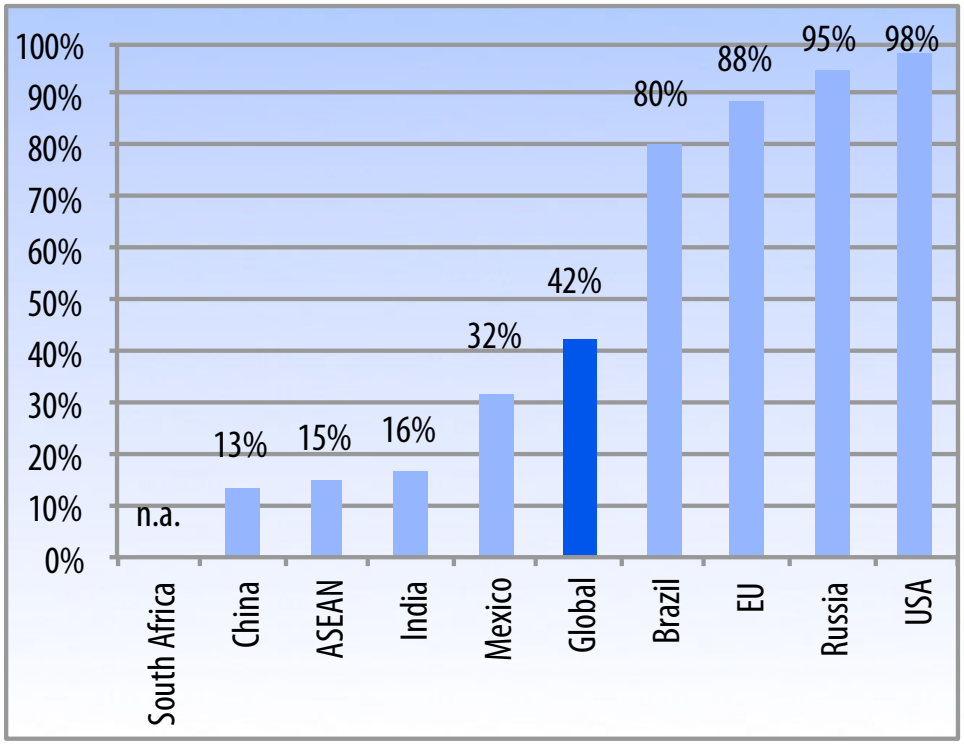


Hermwille and Samadi (2016)

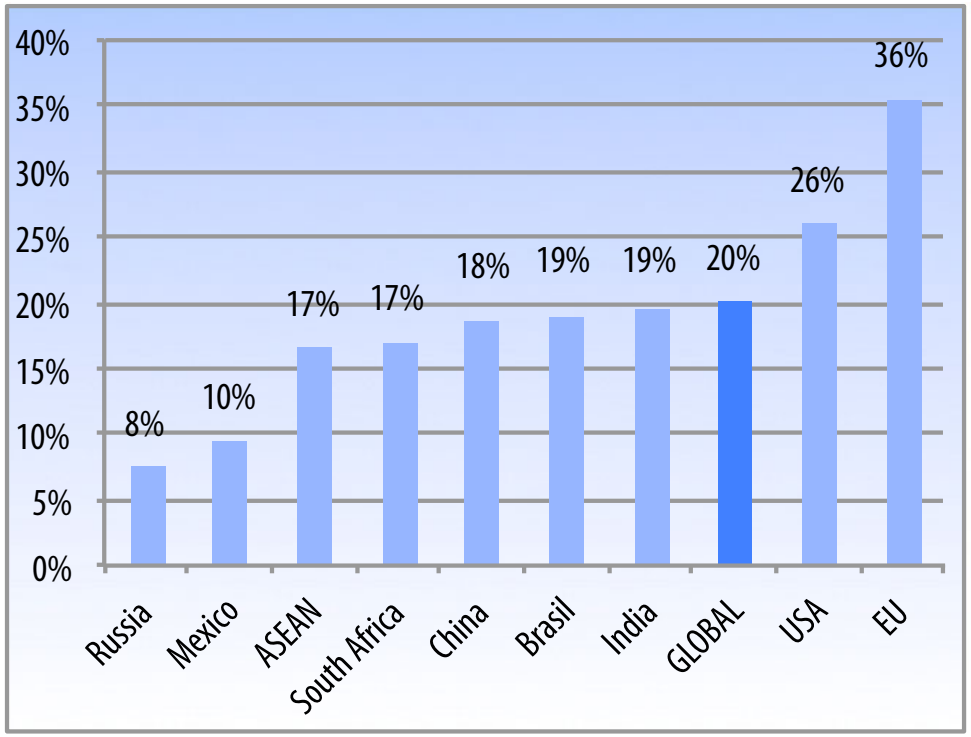
Results

Economic Condition:
Differences in technology diffusion

Share of emissions avoided in natural gas power production through CCS



Share of industrial emissions avoided through CCS



Hermwille and Samadi (2016) based on IEA (2016)

Conclusions

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- **There is no indication that or the physical or the economic condition for carbon trading may be violated by 2050.**
- **Carbon Trading will not be obsolete in 2050, even if we are on track of meeting the 1.5 °C target.**
- **Estimate the potential volume of trade would require making assumptions with respect to political dimensions (what is the fair share of each country) as well as more detailed data regarding regional/sectoral abatement costs.**

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Thank you very much for your attention

The full paper is available at:
www.carbon-mechanisms.de/en/2050

Research Question

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Parties have agreed to

"Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change"
(UNFCCC, 2016, Art. 2.1a).

Assuming we take the Paris Agreement seriously and implement it accordingly,

- **Will there be room left for international transfer of mitigation results among Parties in 2050?**

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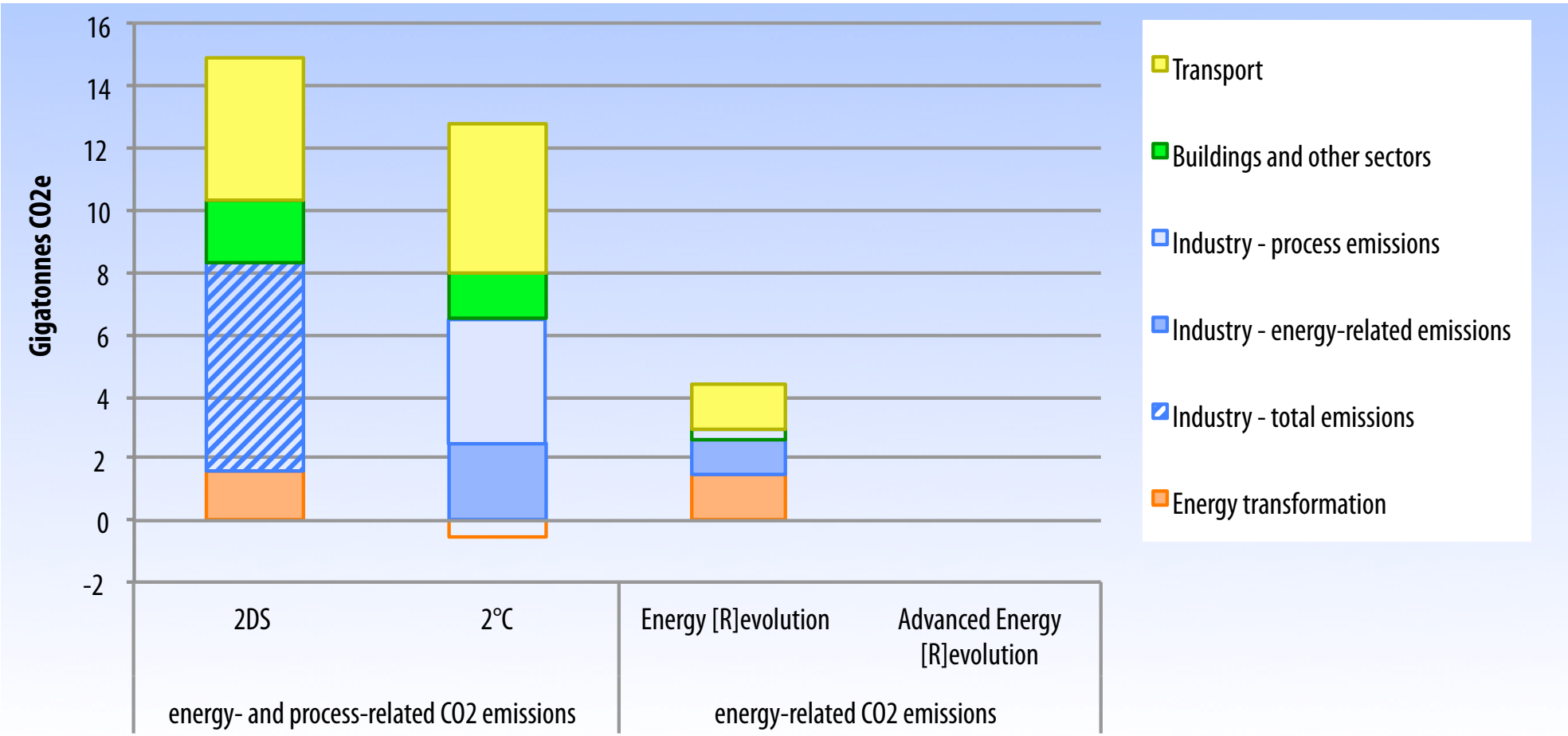
CO_2 emissions in 2050 as projected in the four scenarios analysed by sector



Hermwille and Samadi (2016)

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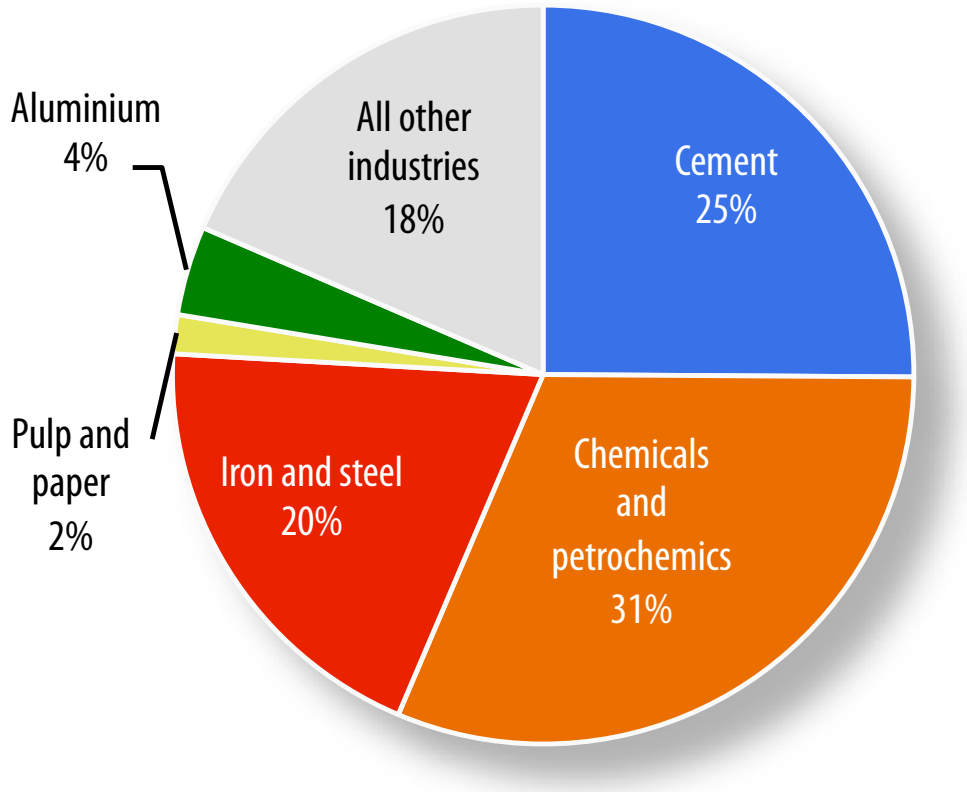
Sectoral Breakdown:

- Power sector has phased out CO2 emissions in the 2°C scenario (EC/JRC), but still emit in both the other two scenarios.
- Industry emissions are dominated by cement, chemicals and steel
- The largest share of the remaining emissions in 2050 as projected by the scenarios result from the transport sector.



Shares of sub-sectors in industrial emissions in 2050 according to the 2DS scenario