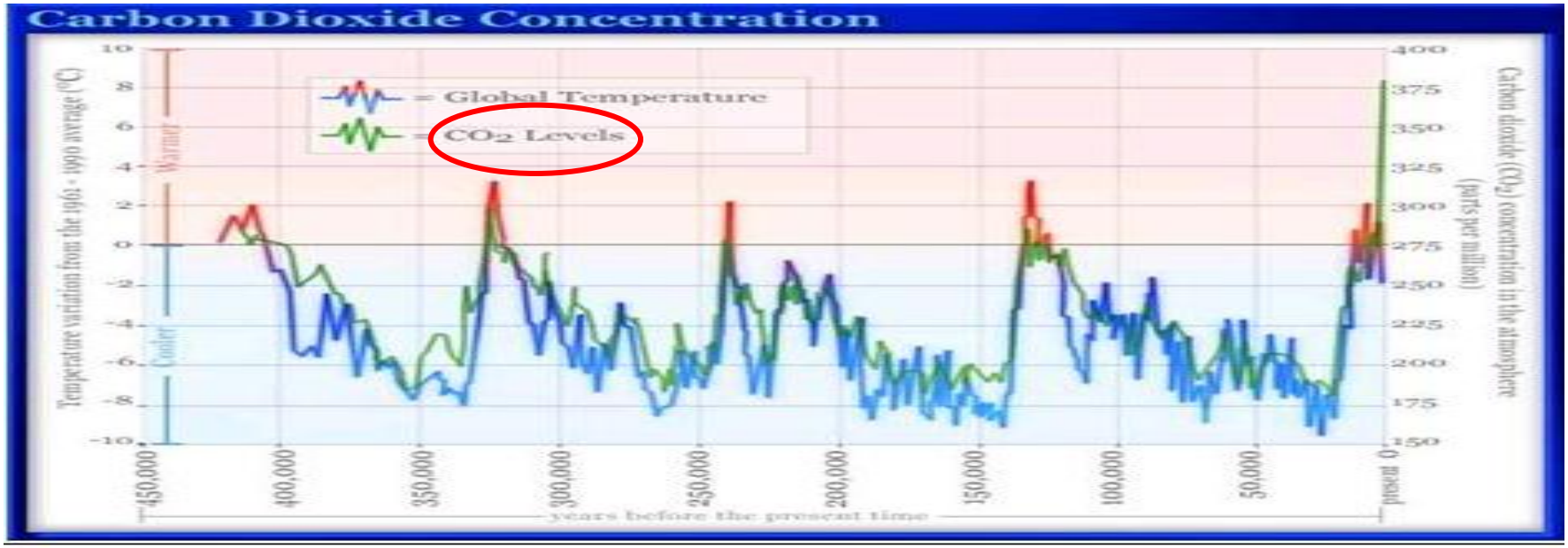
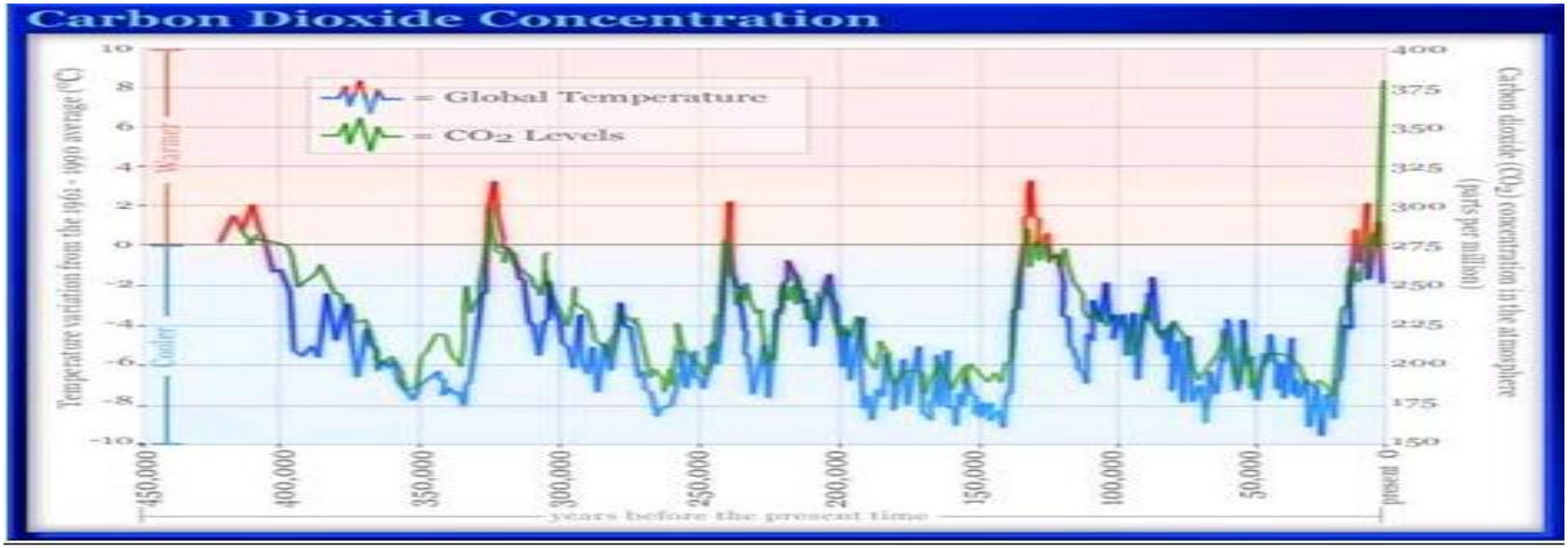
CO_2 content in atmosphere

- correlation with average atmospheric temperature



Source: Data adopted from National Oceanic & Atmospheric Administration <http://www.noaa.gov/> Accessed at: <http://www.seed.slb.com/en/scictr/watch/climate_change/causes_co2.htm>

CO_2 content in atmosphere



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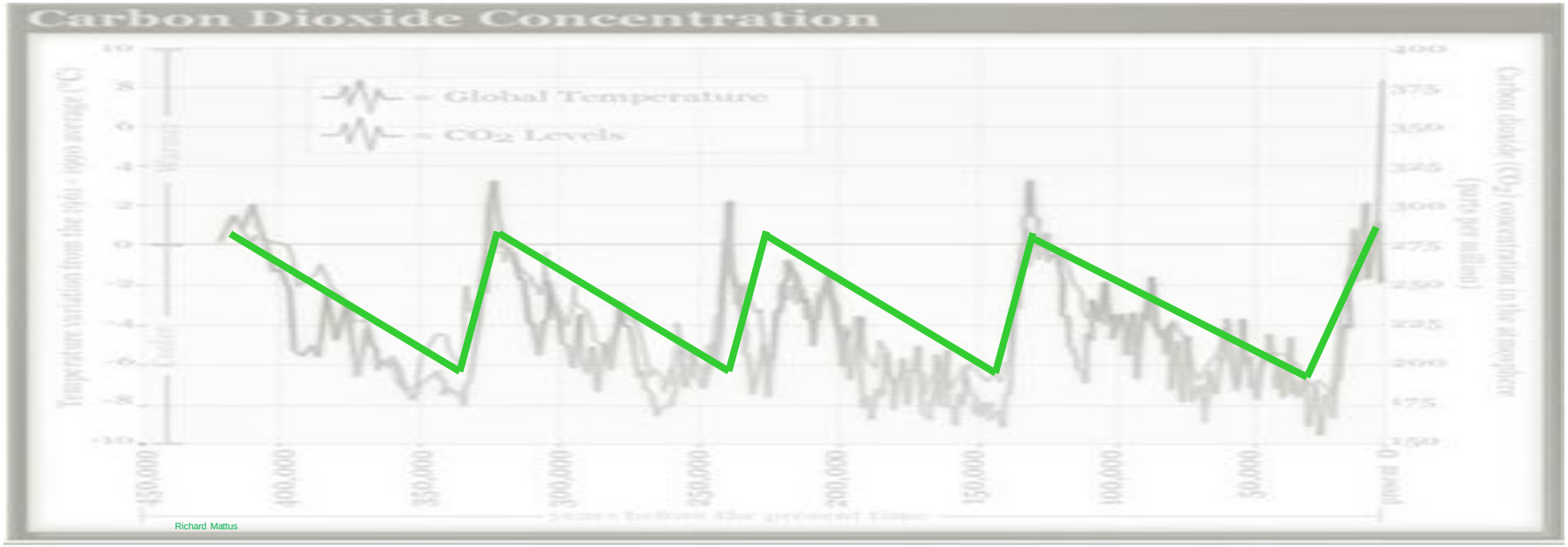

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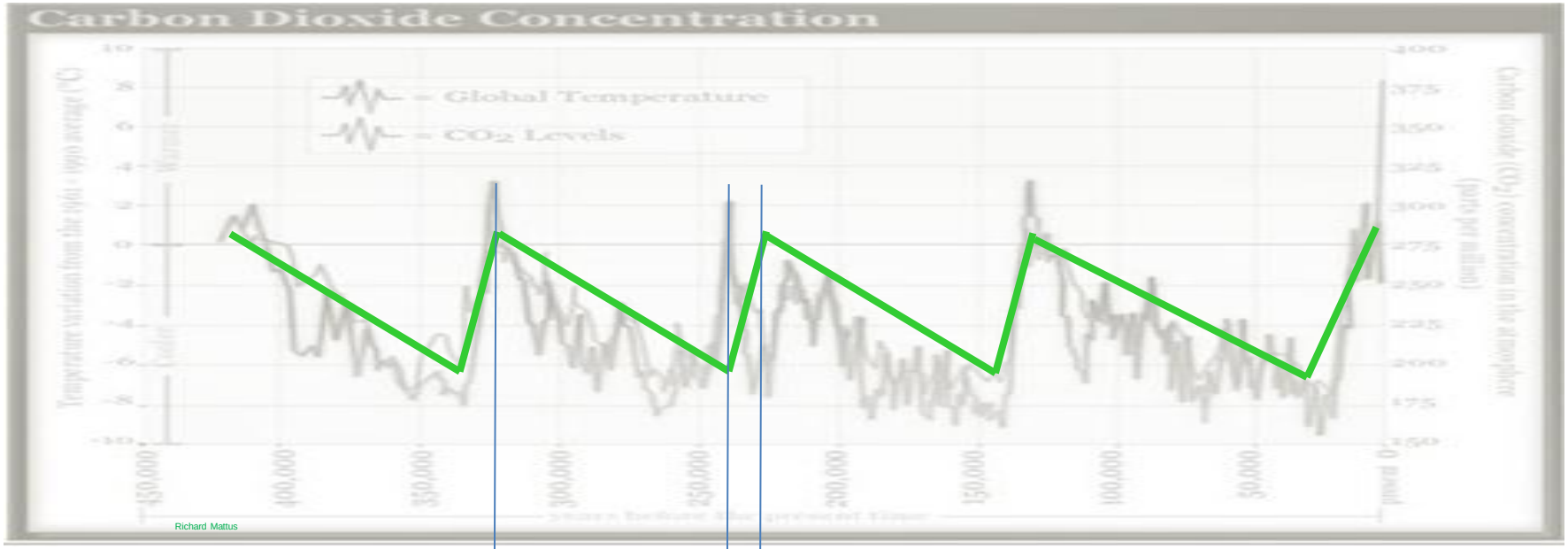

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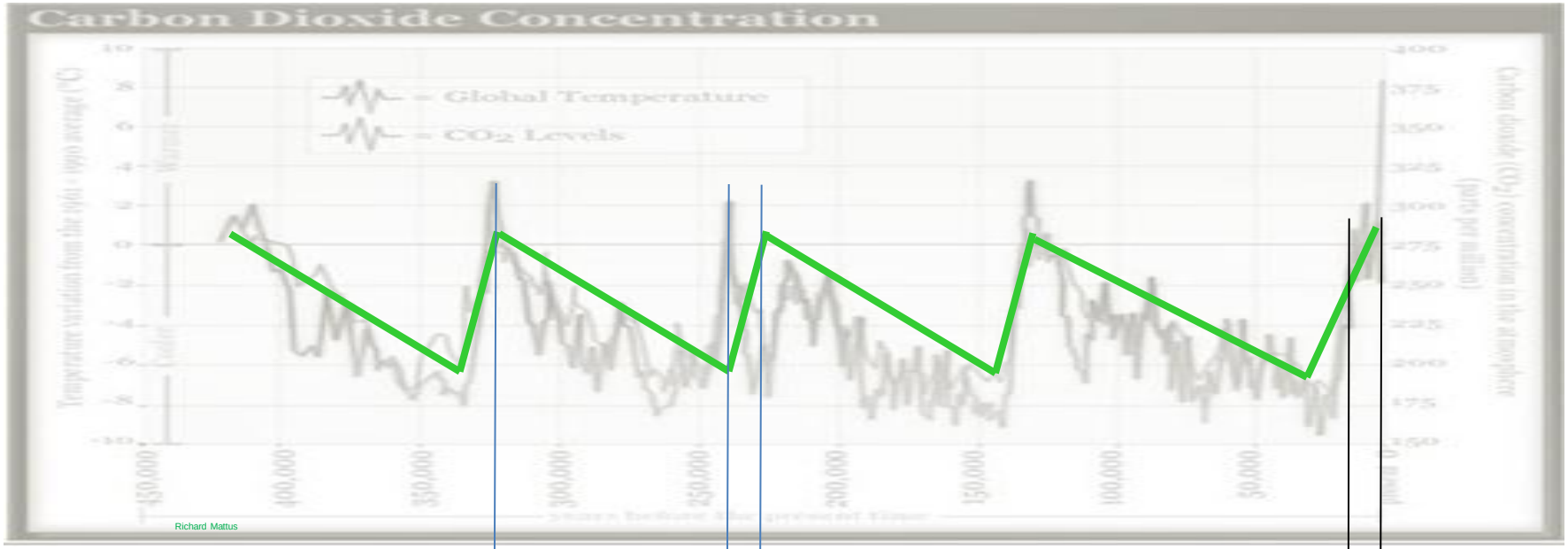
10,000 yrs

90,000 yrs

CO_2 content in atmosphere



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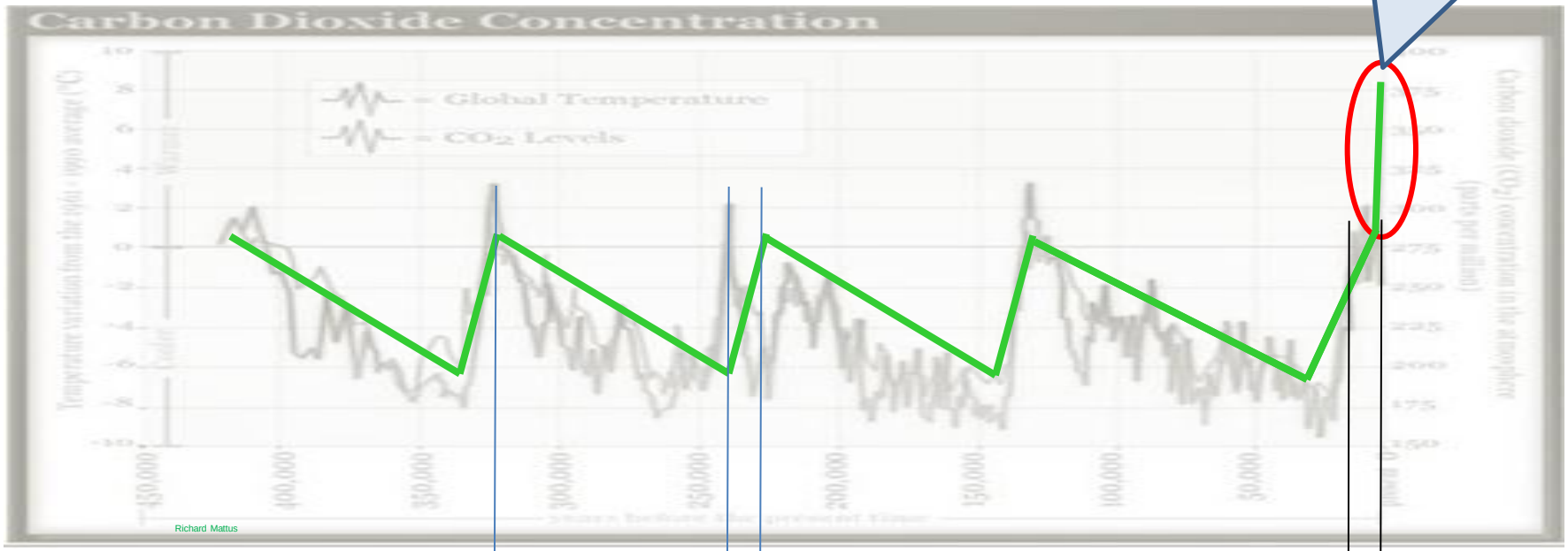
10,000 yrs

90,000 yrs

FOR REFERENCE:
History of mankind.
Start of agriculture
10,000 yrs ago

CO_2 content in atmosphere

Latest 150 yrs.
Clear link to
industrialization.



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90,000 yrs

10,000 yrs

FOR REFERENCE:
History of mankind.
Start of agriculture
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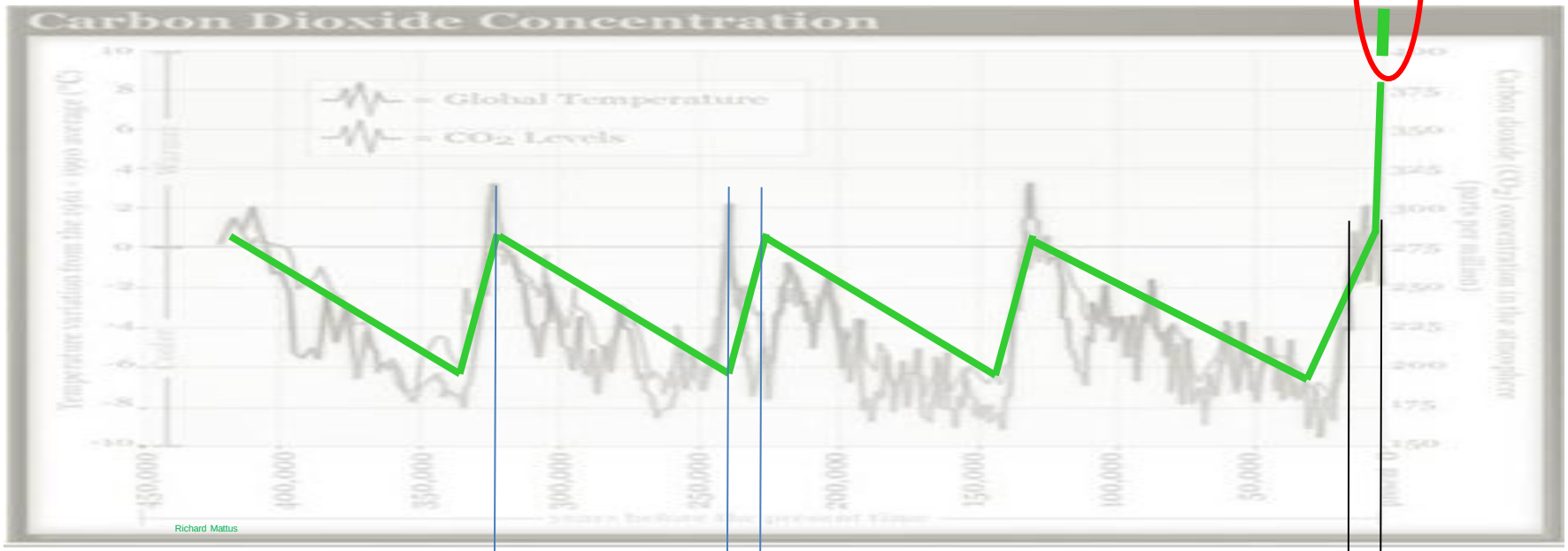
CO_2 content in atmosphere

Expected next 50 yrs.



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90,000 yrs

10,000 yrs

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History of mankind.
Start of agriculture
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Effects of global warming

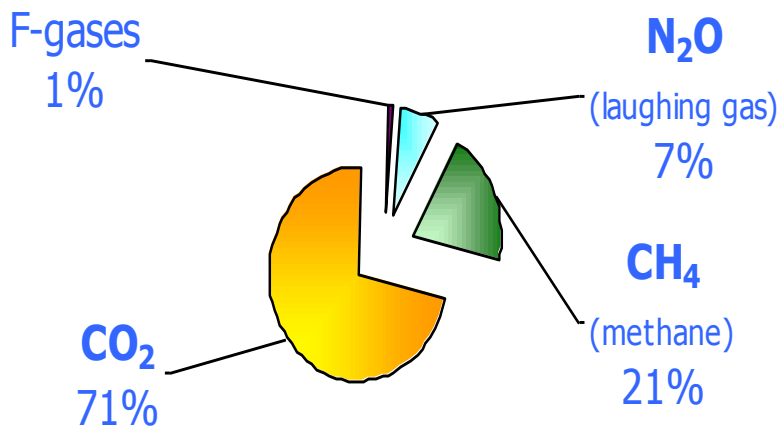
	+2 degrees	+4 degrees
Eco systems in general: Portion of known species becoming extinct	20 – 30 %	40 – 70 %
Corral reefs	Most corral reefs bleeched	Wide spread corral mortality
Rising seawater level	• Coastal cities drowned • Decreased fresh water availability (salt water intrusion)	• Same to larger extent • Same to larger extent
Food: Crop productivity	• Low latitude (e.g. Mediterranean): Decrease for some cereal. • Mid to high latitude: Increase for some cereal.	• Low latitude: Decrease for all cereal. • Mid to high latitude: SuDecrease in some regions.

Source: UNEP report "Climate in Peril, A popular guide to the latest IPCC reports" 2009
Supported by ……..

(ANTHROPOGENIC)

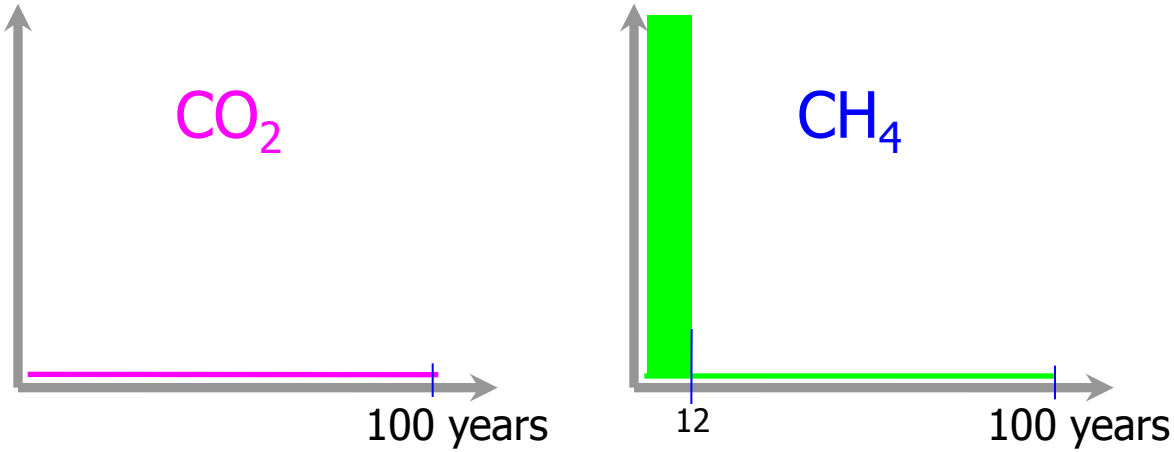
Global GHG contributions 2004

- excluding CO_2 addition from deforestation



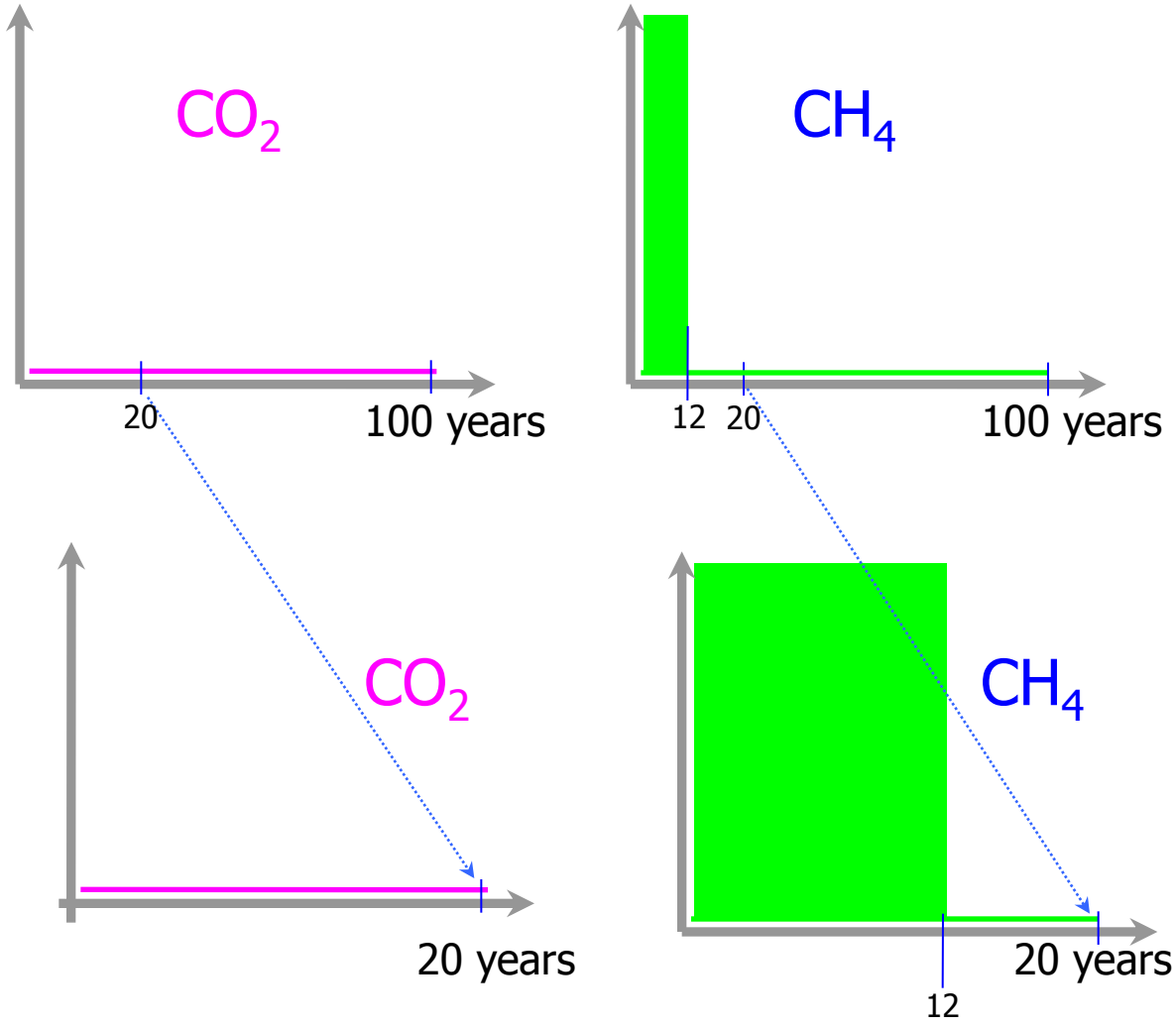
Numbers of IPCC	CO_2	CH_4
Life time in atmosphere (years)	20 000 – 50 000	12
Global Warming Power (compared on 100 year basis)	1	34 ~~25~~ ~~23~~ (21 in the first Kyoto Period)

Global Warming Impact; CO_2 vs CH_4



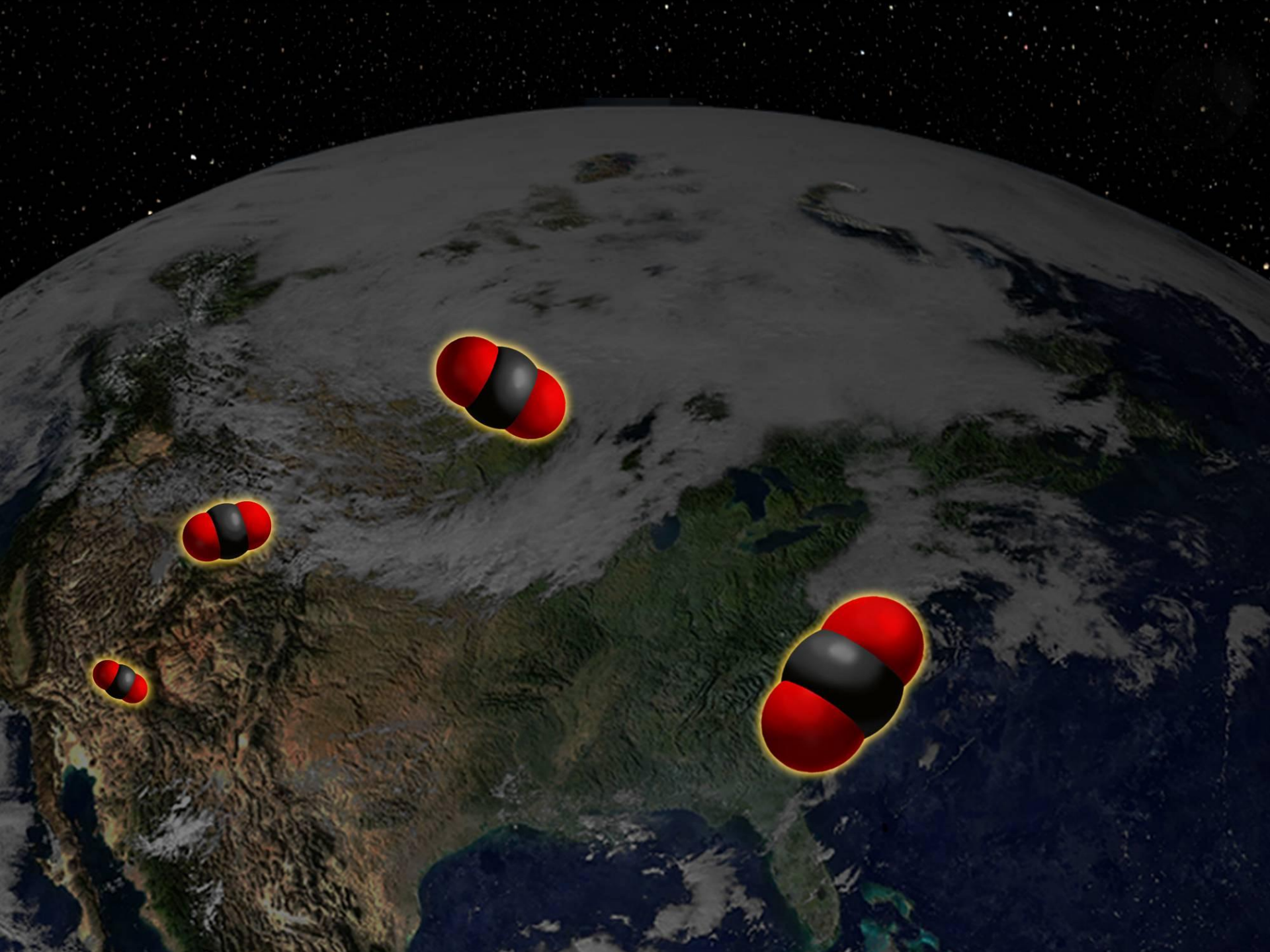
Based on 100 years comparison: 34 times

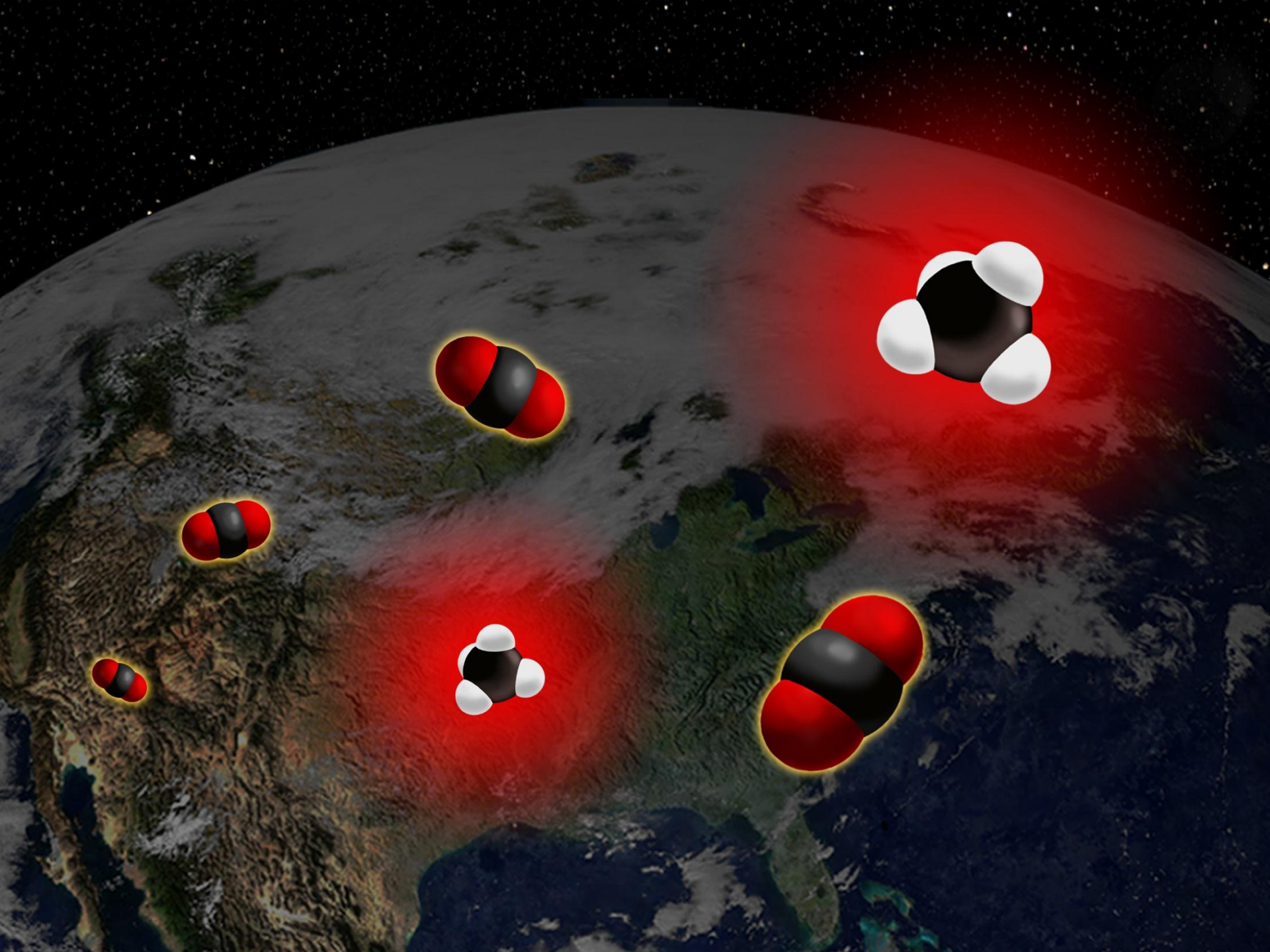
Global Warming Impact; CO_2 vs CH_4



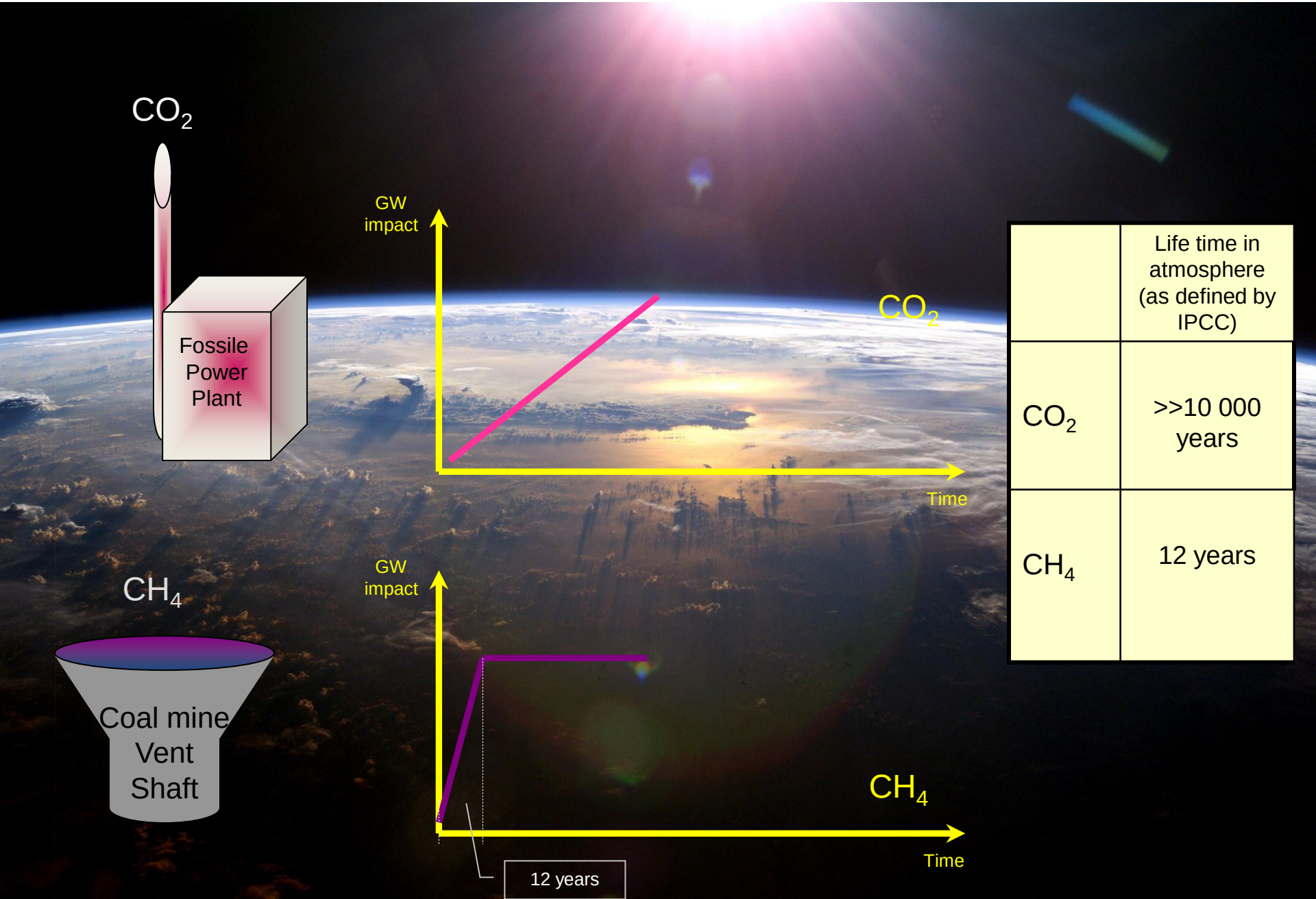
Based on 100 years comparison: 34 times

Based on 20 years comparison: 86 times



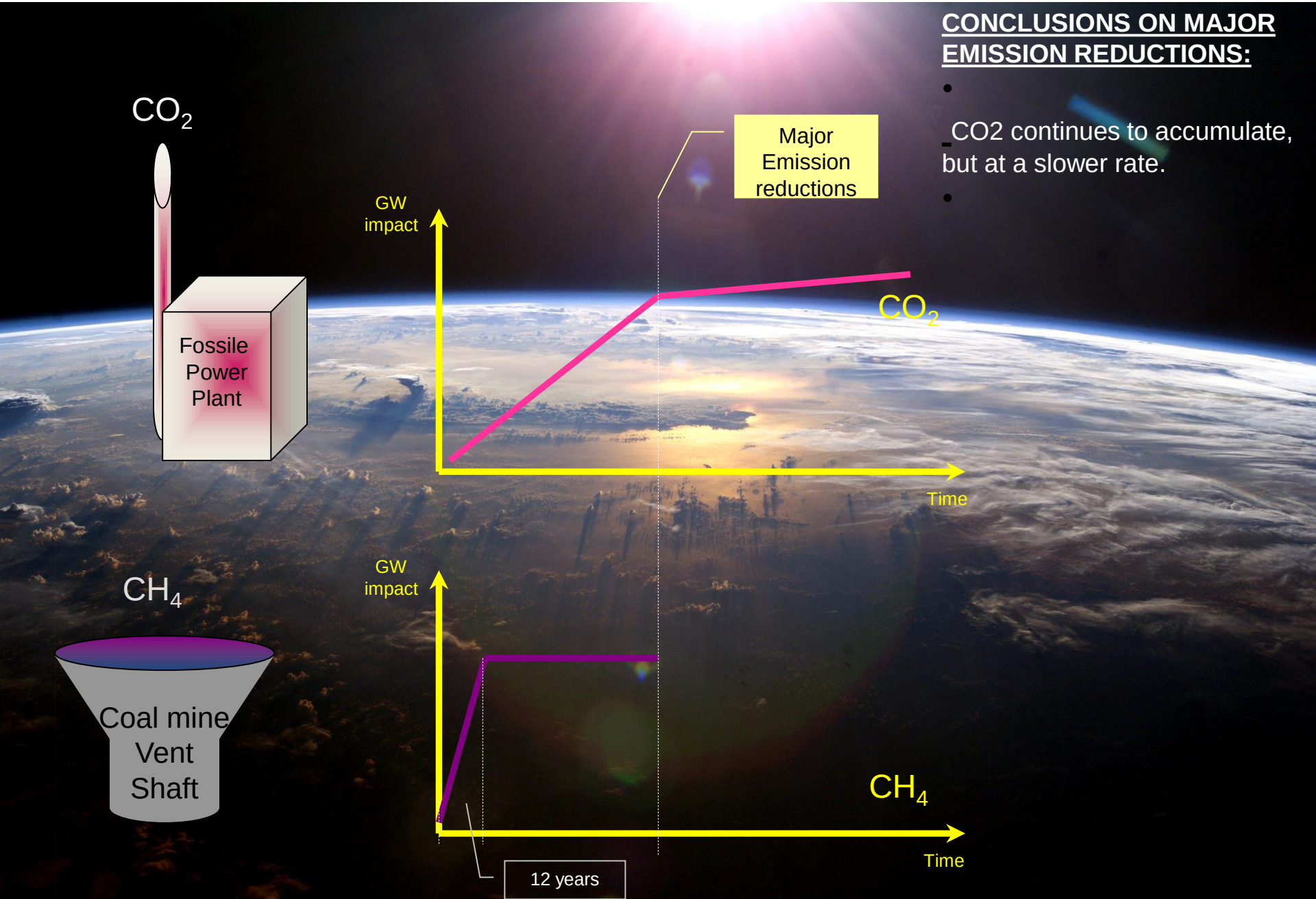


Green House Gas METHANE - in comparison with CO_2



	Life time in atmosphere (as defined by IPCC)
CO_2	>>10 000 years
CH_4	12 years

Green House Gas METHANE - in comparison with CO_2



CONCLUSIONS ON MAJOR EMISSION REDUCTIONS:

- _CO2 continues to accumulate, but at a slower rate.
-

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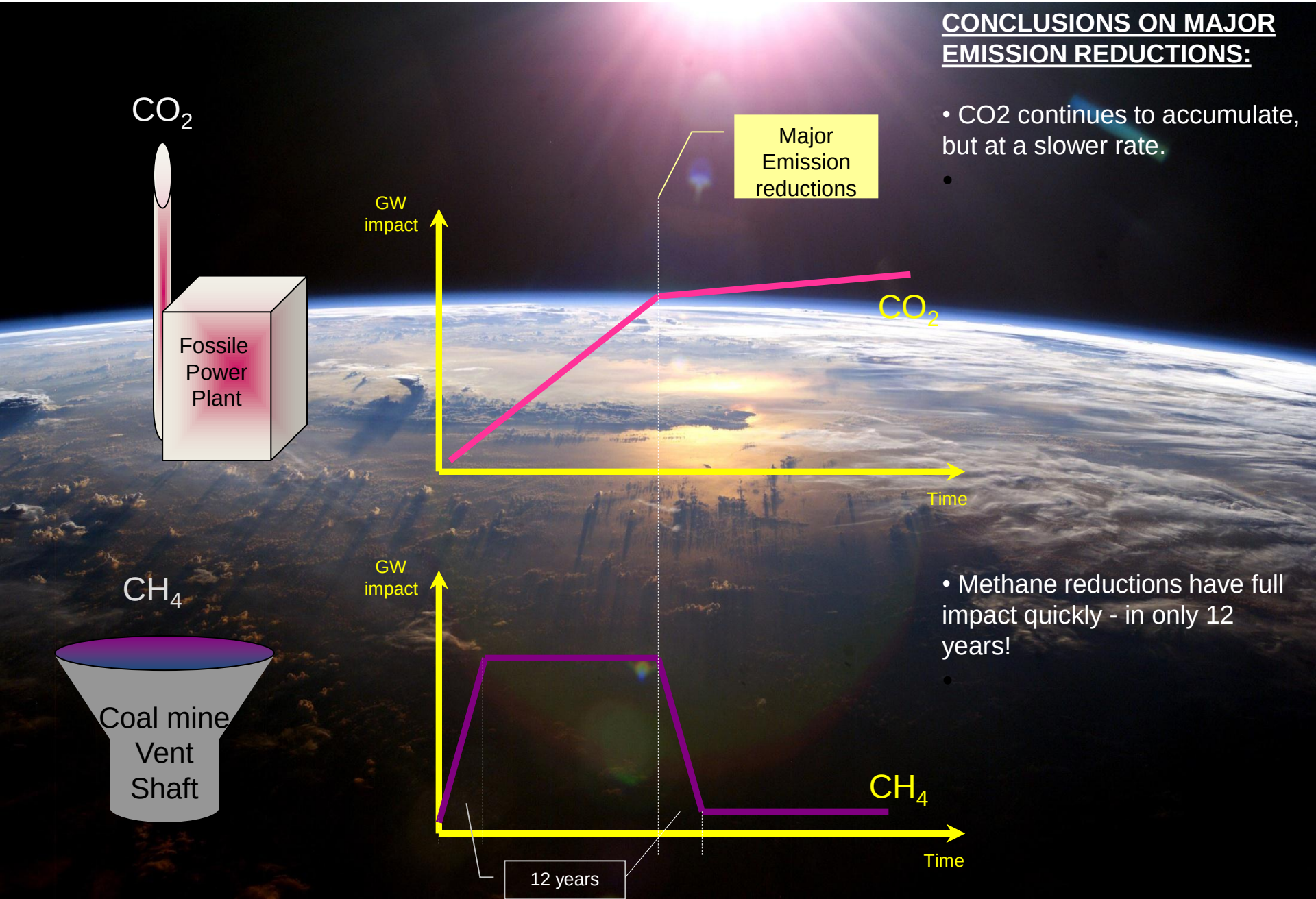


CONCLUSIONS ON MAJOR EMISSION REDUCTIONS:

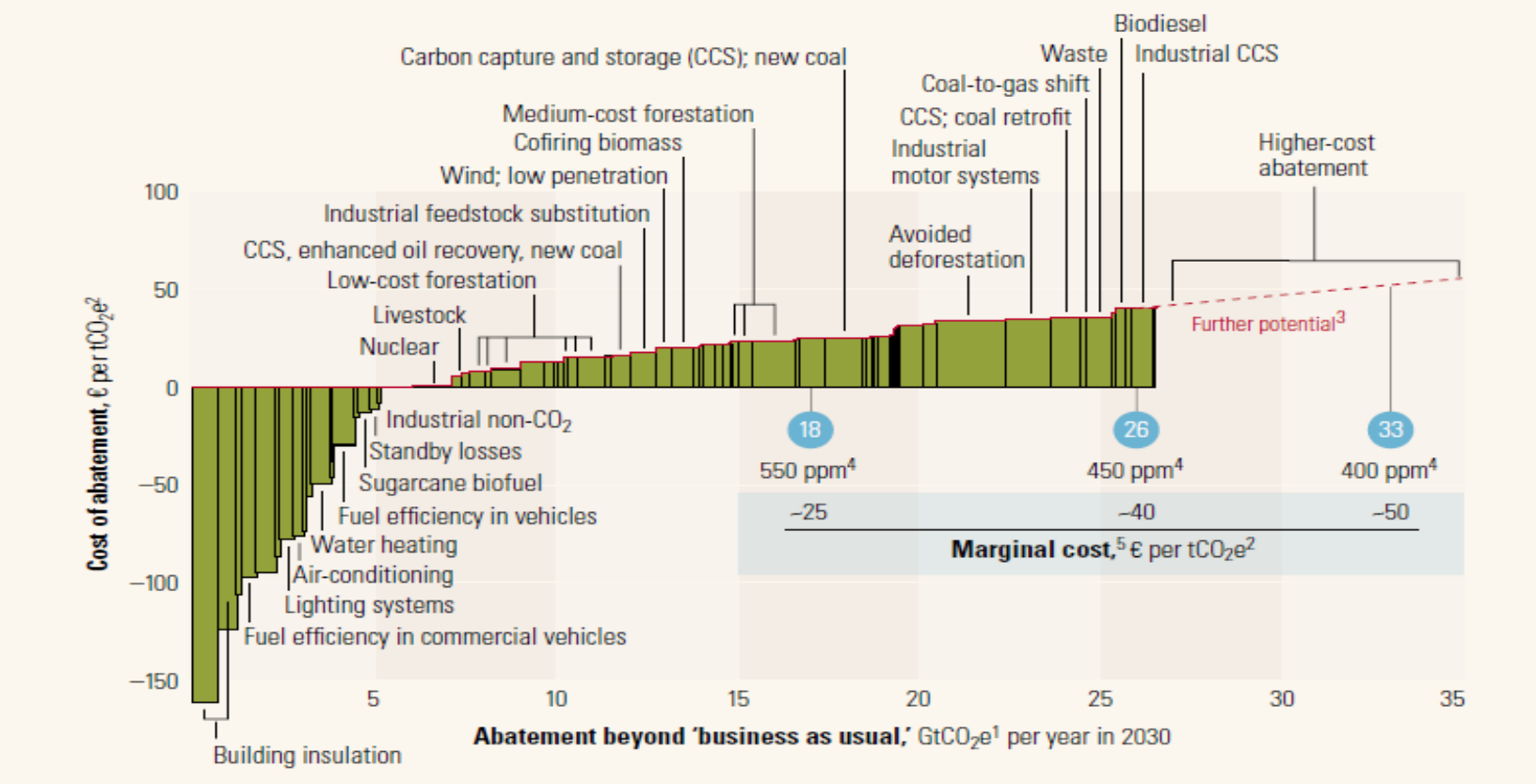
- CO2 continues to accumulate, but at a slower rate.
-

- Methane reductions have full impact quickly - in only 12 years!
-

Quick reference to:

McKinsey study of GHG abatement costs

Estimated costs per ton CO2e (over 25 years) to achieve increasing reductions (GtCO2e) and resulting levels of atmospheric CO2.



• Example; To achieve atmospheric CO2 level of 450 ppm, a total of 26 GtCO2e needs to be abated, including all of the actions noted in the graph – i.e. up to and including Industrial CCS.

• The items with negative costs are profitable in their own merits (energy efficiency over 25 years).

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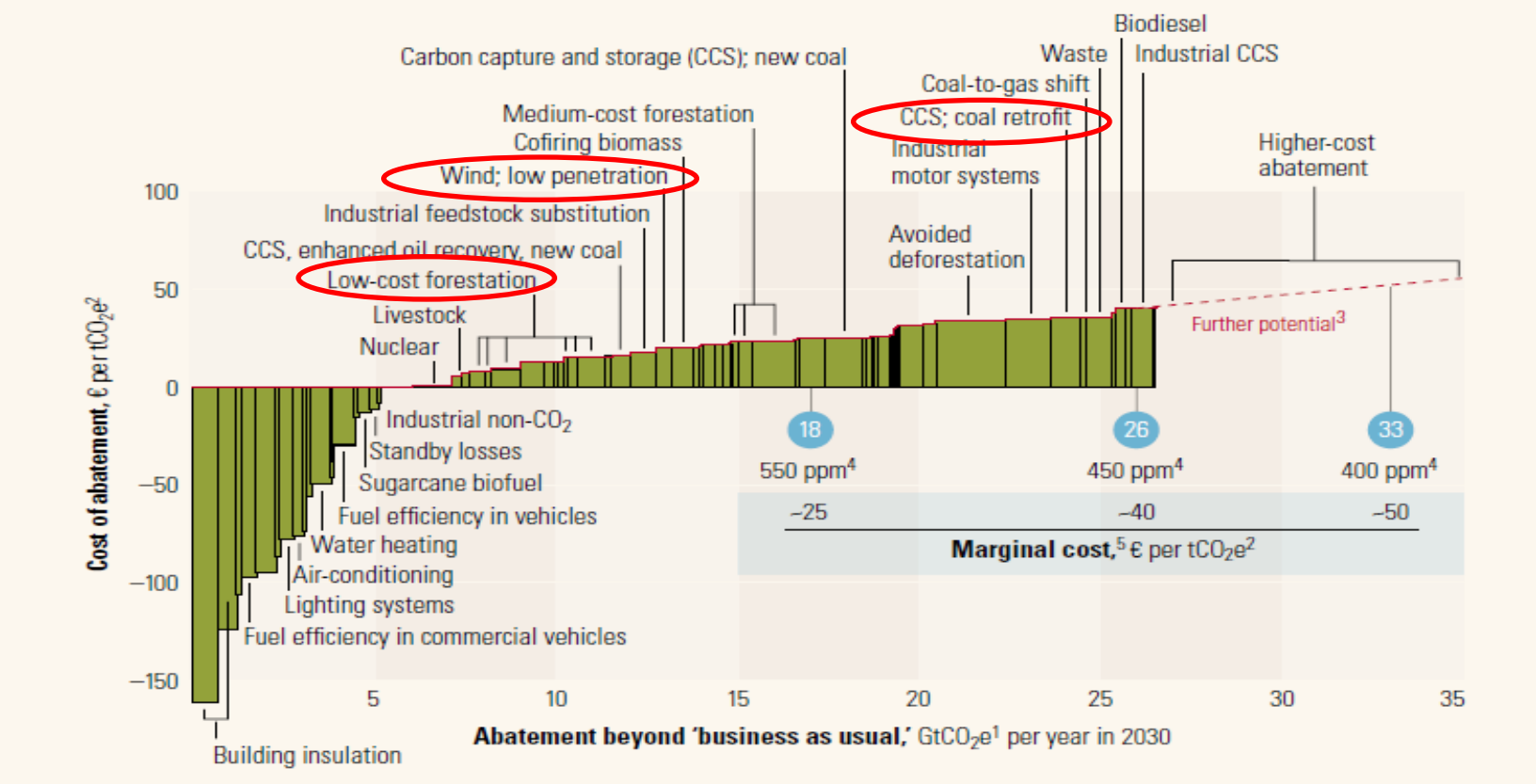

EXAMPLES

- Low cost forestation is EUR 10 – 15 /t CO2e
- Low penetration Wind Power is EUR ~20 /t CO2e
- CCS (Carbon Capture & Storage) applied as retrofit on existing coal fired power plants is EUR ~35 /t CO2e

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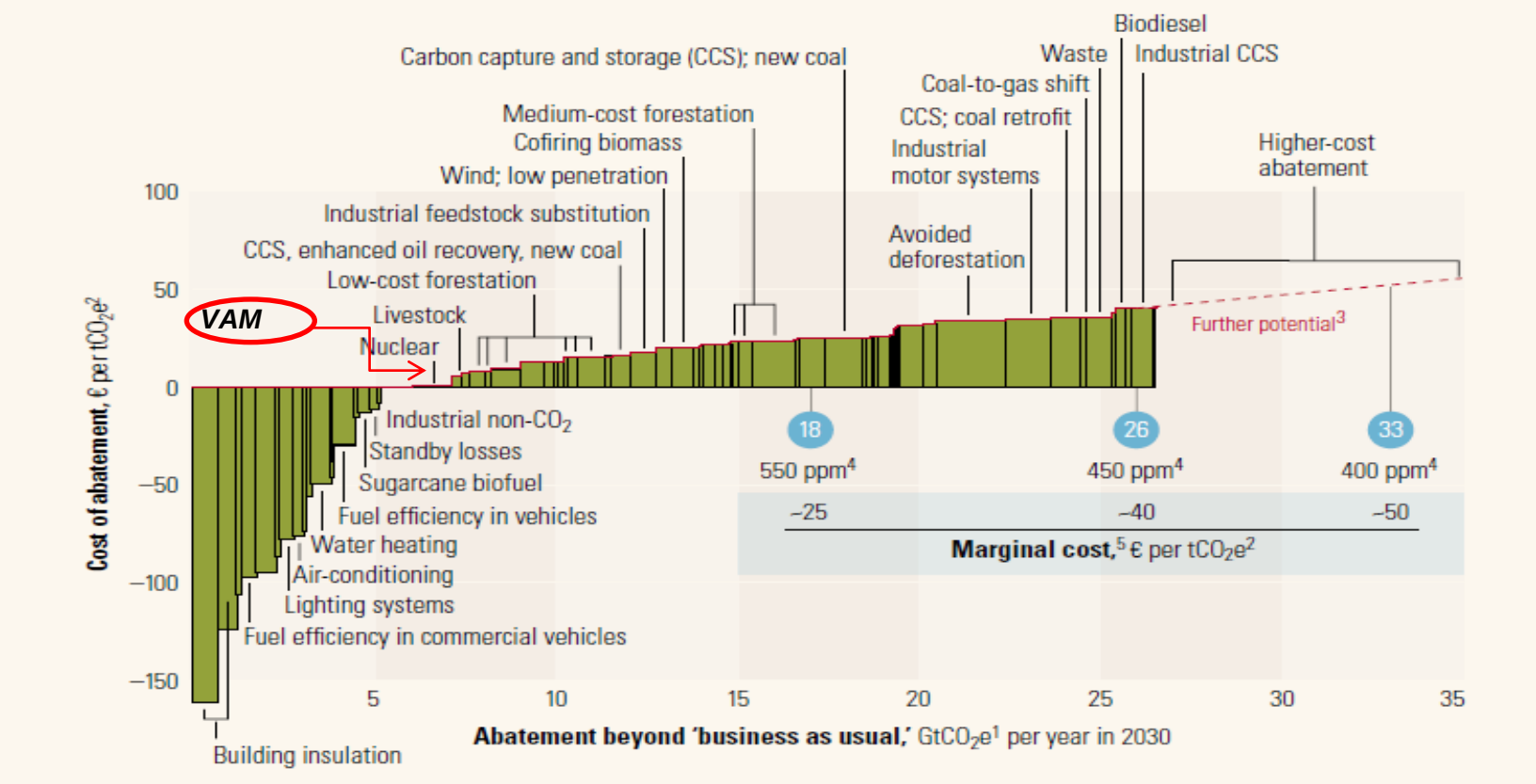
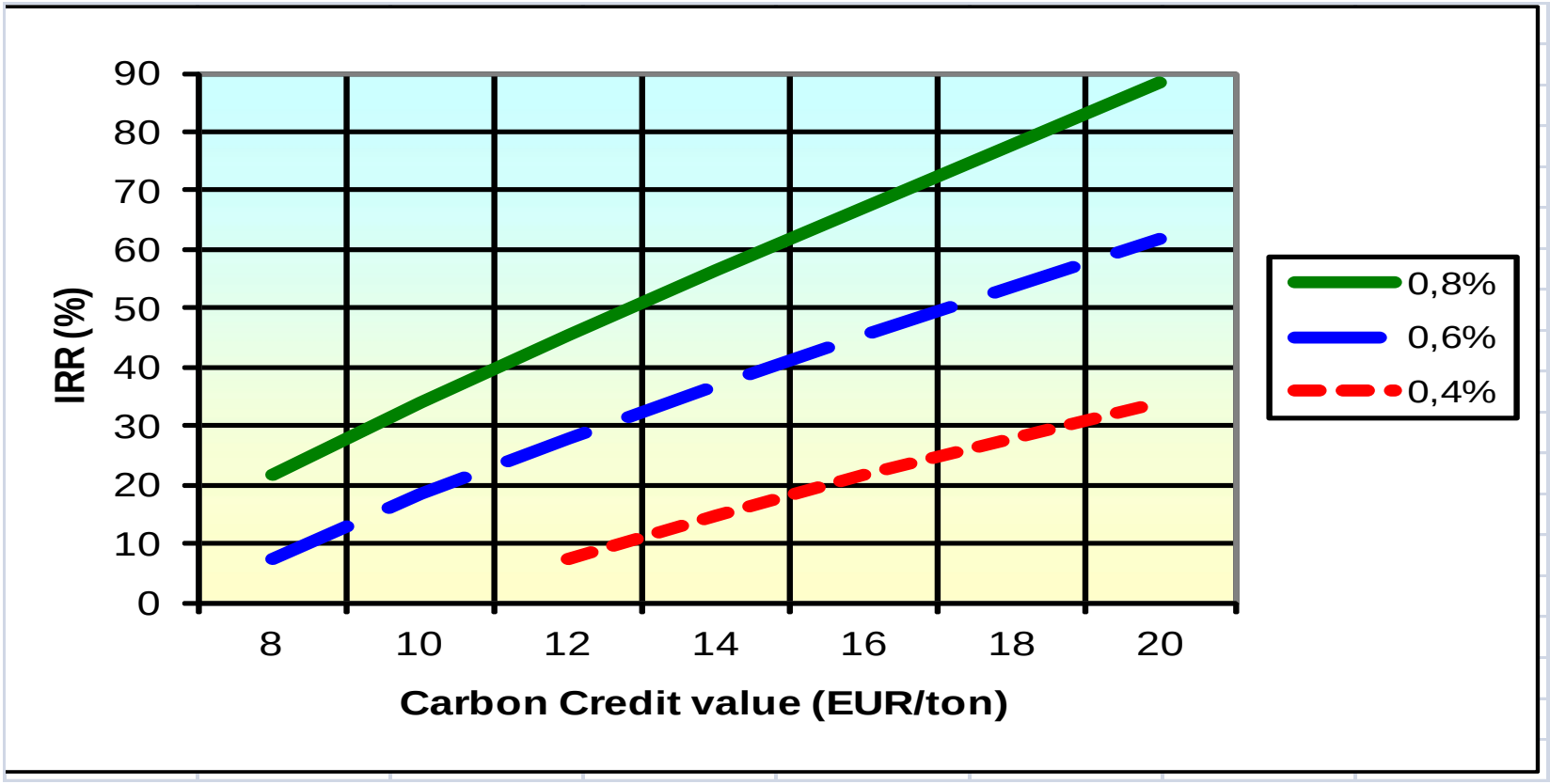


In this comparison, <u>VAM processing as a pure cost</u> of abatement would come out at EUR 3-4 /t CO_{2e}.

VAM processing is a cost efficient way to reduce large volumes of GHG emissions in single sources of emission.

VAM project economics indications



For reasonable/good pay back:

- VAM concentrations should be min ½ percent
- Carbon Credits should be more than EUR 10/t CO_{2e}

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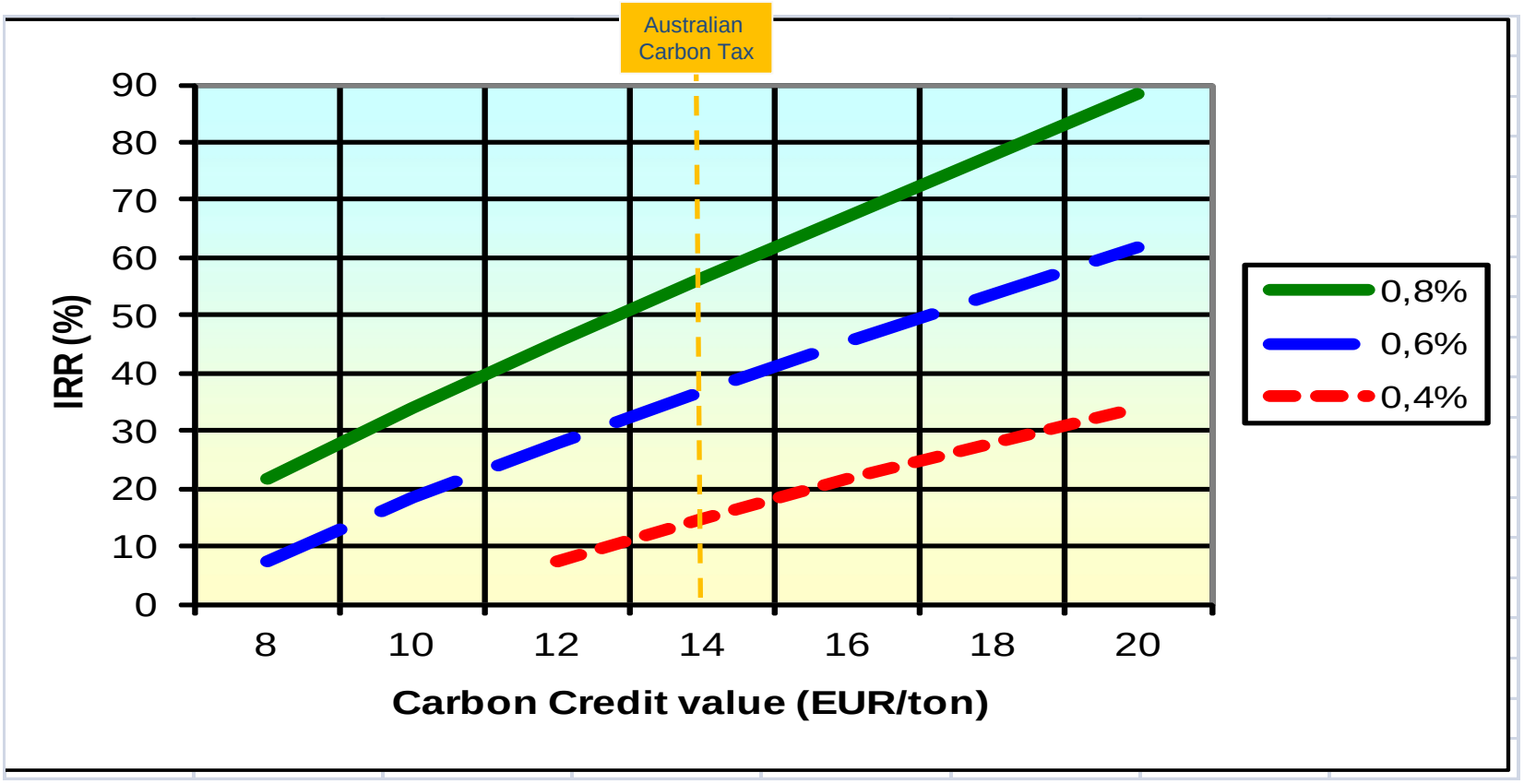

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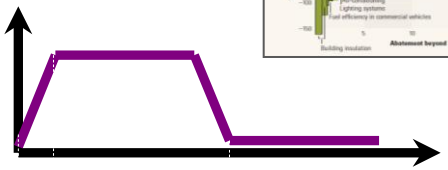

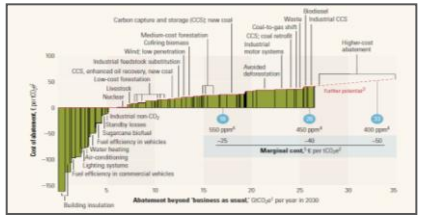

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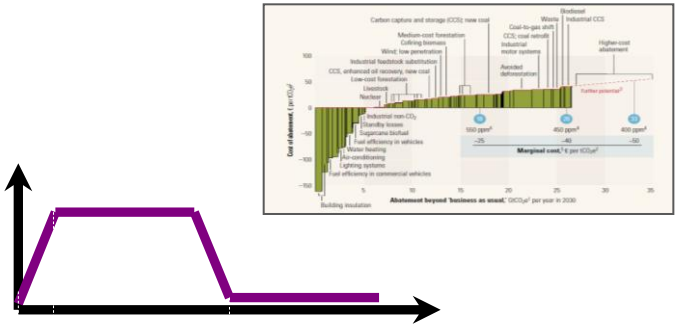

- Drivers such as sufficient value of carbon credits can make projects very attractive to investors.