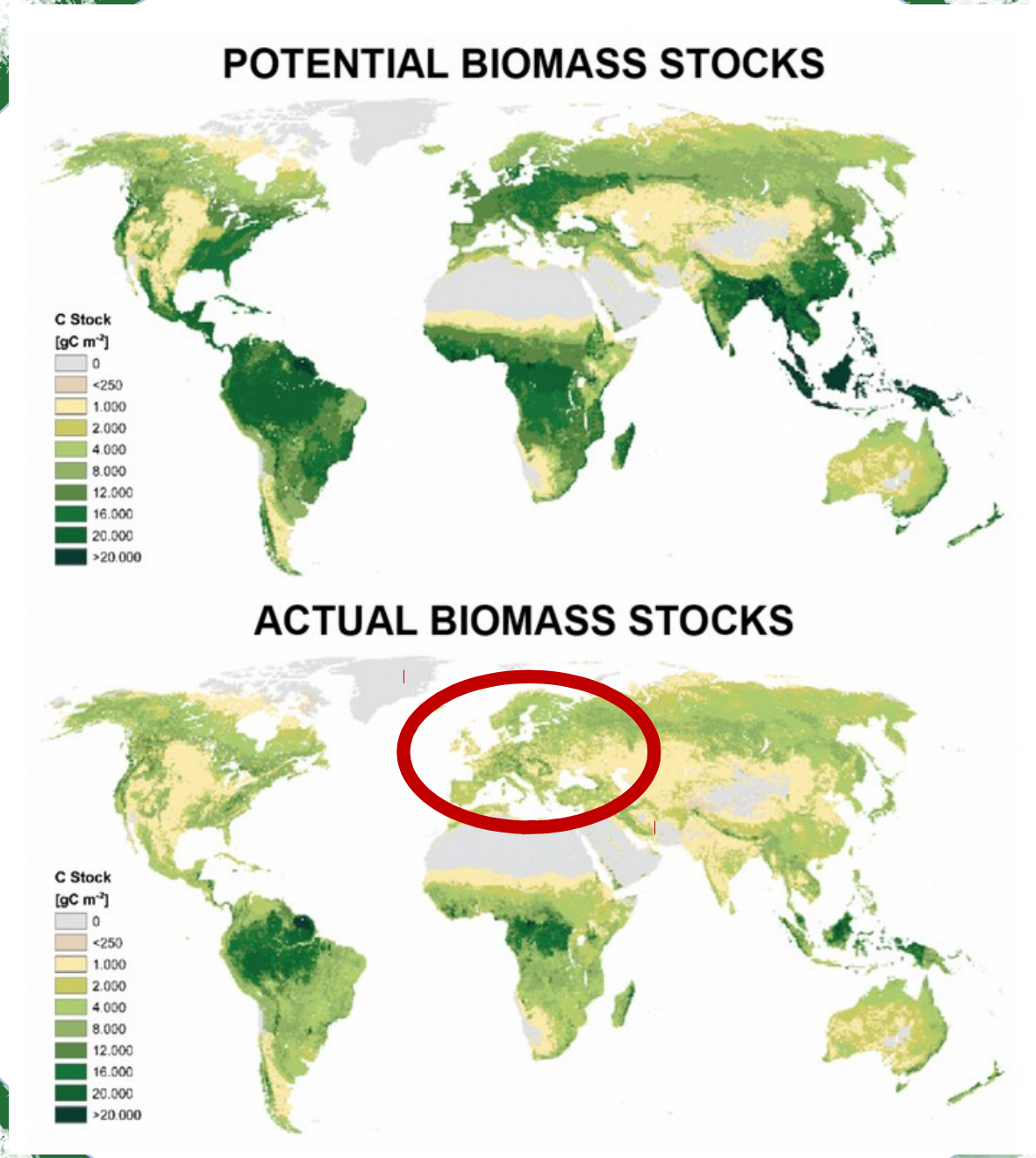
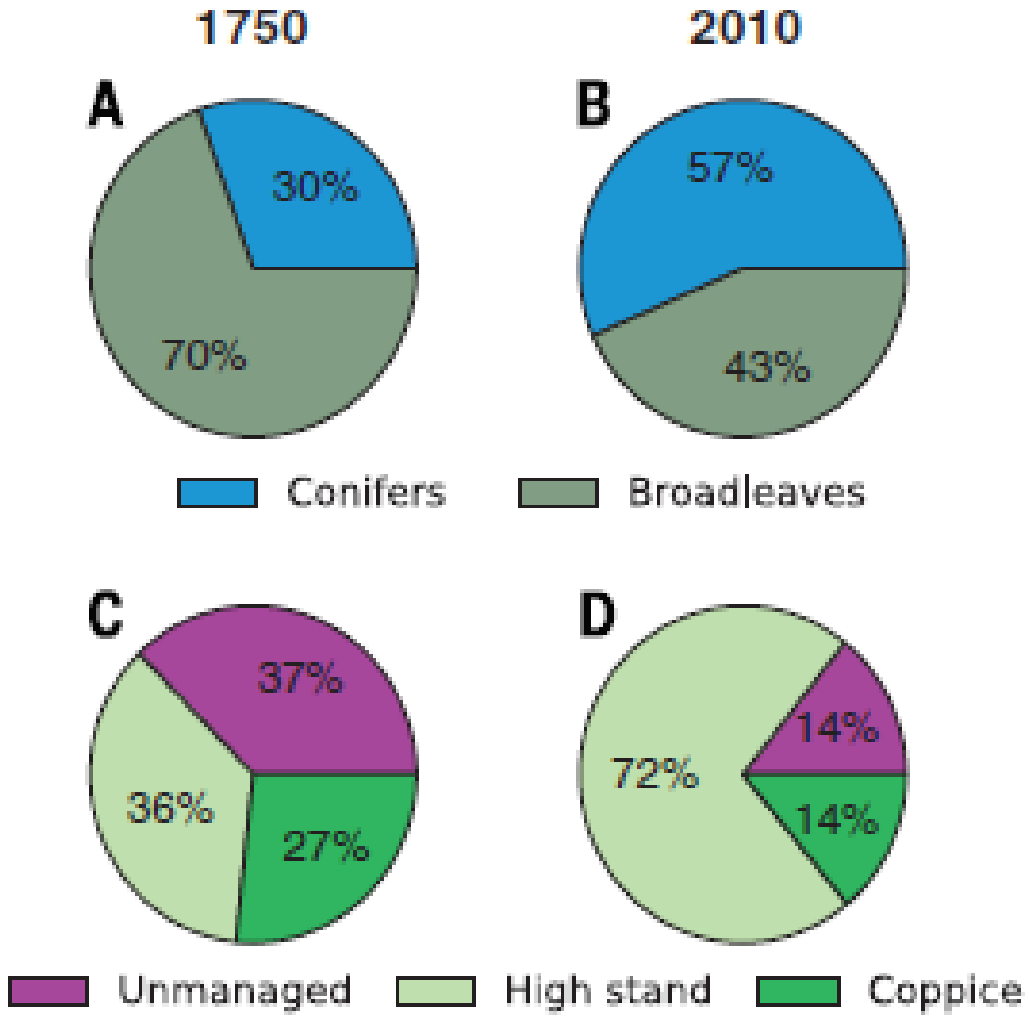

POTENTIAL BIOMASS STOCKS
C Stock
[gC m⁻²]
0
<250
1.000
2.000
4.000
8.000
12.000
16.000
20.000
>20.000
ACTUAL BIOMASS STOCKS
C Stock
[gC m⁻²]
0
<250
1.000
2.000
4.000
8.000
12.000
16.000
20.000
>20.000

FOREST MANAGEMENT

Europe's forest management did not mitigate climate warming

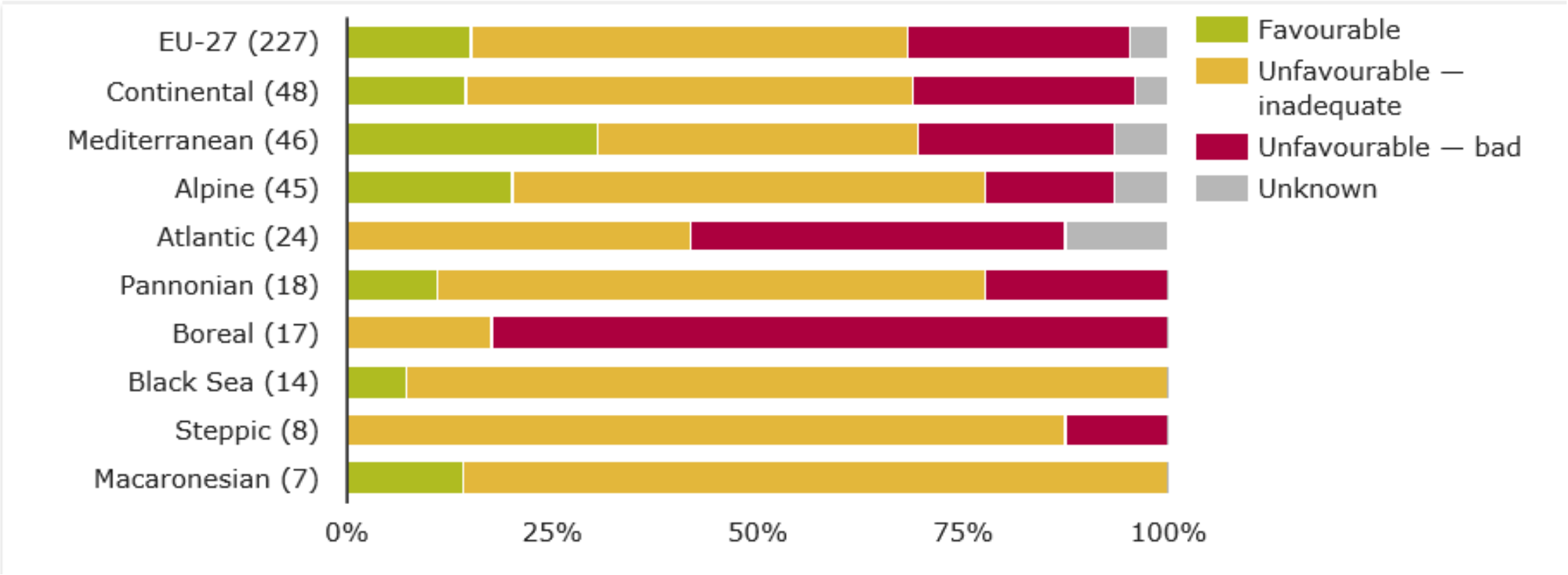
Kim Naudts,[1*†] Yiying Chen,[1‡] Matthew J. McGrath,[1] James Ryder,[1] Aude Valade,[2] Juliane Otto,[1§] Sebastiaan Luyssaert[1||]

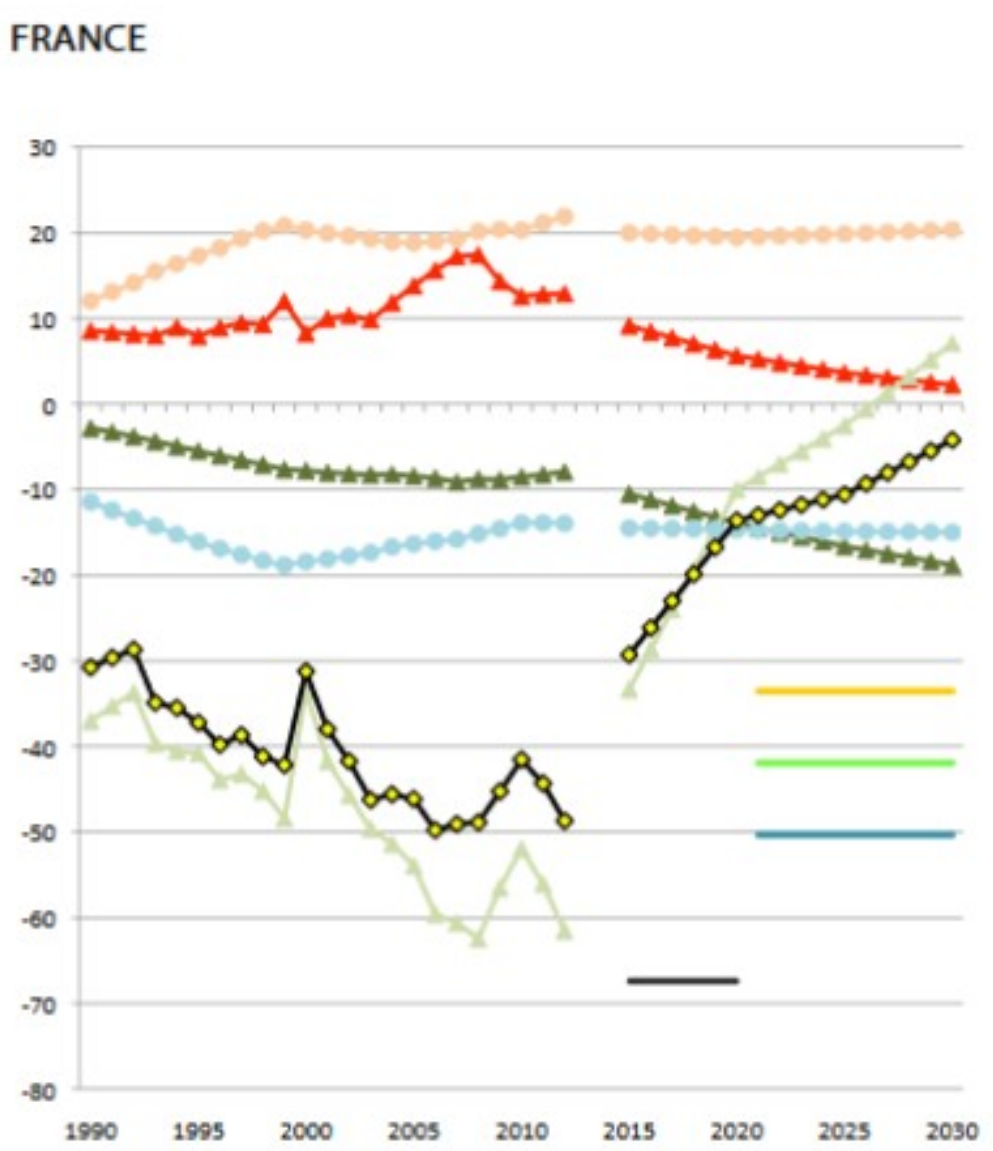
Afforestation and forest management are considered to be key instruments in mitigating climate change. Here we show that since 1750, in spite of considerable afforestation, wood extraction has led to Europe's forests accumulating a carbon debt of 3.1 petagrams of carbon. We found that afforestation is responsible for an increase of 0.12 watts per square meter in the radiative imbalance at the top of the atmosphere, whereas an increase of 0.12 kelvin in summertime atmospheric boundary layer temperature was mainly caused by species conversion. Thus, two and a half centuries of forest management in Europe have not cooled the climate. The political imperative to mitigate climate change through afforestation and forest management therefore risks failure, unless it is recognized that not all forestry contributes to climate change mitigation.



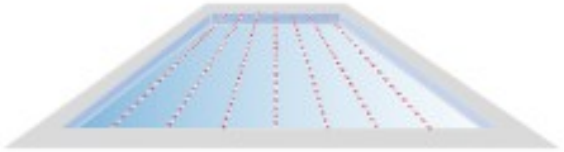
In a single year, a large, old tree can absorb **the same amount of carbon** as a mid-sized tree has absorbed **over its entire lifetime.**

Figure 1: Conservation status of forest habitat types by region



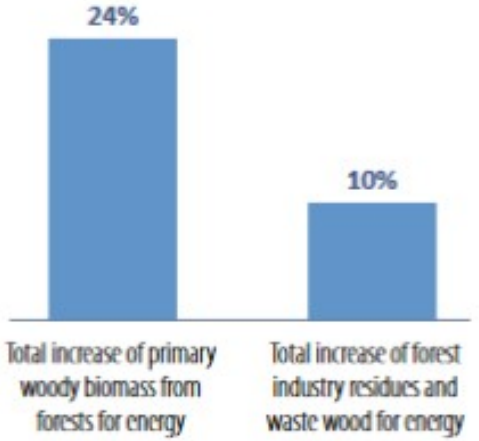

FRANCE
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1990
1995
2000
2005
2010
2015
2020
2025
2030

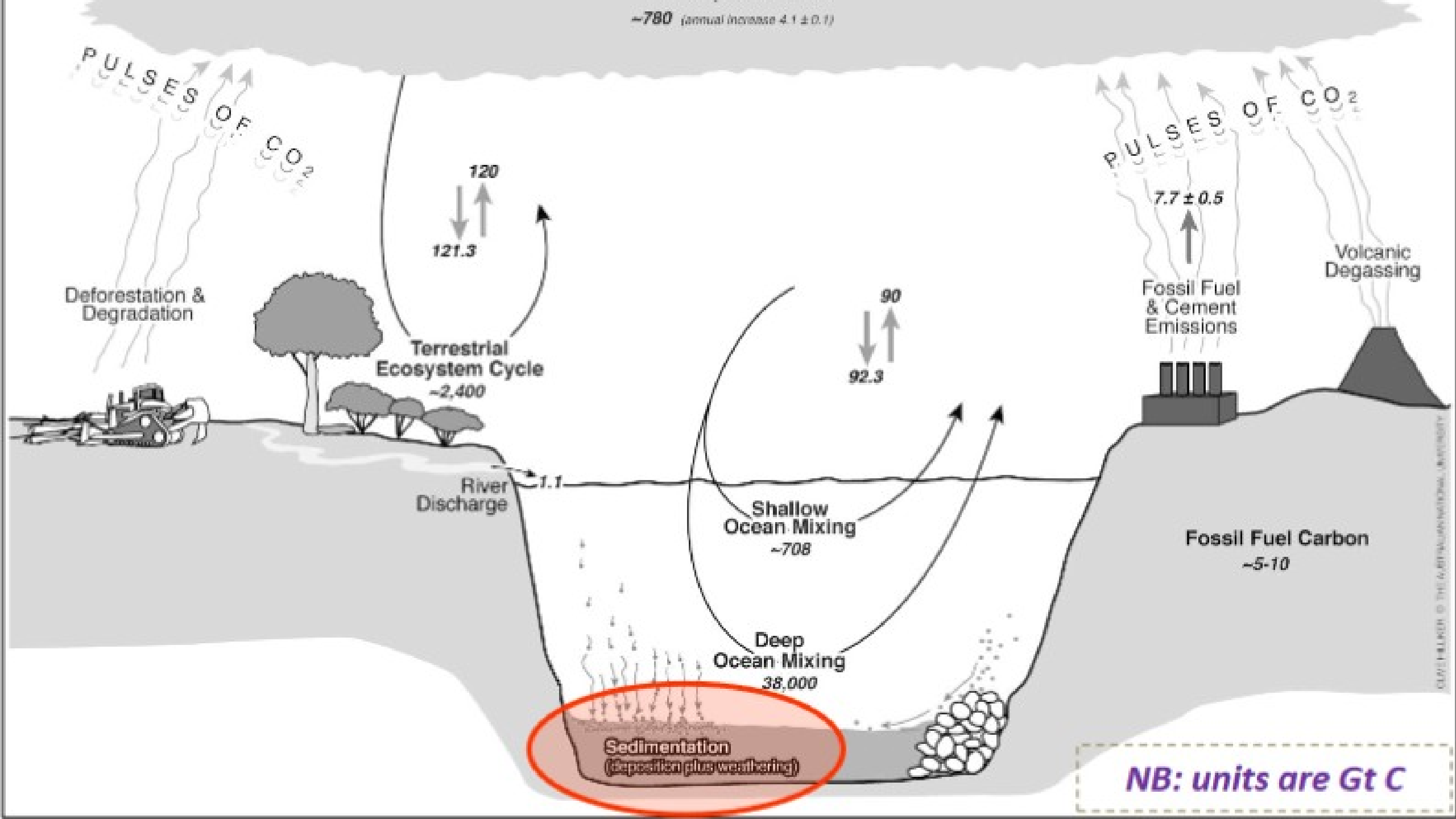
*Wood use for energy increased by about **75 million cubic meters over the past five years.***



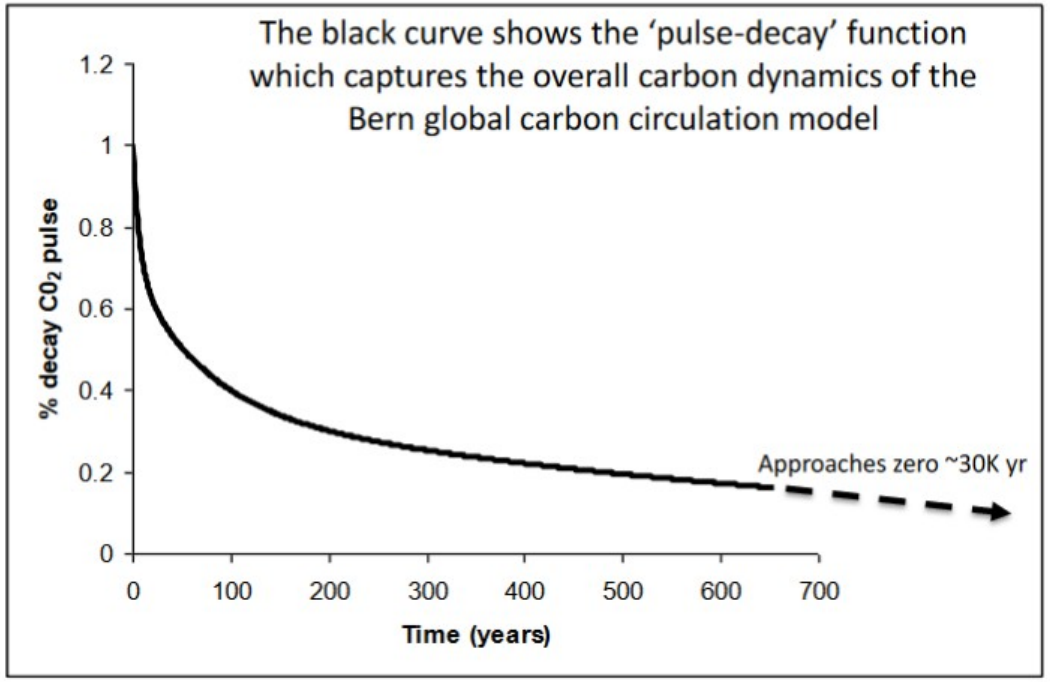
An equivalent of 30 000 Olympic swimming pools

*Not only the wood for energy increased but the percentage of this that comes **directly from the forest** has increased by much more (+24%) than for forest industry residues (+10%).*



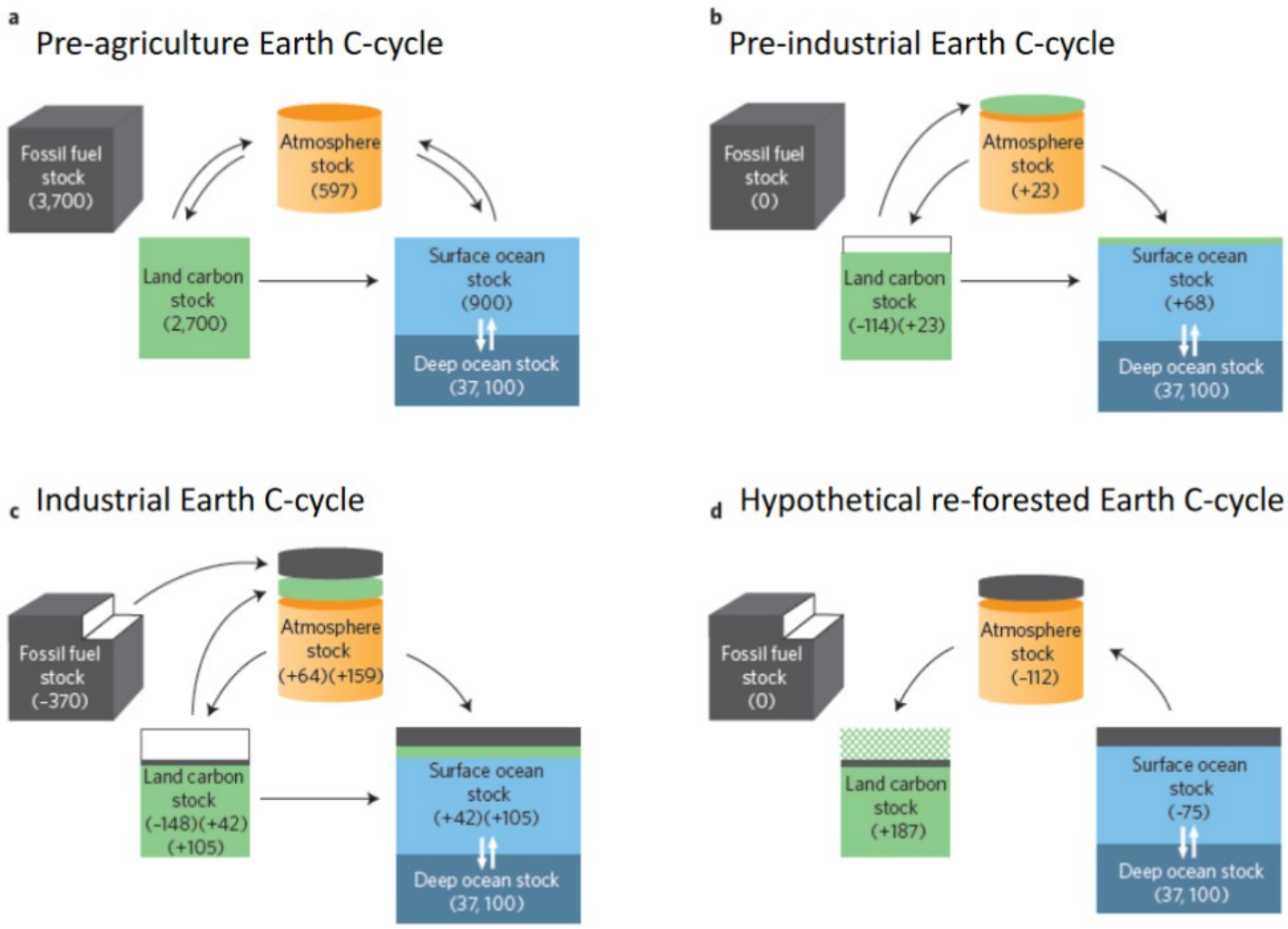

~780 (annual increase 4.1 ± 0.1)
PULSES OF CO2
120
121.3
Deforestation &
Degradation
Terrestrial
Ecosystem Cycle
~2,400
90
92.3
River
Discharge
1.1
Shallow
Ocean Mixing
~708
Deep
Ocean Mixing
38,000
Sedimentation
(deposition plus weathering)
PULSES OF CO2
7.7 ± 0.5
Fossil Fuel
& Cement
Emissions
Volcanic
Degassing
Fossil Fuel Carbon
~5-10
NB: units are Gt C

Therefore, atmospheric CO_2 is very long lived



The life-time in the atmosphere of the air-borne fraction of a pulse of fossil fuel $C0_2$ is about 300 years for the first 75% and up to 30,000 years for the remaining 25%.

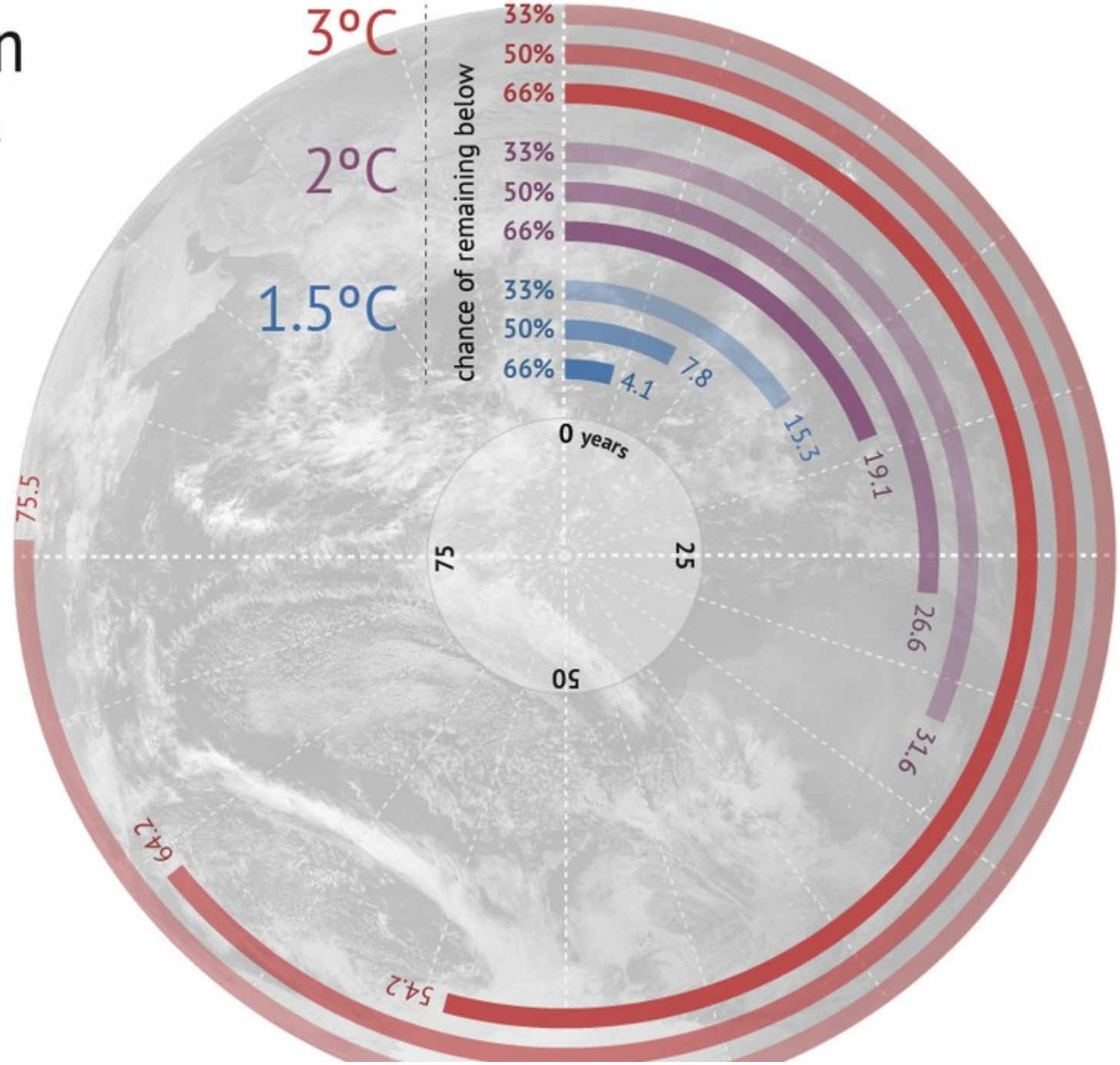
See: Archer, D. *et al.* Atmospheric lifetime of fossil fuel carbon dioxide. *Annu. Rev. Earth Planet. Sci.* **37,** 117–34 (2009)



Source: Mackey B. Et al. (2013) Untangling the confusion around land carbon science and climate change mitigation policy. *Nature Climate Change* **3**, 552–557; doi:10.1038/nclimate1804

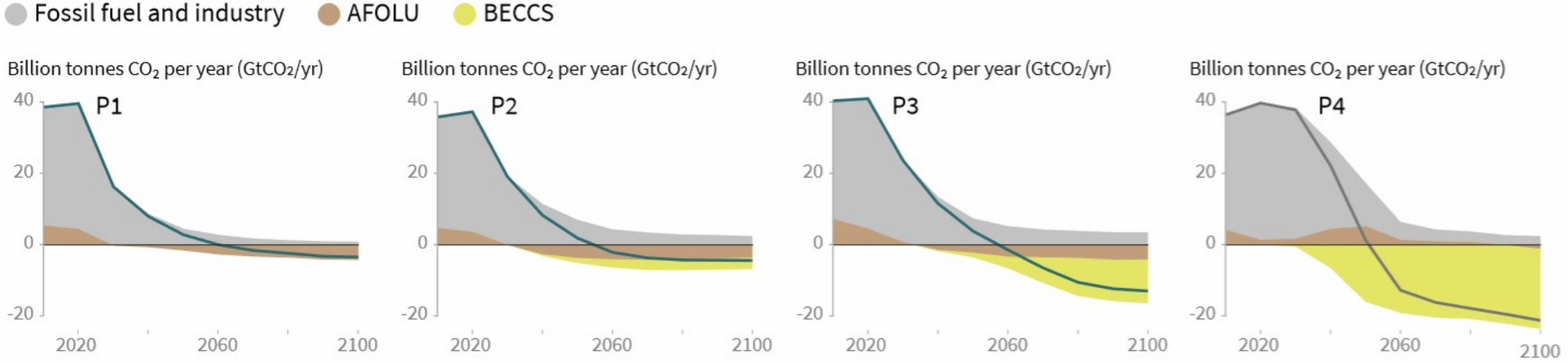
Carbon Countdown

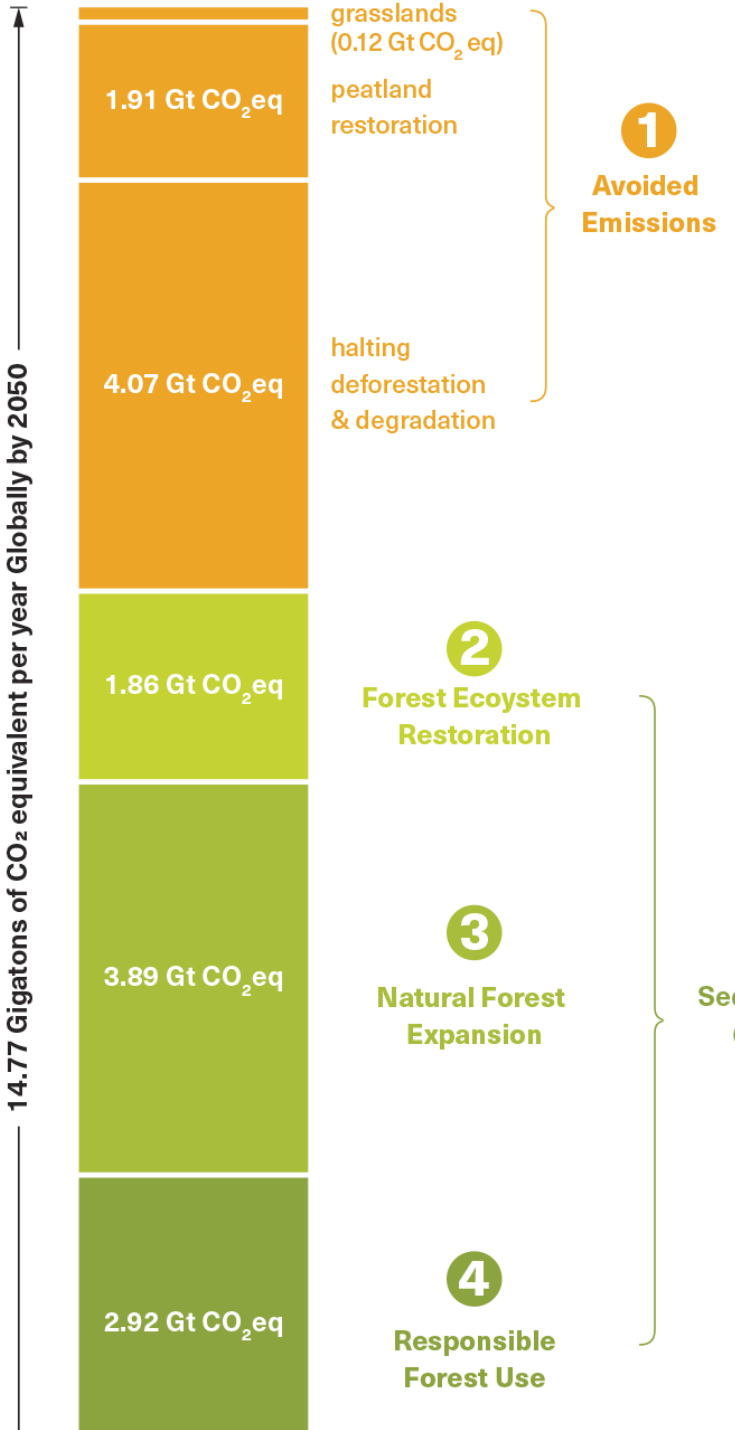
As of the start of 2017, how many years of current emissions would use up the IPCC's carbon budgets for different levels of warming?



CarbonBrief
CLEAR ON CLIMATE

Breakdown of contributions to global net CO_2 emissions in four illustrative model pathways





Target = 50% of forests return to natural state. Would mean setting aside 25% of degraded forests.

Target = 350m ha of reforestation (Bonn challenge)

Target = 25% reduction in harvesting in managed forests