Rethinking Methane
The Path to Climate Neutrality

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RETHINKING METHANE

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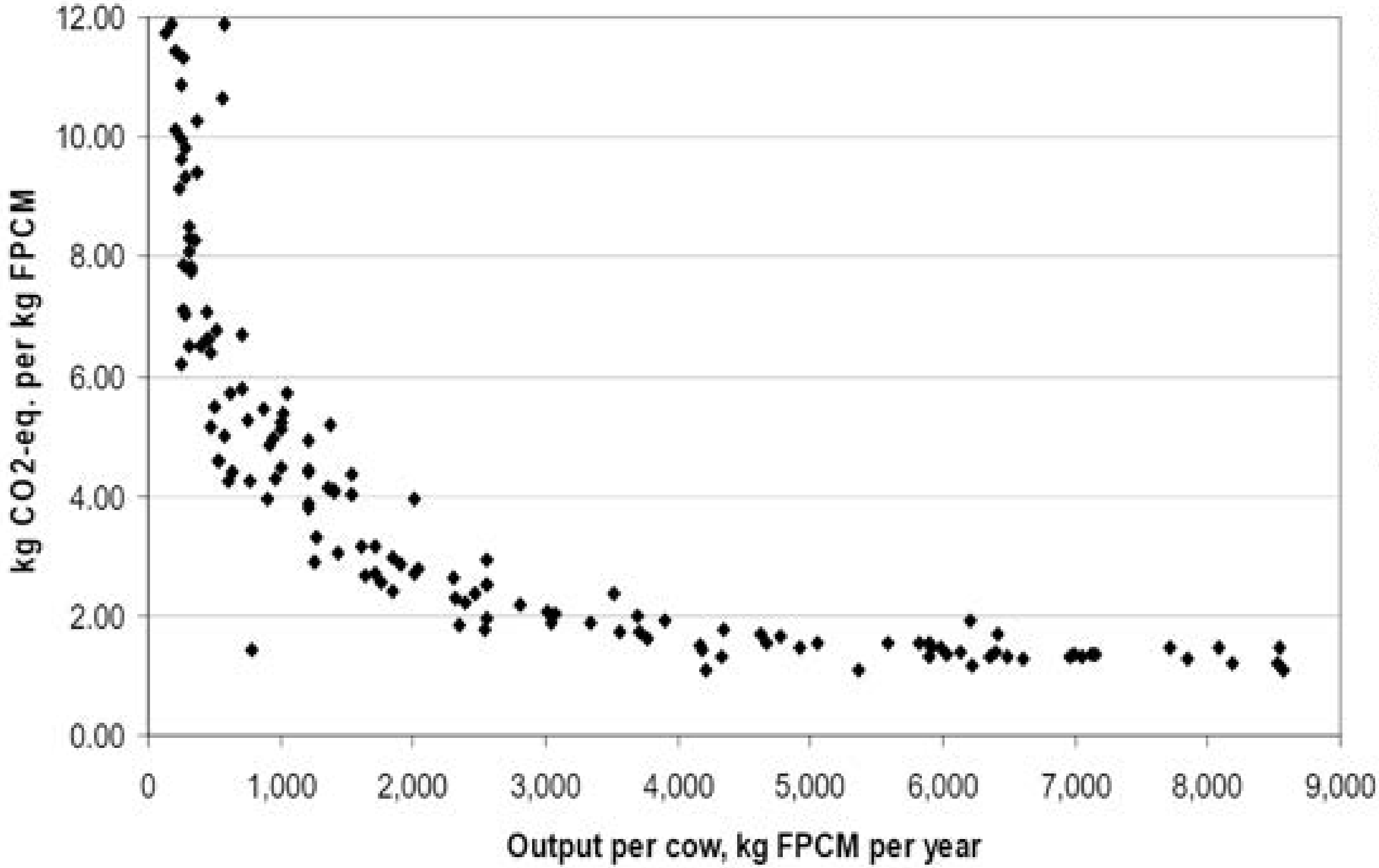

Relationship between total greenhouse gas emissions and milk output per cow

H. Steinfeld, 2015

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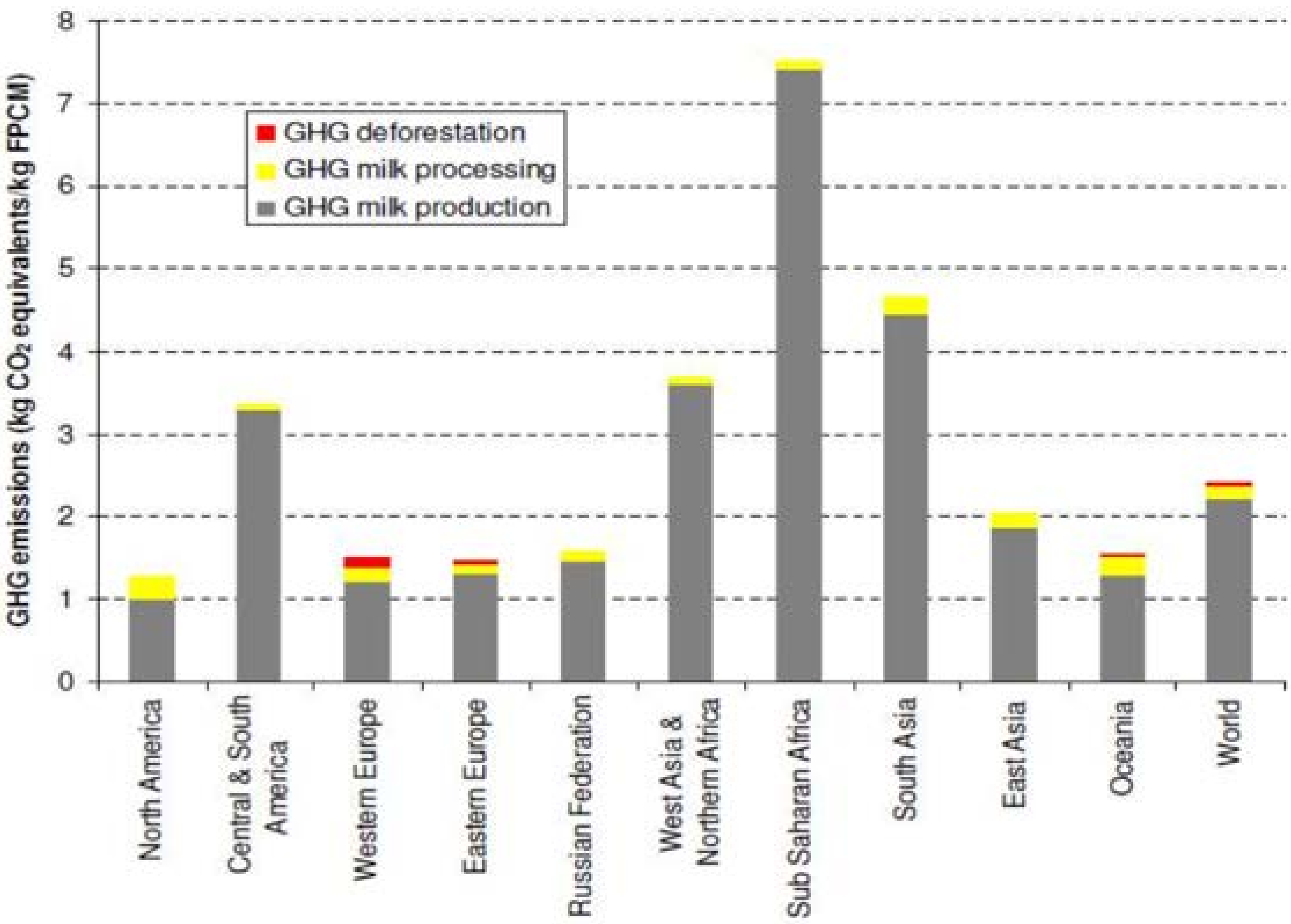
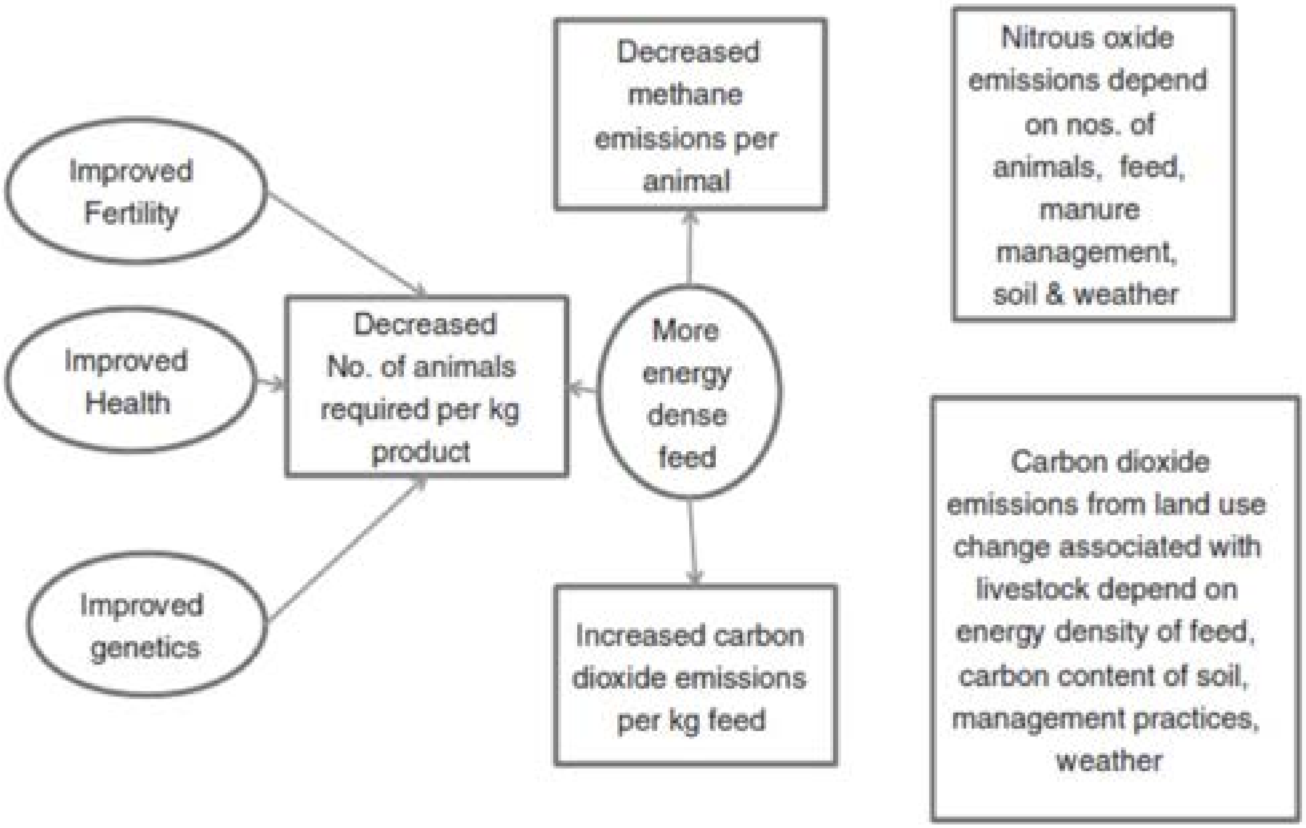

GHG emissions (kg CO2 equivalents/kg FPCM)
GHG deforestation
GHG milk processing
GHG milk production
0
1
2
3
4
5
6
7
8
North America
Central & South America
Western Europe
Eastern Europe
Russian Federation
West Asia & Northern Africa
Sub Saharan Africa
South Asia
East Asia
Oceania
World

FAO (2010)

Mitigation: interventions to improve productivity



Gill et al. (2010)

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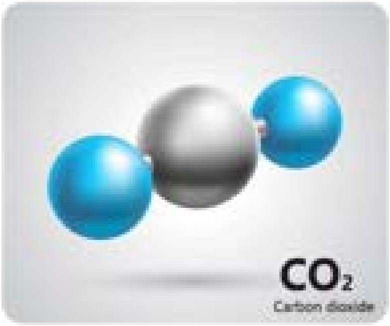

Global Warming Potential (GWP_{100}) of Main Greenhouse Gases

Carbon Dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous Oxide (N_2O)	265

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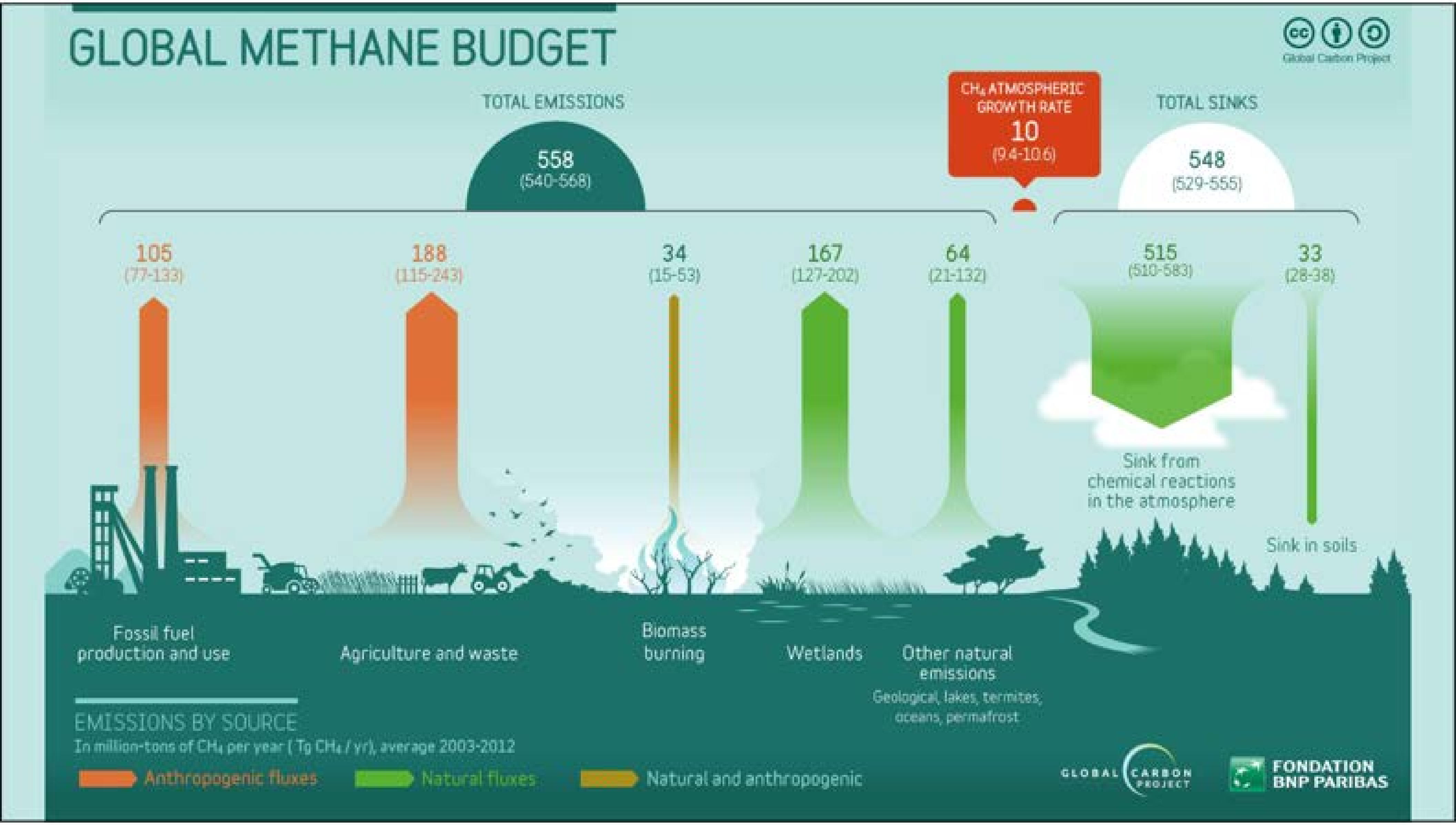
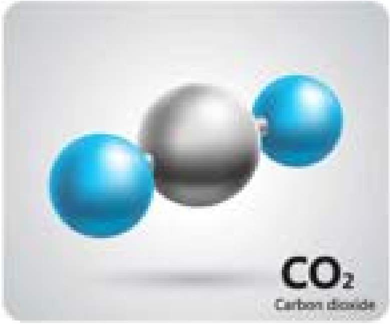

GLOBAL METHANE BUDGET
Global Carbon Project
TOTAL EMISSIONS
558
(540-568)
CH4 ATMOSPHERIC GROWTH RATE
10
(9.4-10.6)
TOTAL SINKS
548
(529-555)
105
(77-133)
188
(115-243)
34
(15-53)
167
(127-202)
64
(21-132)
515
(510-583)
33
(28-38)
Sink from chemical reactions in the atmosphere
Sink in soils
Fossil fuel production and use
Agriculture and waste
Biomass burning
Wetlands
Other natural emissions
Geological, lakes, termites, oceans, permafrost
EMISSIONS BY SOURCE
In million-tons of CH4 per year (Tg CH4 / yr), average 2003-2012
Anthropogenic fluxes
Natural fluxes
Natural and anthropogenic
GLOBAL CARBON PROJECT
FONDATION BNP PARIBAS

Half-Life of Main Greenhouse Gases in Years

Carbon Dioxide (CO_2)	1,000
Methane (CH_4)	10
Nitrous Oxide (N_2O)	110



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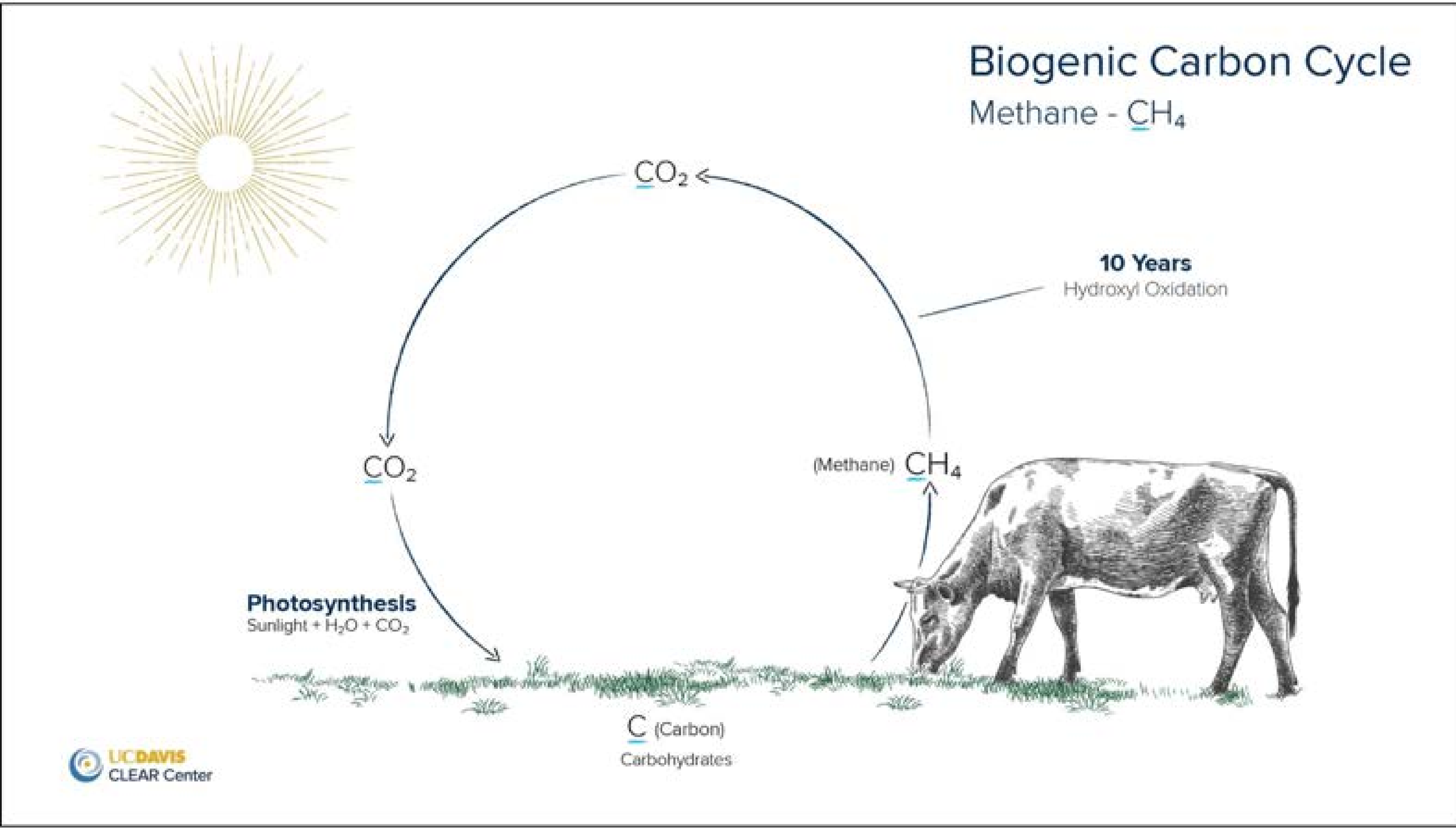
Biogenic Carbon Cycle
Methane - CH_4
CO_2
10 Years
Hydroxyl Oxidation
CO_2
(Methane) CH_4
Photosynthesis
Sunlight + H_2O + CO_2
C (Carbon)
Carbohydrates
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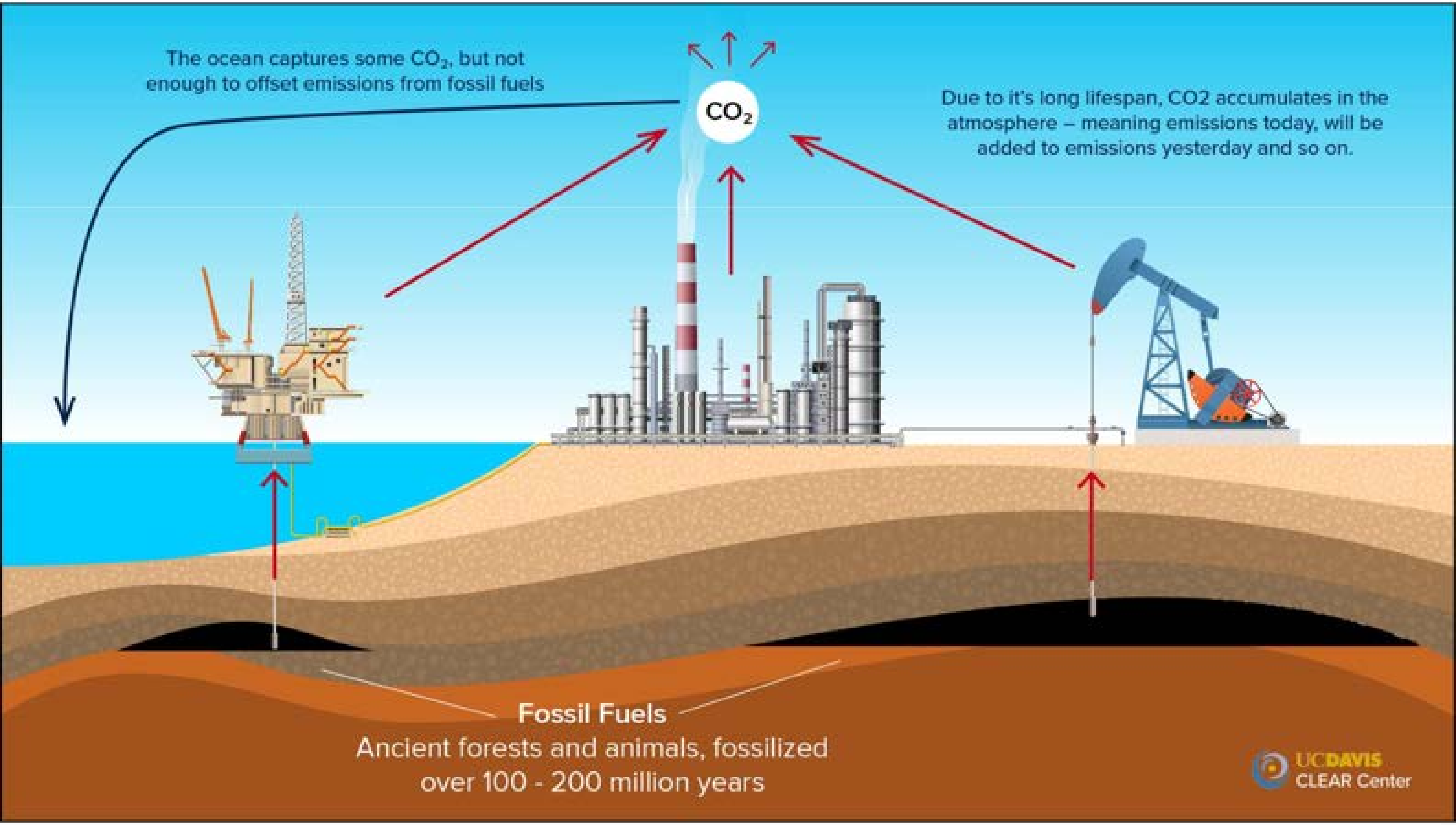

The ocean captures some CO_2, but not enough to offset emissions from fossil fuels
CO_2
Due to it's long lifespan, CO2 accumulates in the atmosphere – meaning emissions today, will be added to emissions yesterday and so on.
Fossil Fuels
Ancient forests and animals, fossilized over 100 - 200 million years
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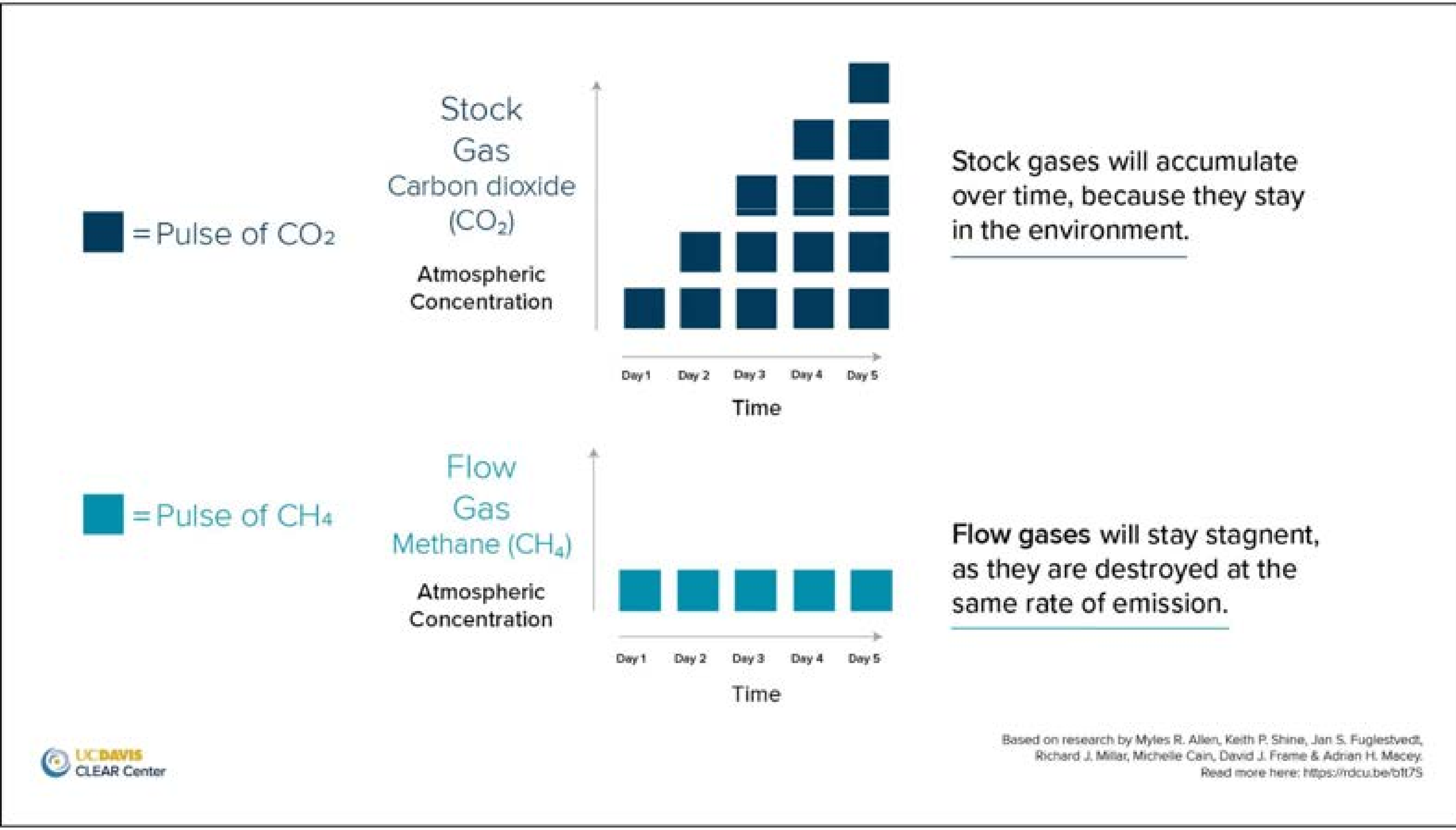
= Pulse of CO2
Stock
Gas
Carbon dioxide
(CO2)
Atmospheric
Concentration
Day 1
Day 2
Day 3
Day 4
Day 5
Time
Stock gases will accumulate over time, because they stay in the environment.
= Pulse of CH4
Flow
Gas
Methane (CH4)
Atmospheric
Concentration
Day 1
Day 2
Day 3
Day 4
Day 5
Time
Flow gases will stay stagnent, as they are destroyed at the same rate of emission.
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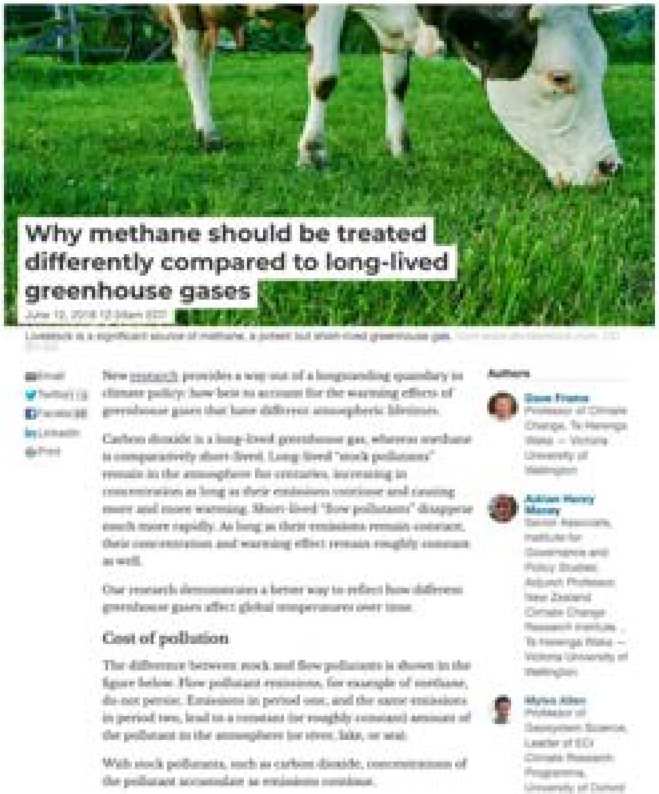
Based on research by Myles R. Allen, Keith P. Shine, Jan S. Fuglestvedt,
Richard J. Millar, Michelle Cain, David J. Frame & Adrian H. Macey.



Why methane should be treated differently compared to long-lived greenhouse gases

Authors

Cost of pollution

https://theconversation.com/why-methane-should-be-treated-differently-compared-to-long-lived-greenhouse-gases-97845

CarbonBrief

GUEST POSTS 7 June 2018

Guest post: A new way to assess 'global warming potential' of short-lived pollutants

DR MICHELLE CAIN

Dr Michelle Cain in a science and policy research associate on the Oxford Martin School's

https://www.carbonbrief.org/guest-post-a-new-way-to-assess-global-warming-potential-of-short-lived-pollutants

npj | Climate and Atmospheric Science

ARTICLE OPEN

Improved calculation of warming-equivalent emissions for short-lived climate pollutants

INTRODUCTION

https://www.nature.com/articles/s41612-019-0086-4.pdf

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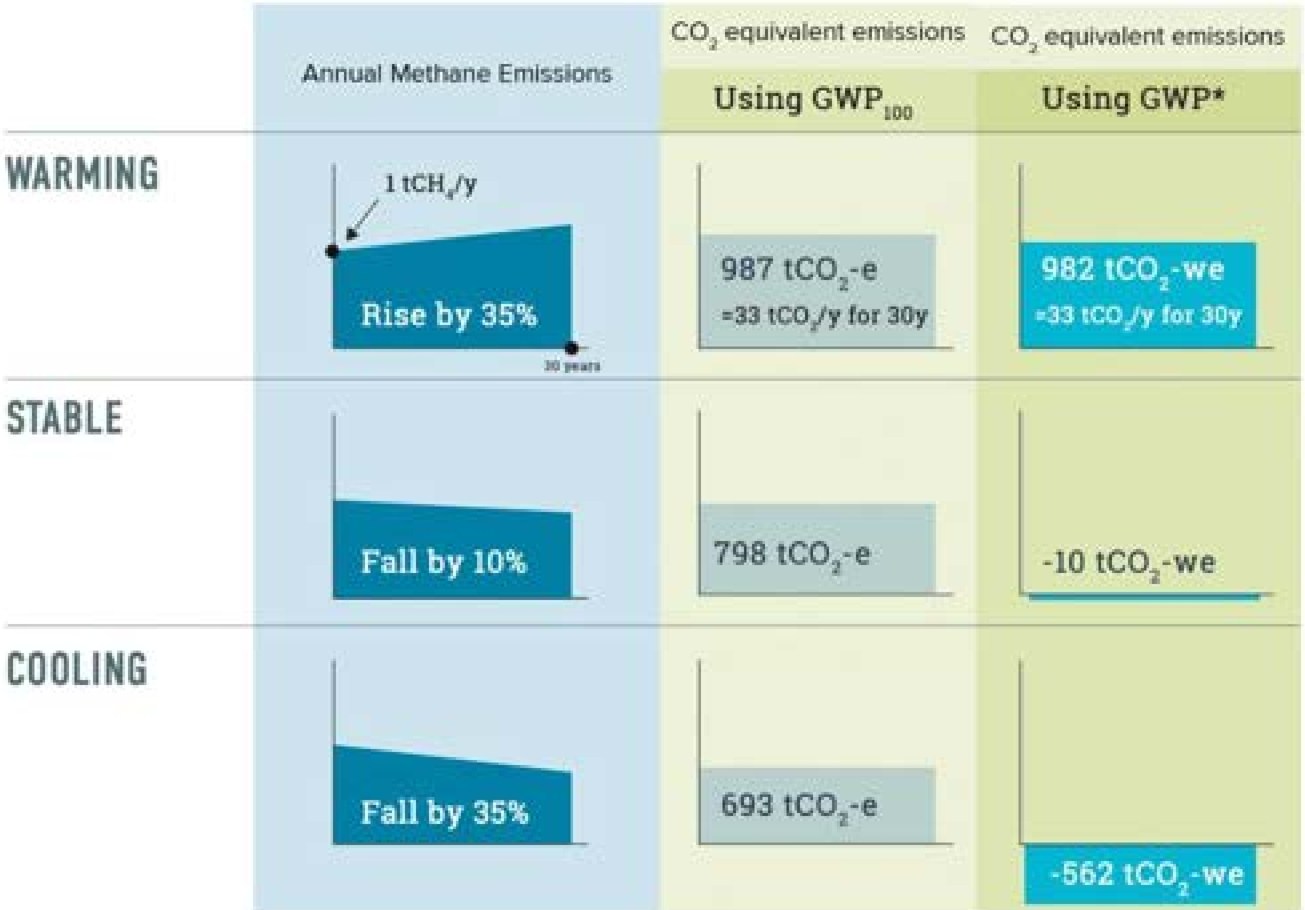

Cain, M., Allen, M. & Lynch, J. *Oxford Martin Programme on Climate Pollutants* (2019). Read more at: https://www.oxfordmartin.ox.ac.uk/downloads/academic/201908_ClimatePollutants.pdf.

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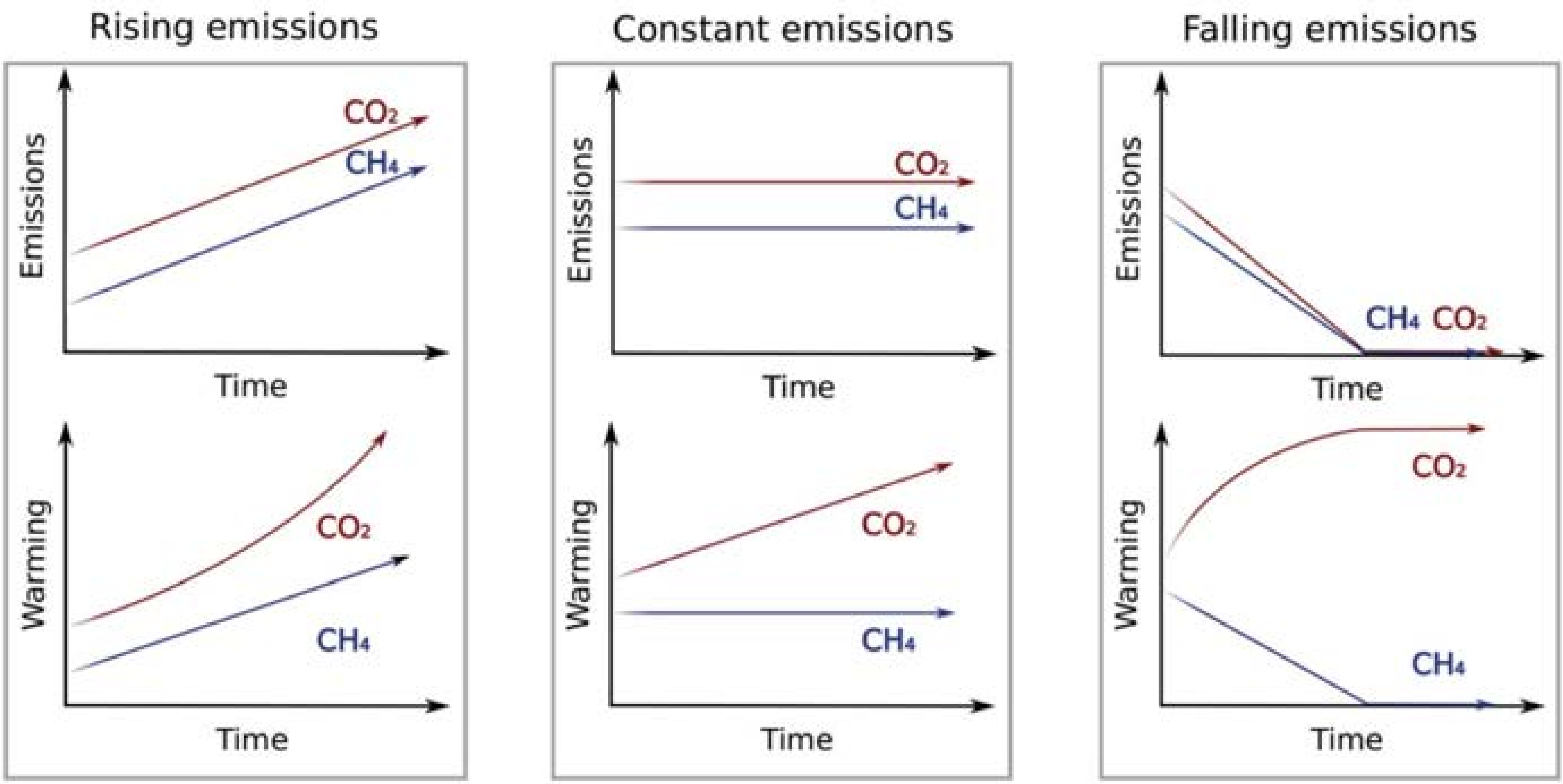

Oxford Martin, Climate Metrics for Ruminant Livestock, July 2018,
https://www.oxfordmartin.ox.ac.uk/downloads/reports/Climate-metrics-for-ruminant-livestock.pdf%C2%A0

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How do we do it?

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Since 2015 California dairies have reduced **2.2 million metric tons** of greenhouse gases

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That's a **25 percent** reduction in manure methane emissions.

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