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Reframing Climate Change:

How recent emission trends & the latest science change the debate

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Talk outline

1) Dangerous climate change - *post-Copenhagen*

2) Cumulative emissions - *a new chronology*

3) Misplaced optimism - *ignoring the bean counters*

4) Global GHG pathways - *impossible challenges?*

What is dangerous climate change?

UK & EU define this as 2°C

But:

… *2℃ impacts at the worst end of the range*

… *ocean acidification devastating even at 400-450ppmv CO_2*

… *failure to mitigate leaves 2℃ stabilisation highl y unlikely*

Emission-reduction targets

- UK, EU & Global - long term reduction targets

UK's ***80%***	*reduction in CO_2e by*	***2050***
EU ***60%-80%***	"	***2050***
Bali ***50%***	"	***2050***

- CO_2 stays in atmosphere for 100+ years,

- Long-term targets are dangerously misleading

Put bluntly …

2050 reduction unrelated to avoiding dangerous climate change *(2°C)*

cumulative emissions that matter (i.e. carbon budget)

this fundamentally rewrites the chronology of climate change

- from long term gradual reductions

- to urgent & radical reductions

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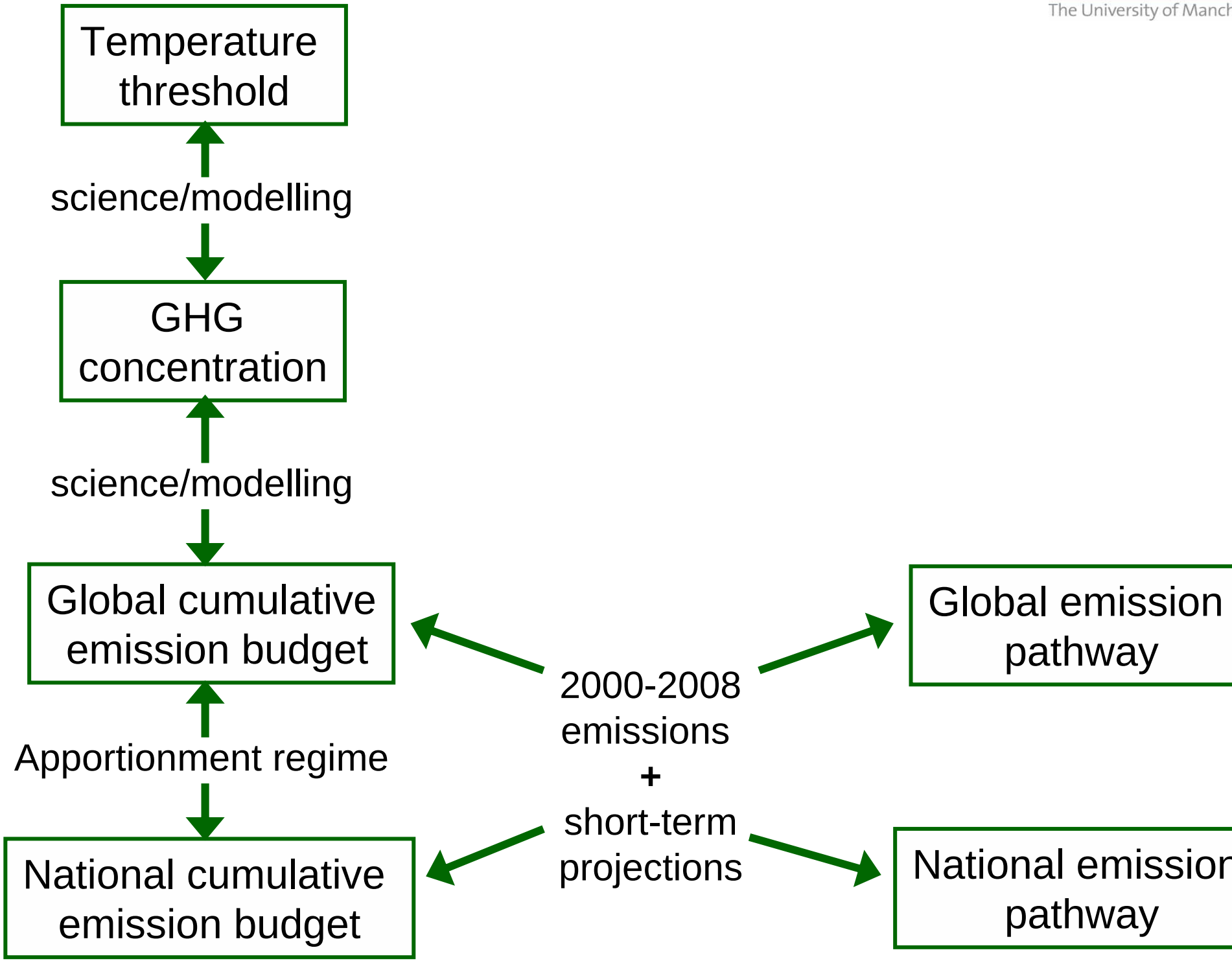
How do global **temperatures**

link to

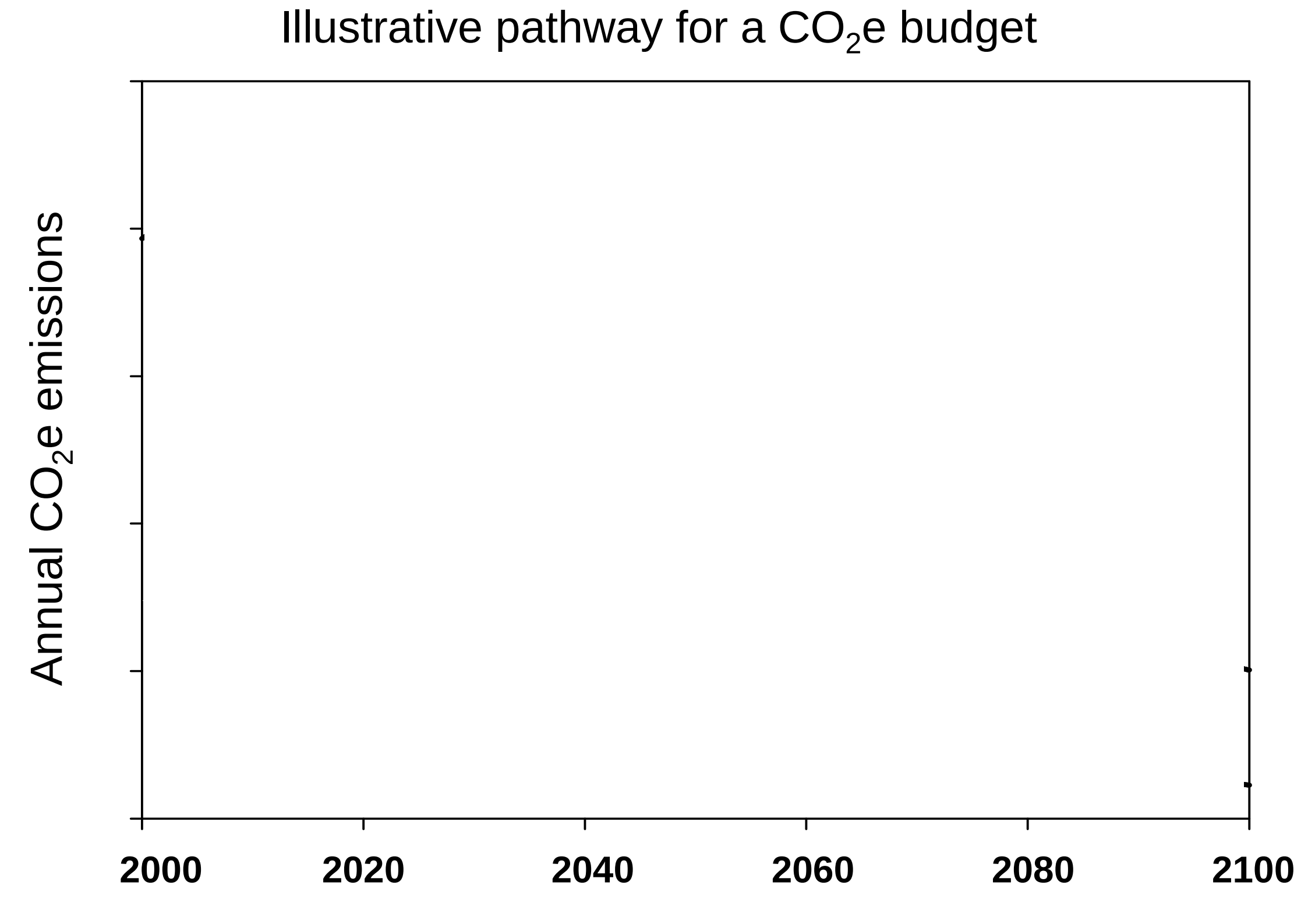
global and national **carbon budgets**

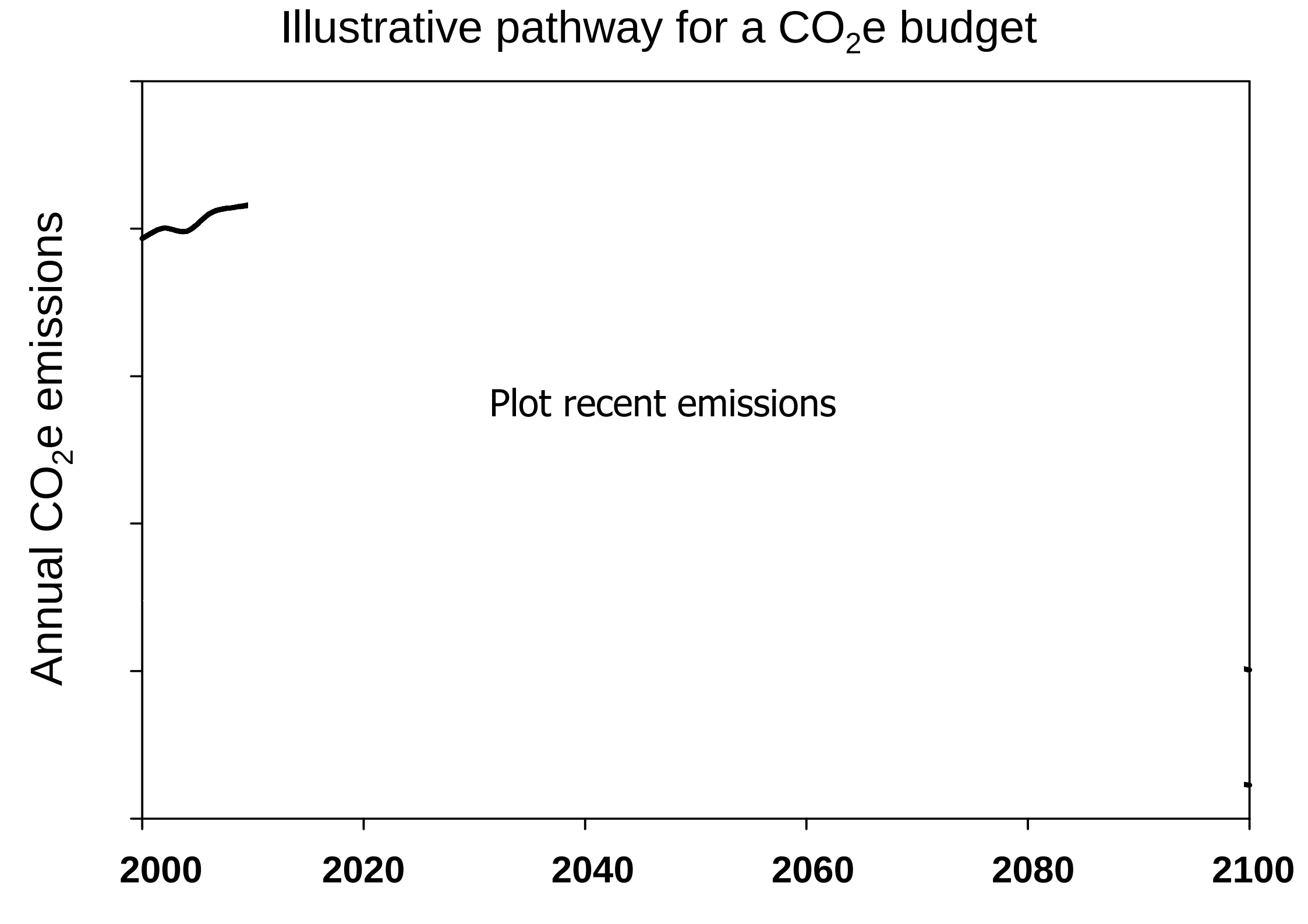
& from there to

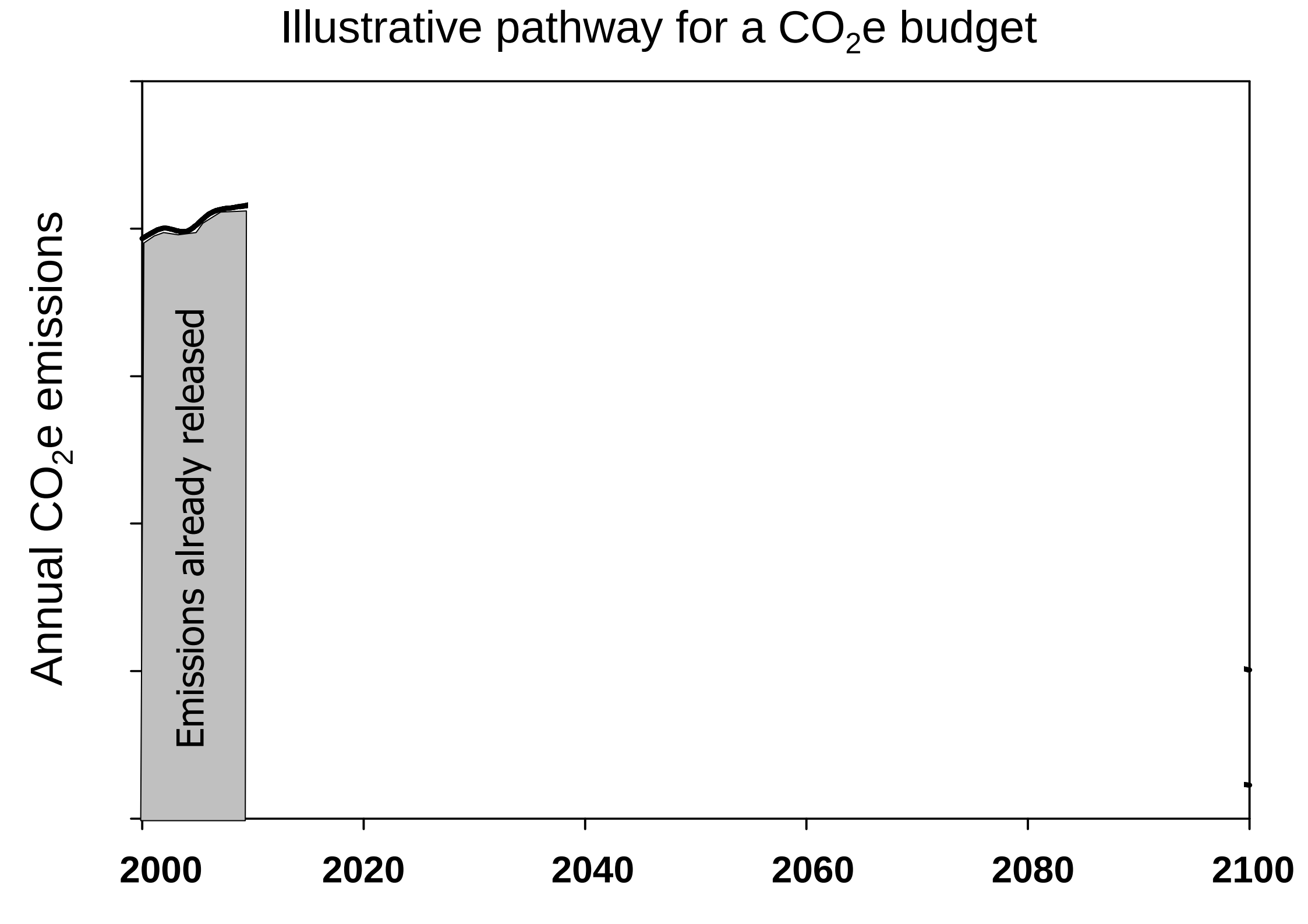
emission-reduction **pathways**?


Temperature threshold
science/modelling
GHG concentration
science/modelling
Global cumulative emission budget
Apportionment regime
National cumulative emission budget
2000-2008 emissions
+
short-term projections
Global emission pathway
National emission pathway

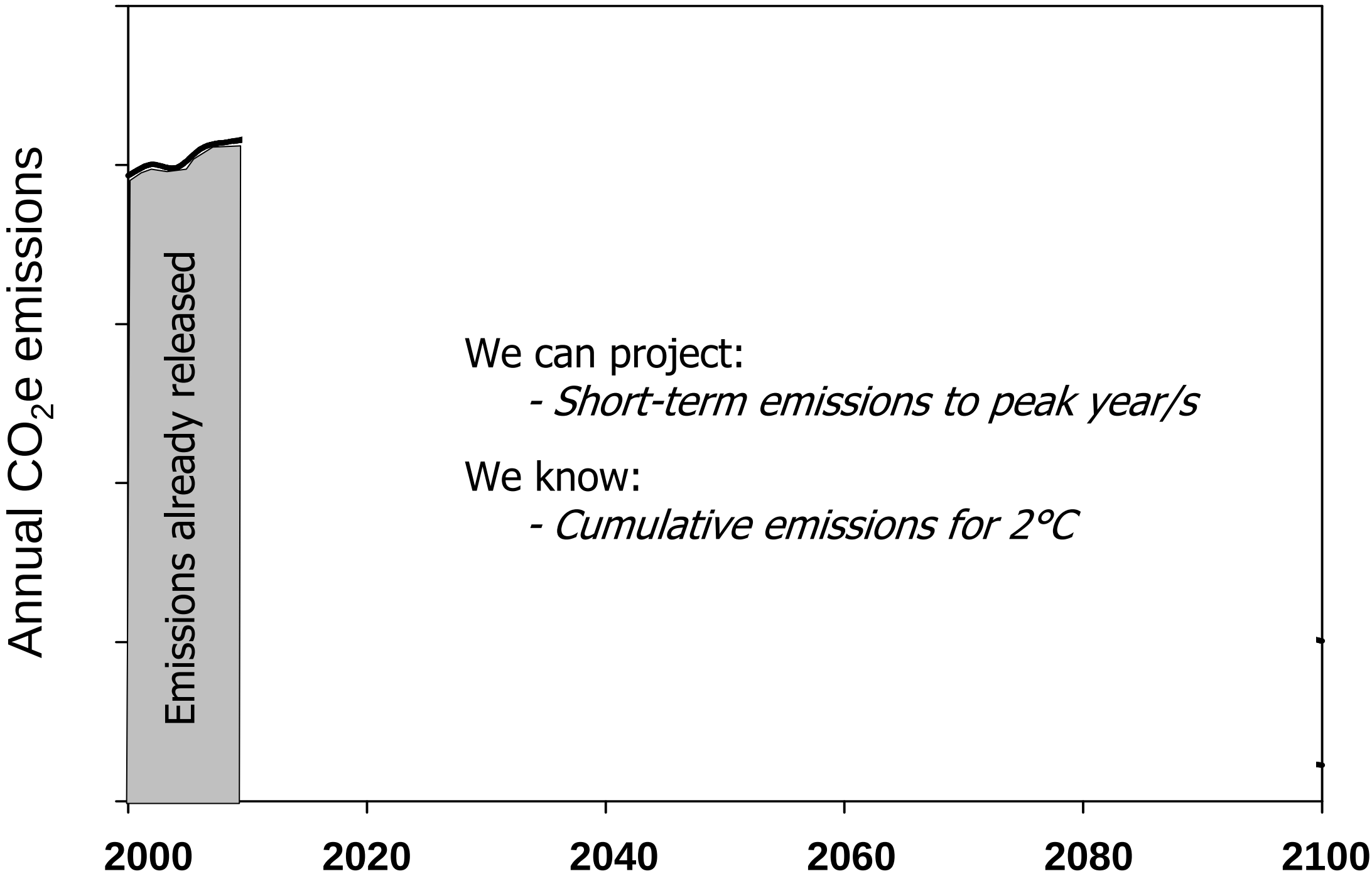
Illustrative pathway for a CO_2e budget

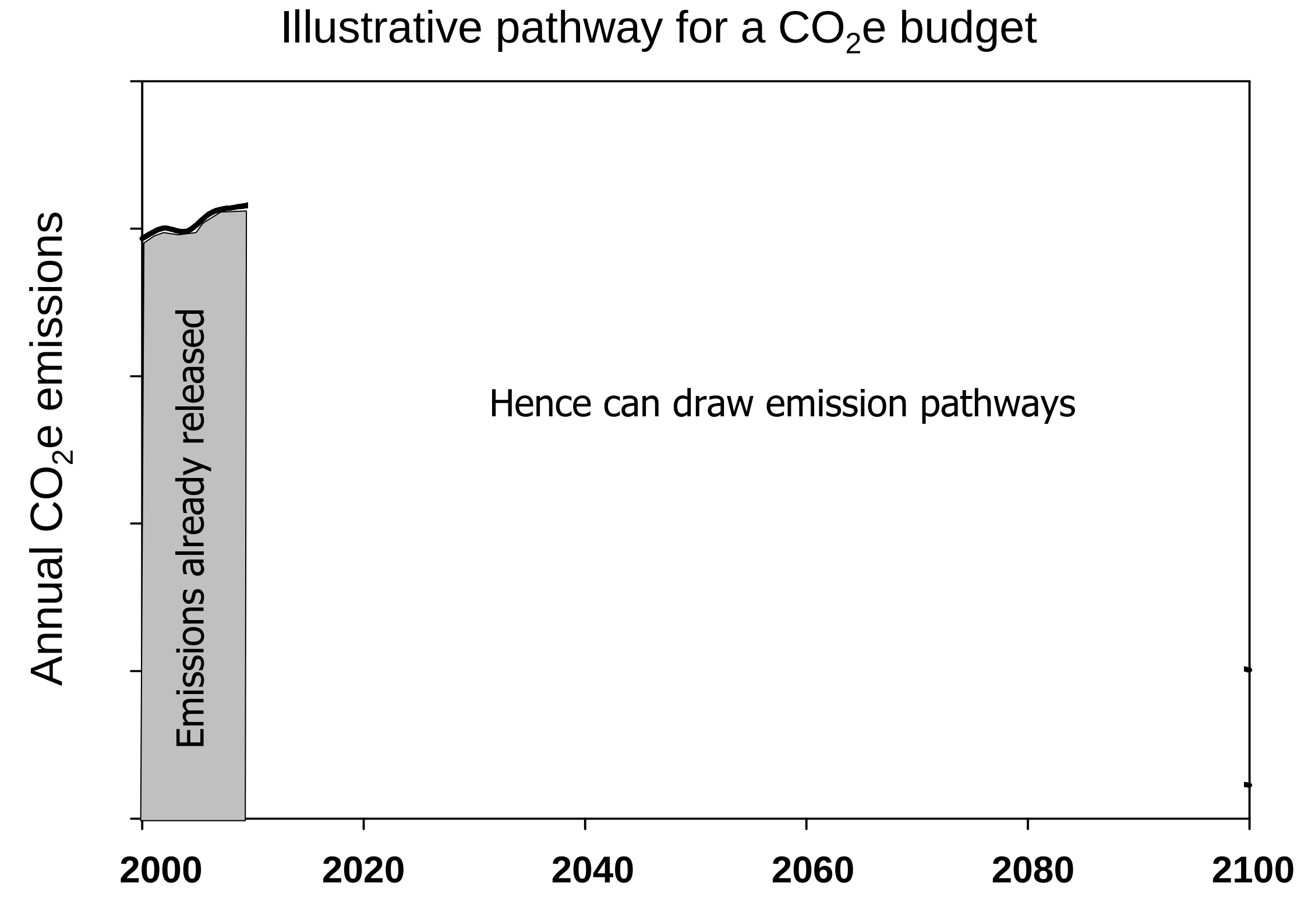

Illustrative pathway for a CO_2e budget
Annual CO_2e emissions
2000
2020
2040
2060
2080
2100

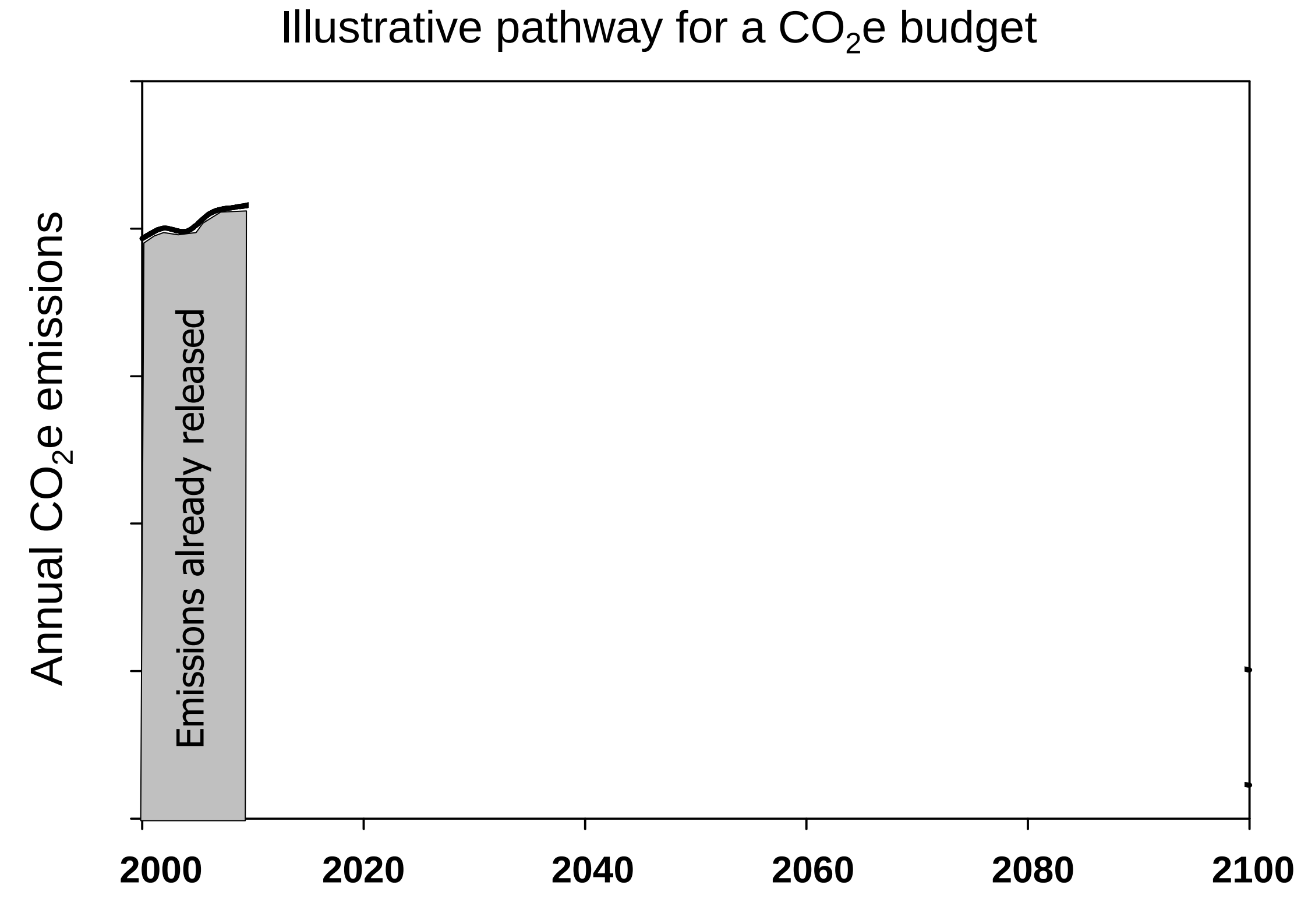

Illustrative pathway for a CO_2e budget
Annual CO_2e emissions
Plot recent emissions
2000
2020
2040
2060
2080
2100


Illustrative pathway for a CO_2e budget
Annual CO_2e emissions
Emissions already released
2000
2020
2040
2060
2080
2100

Illustrative pathway for a CO_2e budget




Illustrative pathway for a CO_2e budget
Annual CO_2e emissions
Emissions already released
Hence can draw emission pathways
2000
2020
2040
2060
2080
2100


Illustrative pathway for a CO_2e budget
Annual CO_2e emissions
Emissions already released
2000
2020
2040
2060
2080
2100

How does this 'scientifically-credible' way of thinking alter the challenge we face?

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Tyndall's *emission scenarios* *(2000-2100 CO_2e)*

To consider:

1. *CO_2 emissions from landuse (**deforestion**)*
2. *Non-CO_2 GHGs (principally **agriculture**)*

What emission space remains for:

3. *CO_2 emissions from **energy?***

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Tyndall's *emission scenarios* *(2000-2100 CO_2e)*

… data from:

Empirical

CO_2	*CDIAC*
Non-CO_2 GHGs	*EPA*
Land-use	*FAO*

Model

AR4, Hadley Centre and Stern

Tyndall's *emission scenarios* *(2000-2100 CO_2e)*

- Included very optimistic:
  - CO_2 from land-use & forestry emission scenarios

Tyndall's

emission scenarios

(2000-2100 CO_2e)

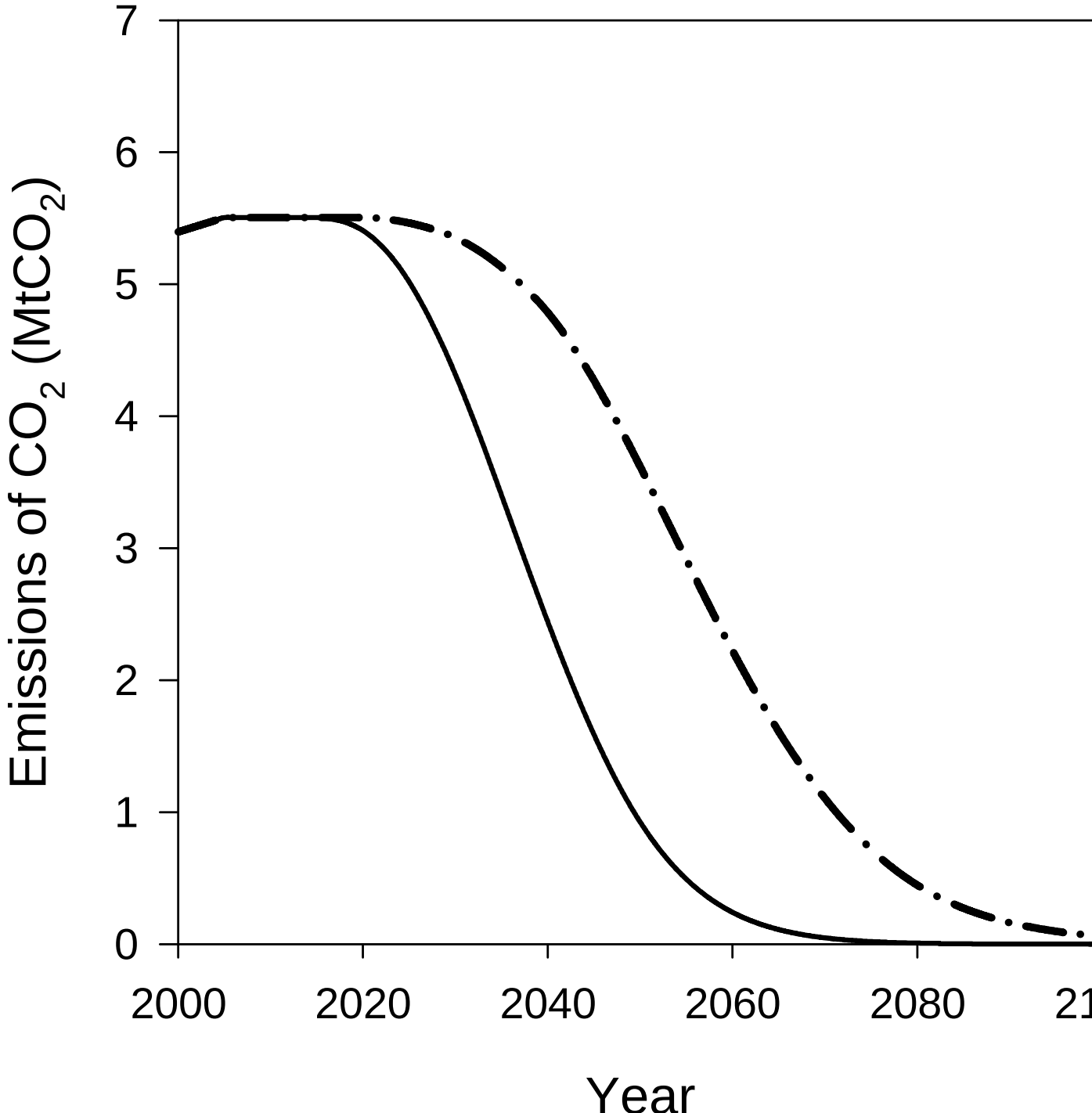
- Included very optimistic:

  - CO_2 from land-use & forestry emission scenarios

- CO_2 from land-use & forestry emission scenarios

Characterised by high uncertainty *(principally driven by deforestation; 12-25% of global CO_2e)*

Two Tyndall scenarios with different carbon-stock levels remaining: *70% & 80%*



Tyndall's *emission scenarios* *(2000-2100 CO_2e)*

- Included very optimistic:
  - land-use & forestry emission scenarios
  - non-CO_2 greenhouse gas emissions

Tyndall's *emission scenarios* *(2000-2100 CO_2e)*

- Included very optimistic:
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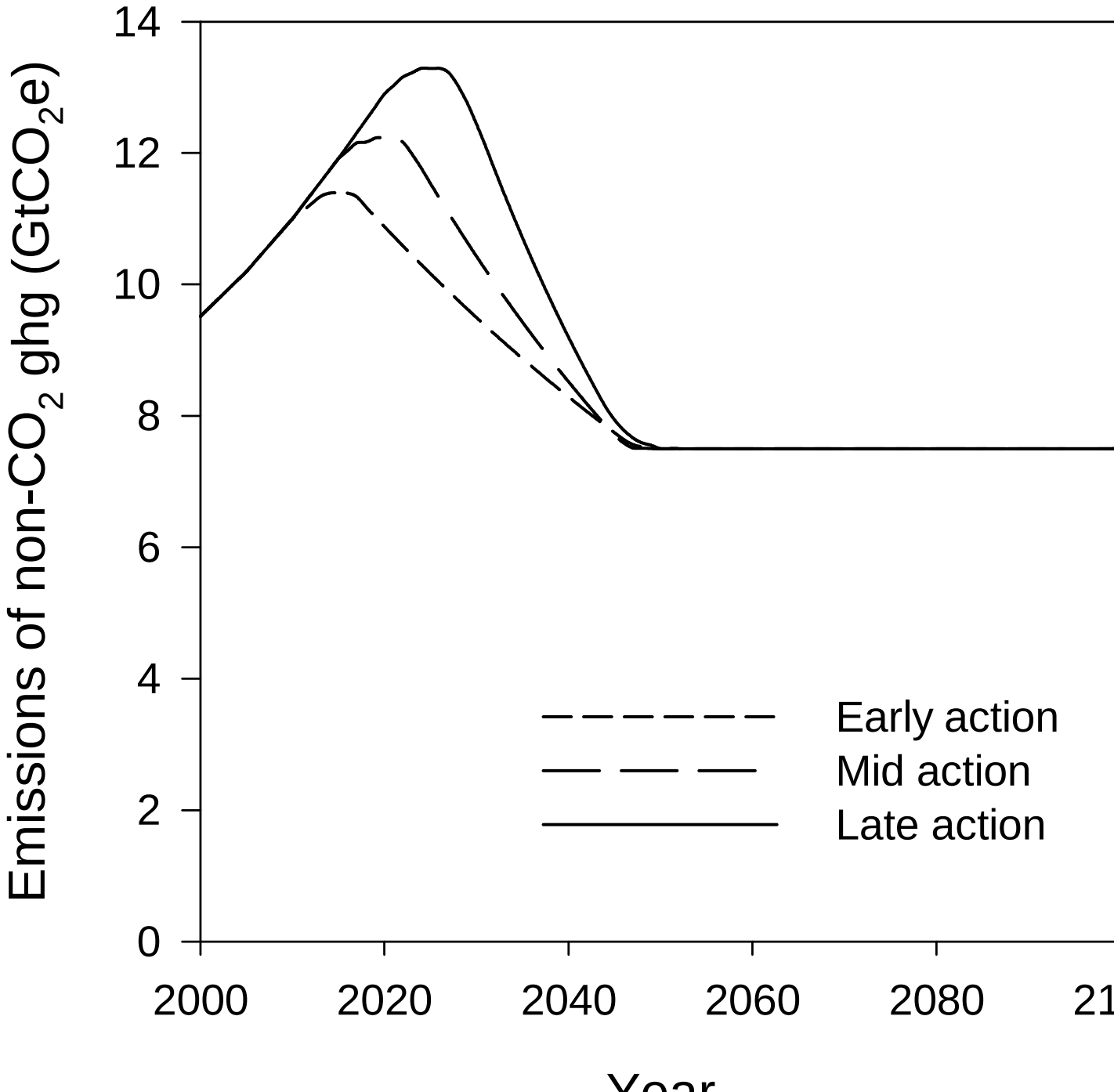
- non-CO_2 greenhouse gas emissions

Marked tail from food related emissions

Food emissions/capita assumed to halve by 2050



Tyndall's *emission scenarios* *(2000-2100 CO_2e)*

- Included very optimistic:
  - land-use & forestry emission scenarios
  - non-CO_2 greenhouse gas emissions?
- Global CO_2e emissions peaks of 2015/20/25?

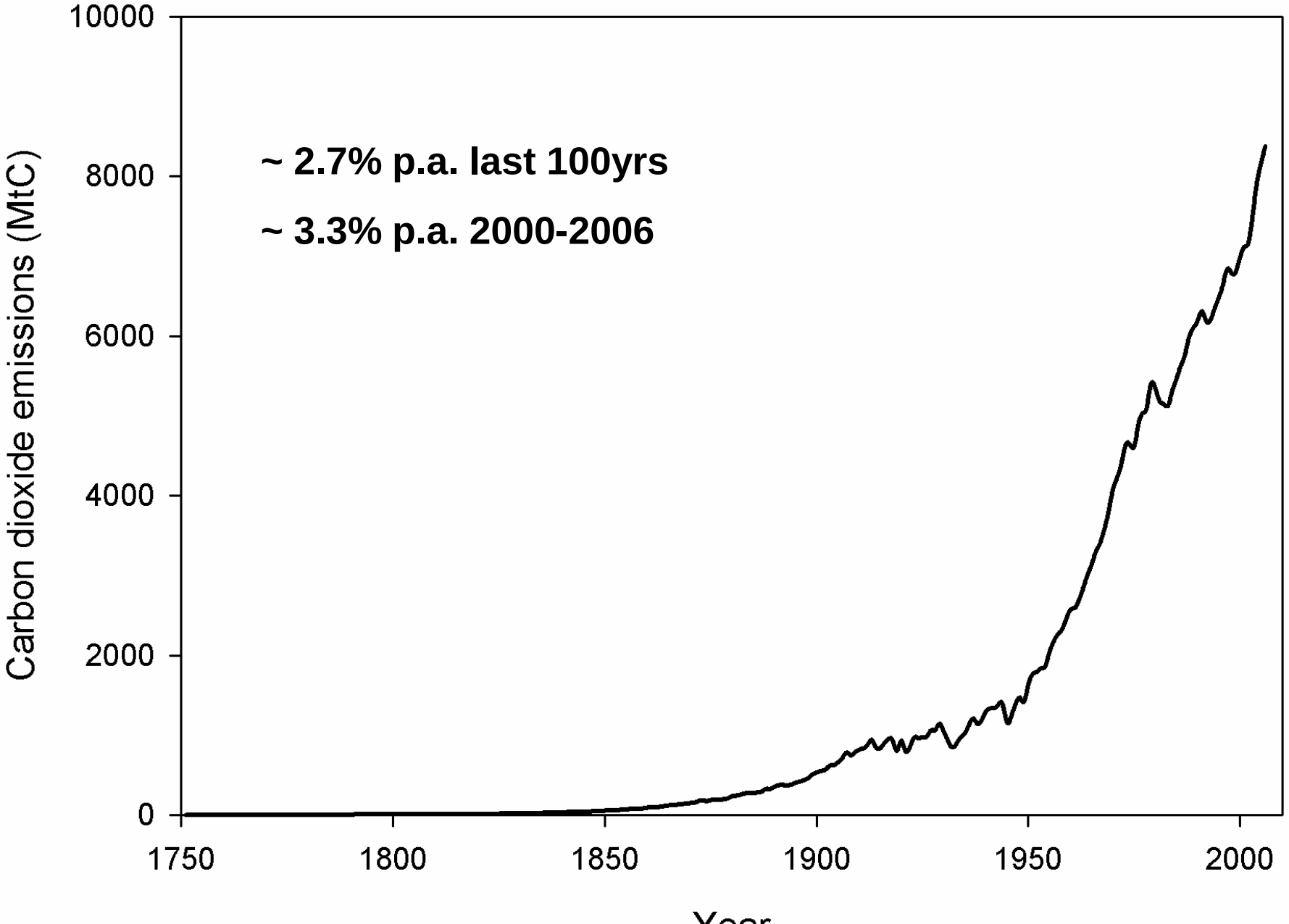
factoring in…

the latest emissions data

what is the scale of the global ‘problem’ we now face?

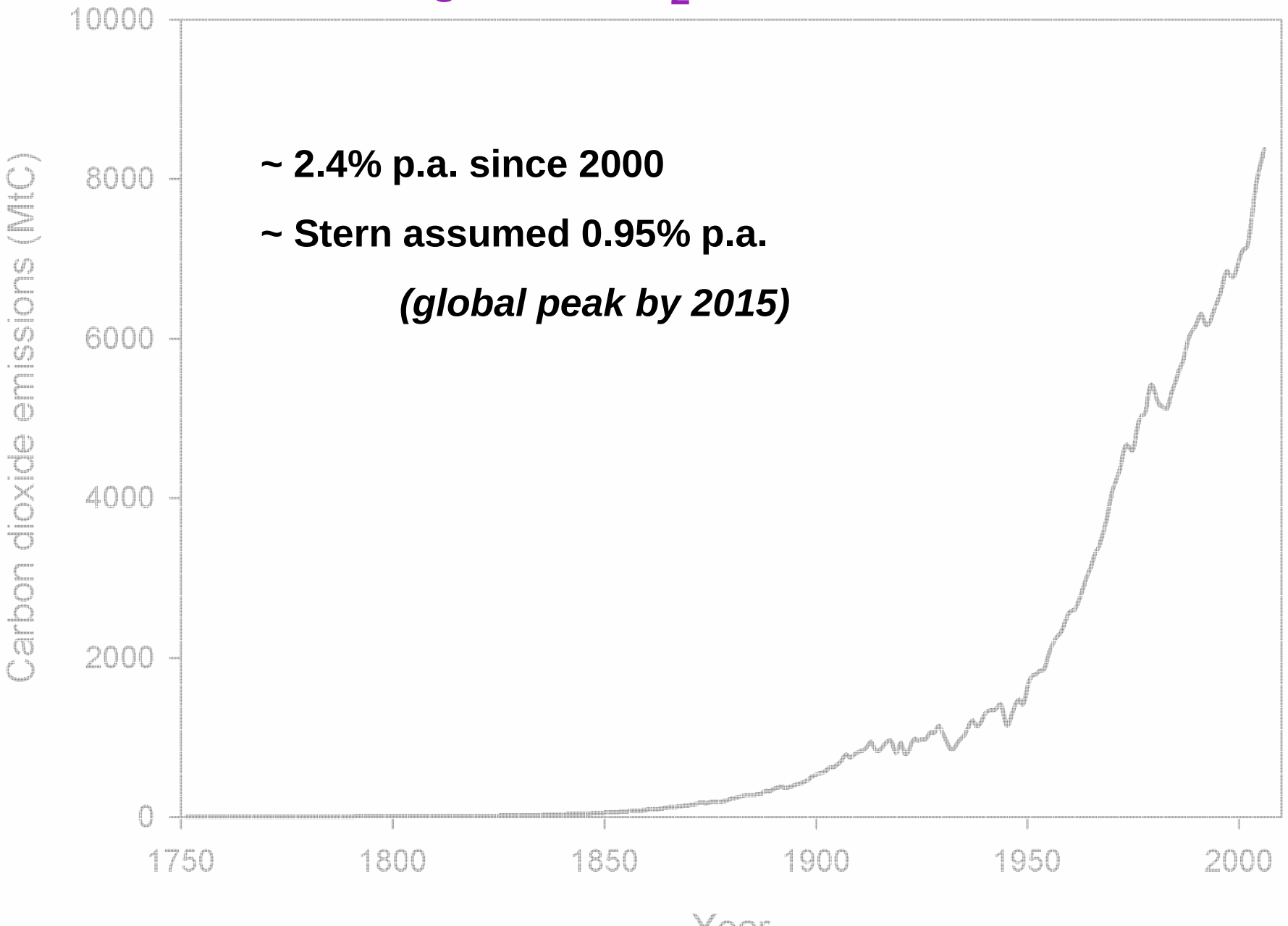
It’s getting worse!

Global CO_2 emission trends?



… appears we're denying its happening

latest global CO_2e emission trends?



~ 2.4% p.a. since 2000

~ Stern assumed 0.95% p.a.

(global peak by 2015)

What does:

- this failure to reduce emissions

&

- the latest science on cumulative emissions

Say about a 2°C future?

450ppmv CO_2e

greenhouse gas emission pathways

50% chance of 2°C

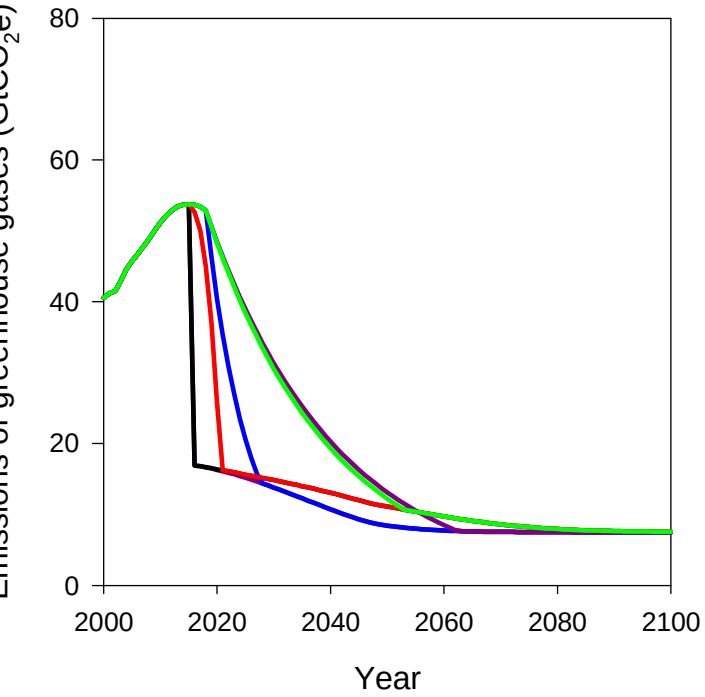
For 450ppmv CO_2e emission estimates for 2000-2100 range from:

~ 1400 to 2200 $GtCO_2e$

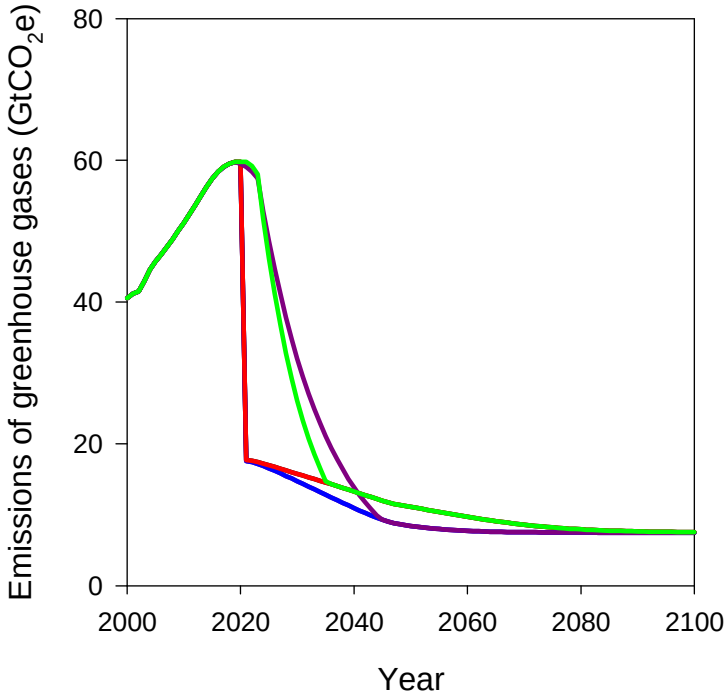
(i.e. the global carbon budget)

Total greenhouse gas emission pathways

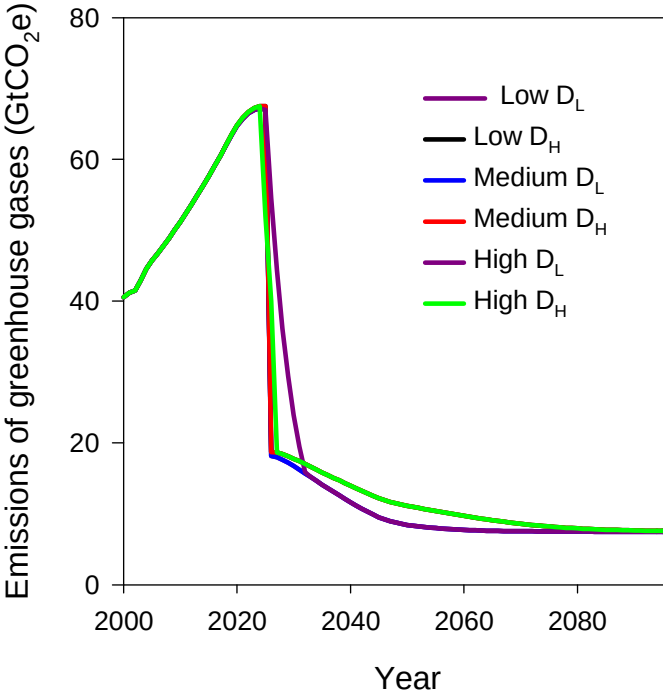
2015 peak



2020 peak

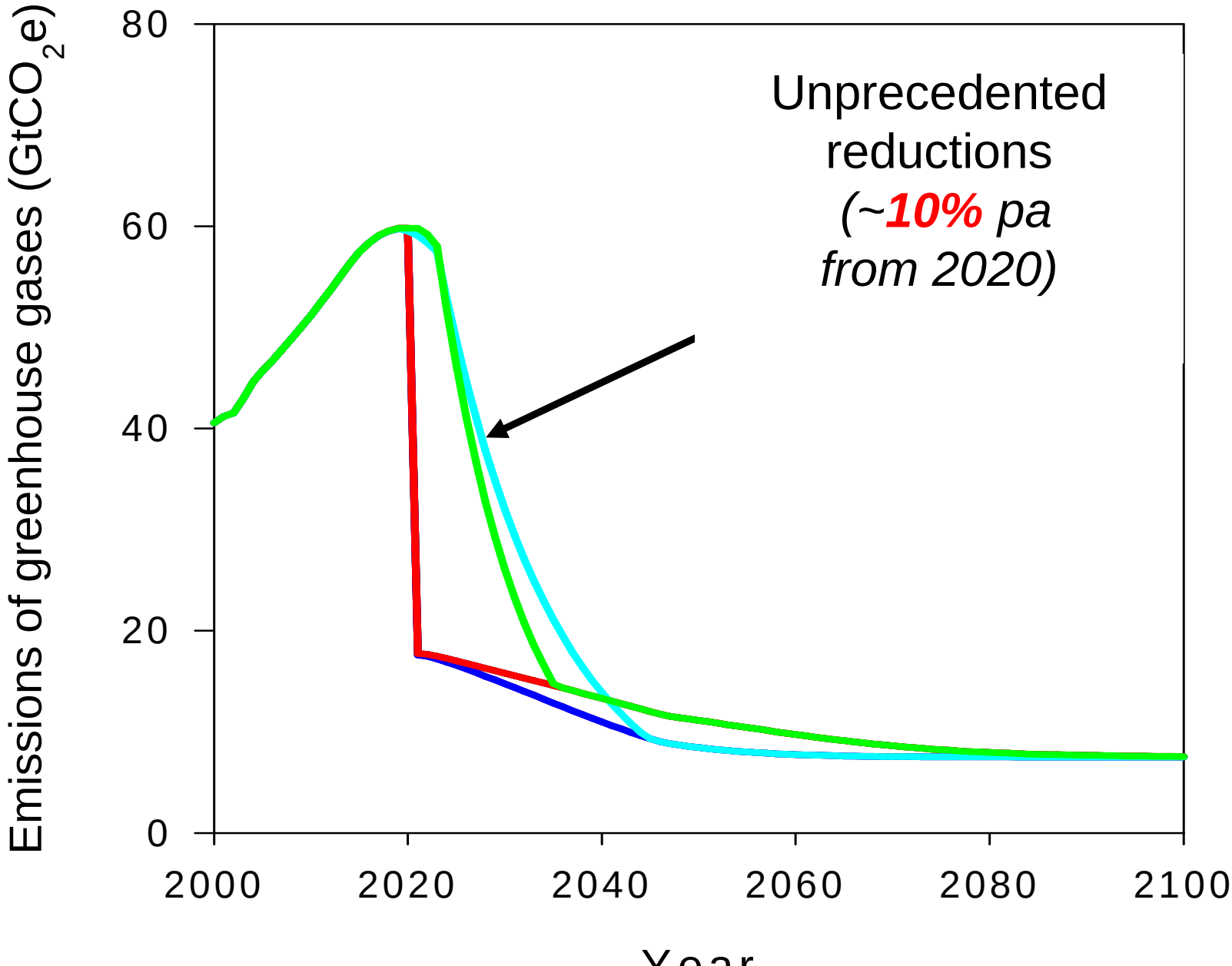


2025 peak



(Anderson & Bows. 2008 Philosophical Transactions A of the Royal Society. 366. pp.3863-3882)

… for 450ppmvCO_2e & 2020 peak

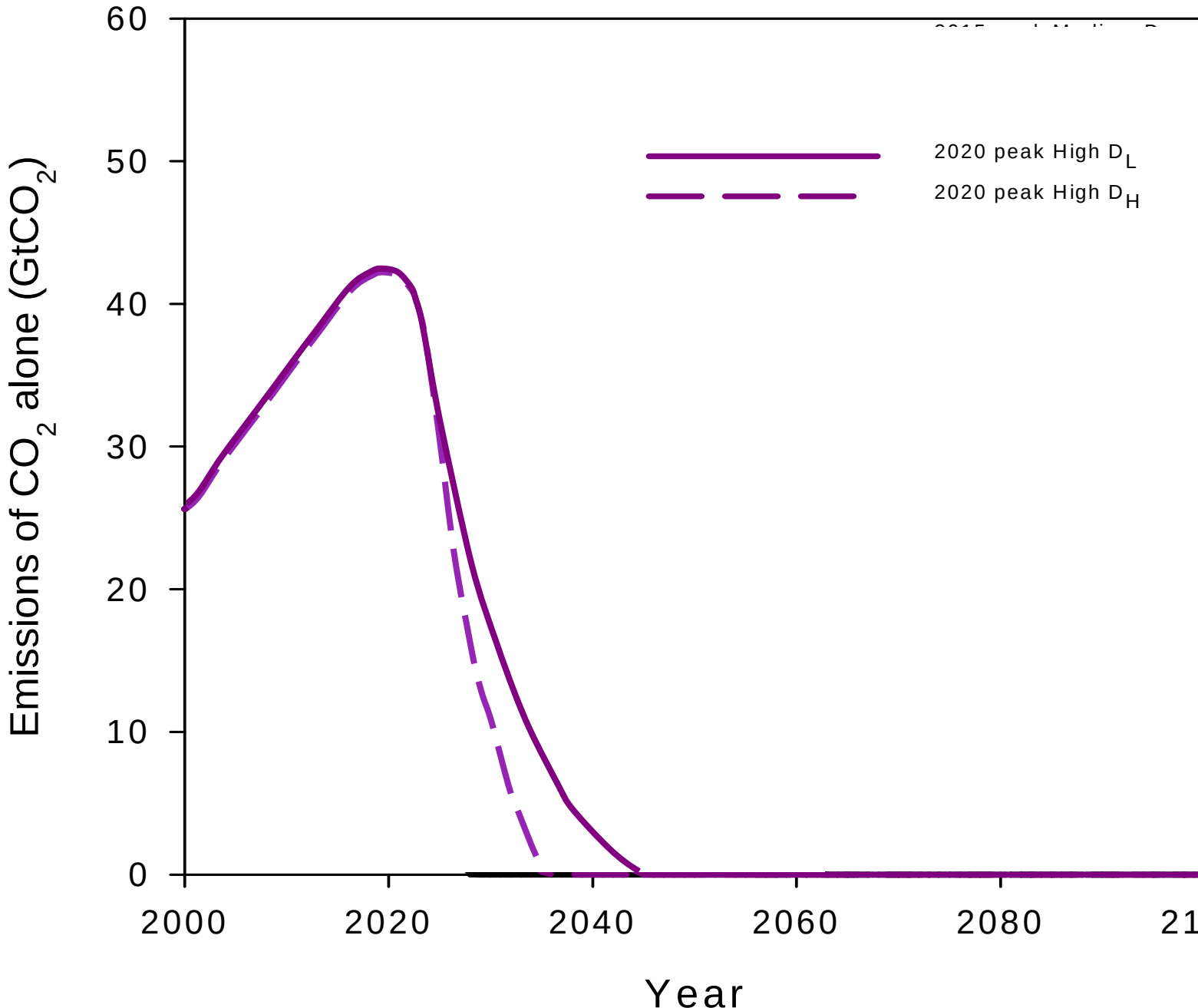


… and for energy emissions?

(with 2020 peak)

13 of 18 scenarios ‘impossible’

Even then total decarbonisation by ~2035-45 necessary



550 & 650 ppmv

greenhouse gas emission pathways

50% chance of 3 & 4°C respectively

For **3℃** & emissions peaking by 2020:

***… 9%** annual reductions in CO_2 from energy*

For **4℃** & emissions peaking by 2020:

***… 3.5%** annual reductions in CO_2 from energy*

What are the precedents for such reductions?

Annual reductions of greater than 1% p.a. have only

"been associated with economic recession or upheaval"

Stern 200

- *UK gas & French 40x nuclear ~1% p.a. reductions*

  (ex. aviation & shipping)

- *Collapse Soviet Union economy ~5% p.a. reductions*

Need to reframe climate change drivers:

- For mitigation

  2℃ should remain the driver of policy

- For adaptation

  4℃ should become the driver of policy

Urgent need for reality check

If economic growth not possible with 6% p.a carbon reduction

… then

need planned economic 'contraction' to stabilise even at ~4℃

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Urgent need for reality check

- *Focus on win-win opportunities is misplaced*
- *Significant 'pain' & many losers*
- *4℃ is not 'business as usual'*
  - but all orthodox reduction in place & successful
- *Adaptation agenda needs completely rewriting*

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Urgent need for reality check

Both mitigation & adaptation rates are:

- *beyond what we have been prepared to countenance*
- *without historical precedent*

We've entered new and unchartered territory

… ultimately ..

"at every level the greatest obstacle to transforming the world is that we lack the clarity and imagination to conceive that it could be different."

Roberto Unger

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Reframing Climate Change: End

How recent emission trends & the latest science change the debate

Kevin Anderson & Alice Bows