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Do we really need CCUS?

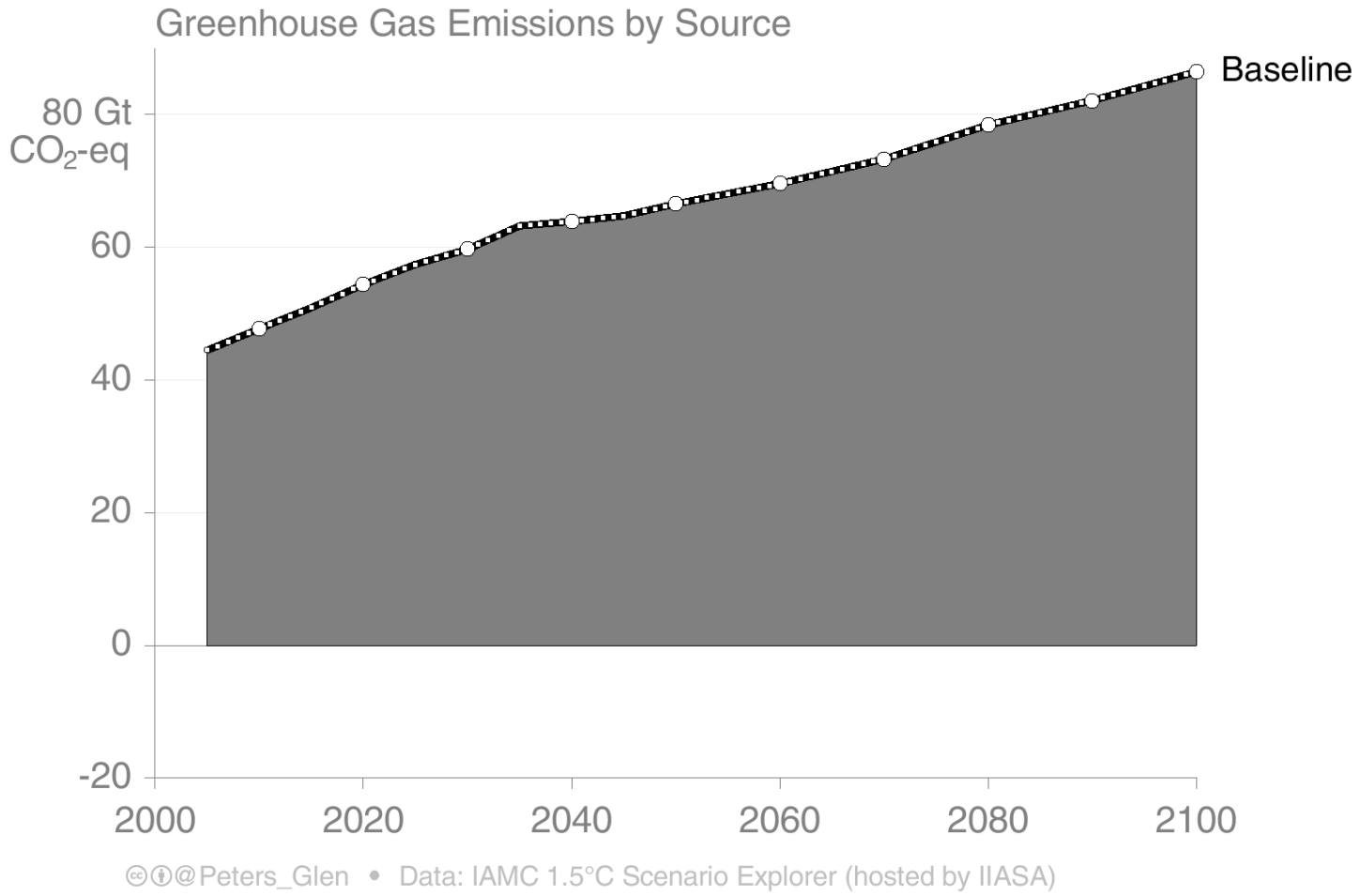
Glen Peters (CICERO Center for International Climate Research, Norway)

Clean Air Task Force, Third Way (remote, 4/12/2020)

Anatomy of a scenario

Anatomy of a scenario

Baseline: A world with no or little climate policy



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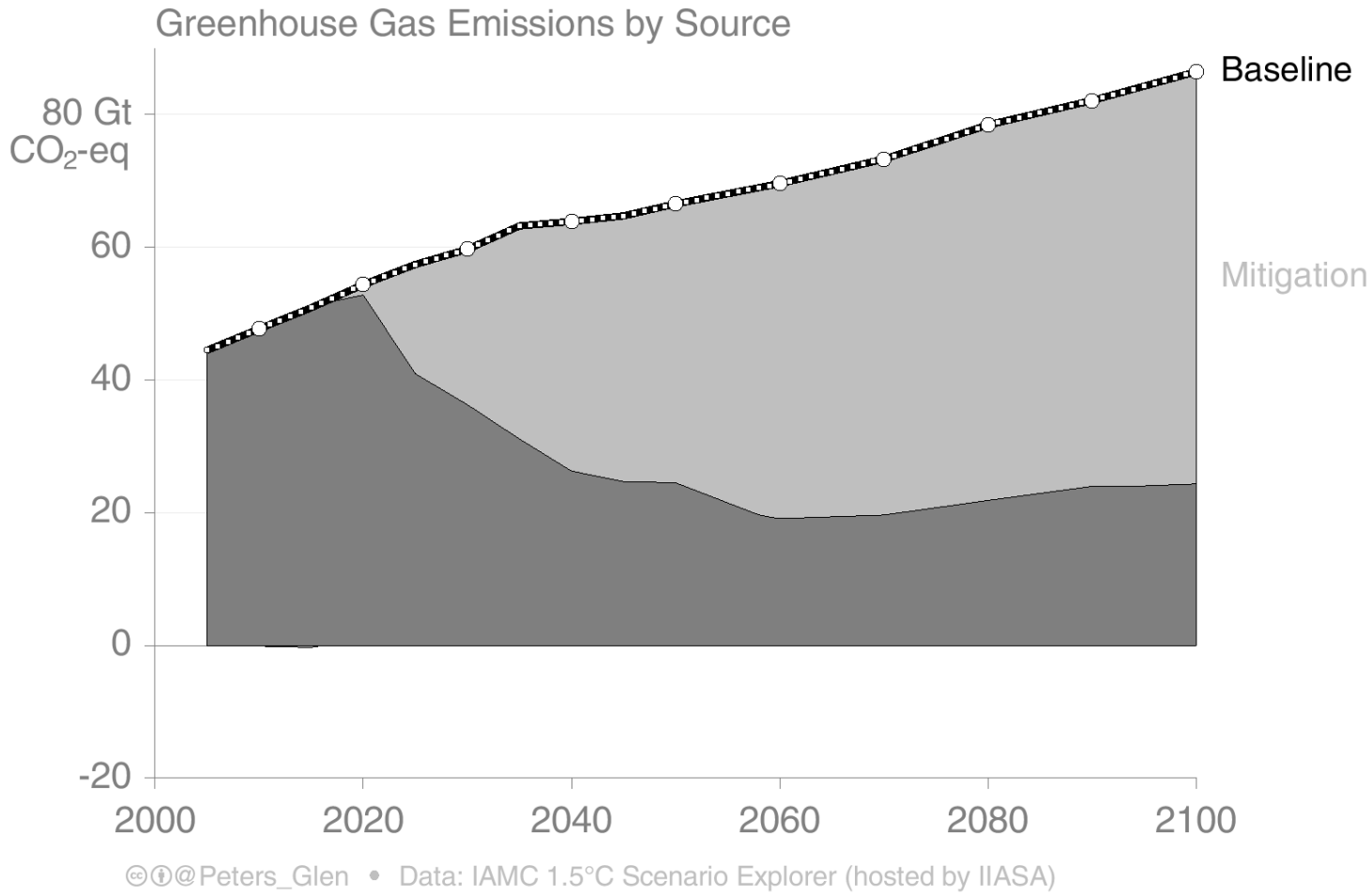
Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

Anatomy of a scenario

Mitigation: Reduce emissions by technical and behavioural change (e.g., renewables, electric cars, efficiency)



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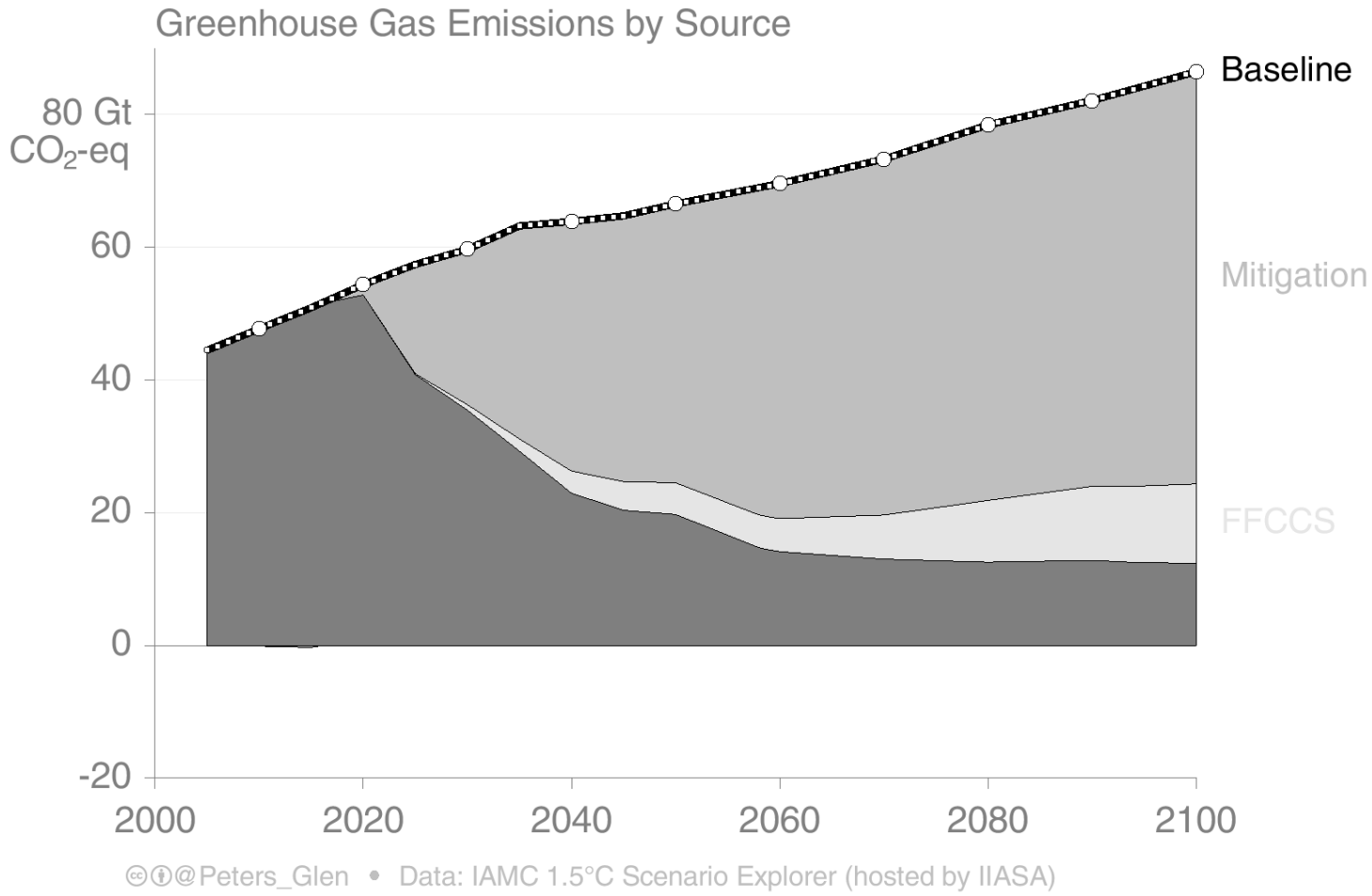
Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

Anatomy of a scenario

Fossil CCS: Perhaps we continue to use coal in industry or gas in electricity, but apply CCS to avoid emissions



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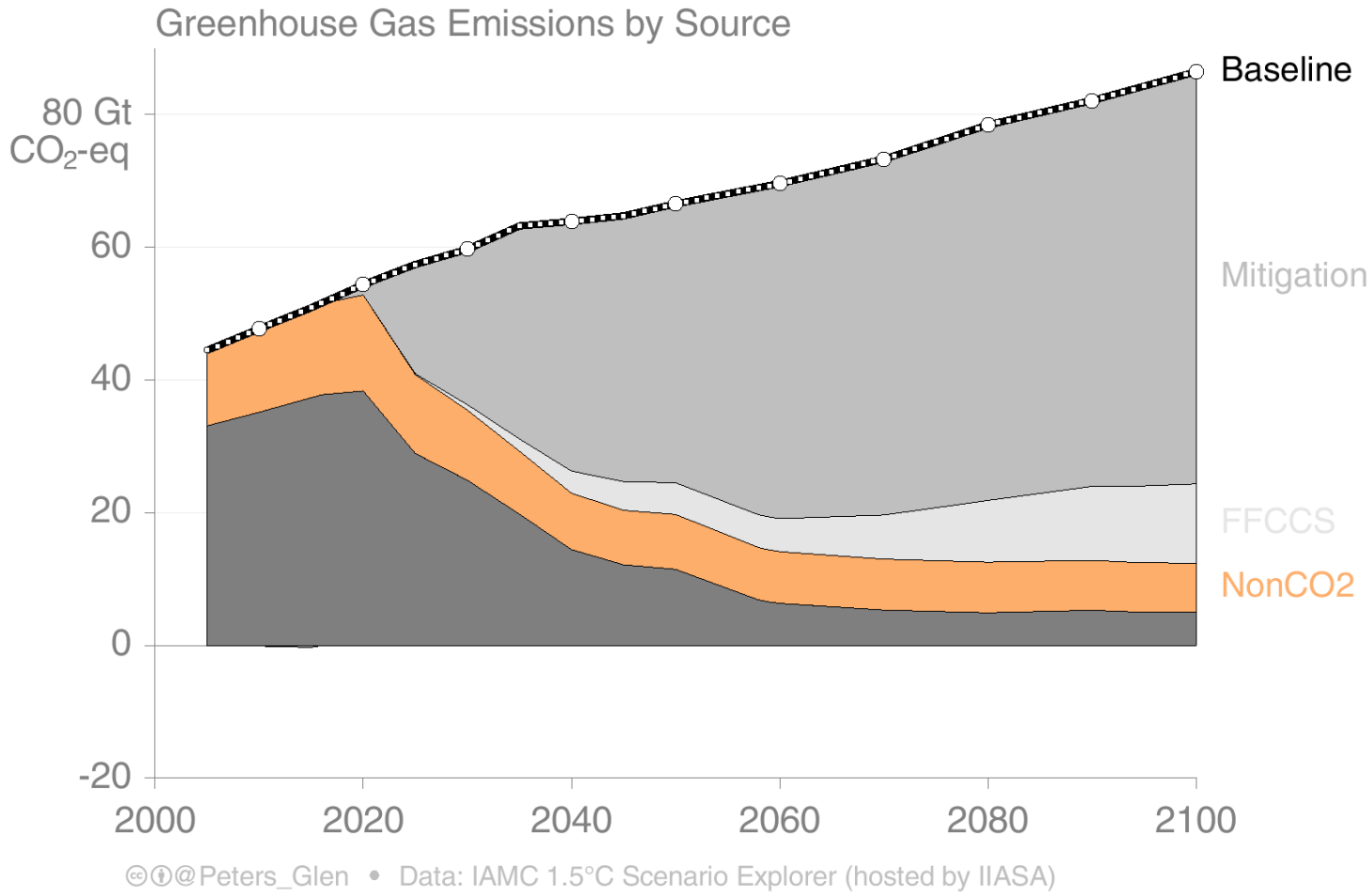
Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

Anatomy of a scenario

Non-CO_2: Emissions in agriculture might be hard to avoid, such as paddy rice or meat consumption



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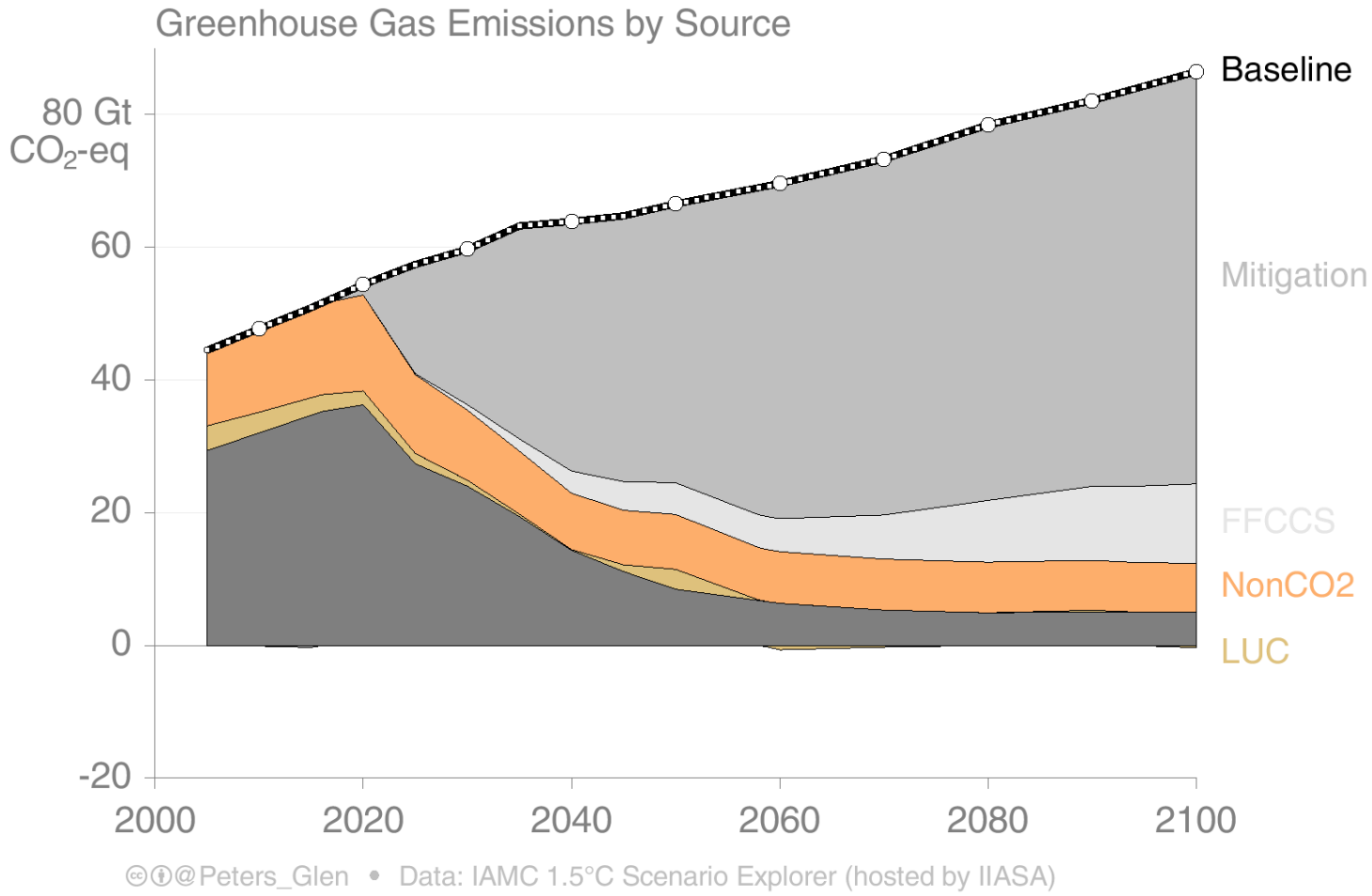
Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

Anatomy of a scenario

Land-use change: Large emissions from deforestation, but this needs to go to zero and preferably afforestation



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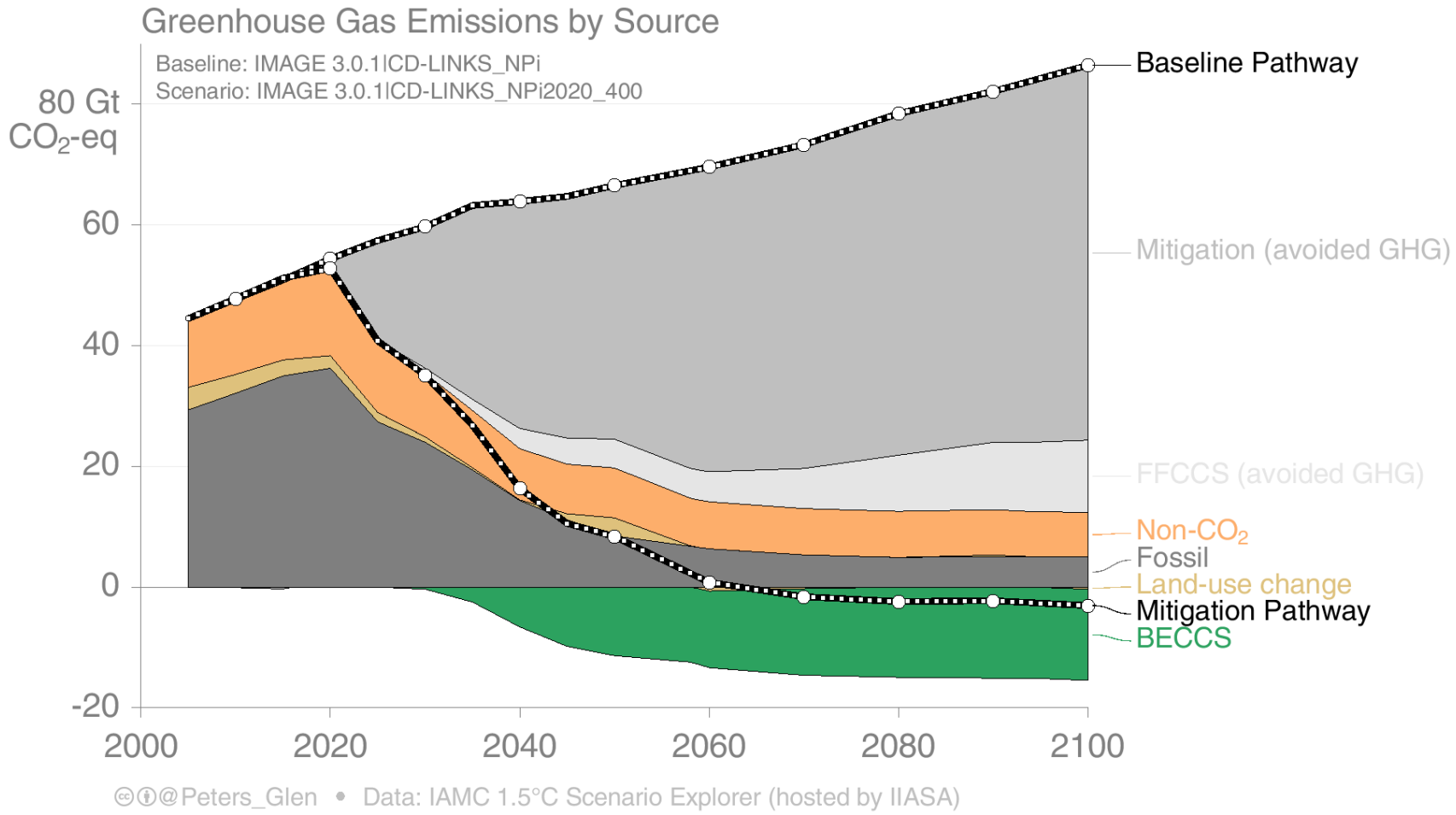
Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

Anatomy of a scenario

Carbon Dioxide Removal: We can't get everything to zero, so we physically remove CO_2 from the atmosphere (BECCS: Bioenergy with Carbon Capture and Storage)



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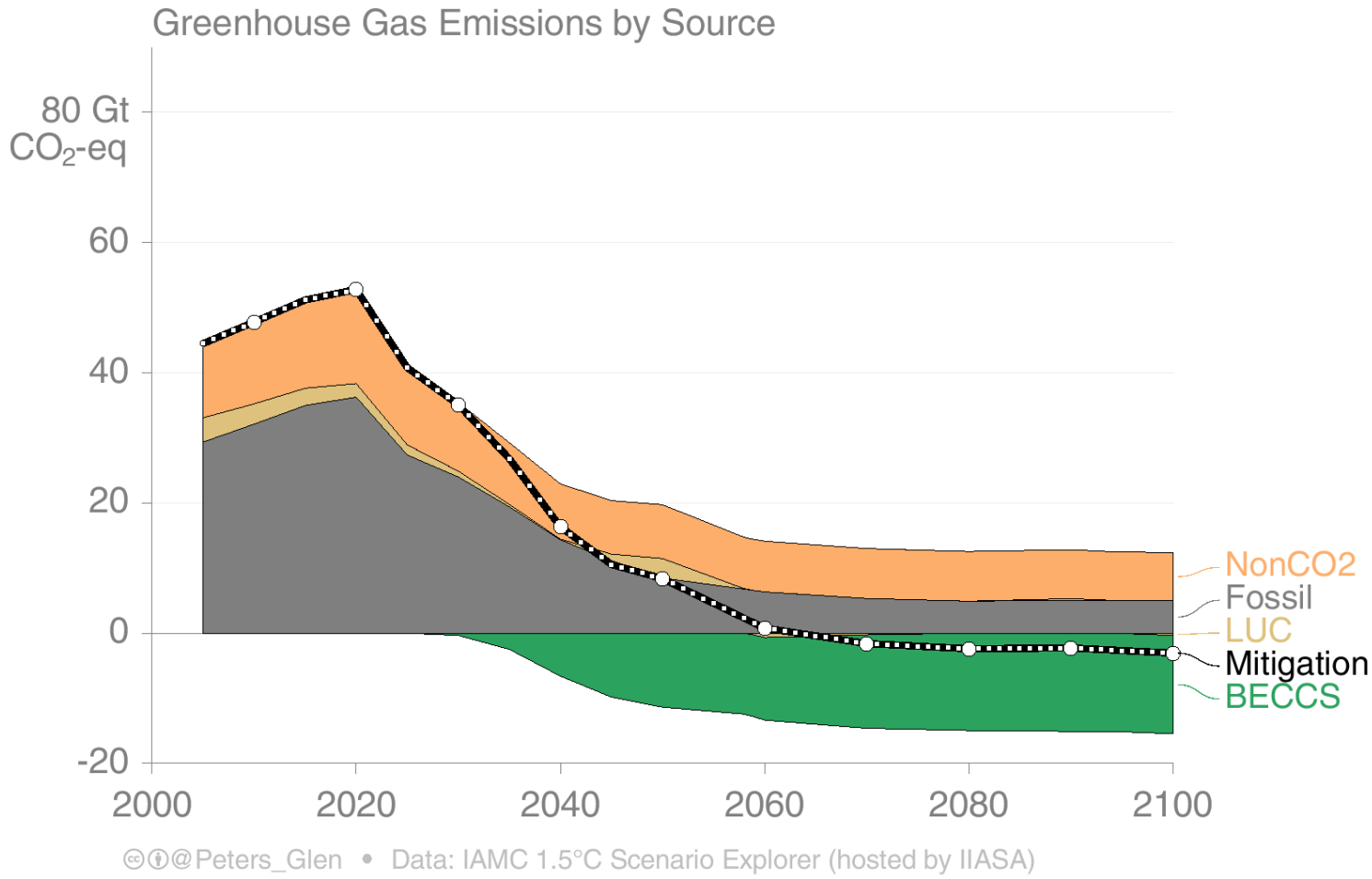
Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

Anatomy of a scenario

We now have now successfully kept global warming to 1.5C



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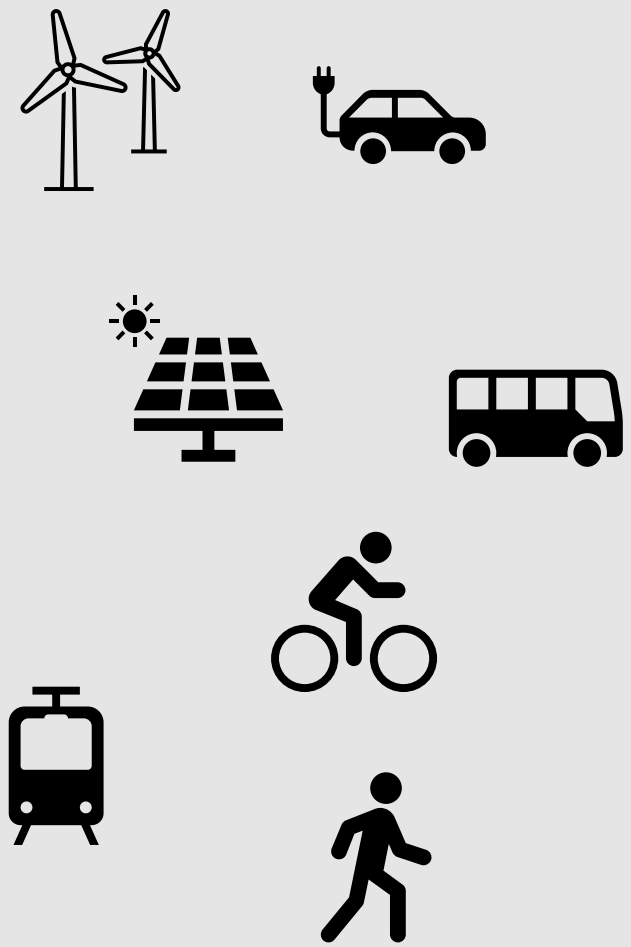
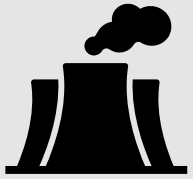
Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

How does CCS fit in?

Conventional mitigation

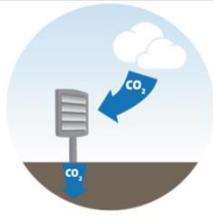


Fossil with CCUS



Removal involving CCUS

Bioenergy with carbon capture and storage
Plants turn CO_2 into biomass that fuel power plants. CO_2 captured and stored underground.



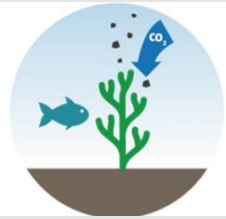
Direct Air Capture
CO_2 is removed from ambient air through chemical processes and stored underground.

Removal using other techniques

Afforestation and Reforetation
Tree growth takes up CO_2 from the atmosphere.

Biochar
Partly burnt biomass is added to soils absorbing additional CO_2.

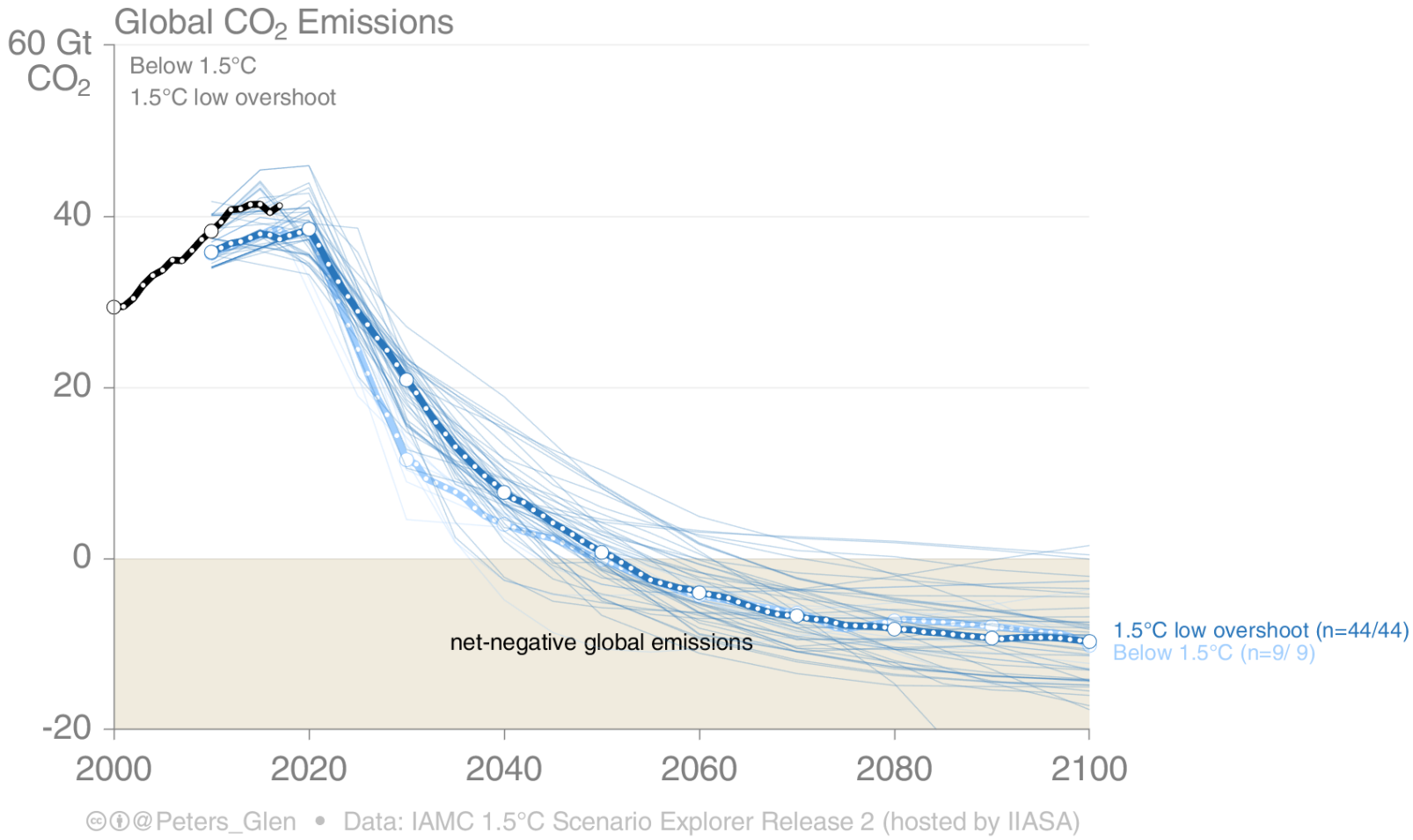
Enhanced weathering
Crushed minerals are applied to soil for chemical CO_2 absorbtion.



Ocean fertilization
Iron or other nutrients are applied to the ocean increasing CO_2 absorption.

There are many alternative pathways

There are many ways to 1.5C, even more ways to <2C, many pathways to 2.5C, and so on.
They all differ, but they all have the same general characteristics (less fossils, more non-fossil, some removals)



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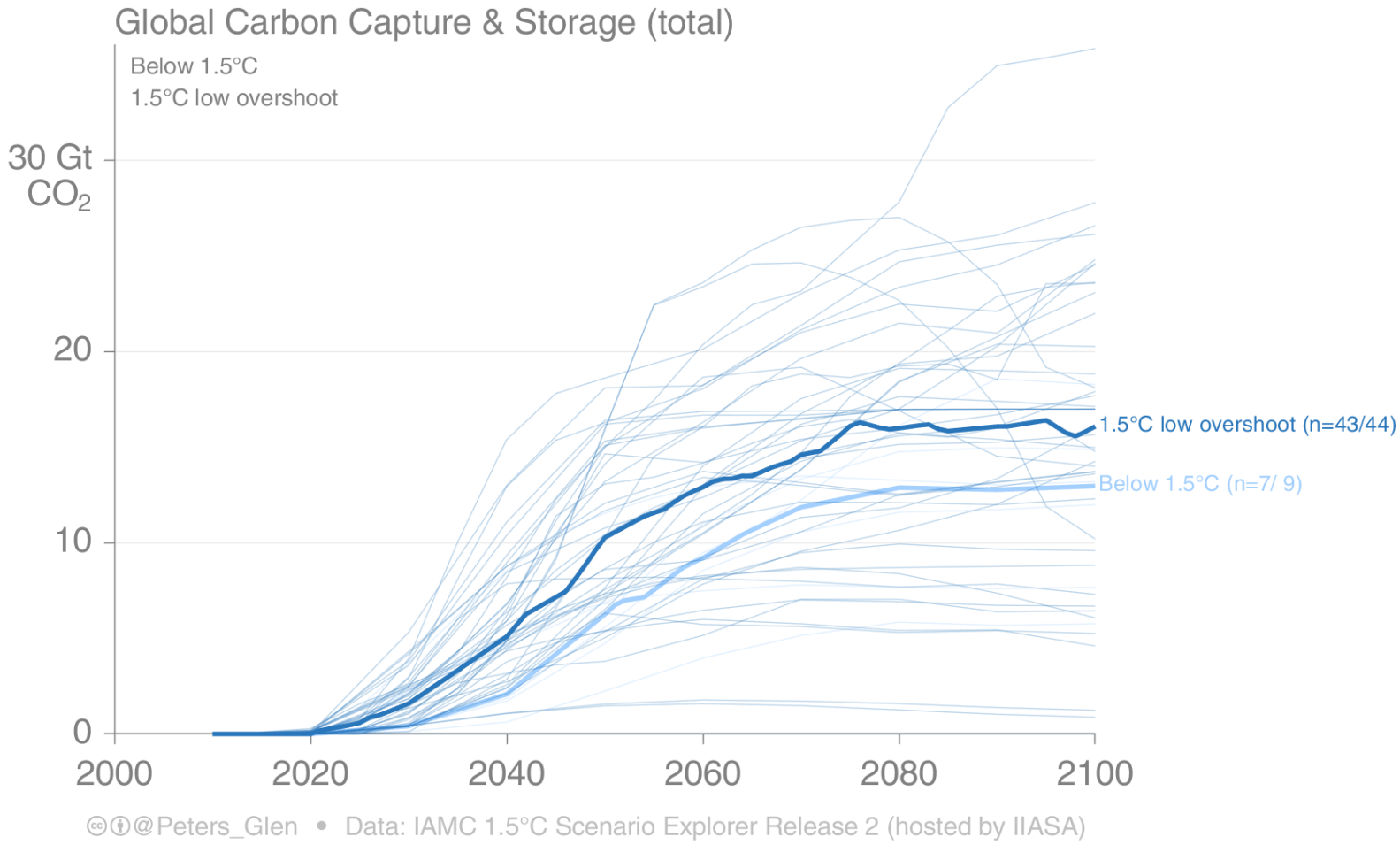
Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

Nearly all pathways require a lot of CCS

An average CCS facility is about 1MtCO_2/yr. Building 1 per day will give 1GtCO_2/yr in 2050!
Unlikely we can deploy CCS at these rates. This is just what a cost-optimising models shows!



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Source: Own calculations based on the IAMC 1.5°C Scenario Explorer

Do we *need* CCS?

- Scenarios (generally) assume rationale behaviour, cost optimisation over 100 years, discounting, “overshoot”, etc.
  - They use a lot of carbon capture and storage
  - Can argue scenarios use too much CCS
- But we will need some level of CCS (several $GtCO_2$/yr)
  - Mitigation: CCS may be cheapest (eg in industry)
  - Removal: Offset hard-to-mitigate sectors & agriculture
  - Overshoot: Reduce temperature (maybe)

Source: Sognnæs & Peters (2020)

A future for CCS? Yes…

We probably need more CCS than we can feasibly deploy!

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