



MEASURING CLIMATE CHANGE THE ECONOMIC AND FINANCIAL DIMENSIONS

GDP and Welfare through an Environment Lens

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The views expressed are those of the authors and not necessarily of the ONS.

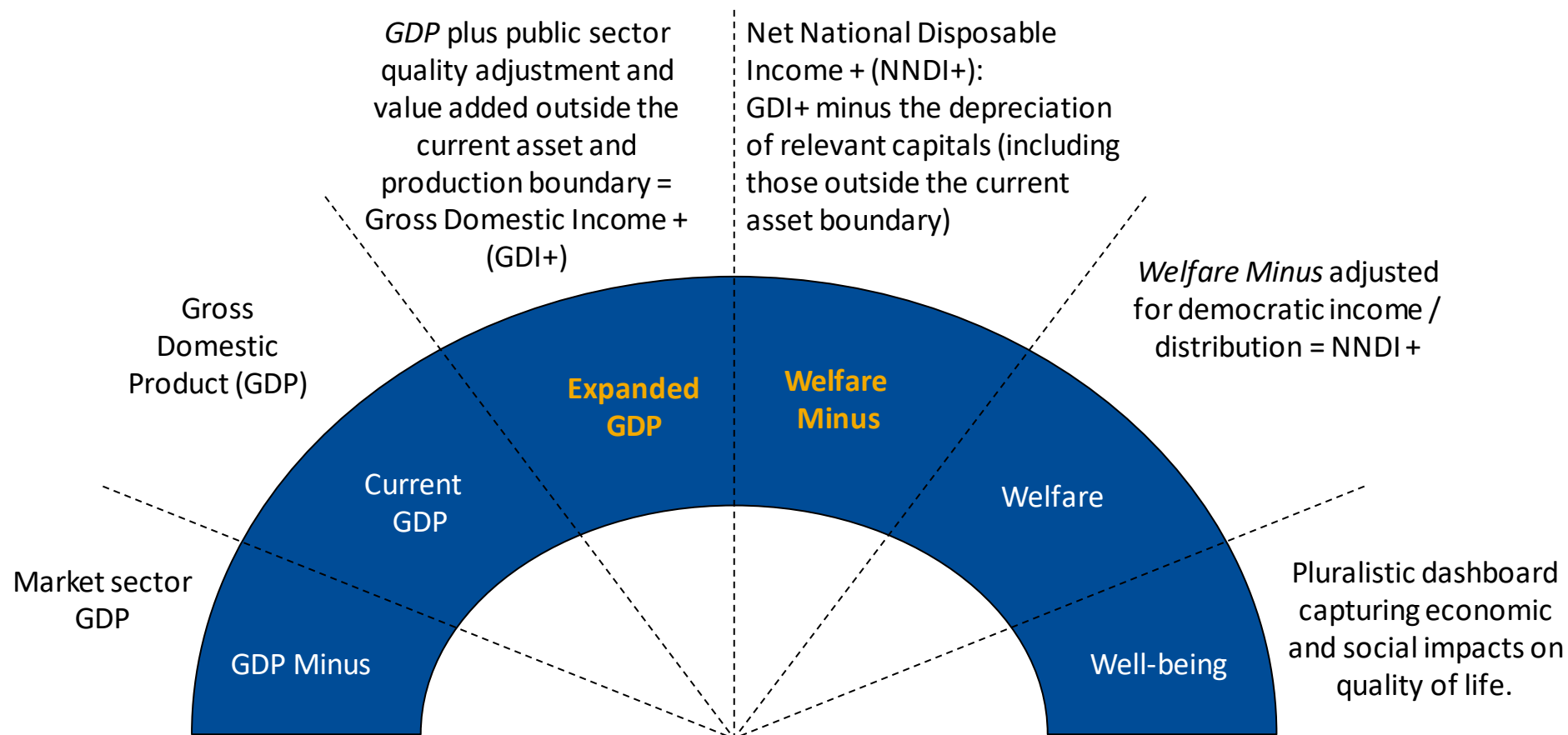
Delivering an Economic Welfare Measure

What's GDP not doing for us?



What's missing from GDP?

The 'Spectrum' model from, adapted from Heys, Martin, and Mkandawire (2019)



What adjustments do we make to GDP in Spectrum (2021)?

Quality Adjusted Public Services

Expanded Intangible Asset (IPPs) Definition

Unpaid Household Services

Natural Capital Flow of Benefits

Human Capital Investment

Free Digital Products

Included in paper

Included in paper

Included in paper

Partially included in paper

Not included in paper

Not included in paper

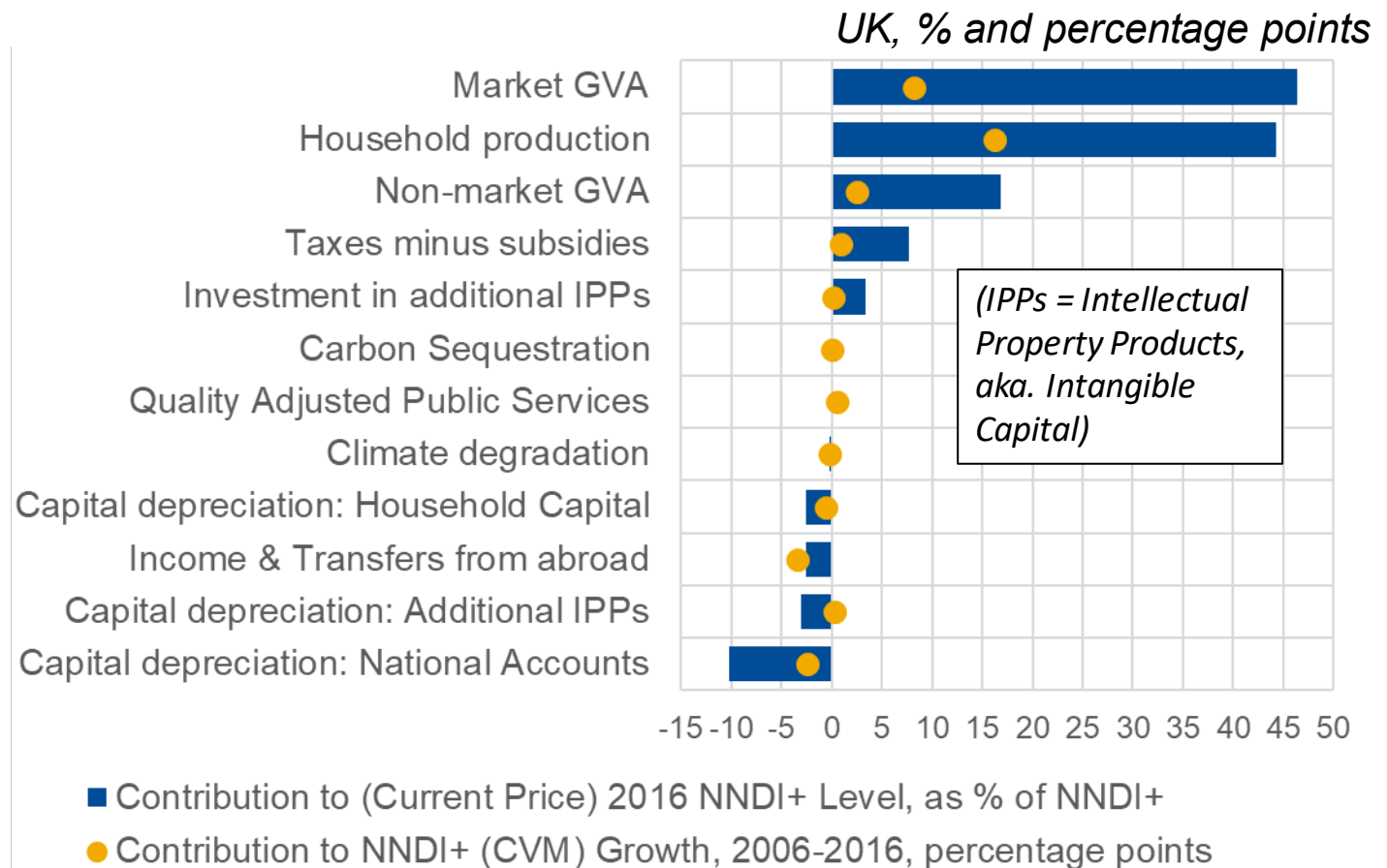
- Would capture substantial chunk of non-market economic activity currently excluded from GDP
- Feasible for the UK to compile over the next few years
- Including these in our definition of “the economy” would give a much better insight into the fundamental shifts in the economy likely to be associated with climate change (as well as the shifts we’ve seen during the pandemic).

We also include relevant measures of capital consumption to create a **Net National Disposable Income + (NNDI+)** Measure

The financial crisis saw a shift into non-market economic activities

- Market Gross Value Added (GVA) still accounts for a substantial portion of growth
- However, growth in (unpaid) household services expanded substantially during/following the 2008/09 downturn
- Suggests that, in the UK, the financial crisis saw a shift into non-market economic activities not captured by National Accounts

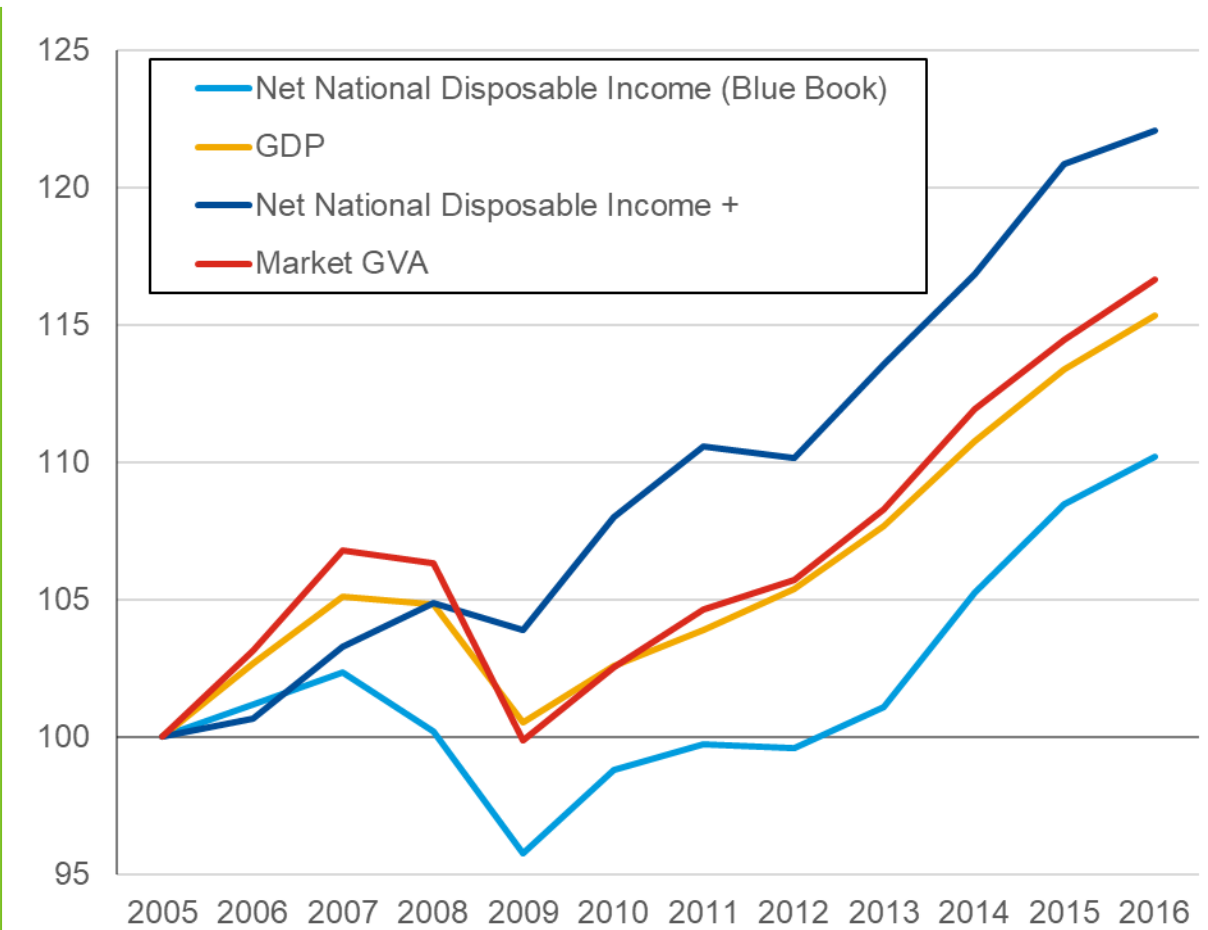
Contributions to growth in UK Chain Volume Measure (CVM) Net National Disposable Income + (NNDI+) between 2005 and 2016



Net National Disposable Income + shows stronger, more consistent economic growth

A comparison of Market GVA, GDP and Net National Disposable Income (as published by the ONS in Blue Book 2020) with NNDI +

UK, 2005 = 100, Chained Volume Measures



Atmosphere Degradation

Atmospheric Degradation

Purpose of this model/analysis:

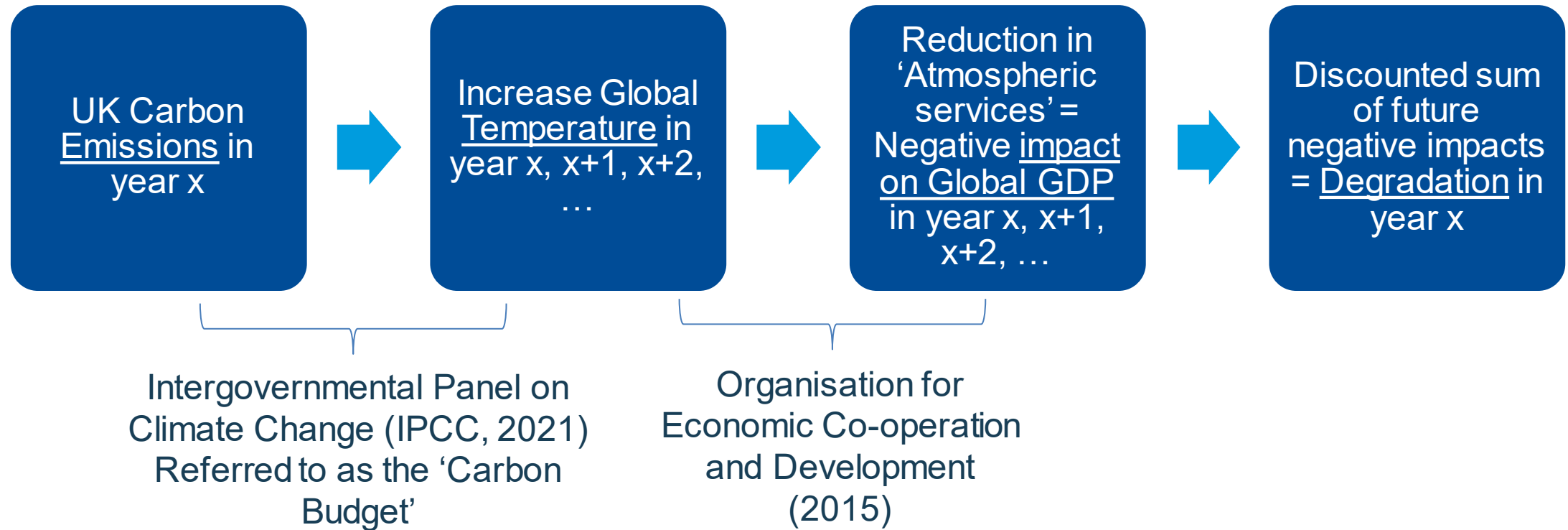
- This is mostly intended as an early, **explorative model**, to show how changes in assumptions feed through into outputs.
- We put less emphasis on exact amounts, levels etc. (as these depend on input data which are still imperfect), and rather on **differences in paths**

Atmospheric Degradation

- Treats the Atmosphere as a (produced/cultivated) environmental asset, which has some amount of services it provides (“atmospheric services”)
- Uses ‘Polluter Pays’ approach
- Measures the degradation to the atmosphere due to carbon emissions – which includes the reduction in “atmospheric services” in year x , $x+1$, $x+2$, ... due to carbon emissions in year x

Atmospheric Degradation

Simplified Methodology



Atmospheric Degradation

Slight updates since Spectrum (2021) publication

- Model updated using new Intergovernmental Panel on Climate Change (2021) report for this presentation (but same model used – on which more information can be found in Spectrum (2021)'s Annex)
- Added exploration of an experimental time-consistency adjustment

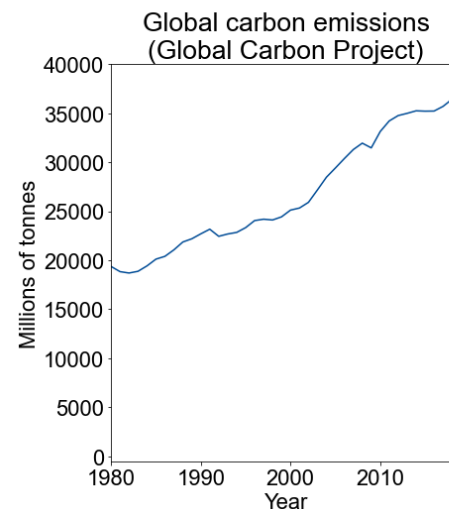
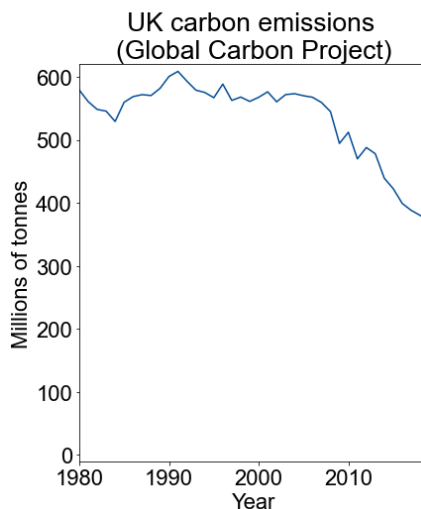
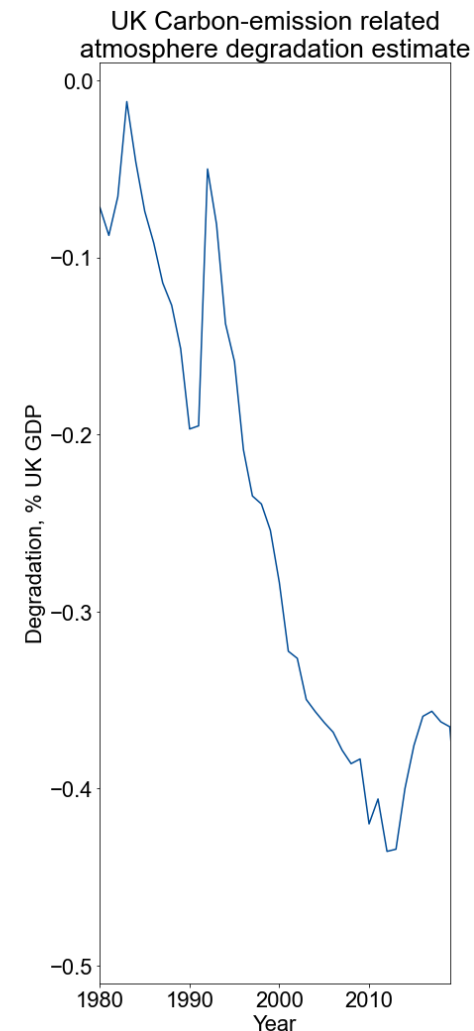
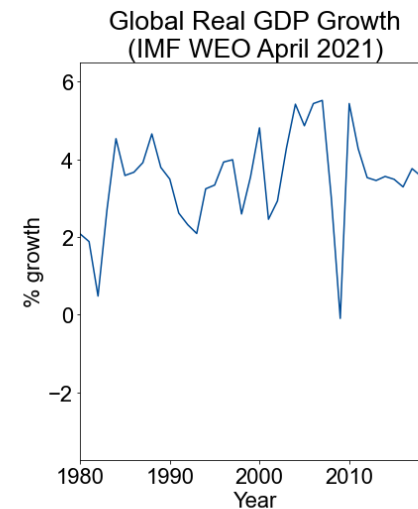
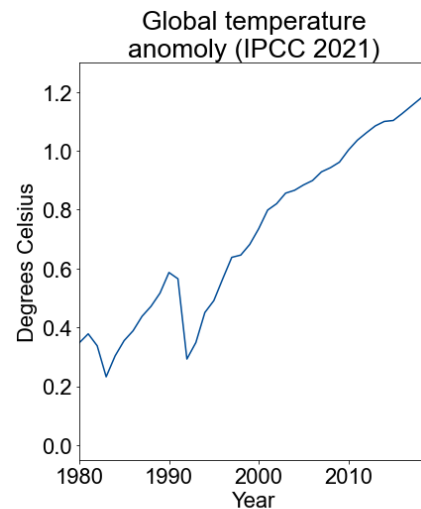
UK atmosphere degradation remains near 4-decade high

Key take-away:

Despite UK carbon emissions falling substantially since ~2007, degradation in 2020 is broadly similar to its 2007 value

Note:

- This measures the value of ‘damage’ caused *in the year the ‘cause’* (i.e. carbon emissions) occurred, rather than *the year in which the ‘damage’* occurred.
- We would encourage users to focus on the path of degradation and the mechanisms rather than the level



Atmospheric Degradation: Alternate Methodology

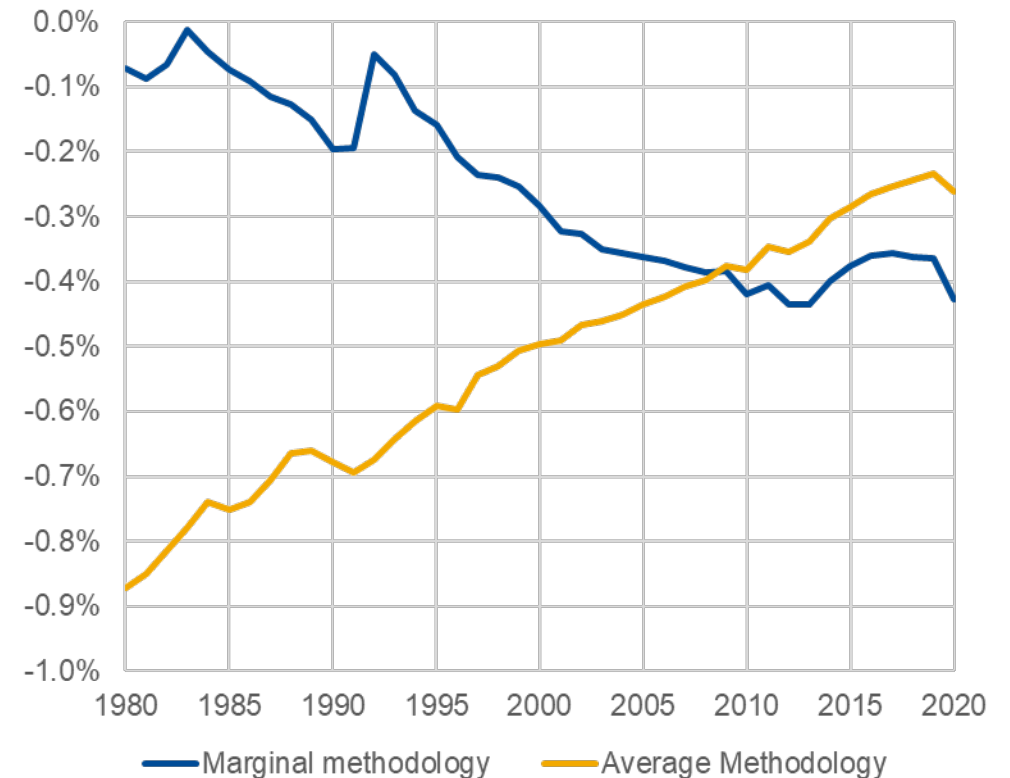
Alternative methodology for measuring Atmospheric Degradation

- Currently this methodology can be seen as **time inconsistent**. The negative damage caused by a unit of carbon is lower in previous (colder) time periods than in future (warmer) time periods – the carbon price increases over time.
- However, it could be desirable – as an alternative, or as a complement – to adjust this model so that the amount of ‘damage’ caused by a unit of carbon is constant (in real terms) over time
- Using IPCC (2021) scenarios, IMF GDP forecasts, and an assumption of 2.4% long term GDP growth, we can forecast the total damage of climate change 100 years into the future, calculate the average degradation per unit of carbon between 1980 and 2100, and use this to re-calculate degradation

Atmospheric Degradation: Alternate Methodology

- Illustrative example: SSP126 scenario from IPCC (2021) (which sees the global temperature anomaly peak at ~1.8 degrees), and a path for UK carbon emissions consistent with achieving net zero carbon emissions by 2050
- Key take away – Changing the methodology in this way can fundamentally change the long-term path of atmosphere degradation
- While ‘marginal methodology’ is more in spirit with accounting principles of the SEEA (System of Environmental Economic Accounting) and the System of National Accounts, ‘average methodology’ is also of analytical interest for understanding atmosphere degradation, particularly if used to compare across countries/time periods.

Atmospheric degradation as % of GDP, using ‘marginal’ methodology (as in Spectrum 2021), and ‘average’ methodology



Conclusions

- The work on Atmosphere Degradation is intended as exploratory, highlighting issues in this area that will need to be tackled for its inclusion in a measure of economic welfare.
- Further work is needed on the NNDI+ of economic welfare – expanding natural capitals, including human capital, and the value of free digital products.
- More work needed on relationship between global temperature anomaly and impact on GDP – but methodology presented here can be updated as this work advances
- An important role for GDP in economic decision making, but we envisage a measure like NNDI+ being useful to users who need a broader definition of the ‘economy’
- Such a broader definition may be of particular use to analyse large shifts in society and the economy – such as occurred during the Covid-19 pandemic, and as may occur due to the effects of, and response to, climate change