

# CLIMATE-ECONOMIC HANDBOOK

How the climate movement **in Denmark** can engage  
with New Economic Thinking



# PREAMBLE

## The case for engagement with pluralist economics

In the heart of the Climate-Economic Handbook lies an essential mission: to empower organizations and activists championing a green transition with a robust understanding of economics. As we confront the pressing need for an ecological paradigm shift, the discourse often becomes a battleground of ideologies, with mainstream economists advocating for market-based solutions and green growth driven by technological innovation. Yet, the voices of climate scientists and ecological economists resound with skepticism, cautioning against sole reliance on markets and underscoring the urgency for more transformative approaches.

This handbook is crafted to serve as a bridge between the diverse economic narratives — from those touting the merits of green growth to proponents of degrowth and the Wellbeing Economy. It is designed to demystify economic principles, equipping environmental advocates with the knowledge to critically engage in debates that shape our collective future.

Herein, we explore the spectrum of economic thought, acknowledging the allure of market mechanisms while also presenting radical policies and regulations that suggest alternative paths. We delve into the concept of keeping nature outside the economy by endowing rights to nature and animals, and by considering bans on polluting activities that harm our planet.

This handbook is not just an educational tool; it is a call to action for those ready to question the status quo, challenge market failures, and advocate for a sustainable and just economy. It is for the thinkers, the campaigners, and the changemakers who believe in a future where economic systems support rather than undermine the health of our planet.

As we navigate through these pages, we will engage with complex ideas, examine diverse indicators, and consider how best to align economic policies with environmental imperatives. The journey towards a green transition is multifaceted, and it is through a pluralistic economic engagement that we can hope to understand and influence the tides of change.

Welcome to a handbook that is as dynamic and evolving as the movement it seeks to support. May it inspire informed dialogue, strategic advocacy, and bold action towards a thriving, resilient, and equitable world.



# INTRODUCTION

**This handbook was written for the Climate-Economic Network in Denmark**

Welcome to a pivotal resource in the journey towards a sustainable and equitable future — the Climate-Economic Handbook. This handbook arrives at a time when the necessity for systemic change is undeniable, as we confront the intertwined crises of climate change and social inequity. It is crafted for activists, policymakers, and any engaged citizen who believes in the possibility of a Wellbeing Economy — one that values ecological balance, social fairness, and economic diversity.

The chapters herein are not mere literature; they are a call to action, a guide to transforming Denmark's approach to climate and economic challenges. From the 'Quickguide to Socioeconomic Analysis' to exploring key indicators of Denmark's ecological footprint, this handbook provides tools to scrutinize the prevailing economic narrative that has long dictated policy and management.

We delve into the complexities of socioeconomic analysis, questioning the adequacy of traditional measures in capturing the true value of nature. Can socioeconomic analysis be relevant if it fails to acknowledge the intrinsic worth of our natural world? We explore alternative economic arguments that dare to imagine a different paradigm.

Our focus on key indicators such as Denmark's climate debt and ecological overshoot is designed to highlight the urgent need for a shift towards justice and sustainability. Through the lens of mainstream climate economics, we critique the status quo and provide a list of key climate and environmental policies, supporting assumptions, and their criticisms.

The ideas presented are backed by rigorous discussions and insights from leading thinkers and activists, reflecting the collective wisdom of the Danish climate movement. This handbook is not just a repository of knowledge but a manifesto for change, echoing the voices that demand a transformation of our economic systems.

We hope this handbook serves as a beacon, guiding us towards a future where economics and ecology walk hand in hand, fostering a society that thrives on well-being for all.



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Developed by Mads Falkenfleth & Maj Larsen-Lechuga  
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With funding from





# Introduction to economy and climate

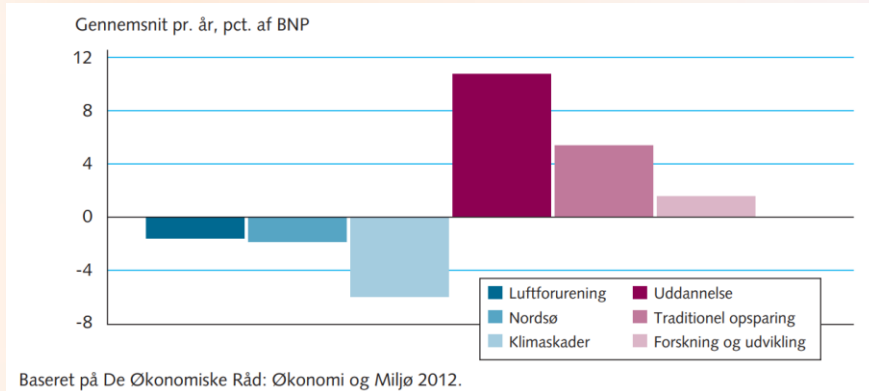
What overall approaches to environment, climate and economy exist and what are their key tenets?

*This section introduces four different approaches to economic issues in relation to environmental and climate matters.*

*These include the traditions within economics, environmental economics and ecological economics, as well as two approaches that amount to more general ecopolitical projects namely degrowth and wellbeing economy.*



## Conceptualization



*The economy includes both natural, human and human-made capital. To make the most cost-effective decisions, we need to understand and optimize the overall monetary values of them all—the total economic value.*

# INTRODUCTION TO ECONOMY AND CLIMATE

## Environmental Economics

*Environmental Economics is mainstream economics applied to the environmental issues. It provides a framework for understanding and addressing environmental issues within the historically dominant paradigm in economics, emphasizing market-based solutions and the valuation of environmental goods and services.*

### Starting point

Environmental economics operates on the principle that environmental problems are primarily the result of market failures. These arise due to pollution—so-called externalities—which can be corrected through appropriate market-based interventions. This school of thought posits that economic activities can impact the environment, but these impacts can be quantified, priced, and in this way managed within the economic system.

### Methodological Approaches

This tradition heavily relies on cost-benefit analysis to evaluate environmental policies and interventions. It employs methods like so-called contingent valuation (e.g. asking how much an individual would pay to maintain a forest) to assign monetary values to environmental goods and services, which are often not priced in markets. Environmental economists seek to understand and quantify the trade-offs between economic development and environmental degradation.

### Policy Implications

The solutions proposed by environmental economics typically involve market-based instruments like taxes and cap-and-trade systems for pollution control. These tools are designed to internalize (include) the external costs of environmental harm into the decision-making processes of businesses and consumers, thereby aligning private interests with societal environmental goals.

### Key Objectives

The primary aim is efficient allocation and management of environmental resources to balance economic growth with environmental sustainability. This involves minimizing the cost of environmental policies and ensuring that the benefits of environmental preservation and improvement outweigh these costs.

### Examples of the approach in Denmark

Two of the most famous examples of the approach in recent years in Denmark, are

1. **The GRØN REFORM model** built by DREAM and used by the Ministry of Finance to evaluate how economic policies impact the environment.
2. **The Green GDP** estimated by economists at the University of Copenhagen along with Statistics Denmark.

Most economists in Denmark are trained only in mainstream economics—and far from everybody is trained in environmental economics specifically. The environmental economics approach underpins the argument that the policies to address climate change should be evaluated on the basis of how cost-effective they are. This means that solutions that are not market-based such as giving nature rights will not be considered.



## Ecological Economics

*Ecological Economics represents a paradigm shift from mainstream environmental economics, recognizing ecological limits to growth and placing a stronger emphasis on complexity, sustainability, and equity.*

### Starting point

Ecological economics views the economy as a subsystem of the larger ecological system, inherently constrained by the planet's finite resources and ecosystems. It emphasizes biophysical limits of economic growth, recognizes the intrinsic value of nature and rejects the commensurability (ability to rank or numerically compare) of different values.

### Methodological Approaches

This school adopts an interdisciplinary approach, combining insights from economics, sociology, ecology, thermodynamics, and other disciplines. It often employs systems thinking to understand complex interactions and feedback loops between economic activities and ecological systems, focusing on long-term sustainability rather than short-term efficiency.

### Policy Implications

Ecological economics advocates for a sustainable scale of economic activity, defining progress not in terms of GDP growth but in terms of improved well-being, equity, and ecological health. It supports policies that reduce energy consumption, promote renewable energy, conservation of ecosystems, and a transition to a steady-state economy where material and energy throughput are kept within ecological limits.

### Key Objectives

The primary goal is to maintain the integrity and stability of the ecological system, ensuring that economic activities do not exceed the carrying capacity of the environment. It seeks equitable distribution of resources to ensure that all people can live decent lives.

### Examples of the approach in Denmark

There are not that many examples of ecological economics being applied in Denmark, but two noteworthy ones are:

1. **Copenhagen Doughnut:** In June 2020, Copenhagen's city council voted to adopt the Doughnut as an economic model, inspired by Amsterdam's successful implementation of the same. This decision represents a shift towards a holistic approach to urban development, one that balances social, economic, and environmental sustainability.
2. **Inge Røpke Award:** The award was introduced by Rethinking Economics Denmark at its first edition given to Prof. Inge Røpke herself in 2022 in honor of her substantial contributions to the field. From 2023 onwards, it is granted to a graduate for the best dissertation on ecological economics annually. Read more [here](#).

For more information on Ecological Economics, visit [www.ecomacundervisning.dk](http://www.ecomacundervisning.dk), which was built by Prof. Inge Røpke and her colleagues at Aalborg University, to make ecological economics much more accessible to a wider audience (*in both Danish and English*). It can also be easily applied by teachers with a lot of instructional material.

## Conceptualization



*The economy is embedded in the wider society, which is in turn embedded in ecology. This means the economy is a subset of and deeply dependent on the societal and ecological systems.*

# INTRODUCTION TO ECONOMY AND CLIMATE





Consider joining the "[Degrowth Copenhagen](#)" in Denmark.

# INTRODUCTION TO ECONOMY AND CLIMATE

## Degrowth

Degrowth is not a school of thought in economics. Rather, it is a "*proposal for a radical reorganization of society that leads to a drastic reduction in the use of energy and resources and that is deemed necessary, desirable, and possible*" (Schmelzer, Vetter & Vansintjan, 2022).

### Introduction to Degrowth

Degrowth does not—despite its name—imply recession. Rather, it proposes "*a planned downscaling of energy and resource use to balance the economy with the living world in a safe, just, and equitable way*" (Hickel, 2020). This also involves upscaling of necessary sectors of the economy.

The degrowth movement challenges the prevailing paradigm of continuous economic growth, especially critiquing the notion of "progressive productivism." The authors argue that it is not sufficient to focus solely on social justice and redistribution in the Global North, but rather policies need to address fundamental changes in the economy, technology, institutions, and lifestyles. This critique extends to initiatives like the Green New Deal, which remain tied to the paradigm of economic growth and thus fail to address the deep-seated issues of resource and energy demand in industrial societies.

Degrowth is presented not just as an economic alternative, but as a broader exercise in political imagination and rethinking societal priorities. It's about breaking away from the entrenched focus on growth and considering how societies can function sustainably within ecological limits. This reimagining involves reshaping consumption patterns, resource use, and broader economic and social structures to achieve a balance that supports both the planet and equitable human development.

### Three strategies for achieving degrowth:

1. **Transformation through Democratic Control:** Advocating for global ecological justice by reducing material throughput, particularly in Global North societies. This principle emphasizes not only the reduction in consumption and production but also aims for social justice and self-determination. This transformation is envisioned as a democratic process, reshaping both technological and social infrastructures, and revising societal values and political imaginations.
2. **Policy Proposals for a Degrowth Society:** The book presents a range of policy proposals that support the degrowth vision. These include democratizing the economy, commoning the means of production, expanding social security, technological redesign, redistributing and revaluing labor, dismantling capital-centered production, and fostering international solidarity through actions like [reparations](#) and restructuring global production chains. The authors note that many of these proposals overlap with other progressive political currents, suggesting opportunities for building broader political alliances.
3. **Strategic Approaches - Combining Top-Down and Bottom-Up Methods:** The book argues for a dual strategy that combines top-down state-level reforms with grassroots activism. This approach involves creating autonomous local communities or "nowtopias" while simultaneously pushing for systemic, non-reformist state-level reforms. This strategy acknowledges the need for balancing local initiatives with broader structural changes, although it also recognizes the inherent tensions and challenges in aligning these different scales and approaches.





Consider joining the "[Wellbeing Economy Alliance Hub](#)" in Denmark.

# INTRODUCTION TO ECONOMY AND CLIMATE

## Wellbeing Economy

Wellbeing Economy is not an economic school of thought, but a movement for a transformative shift in economic thinking towards enabling good lives for everyone within planetary boundaries. It is not to be confused with '*economics of wellbeing*', which attempts to quantify mental wellbeing in monetary terms to augment GDP. Instead, the wellbeing economy framework posits that the economy should be a means to the end of increasing human and ecological wellbeing, not an end in and of itself.

### Introduction to the Wellbeing Economy:

Wellbeing economy seeks to provide a systemic alternative to the current economic model, asserting that the relentless pursuit of GDP growth often fails to translate into increased human wellbeing and can exacerbate ecological degradation. The movement emphasizes that societies should directly aim for wellbeing outcomes that respect planetary boundaries, rather than assuming that wellbeing will automatically result from GDP growth—a presumption contradicted by empirical evidence.

### Cases from 5 members of the Wellbeing Economy Governments (WEGo):

1. **Iceland's General Wellbeing Economy:** Since the financial crisis of 2008, which hit Iceland particularly hard, the country has "focused on returning to the Nordic Model that aims to protect people's wellbeing through a strong welfare system while also protecting the environment". They have e.g. done that by **electing women into key political and decision-making functions**, and when Covid-19 hit Iceland, the metrics and monitoring of wellbeing indicators helped steer effective policies to secure societal resilience and minimize the loss of wellbeing ([Read More](#)).
2. **Wales' Future Generations Act:** The Wellbeing of Future Generations Act represents a commitment by Wales to sustainable development. It establishes a statutory framework that compels public bodies to consider the long-term social, economic, environmental, and cultural well-being of the country. This pioneering approach ensures that the decisions made today do not compromise the ability of future generations to meet their own needs, aligning with the principles of a wellbeing economy that values sustainability and intergenerational equity. ([Read more](#))
3. **Finland's Wellbeing-Oriented School System:** Finland's education system, internationally recognized for its high performance, has integrated wellbeing into its core, creating an environment where students' happiness and personal development are as important as academic success. The system's focus on less standardized testing and more creative play fosters a holistic development approach, producing citizens who contribute positively to a wellbeing economy that values mental health and life satisfaction. ([Read more](#))
4. **The Wellbeing Economy Monitor of Scotland:** Scotland's Wellbeing Economy Monitor is a tool designed to assess the country's progress across various dimensions, including health, education, and the environment. By measuring success beyond GDP, the monitor helps policymakers ensure that economic progress translates into real improvements in citizens' lives, embodying a wellbeing economy approach that prioritizes holistic societal health over mere economic growth. ([link](#))
5. **The CBAX Model of New Zealand:** New Zealand's Cost-Benefit Analysis incorporating the Wellbeing Approach (CBAX) is a policy appraisal tool that includes broader measures of wellbeing in its assessment. This model evaluates the impact of policies on the quality of life of citizens, considering factors such as mental health, community cohesion, and environmental sustainability. It guides decision-making toward outcomes that support a wellbeing economy by ensuring policies contribute positively to the holistic welfare of New Zealanders. ([Read more](#))



# Intro to Socio-economic Analysis

A guide to environmental and climate economic analysis in **Danish politics**

*This section introduces you to mainstream socio-economic analyses on climate and nature, how to use such analyses for a green agenda and how to criticize them. The guide is filled with links where you can read more in depth and find examples of how others have criticized the analyses or used the same methods to promote a green agenda.*

*The next time the Ministry of Finance, the Ministry of Environment, the Ministry of Transport or others present calculations that show that climate action is too expensive, that there should be no more electric cars on the roads or that new highways are a good idea economically, you can go back to this section.*



# WHAT IS A SOCIO-ECONOMIC ANALYSIS?

While a budget economic analysis takes into account the income and expenses associated with a given measure, a socio-economic analysis looks at market prices AND monetary values of e.g. air pollution, noise nuisance, etc.

In other words, the monetary value of phenomena that do not cost or bring in money is calculated using different methods. The Ministry of Finance talks about two main approaches:

1. Hypothetical valuation. Here you look at feedback, for example in the form of questionnaires (asking what you are willing to pay for e.g. groundwater protection).
2. Observed behavior/hedonistic valuation (willingness to pay is found indirectly, e.g. by looking at differences in house prices for houses with different distances to highways, water, forest, etc.)

Take a look at [Zetland's article](#) for more.

## Intro til socio-economic analysis

*The Ministry of Finance's description: "Socio-economic impact assessments are used to provide a **systematic quantification of all the advantages and disadvantages** of initiatives such as an investment project or a change in public regulation."*

Socio-economic analyses equate actual payments and theoretical monetary value of environmental and climate impacts. They are not about what things actually cost or what you pay, but what you would pay or need to be compensated with to be at the same "happiness level."

*The best intro to economic analysis in Danish is written by Zetland. The article is based on the work of the Eldrup Commission.*

### NOT A "BUDGET"-ØKONOMISK ANALYSE

Although there is a "surplus" for the state from taxes, the Eldrup Commission estimated overall negative socio-economic consequences.

EXAMPLE OF A SOCIO-ECONOMIC ANALYSIS  
FROM [THE ELDRUP COMMISSION](#) ON CAR TAXATION.



<https://fm.dk/media/27196/vejledning-i-samfundsøkonomiske-konsekvensvurderinger-juni-2023.pdf>

NB. THE MINISTRY OF FINANCE'S CALCULATION METHODS INCLUDE BOTH SOCIO-ECONOMIC ANALYSES AND "BUDGET" ECONOMIC ESTIMATES OF GOVERNMENT REVENUE AND EXPENDITURE AS A RESULT OF A GIVEN POLITICAL INITIATIVE

Read more on this by the Ministry of Financen [here](#)

Tabel 5.7  
Sammenligning af effekter af afgiftsmodeller

Effekter i 2030	Model 1	Model 2	Model 3	Model 4
Antal nul- og lavemissionsbiler i bestand	500.000	600.000	750.000	1.000.000
Ændring i antal nul- og lavemissionsbiler i bestand ift. grundforløb	100.000	200.000	350.000	600.000
Andel nul- og lavemissionsbiler i nysalget (pct.)	39	41	50	62
Ændring i andel nul- og lavemissionsbiler i nysalget ift. grundforløb (pct.-point)	1	3	12	24
CO <sub>2</sub> -reduktion ift. grundforløb (mio. ton)	0,2	0,3	0,9	1,5
Provenuændring efter tilbageløb og adfærd inkl. finansieringstiltag ift. grundforløb (mia. kr., 2020-niveau)	2,7	2,3	2,9	4,0
Samfundsøkonomi ekskl. CO <sub>2</sub> (mia. kr.)*	-0,0	-0,3	-2,4	-5,7
Skyggepris (kr. pr. ton CO <sub>2</sub> )*	200	2.000	3.400	3.800

#### Årlig afgiftsændring

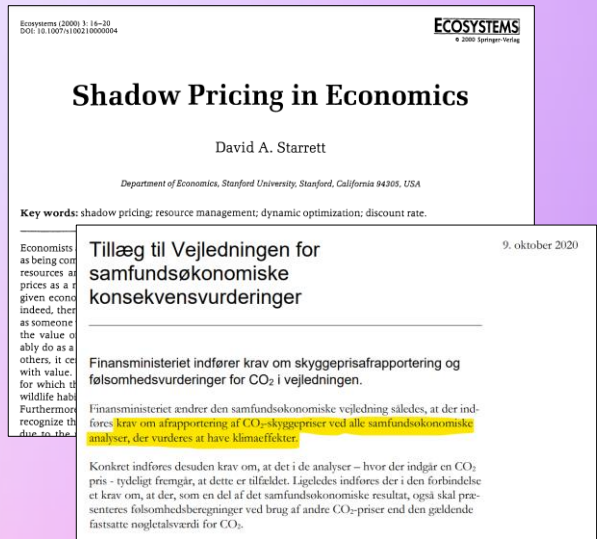
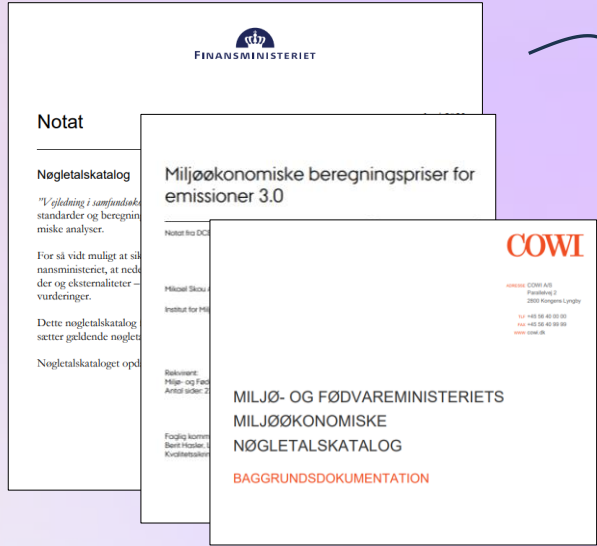
Gennemsnitlig konventionel bil	400	400	2.300	5.900
Gennemsnitlig elbil	-2.000	-2.300	-2.000	-1.500

Anm.: Ændringerne er opgjort relativt til grundforløbet, jf. afsnit 3.3. I grundforløbet er antallet af nul- og lavemissionsbiler i bestanden ca. 400.000 og andelen af nul- og lavemissionsbiler i nysalget ca. 38 pct. i 2030.  
\* Samfundsøkonomi og skyggepris er opgjort over levetiden for nyregistreringsårgangen 2030.  
Kilde: Egne beregninger.



# WHAT TO TAKE NOTE OF IN A SOCIO-ECONOMIC ANALYSIS

An example of "insider" criticism of socio-economic analyses and calculations of road projects in Denmark can be found [here \(link\)](#). The criticism is written by Søren Have from CONCITO.



## Catalogue of key figures

The Danish civil service has established values for a wide range of phenomena, which are the reference point for analyzing Danish politics.

- Look at the latest 2023-update from the Ministry of Finance [here](#) and see an overview of socio-economic key figures for environment, nature and health [here](#).

### EXAMPLE FROM NØGLETALS KATALOGET ON RECREATIONAL VALUE OF NATURE

Rekreativ værdi af natur (rekreativ værdi udtrykt som rejseomkostning)	
<b>Nøgletal:</b>	
Nationalt gennemsnit pr. besøg: 26 kr <sub>2014</sub> pr. besøg.	
Nationalt gennemsnit pr. areal: 8.260 kr <sub>2014</sub> pr. ha pr. år.	
Tabel 7-1 Rekreativ værdi af natur efter område (afrundet til nærmeste 100)	
Område	Kr./ha pr. år (2014)
Københavns omegn 1	159.700
Københavns omegn 2	67.700
Københavns omegn 3	24.800
Øvrige Sjælland + Lolland-Falster	8.800
Region Syddanmark	6.100
Odense	28.100
Region Nordjylland	3.700
Ålborg	18.800
Region Midtjylland	3.100
Århus	26.500

Note: En mere geografisk detaljeret opgørelse på kommuneniveau findes i herunder. Opdelingen er: Københavns omegn 1 kommuner: Gentofte, Brøndby, Hvidovre, Vallensbæk, Lyngby-Taarbæk; Københavns omegn 2 kommuner: Ishøj, Herlev, Høje Tåstrup, Glostrup, Albertslund, Dragør, Gladsaxe, Ballerup, Tårnby, greve, Solrød ; og Københavns omegn 3 kommuner: Furesø, Roskilde, Rudersdal, Egedal, Hørsholm, Helsingør, Allerød, Fredensborg. De 3 regioner er eksklusiv hhv. Odense, Ålborg og Århus.

## Methods for valuation

Most of the figures in the key figures catalog are determined using a variety of different methods. These methods include surveys and behavioral observations, which aim to determine how much people are willing to pay to gain an advantage or avoid a disadvantage. NB. Climate is an exception\*

*Se Zetlands intro til samfundsøkonomisk analyse og metoder til værdifastsættelse for mere dybdegående forklaring og relevante eksempler*

## The idea of cost efficiency

Economic analyses focus on cost efficiency - how can we get the most for the least? But it's about **socio-economic cost-effectiveness** - not what's cheapest from an operational or budgetary perspective. That's why shadow prices, which are [the socio-economic cost of reduction in CO2-emissions for a given policy](#). NB. There is a requirement to report shadow price in analyses.

The definition of shadow price by the Ministry of Finance: *"Den marginale pris, samfundet skal betale for at reducere/modtage en enhed af et givent gode/tjeneste."*

\*CO2 emissions follow the price in the EU ETS because you can sell a quota at that price if you reduce emissions. Now that climate has received increased political attention, the Danish Council on Climate Change's proposal for a price on CO2 to reach the 70% target has been added - a significant upward adjustment.



# CAN SOCIO-ECONOMIC ANALYSES BE USEFUL TO YOU EVEN IF YOU DON'T BELIEVE IT MAKES SENSE TO MAKE ECONOMIC ASSESSMENTS OF NATURE?

## Principles for the use of monetary values

There is a long-standing debate in ecological economics about whether nature should be valued in monetary terms. In 2013, an article was published that laid out principles for when it is a good idea to use such calculations, even if you value nature intrinsically. The researchers establish four questions to guide application:

1. Will it improve environmental conditions?
2. Will it reduce inequalities and redistribute power?
3. Is it likely to suppress other valuation languages?
4. Will it serve the enclosure of the commons (neoliberalism)?



Source: Kallis, G., Gómez-Baggethun, E. & Zografos, C. To value or not to value? That is not the question. *Ecological Economics* 94, 97–105 (2013). [LINK](#)

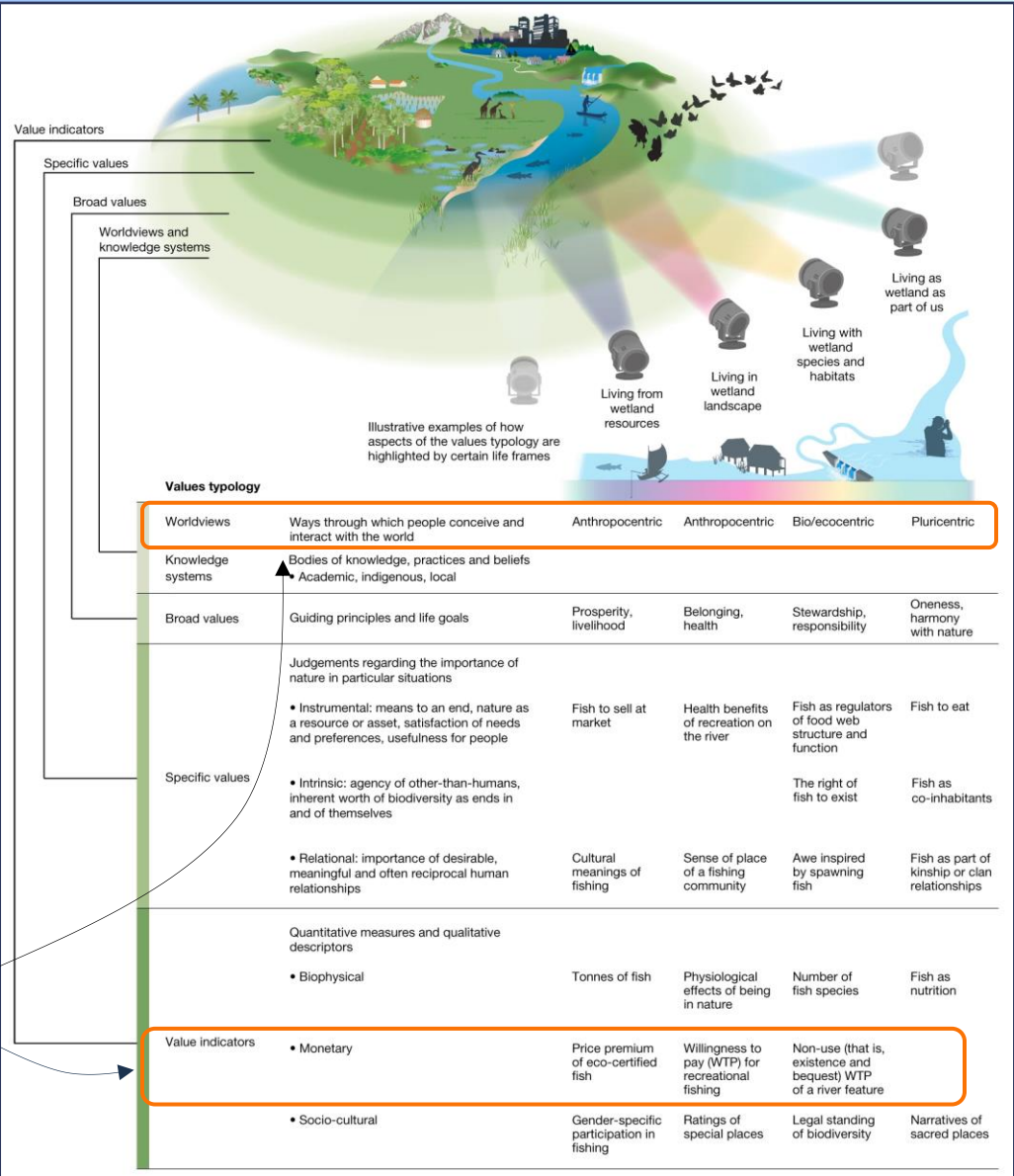
## The International Panel on Biodiversity (IPBES) recognizes different languages for valuation

In 2022, IPBES released the '[report on diverse values and valuation of nature](#)', where they reviewed different ways of perceiving and measuring value. It highlights a wide range of different approaches - including indigenous knowledge - with economic valuations being one of them.

This points to the importance of question 3 above - as long as it does not suppress other languages of valuation, there may be good perspectives in also pointing to the socio-economic. The importance of multiple languages has been stated in no uncertain terms by the highest authority on biodiversity. In fact, IPBES argues for a regular '[values crisis](#).'

In this new Nature article by IPBES researchers (including environmental economists), environmental economic and human-oriented value judgments are listed as one language among several

Source: Pascual, U., Balvanera, P., Anderson, C.B. *et al.* Diverse values of nature for sustainability. *Nature* 620, 813–823 (2023). <https://doi.org/10.1038/s41586-023-06406-9>





# WHAT ABOUT ALTERNATIVE ECONOMIC ANALYSES AND ALTERNATIVE MODELS?

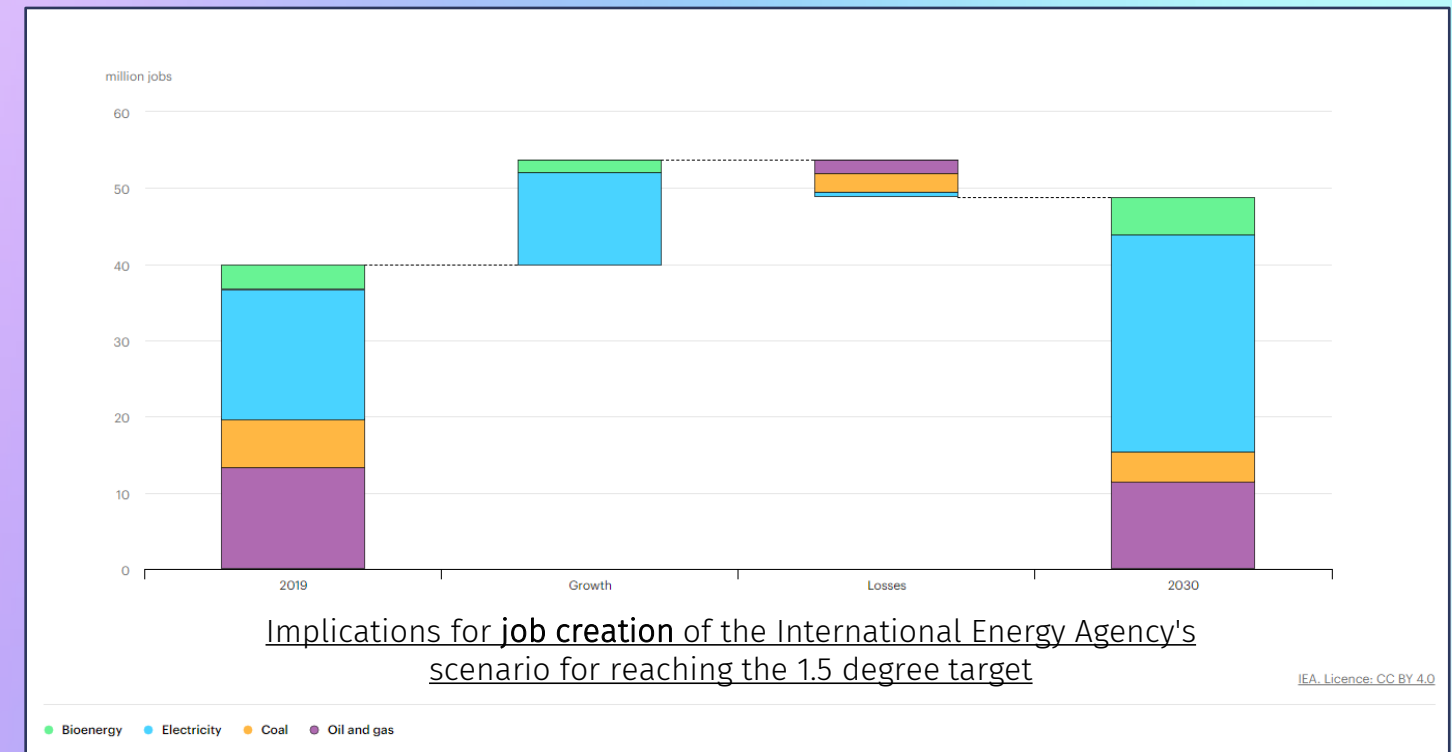
Socio-economic analyses are difficult to understand. Nor are they the ones that businesses and investors navigate by. They look at the financial and economic implications for themselves and make decisions based on growth opportunities.

## The relevance of non-socio-economic analyses

Many reports and analyses (both in a Danish and especially in an international context) do not focus on the "socio-economic" advantages/disadvantages but instead examine actual costs (e.g. by calculating investment costs and comparing these to other consequences such as future savings and job creation).


### EXAMPLES OF RELEVANT ANALYSES THAT DO NOT TAKE A SO-CALLED SOCIO-ECONOMIC STARTING POINT

This article in a highly respected journal uses a heterodox-based macroeconomic model to show that investments in renewable energy, energy efficiency and the replacement of fossil fuel infrastructure can have positive economic consequences also in a financial economic sense



IEA, Global employment in energy supply in the Net Zero Scenario, 2019-2030, IEA, Paris <https://www.iea.org/data-and-statistics/charts/global-employment-in-energy-supply-in-the-net-zero-scenario-2019-2030>, IEA. Licence: CC BY 4.0

Energy models have been too pessimistic about technology prices for years - new research suggests climate investments in line with the Paris Agreement are also positive from a budget economic perspective



ARTICLES

<https://doi.org/10.1038/s41560-021-00934-2>

Check for updates

### Reframing incentives for climate policy action

J.-F. Mercure<sup>1,2,3</sup>, P. Salas<sup>2,4</sup>, P. Vercoulen<sup>1,3</sup>, G. Semieniuk<sup>5,6</sup>, A. Lam<sup>2,7</sup>, H. Pollitt<sup>2,3</sup>, P. B. Holden<sup>8</sup>, N. Vakili<sup>9</sup>, U. Chewpreecha<sup>3</sup>, N. R. Edwards<sup>2,8</sup> and J. E. Vinuales<sup>2</sup>

**A key aim of climate policy is to progressively substitute renewables and energy efficiency for fossil fuel use. The associated rapid depreciation and replacement of fossil-fuel-related physical and natural capital entail a profound reorganization of industry value chains, international trade and geopolitics. Here we present evidence confirming that the transformation of energy systems is well under way, and we explore the economic and strategic implications of the emerging energy geography. We show specifically that, given the economic implications of the ongoing energy transformation, the framing of climate policy as economically detrimental to those pursuing it is a poor description of strategic incentives. Instead, a new climate policy incentives configuration emerges in which fossil fuel importers are better off decarbonizing, competitive fossil fuel exporters are better off flooding markets and uncompetitive fossil fuel producers—rather than benefitting from ‘free-riding’—suffer from their exposure to stranded assets and lack of investment in decarbonization technologies.”**

[Link til artikel](#)

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### Perspective

#### Technological innovation enables low cost climate change mitigation

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**Keywords:** Climate change mitigation, Renewable energy, Demand, CCS, Costs, Scenarios

**ABSTRACT**

Scenarios from integrated assessment models play a central role in helping policymakers limit global warming to well below 2 °C. We demonstrate that many models maintain combustion, in particular by relying on coal and bioenergy. In contrast to recent studies, scenarios are optimistic on deployment of lumpy energy-systems technologies and storage, while insufficiently reflecting empirically observed innovation dynamics such as solar photovoltaics. Our analysis shows that two key options for reducing emissions are systematically undersampled in models that underpin IPCC scenarios: A) strong growth in renewable energy, in particular solar PV, together with electrification of sectors; and B) widespread adoption of efficient end-use technologies enabling high service provision at low levels of energy demand. A combination of continued PV growth and sector coupling with low to medium energy demand (a corridor of 250 to 500 EJ of primary energy) would render carbon neutrality by 2050 feasible, thus enabling near-term cost-effective climate change mitigation and reducing the need for carbon dioxide removal in the 2nd half of the century. Models would benefit from updated cost assumptions, higher resolution on granular end-use technologies, higher resolution on sector coupling, and an overall consideration of demand-side solutions. Such updates – of which some are starting to be explored by modeling teams – are likely to demonstrate that some mitigation pathways are cost saving, rather than costly.

[Link til artikel](#)

“[Updated models] are likely to demonstrate that some mitigation pathways are cost saving, rather than costly.”



# Key indicators

This section contains a range of key indicators and figures with relevance for the climate movement **in Denmark**, based on the planetary boundaries and doughnut economics principles.

*This section introduces a series of key indicators regarding Denmark and its climate debt, contribution to ecological overshoot and some considerations regarding climate justice that are relevant for the minority world.*

*The section contains several relevant academic references, and the indicators are well founded. The intention of this section is to provide shared indicators to be used in any advocacy work for the green transition in Denmark.*

*Next time you want to look up Denmark's responsibilities to the rest of the world, you can return to the indicators and references in this section.*

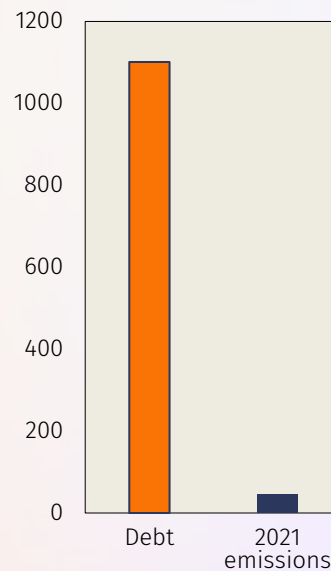


# DENMARK'S CLIMATE DEBT

## Climate debt in CO<sub>2</sub>e



By emitting more than the global average, DK accumulated a climate debt of **1101 Mt CO<sub>2</sub>e** from 1990 to 2020 – equal to 25 times DK's 2021 emissions.\*\*



Source: Tilsted, J.P., Bjørn, A. Green frontrunner or indebted culprit? Assessing Denmark's climate targets in light of fair contributions under the Paris Agreement. *Climatic Change* 176, 103 (2023). <https://doi.org/10.1007/s10584-023-03583-4>

## Climate debt in DKK\*



In compensation or reparations to ensure the 1.5 target is met by 2050, DK is liable to pay to "underemitters":

Since 1992\*\*: **349 billion** constant 2010 USD or **2381 billion DKK** in 2022 prices

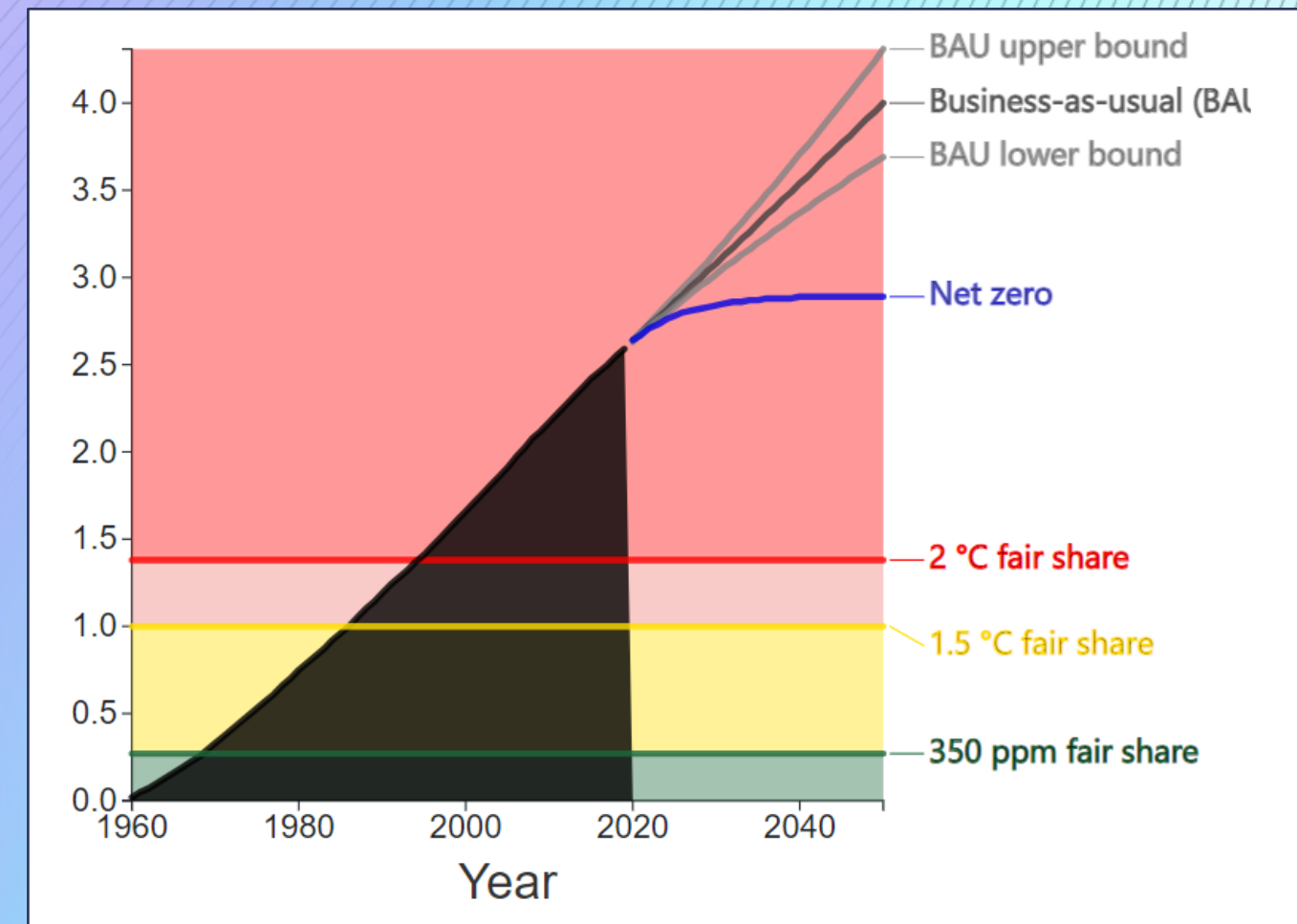
Since 1960\*\*: **712 billion** constant 2010 USD or **4856 billion DKK** in 2022 prices

Since 1850\*\*: **786 billion** constant 2010 USD or **5363 billion DKK** in 2022 prices

For reference, Danish GDP was around 430 billion In 2022.

Source: Fanning, A.L. and Hickel, J. (2023). Compensation for atmospheric appropriation. *Nature Sustainability*. <https://doi.org/10.1038/s41893-023-01130-8>.

## Accumulation of DK's climate debt since 1960



Source: Fanning, A.L. and Hickel, J. (2023). Compensation for atmospheric appropriation. *Nature Sustainability* (in press). <https://doi.org/10.1038/s41893-023-01130-8>.

[Article that explains this study.](#)

**Example for use in an argument:** "Denmark is not a pioneer. A new research article in one of the world's most recognized scientific journals shows that Denmark has a climate debt of up to DKK 5,000 billion, about twice the GDP".

\*Using carbon prices from IPCC scenarios that limit global warming to 1.5 °C

\*\*For more on justification behind choosing 1850, 1960 and 1992 1990 as basis years for the calculation see the references

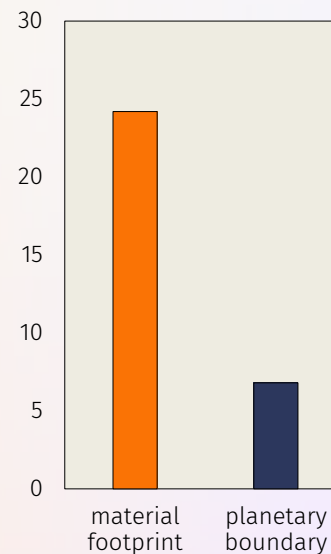


# ECOLOGICAL OVERSHOOT

## Denmark's material footprint



In 2015, DK had a material footprint of **24.2 tons** per capita. That is around 3.5 times the planetary boundary threshold of 6.8 tons per capita per year.

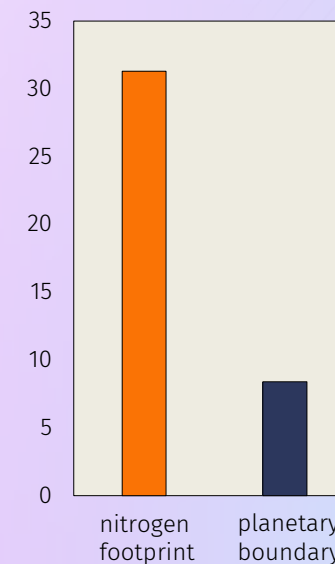


Source: Fanning, A.L., O'Neill, D.W., Hickel, J. et al. The social shortfall and ecological overshoot of nations. Nat Sustain 5, 26–36 (2022). <https://doi.org/10.1038/s41893-021-00799-z>

## Denmark's nitrogen footprint

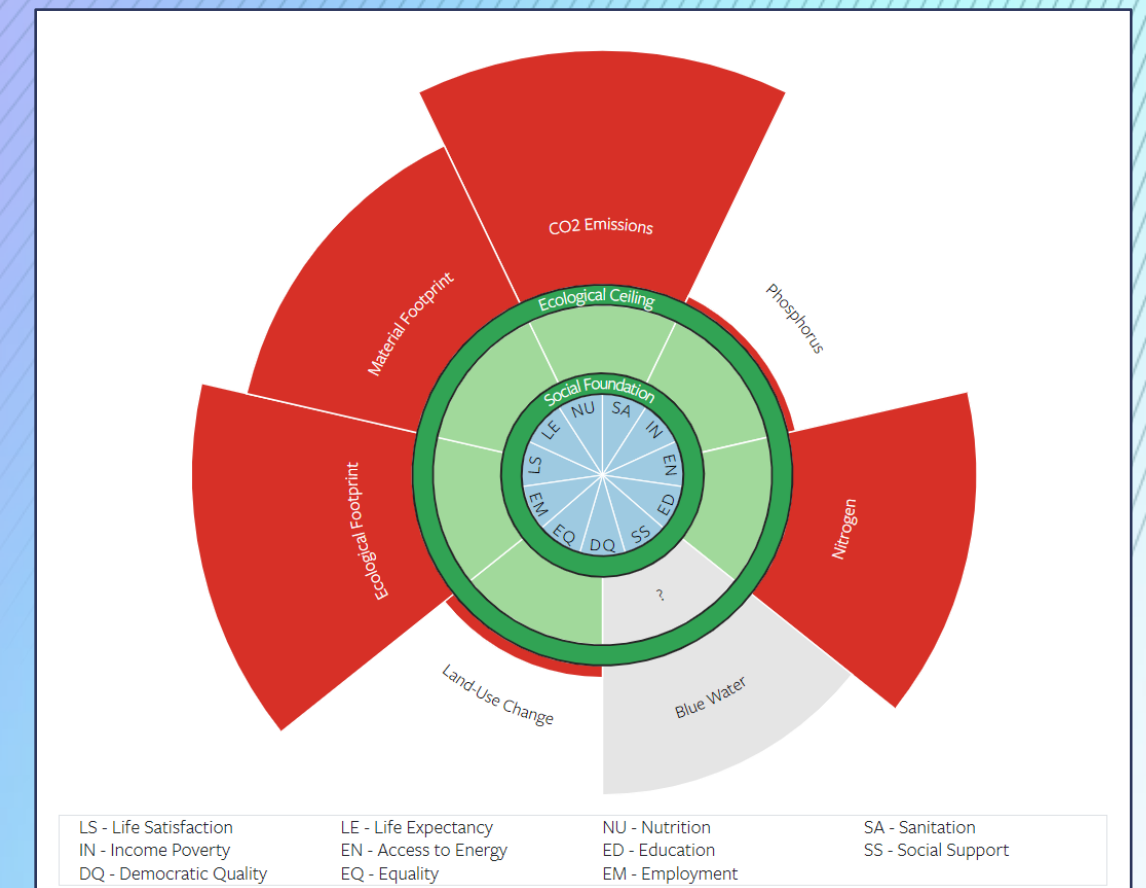


DK had a nitrogen footprint of **31.3 kilograms** per capita in 2015. That is almost four times the planetary boundary threshold of 8.4 kilograms per capita per year.



Source: Fanning, A.L., O'Neill, D.W., Hickel, J. et al. The social shortfall and ecological overshoot of nations. Nat Sustain 5, 26–36 (2022). <https://doi.org/10.1038/s41893-021-00799-z>

## Denmark's ecological overshoot 2015



[See ecological overshoots for all countries](#)

These are consumption-based indicators that are compared to planetary boundaries. The per capita boundary is downscaled from the global to the individual scale. See Fanning et al. (2022) for details.

Source: Fanning, A.L., O'Neill, D.W., Hickel, J. et al. The social shortfall and ecological overshoot of nations. Nat Sustain 5, 26–36 (2022). <https://doi.org/10.1038/s41893-021-00799-z>



# ECOLOGICAL OVERSHOOT

## Land-Use Change

To measure ecological overshoot, Fanning et al. (2022) use the embodied use of net energy generated from photosynthesis, suggesting that this was 2.9 tons C in 2015, **transgressing the suggested boundary** of 2.4 tons C per capita per year. In the recent update of the planetary boundary framework, this indicator is used to measure biosphere integrity showing much stronger transgression.

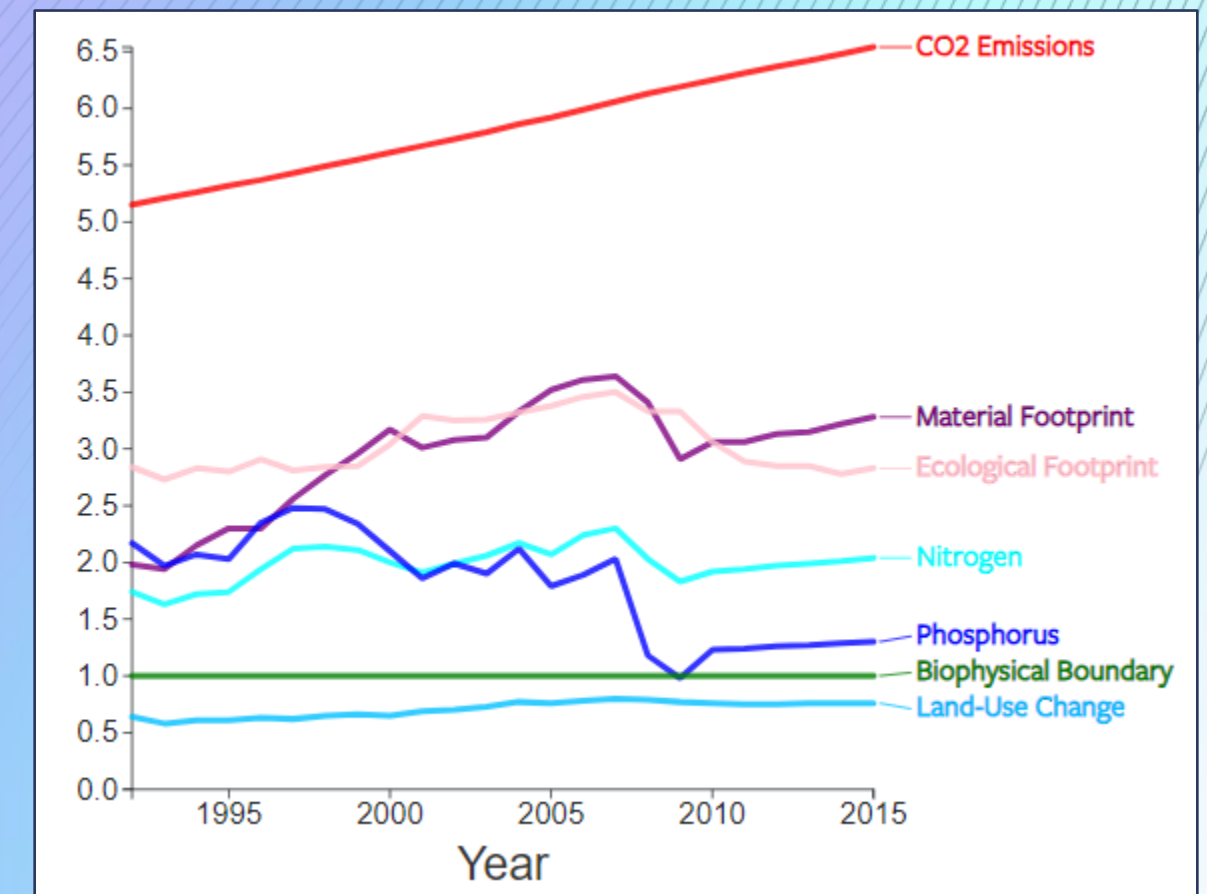
Source: Fanning, A.L., O'Neill, D.W., Hickel, J. et al. The social shortfall and ecological overshoot of nations. Nat Sustain 5, 26–36 (2022). <https://doi.org/10.1038/s41893-021-00799-z>

## DK's ecological footprint

DK had an ecological footprint of **7.1 global hectares** per capita in 2015. That is more than four times suggested maximum levels (Fanning et al., 2022). The ecological footprint is however criticized for including fossil energy as a component and is not used as a control variable in the planetary boundary framework of Richardson et al. (2023).

Sources: Fanning, A.L., O'Neill, D.W., Hickel, J. et al. The social shortfall and ecological overshoot of nations. Nat Sustain 5, 26–36 (2022). <https://doi.org/10.1038/s41893-021-00799-z>  
Katherine Richardson et al. ,Earth beyond six of nine planetary boundaries.Sci. Adv.9,eadh2458(2023).DOI:[10.1126/sciadv.adh2458](https://doi.org/10.1126/sciadv.adh2458)

Denmark's ecological overshoot 1992-2015



Source: Fanning, A.L., O'Neill, D.W., Hickel, J. et al. The social shortfall and ecological overshoot of nations. Nat Sustain 5, 26–36 (2022). <https://doi.org/10.1038/s41893-021-00799-z>

These are consumption-based indicators that are compared to planetary boundaries. The per capita boundary is downscaled from the global to the individual scale. See Fanning et al. (2022) for details.



# ECOLOGICAL OVERSHOOT

## Novel entities

Novel entities is a planetary boundary that describes entities that, in the absence of human economic activity is not present in Earth system. **Plastic and additives in plastics** is a primary driver and we are clearly outside the boundary.

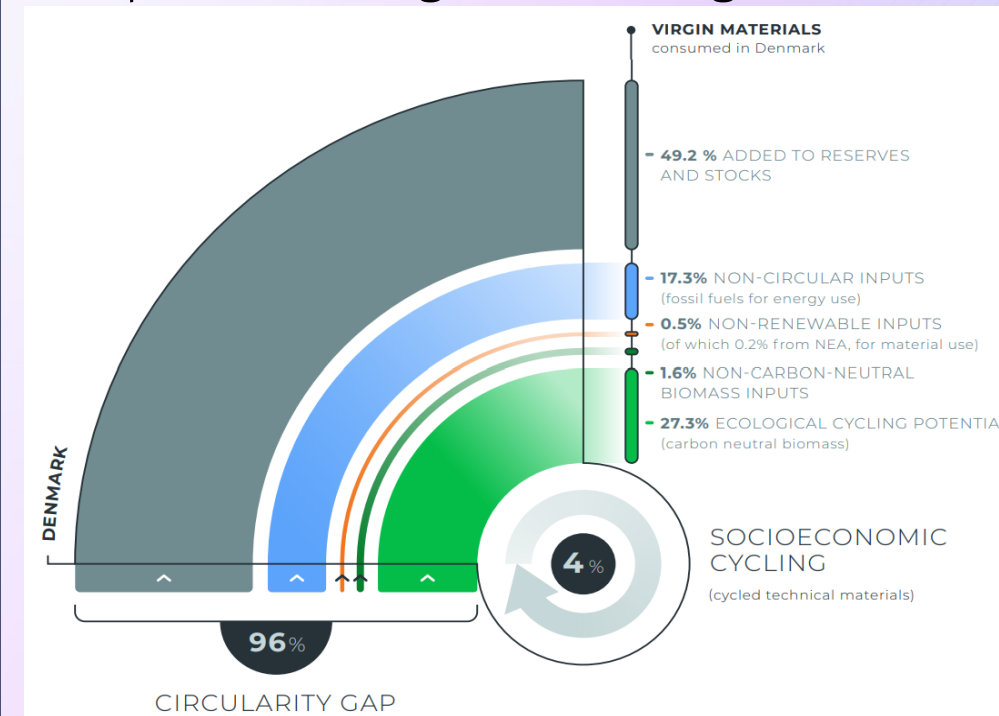
We are inside the planetary boundary when *all* chemicals are tested and monitored for safety. Around 80% of chemicals in use in the EU for at least 10 years have **not** (yet) undergone safety assessment.

Source: Katherine Richardson et al. „Earth beyond six of nine planetary boundaries.Sci. Adv.9,eadh2458(2023).DOI:[10.1126/sciadv.adh2458](https://doi.org/10.1126/sciadv.adh2458)

The scientific article that first concludes that we transgress the planetary boundary for novel entities is [Persson et al. \(2022\)](#). There is no fixed quantitative control variable for this boundary.

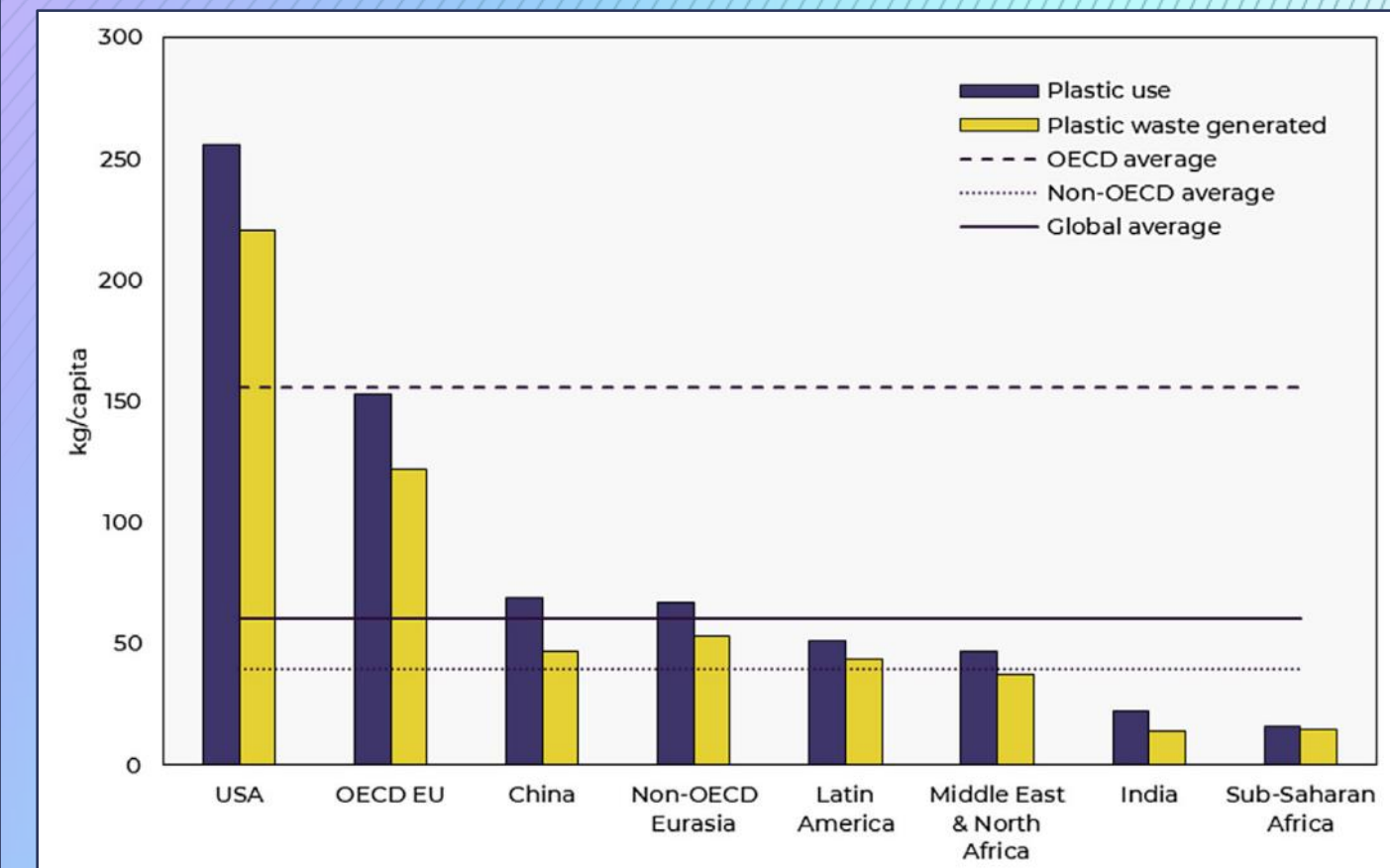
## Circularity in Denmark

The recent circularity gap report identified Denmark as 4% circular compared to an global average of 7.2%



Sources: The circularity gap report – Denmark. [Link](#)

## Inequality in plastic use

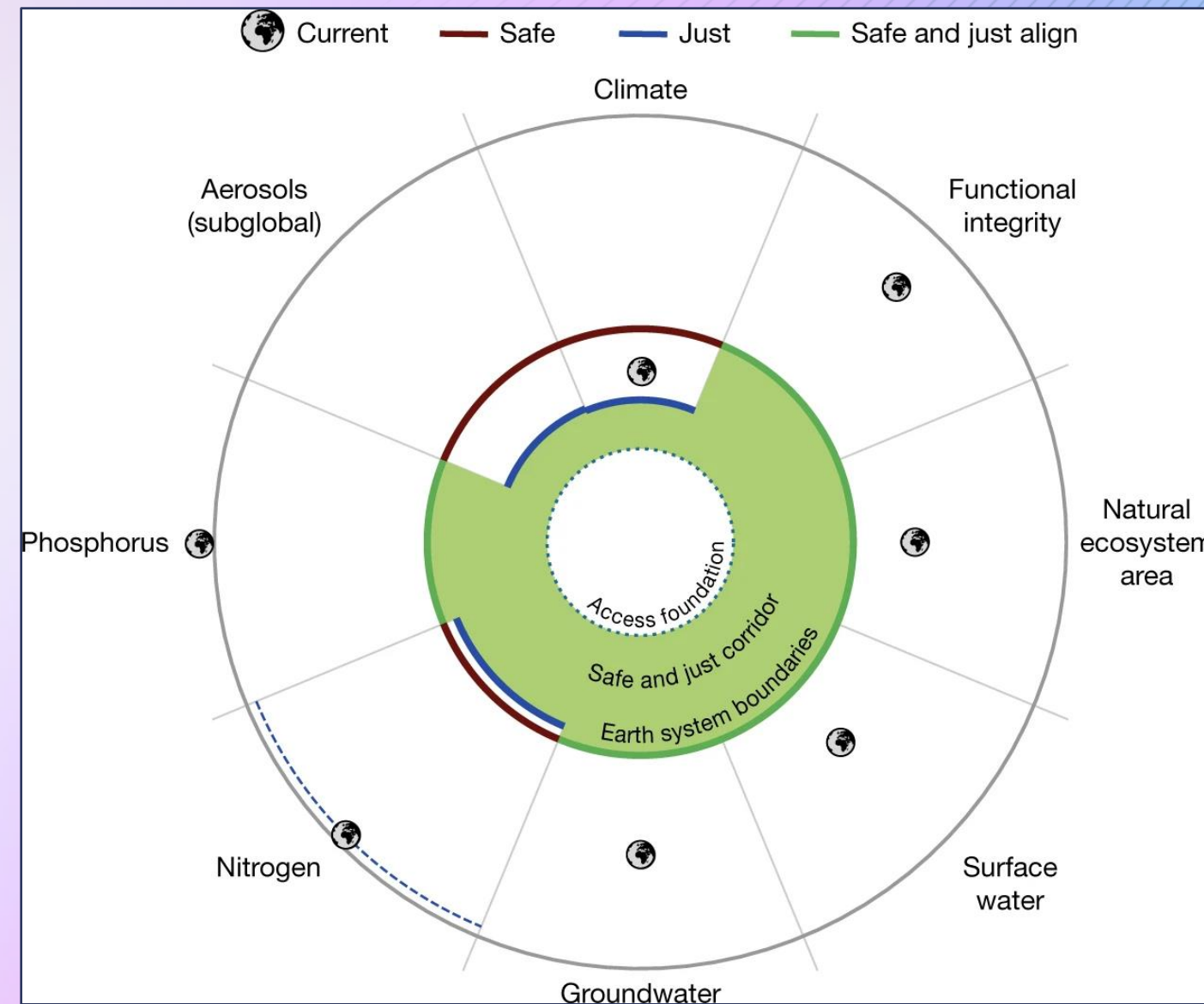


Source: OECD. The OECD Global Plastics Outlook database.  
[https://www.oecdilibrary.org/environment/data/global-plastic-outlook\\_c0821f81-en](https://www.oecdilibrary.org/environment/data/global-plastic-outlook_c0821f81-en) - figure from Tilsted, J. P., Bauer, F., Deere Birkbeck, C., Skovgaard, J. & Rootzén, J. Ending fossil-based growth: Confronting the political economy of petrochemical plastics. One Earth 6, 607–619 (2023).



# JUSTICE AND PLANETARY BOUNDARIES

WHEN WE  
FACTOR IN  
JUSTICE THE  
SCALE OF  
ECOLOGICAL  
OVERSHOOT  
INCREASES



The planetary boundary framework is, as long as considering only the global scale, **unjust**, and therefore needs to be complemented with justice considerations, **raising the bar** for what is needed to not be in overshoot. For this reason, scientists have published research stating this in the article *Nature*.

TL;DR—the researchers say boundaries are stricter than what they thought them to be.

The ‘planetary boundaries’ that define the ‘safe operating space’ is global. But the impact of planetary-level change varies depending on the group or community affected. To take these differences into account, Rockström *et al.* complement the planetary boundaries with a set of ‘safe and just Earth system boundaries’ — limits whose transgression is not only unsafe for humanity and other living species, but also unjust.

Sources: Humphreys, S. How to define unjust planetary change. *Nature* 619, 35–36 (2023); Rockström, J., Gupta, J., Qin, D. *et al.* Safe and just Earth system boundaries. *Nature* 619, 102–111 (2023). <https://doi.org/10.1038/s41586-023-06083-8>



# Key Concepts in Climate Economics

Some of the relevant jargon – and some of the limits of its implications

*This section introduces some of the often-used jargon mainstream economists tend to use either as the basis of an argument or in the argument in itself. This jargon hides some of the crucial ideas behind a lot of economic policies aimed at so-called “cost-effective climate mitigation”, i.e. putting a monetary value on everything and making sure we don’t mitigate too much, because we face a trade-off. That was a good example of such jargon.*

*The section is also intended as a mini-“dictionary”. For a more thorough understanding of the concepts, consult the links provided.*



# Jargon often used in Climate Economics

<b>Externality</b>	<p>An externality refers to the costs or benefits that are not reflected in the market price of a good or service. Negative externalities, such as pollution, are a primary concern in environmental economics, and the field explores ways to internalize these external costs through mechanisms like pollution taxes or cap-and-trade systems. Notice how the <b>idea of externalities</b> reveal what is endogenous (inside) or exogenous (outside) a way of thinking, and thus how it <b>implies an incremental rather than a systemic focus</b> (<a href="#">link</a> for further elaboration).</p>
<b>Market Failure</b>	<p>Environmental economics recognizes that markets often fail to allocate resources efficiently when it comes to environmental goods and services. Market failure can occur due to externalities, public goods (like clean air or water), and information asymmetry. The field explores how government intervention can correct market failures to achieve better environmental outcomes. Notice how <b>this concept can be applied to virtually anything</b> in the real world that deviates from a perfectly free market, which is both its strength and <b>its weakness</b>. (<a href="#">link</a> for further elaboration).</p>
<b>Cost-Benefit Analysis (CBA)</b>	<p>Cost-benefit analysis is a key tool in environmental economics. It involves comparing the costs and benefits of a particular policy or project to determine its overall desirability. CBA helps decision-makers assess the economic efficiency of environmental policies and projects. However, <b>CBA requires atomizing and monetizing everything</b>, which can only be done with strong <b>assumptions that can be criticized</b>. It is easier to locate and criticize such assumptions (in theory, because they are often hidden or simply implied), than it is to criticize the use of the method of CBA itself (<a href="#">link</a> for further elaboration).</p>
<b>(Pigouvian) Pollution Tax and Tradable Permits</b>	<p>These are market-based instruments used to address pollution externalities. Pollution taxes (e.g., carbon taxes) and tradable permits (e.g., cap-and-trade systems) aim to provide economic incentives for polluters to reduce emissions and achieve environmental goals more efficiently. This is an example of a kind of tax aimed at solving a market failure of an externality (<a href="#">link</a> for further elaboration).</p>
<b>(Temporal) Discounting</b>	<p>Environmental economics incorporates the concept of temporal discounting, which reflects the preference for receiving benefits today rather than in the future. Discounting is used to evaluate the present value of future environmental benefits and costs and plays a significant role in long-term decision-making (<a href="#">link</a> for further elaboration). The lower the discount rate is, the higher it values future generations. <b>Some argue any rate above 0 is immoral</b> (read e.g. <i>The Ministry for the Future</i>, chapter 32 for a discussion on the ethics of it). <b>A high discount rate</b> should always be criticized.</p>



# Jargon often used in Climate Economics

<b>Property Rights and the Coase Theorem</b>	<p>The Coase Theorem, named after economist Ronald Coase, suggests that if property rights are well-defined and transaction costs are low, private parties can negotiate and reach efficient solutions to environmental problems without government intervention. Environmental economics explores the application and limitations of this theorem. <b>Note that Coase</b> produced this theorem to suggest that transaction costs are important to consider. However, his theorem has been used to argue for the benefit of lack of intervention in spite of transaction costs, to his regret (<a href="#">link</a>).</p>
<b>Tragedy of the Commons</b>	<p>This concept describes the overuse or depletion of shared resources (the "commons") due to self-interested individuals who do not consider the long-term consequences. (<a href="#">link</a> for further elaboration). This concept was first used by <a href="#">Hardin (1968)</a> and is today widely used in mainstream economics although new empirically based research present a much more nuanced and elaborate view of the governance of the commons. For instance, Nobel prize winner <a href="#">Ostrom's (1990)</a> work on the topic represent a more nuanced view of this but is not part of the environmental economics curriculum.</p>
<b>Willingness to Pay (WTP) and Willingness to Accept (WTA)</b>	<p>WTP and WTA (also called contingent valuation methods, CVM) is often <b>used to determine the monetary value of non-market goods</b>. WTP measures the maximum amount individuals are willing to pay to gain access to environmental benefits, while WTA measures the minimum compensation they would accept to forego those benefits. (Recommended literature: “Contingent Valuation: From Dubious to Hopeless” by <a href="#">Hausman (2012)</a>, arguing results of such methods are somewhat random, because <b>respondents “are essentially inventing their answers on the fly”</b>.).</p>
<b>Environmental Kuznets Curve (EKC)</b>	<p>The EKC hypothesis suggests that as a country's income rises, its environmental degradation first worsens but eventually improves, forming an inverted U-shaped curve. The EKC is used to argue against climate action, as things will eventually get better. (Recommended literature: “The Rise and Fall of the Environmental Kuznets Curve” by <a href="#">Stern (2004)</a>).</p>
<b>Weak Sustainability vs Strong Sustainability</b>	<p>Sustainability is a central concept in environmental economics that emphasizes the long-term well-being of society and the planet. It involves balancing economic, social, and environmental goals to ensure that current generations meet their needs without compromising the ability of future generations to do the same. Sustainability considerations guide decision-making in environmental policy and resource management. <b>Weak sustainability</b> allows for some substitution between natural and human-made capital, while <b>strong sustainability</b> insists that critical natural capital, such as ecosystems and biodiversity, cannot be fully replaced by human-made capital and should be preserved for long-term wellbeing. (<a href="#">link</a> for further elaboration).</p>



# Key Critiques of Environmental Economics

*This section takes a closer look at some of the most common critiques of different aspects of environmental economics, i.e. the mainstream economics approach to our environment, climate and planetary boundaries.*

*The section is intended to provide an overview of what to focus on, if attempting to criticize environmental economics. There is a lot of bad critique, which we attempt to help readers avoid. For a more in-depth understanding of the critiques covered, please consult the references.*

*Notice that the choice of points of critique **does not** indicate it should be criticized, but rather the intention is to qualify such critique.*



# Key Points of Critiques

## Monetization of Nature

Critics argue that one of the fundamental flaws of environmental economics is the tendency to reduce nature's value to monetary terms through methods like cost-benefit analysis and ecosystem services valuation. Such an approach can **overlook the intrinsic value of nature** and **reduce complex ecological and social relationships to simplistic economic calculations**. Read more [here](#) or grab the book “*The Value of a Whale*” by Adrienne Buller.

## Market-Based Solutions

Environmental economics often relies on market-based instruments like pollution taxes and tradable permits to address environmental problems. Critics argue that **these approaches may not always be effective, equitable, or sufficient** in addressing complex ecological issues. They can also lead to **environmental injustices**, where vulnerable communities suffer disproportionately. Listen (or read) more [here](#).

## Discounting Future Benefits

Environmental economics often employs discounting, which reduces the weight of future environmental benefits in economic calculations. Critics contend that **discounting may undervalue the importance of long-term sustainability and future generations' well-being**. Read more [here](#).



# Key Points of Critiques

## Assumption of Substitutability

The field sometimes assumes that environmental resources are substitutable, meaning that one resource can replace another. Critics argue that this assumption can **lead to overexploitation of non-renewable resources and undervalue unique ecosystems**. Read more [here](#). Spoiler: the study finds that substitutability from natural capital to other forms of capital appears “*low to moderate*”.

## Exponential Growth and Sustainability

Some critics question the emphasis on economic growth within environmental economics, arguing that **perpetual growth is unsustainable within the context of finite environmental resources**. Recommended [video](#); “*The greatest shortcoming of the human race is our inability to understand exponential growth*”.

## Incomplete Accounting

Critics argue that environmental economics often **fails to account comprehensively for ecological and social costs and benefits**. For example, it may not adequately consider irreversible environmental damage or the unequal distribution of environmental harms and benefits. Read more [here](#), based on a case on deforestation in the EU in 2018.



# Key Points of Critiques

## Inadequate Treatment of Uncertainty

Environmental economics may not adequately address uncertainties related to climate change, ecosystem dynamics, and technological innovation. Critics argue that this can **lead to underestimating the potential risks and costs associated with environmental degradation**. Read more [here](#) on how uncertainty (“*fat tails*”) imply more climate action than Cost-Benefit Analyses.

## Pareto Optimality or - Efficiency

In economics, "optimal" typically refers to the most *efficient* allocation of resources where the maximum possible benefit is achieved. For an outcome to be optimal, some of the necessary assumptions are, that (1) individuals are *rational*, (2) everyone has *perfect* information, (3) nothing is external to prices, so they represent information and value, and (4) markets are *perfectly competitive*. All these conditions could be considered **unrealistic**, and the **outcome tends to be that status quo is preferable**, [Sen argues](#).

## Sufficiency critique

Sufficiency refers to consuming what is necessary for well-being while minimizing excess and suggests that people seek to satisfy needs rather than to maximize *utility* (*utility* is economics jargon for *happiness*). Critics argue the idea of maximizing utility promotes unbounded growth and consumption, which can harm the environment and exacerbate inequality. Read more [here](#).



# Key Critiques of Growth

*This section takes a closer look at some of the most common critiques of growth and gives an overview of different critiques of GDP vs. the broader systemic critiques of growth. It also provides some critique of the reliance of technological innovation in the green transition.*



## Green Growth

**Green growth** is an economic development strategy that aims to promote economic growth while simultaneously reducing the environmental impact and resource use. It is often seen as a way to reconcile economic development with environmental sustainability. Green growth policies typically involve investing in technologies and practices that improve resource efficiency, reduce pollution, and promote sustainable development.

### Criticisms of Green Growth:

1. **Rebound Effects:** Critics argue that efficiency gains from green growth may be offset by the "rebound effect." When economic activities become more resource-efficient, it can lead to increased consumption, ultimately nullifying the environmental benefits.
2. **Limits to Technological Fixes:** Green growth often relies on technological innovations to mitigate environmental impact. Critics suggest that this approach might not address the root causes of environmental degradation, such as overconsumption and the pursuit of endless growth.
3. **Jevons Paradox:** Jevons Paradox suggests that as resource efficiency improves (e.g., through technological advances), it can lead to increased resource consumption because of lower costs or increased demand for the now-cheaper resources.
4. **Distributional Issues:** Green growth policies may not distribute benefits and burdens equitably, potentially exacerbating environmental and social inequalities.
5. **Overemphasis on GDP:** Critics argue that green growth's primary focus on GDP growth as a measure of success perpetuates a growth-oriented paradigm that may not align with broader well-being and sustainability goals.
6. **Biophysical Limits:** Some argue that there are biophysical limits to growth that cannot be overcome by technological advances alone, and green growth does not adequately address these limits.

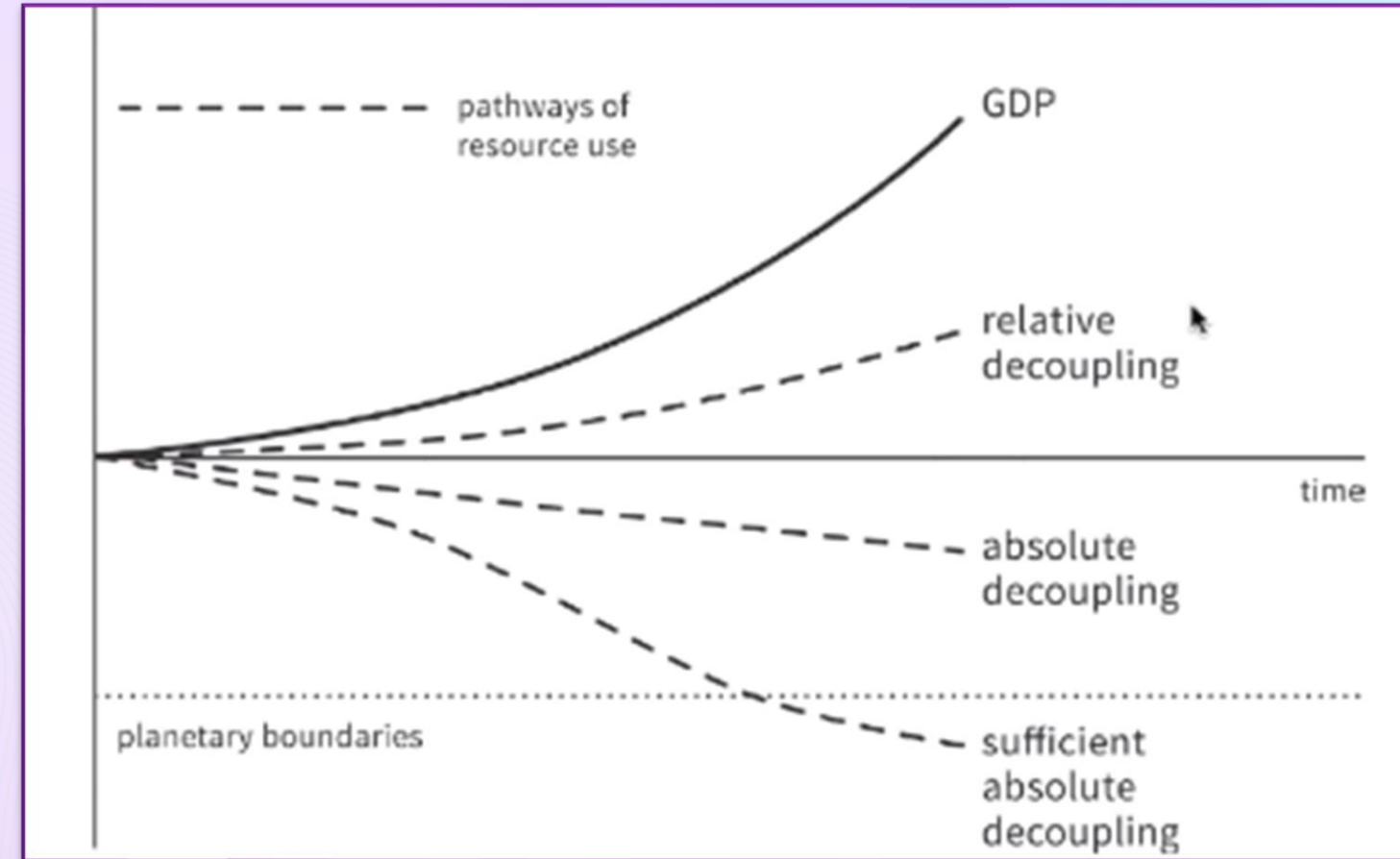
*Critics of green growth emphasize the need for complementary policies that go beyond technological solutions and GDP growth, such as changing consumption patterns, adopting steady-state or degrowth economic models, and prioritizing well-being and equity in development strategies. They argue that green growth, as currently conceptualized, may not be sufficient to address the complex environmental and social challenges the world faces.*

One of the best sources of critique of Green Growth is found [here](#) or find the executive summary [here](#).

# Key Points of Critiques



## Decoupling



**Relative decoupling:** Green growth strategies often focus on achieving relative decoupling by improving the environmental efficiency of economic activities. This means reducing the environmental impact per unit of economic output (e.g., lowering carbon emissions per unit of GDP). While it may lead to a more efficient use of resources, it doesn't necessarily guarantee an absolute reduction in environmental harm.

**Absolute decoupling:** The ultimate goal of green growth is to achieve absolute decoupling, where economic growth is no longer accompanied by a net increase in environmental harm. This would imply a genuine reduction in the overall environmental impact, not just a reduction in intensity per unit of economic output.

A **sufficient absolute decoupling** would represent a sufficiently rapid and large reduction in overall environmental impact to stay within the Paris Agreement. None of the high-income countries who have achieved absolute decoupling (including Denmark) to some extent have achieved sufficient decoupling ([Vogel and Hickel 2023](#)).

# Key Points of Critiques



## Overview of critiques of GDP and growth

	Critique of GDP	Broader critique of growth
Ecological critique	GDP excludes ecological externalities; it disregards diminishing stocks; it does not see the economy as a subsystem of the environment	Economic growth destroys the ecological foundations of human life and cannot be transformed to become sustainable
Socio-economic critique	GDP is a bad measure of well-being or prosperity; mixes goods and bads; disregards inequality	Economic growth does not contribute (anymore) to well-being, but rather stands in the way of prosperity and equality for all
Feminist critique	GDP excludes and devalues non-monetary labor, housework and subsistence work	Economic growth is based on gendered over-exploitation and devalues reproduction
South-North critique	GDP excludes non-monetary labor and the informal sector and does not adequately measure qualitative development and human needs	Economic growth relies on and reproduces relations of domination, extraction and exploitation between the capitalist center and periphery
Cultural critique		Economic growth produces alienating ways of working, living, and relating to each other and nature
Critique of capitalism		Economic growth depends on and is driven by capitalist exploitation and accumulation
Critique of industrialism		Economic growth gives rise to undemocratic productive forces and techniques



# TECHNOLOGICAL INNOVATION

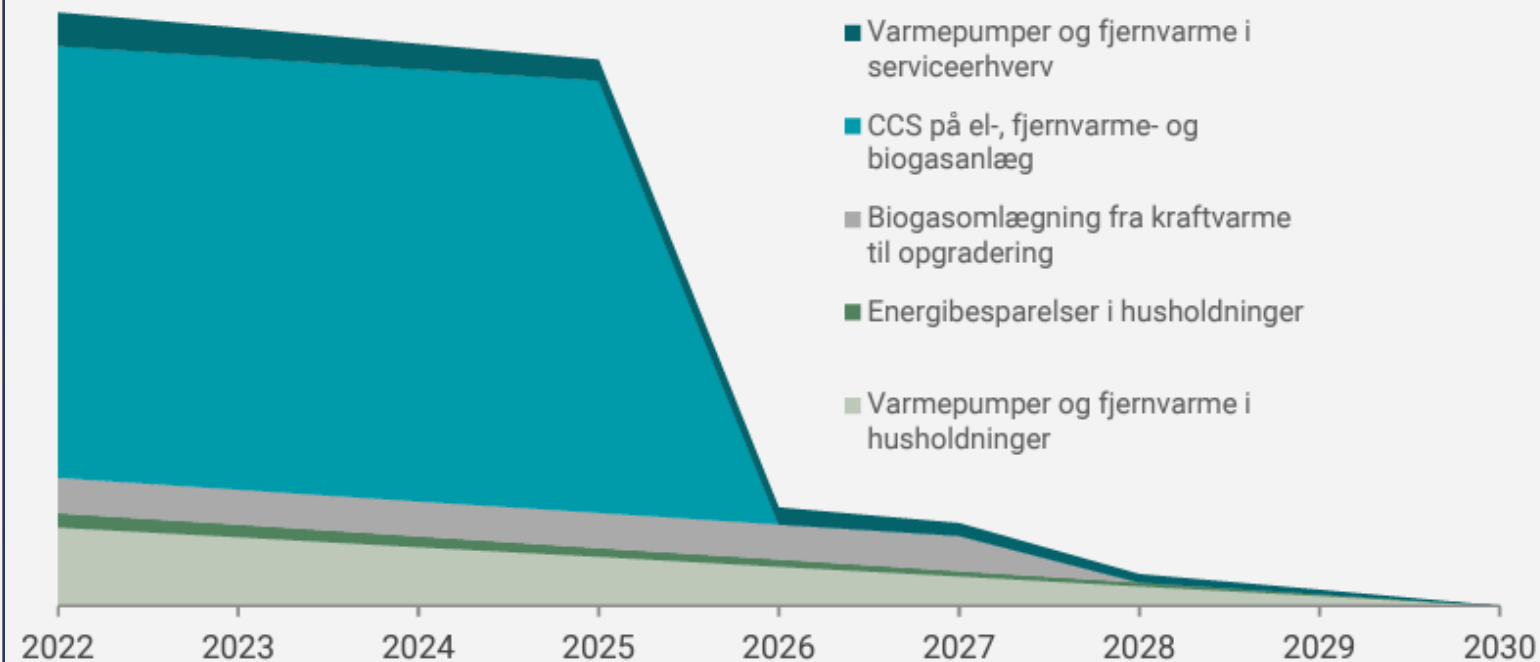
## WHAT IS CCS & DAC, AND WILL TECHNOLOGY FACILITATE NECESSARY ABSOLUTE DECOUPLING I.E. *GREEN GROWTH*?

*Carbon Capture and Storage (CCS) is a technology that captures carbon dioxide emissions from sources like power plants and industrial processes and stores it underground.*

*Direct Air Capture (DAC) is a technology that filters and removes carbon dioxide directly from the atmosphere for storage or utilization.*

Figur 8.6

### Reduktionspotentialer i energisektoren frem mod 2030 (mio. ton CO<sub>2</sub>e)



Source: The climate program 2022 by the Danish Government, pp. 96,  
<https://kefm.dk/Media/637995217763659018/Klimaprogram%202022.pdf>

The rapid scale-up of technologies such as CCS and DAC is crucial for green growth mitigation strategies. As seen to the left, Denmark relies heavily on the potential of CCS to provide emission reductions by 2026 to meet its 70% target by 2030.

The **only** functioning CCS facility, Boundary Dam in Canada, was **not** functional 51% of the time in 2021, according to NOAA ([link](#)).

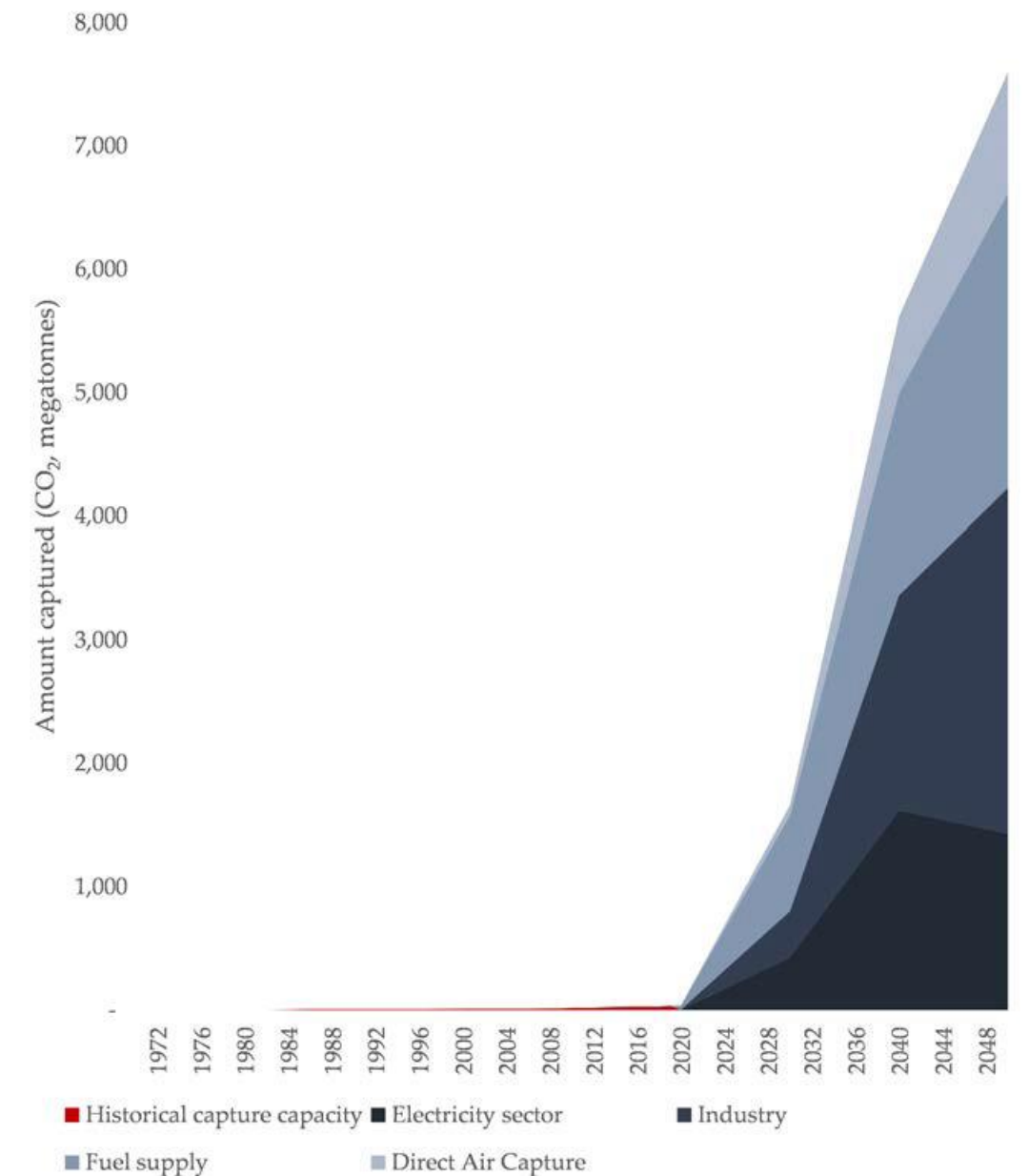
“Carbon dioxide removal (CDR) is **not a current climate solution** ... [If we don't] drastically reduce emissions first, [CDR] will be **next to useless**.”, according to a 2023-article in Nature ([link](#)).

SEE [THIS RECENT SHORT ARTICLE](#) FOR DIVERGING OPINIONS ON CDR BY LEADING RESEARCHES ON NEGATIVE EMISSION TECHNOLOGIES

### Quantity of carbon capture, historical and IEA assumed in net zero scenario

Global CCS Report, 2020

: 'International Energy Agency (2021), Net Zero by 2050, IEA, Paris'



Source: <https://medium.com/lobbywatch/carbon-capture-keeps-proving-its-critics-right-what-comes-next-32ac9750a7aa>



# Economic Justice

*This section provides a short introduction to two concepts under economic justice; debt and tax justice and their connection to climate action. Resources for further reading are also provided.*



# ECONOMIC JUSTICE

## Debt Justice

Advocacy for debt justice seeks to make reforms to how debt crises are prevented and resolved, challenge irresponsible financing and the legitimacy of debt, and put the needs and rights of people ahead of debt service.

*Why is debt justice an important climate solution?*

1. Harmful debt **diverts resources away from climate action** as governments in the Global South are forced to pay off (often illegitimate) debt instead.
2. As export of natural resources is a big source of income and foreign currency for many Global South countries, unsustainable debt keeps them **locked in the exploitation of these natural resources**.
3. Vulnerable countries are forced to pay for a crisis they did not create through debt as they take on more unsustainable debt to tackle increasingly damaging climate disasters on top of existing problems.

Read more about the connection between debt and climate [here](#) (easy to read) and more on debt-related recommendations for climate justice [here](#).

## Tax Justice

Advocacy for tax justice seeks to tackle ‘illicit financial flows’ (tax haven money), promote progressive taxation, eliminating regressive taxation and creating a framework for fair international taxation. The [Tax Justice Network](#) provides great reports and do a lot of work for fairer taxation.

*Why is tax justice an important climate solution?*

Fair international taxation is important for climate action as it could potentially **provide enormous sums of money for climate finance** globally – but especially for the Global South, and potentially curb illicit financial flows and lower global wealth inequalities drastically.

Furthermore, as national taxation of environmentally destructive companies would mostly redistribute fossil wealth from Global North companies to people in Global North countries, **international taxation is crucial to ensure that fossil wealth is redistributed to those most harmed** by its environmental destruction and to those that **need climate finance the most**. Read more about the connection between tax and climate [here](#).



# POLICY SUPPORT

## Support

According to research, economic justice policies have relative support in high-income and middle-income countries. The figure to the right shows percentage of *somewhat* or *strong support*, after excluding indifferent answers.

Source: [Fabre et al. \(2023\)](#): International Attitudes Toward Global Policies. September, 2023.

	United States	Europe	France	Germany	Spain	United Kingdom
Payments from high-income countries to compensate low-income countries for climate damages	55	71	72	70	79	70
High-income countries funding renewable energy in low-income countries	68	82	82	82	85	81
High-income countries contributing \$100 billion per year to help low-income countries adapt to climate change	60	76	77	79	79	71
Cancellation of low-income countries' public debt	46	53	53	43	62	61
Democratise international institutions (UN, IMF) by making a country's voting right proportional to its population	58	71	69	69	78	72
Removing tariffs on imports from low-income countries	62	73	58	73	80	83
A minimum wage in all countries at 50% of local median wage	63	80	80	78	81	83
Fight tax evasion by creating a global financial register to record ownership of all assets	62	87	90	86	91	87
A maximum wealth limit of \$10 billion (US) / €100 million (Eu) for each human	46	62	58	62	65	67
National tax on millionaires funding public services	73	85	81	87	89	88
Global tax on millionaires funding low-income countries	69	84	84	84	87	83



# Additional Resources

Find more information



Readings	Organisations	Websites	Podcasts
<ul style="list-style-type: none"> <li>• <a href="#">Jayati Ghosh's feminist economics curriculum</a> – also exists as a YouTube Playlist</li> <li>• <a href="#">An introduction to pluralist economics</a></li> <li>• <a href="#">Inge Røpke's ecological economics curriculum</a></li> <li>• <a href="#">Exploring Degrowth Policy Proposals</a></li> <li>• <a href="#">Feminst Action Nexus for Climate and Economic Justice</a></li> <li>• <a href="#">Climate Debt and Reparations</a></li> </ul>	<p><b>Networks</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Wellbeing Economy Alliance</a></li> <li>• <a href="#">Rethinking Economics</a></li> </ul> <p><b>Think tanks</b></p> <ul style="list-style-type: none"> <li>• <a href="#">ZOE Institute for future-fit economies</a> (EU/DE)</li> <li>• <a href="#">Wellbeing Economy Lab</a> (DK)</li> <li>• <a href="#">Our New Economy</a> (NL)</li> <li>• <a href="#">People's Economy</a> (UK)</li> <li>• <a href="#">Dezernat Zukunft</a> (DE)</li> <li>• <a href="#">Veblen Institute</a> (FR)</li> <li>• <a href="#">New Economics Foundation</a> (UK)</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Exploring-Economics.org</a></li> <li>• <a href="#">Greenbiz.com</a></li> <li>• <a href="#">Footprintnetwork.org</a></li> <li>• <a href="#">Postcarbon.org</a></li> <li>• <a href="#">Earth4All.life</a></li> <li>• <a href="#">Doughnuteconomics.org</a></li> <li>• <a href="#">goodlife.leeds.ac.uk</a></li> <li>• <a href="#">Degrowth.info</a></li> <li>• <a href="#">Explore.degrowth.net</a></li> </ul>	<p><b>English:</b></p> <ul style="list-style-type: none"> <li>• Upstream</li> <li>• Economics for Rebels</li> <li>• Planet: Critical</li> <li>• Unlearning Economics</li> <li>• Pitchfork Economics</li> </ul> <p><b>Danish:</b></p> <ul style="list-style-type: none"> <li>• Guld og Grønne Skove</li> <li>• Boblen (episode 1-12)</li> </ul>