1.5°C Pathways for Europe Project

Achieving the highest plausible climate ambition

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CLIMATE ANALYTICS

Introduction

1.5°C Pathways for Europe

1.5°C compatible GHG emission and energy mix pathways for the EU27 and nine of its Member States

Aims:

- Show that very high levels of climate ambition for the EU27 and its Member States are possible
- Demonstrate that the Paris Agreement's 1.5°C temperature goal is still alive if countries take immediate and ambitious action to achieve steep emissions reductions this decade
- Produce national-level pathways useful for a select number of EU Member States to inform policy deliberations
- Utilise scenarios that show the most ambitious energy and medium-term emissions outcomes to determine the 'highest plausible ambition' for EU and national climate targets and policies

Project scope

Geographical coverage

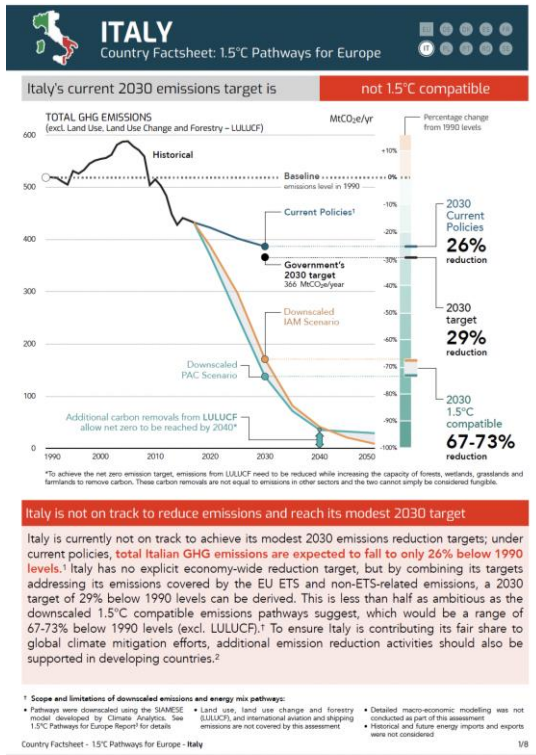
EU27 and nine Member States (Denmark, France, Germany, Italy, Poland, Portugal, Romania, Spain, Sweden)

Indicators

- Economy wide GHG emissions
- Primary energy mix
- Sectoral GHG emissions and pathways for final energy-consumption mix:
  - Power sector
  - Industry sector

Deliverables

Final report and nine country factsheets



CLIMATE ANALYTICS

Methodology

Choice of scenarios

Highest plausible ambition for Europe

Defined as scenarios with the greatest GHG emission reductions below 1990 levels in 2030

Methodological variation

- Integrated assessment models (IAMs) are most prominent approach to deriving global and regional 1.5°C pathways from a global coherent and consistent system perspective
- Bottom up approaches to building regional 1.5°C scenarios exist, but are less common
- Incorporating one scenario from each of these approaches can reduce risk of systematic errors or errant assumptions underpinning scenarios derived using the same methodology

Scenarios chosen

- REMIND 1.7 CEMICS-1.5-CDR8 as IAM scenario for Europe region with largest emissions reduction to 2030
- Paris Agreement Compatible (PAC) scenario as example of bottom-up scenario building with very steep emissions reductions to 2030

Difference to other national 1.5°C pathways approaches

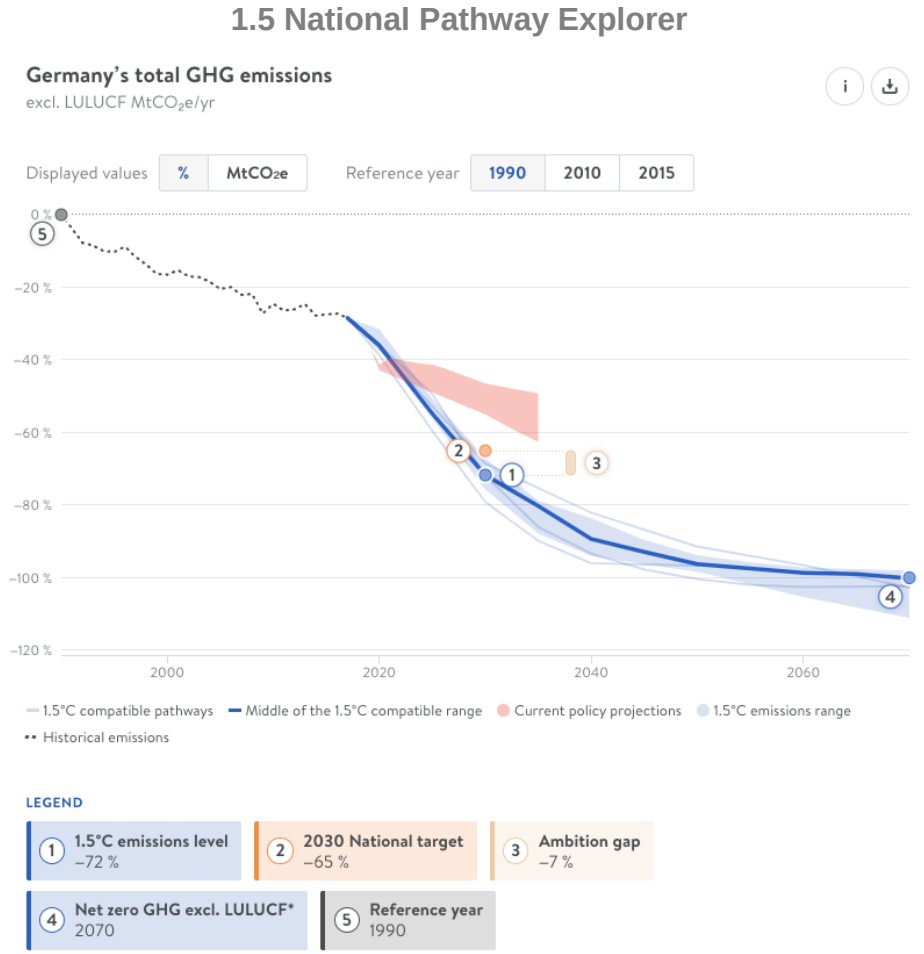
1.5°C National Pathway Explorer and *Climate Action Tracker*

(modelled domestic pathways)

- Existing 1.5°C pathways resources utilise broad subset of scenarios from the IPCC Special Report on 1.5°C
- Limited to IAM model scenarios
- Limited overlap in EU countries covered by the 1.5°C Pathways for Europe Project

1.5°C Pathways for Europe

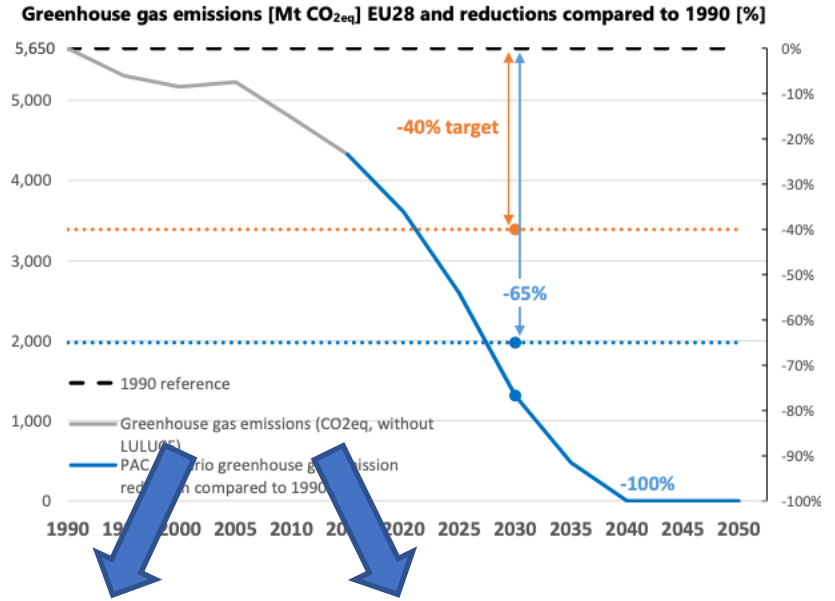
- Choice of two scenarios with highest emissions reduction to 2030 to represent the ‘highest plausible climate ambition’ for Europe
- Incorporates methodological variation represented by bottom-up collective research exercise of PAC scenario

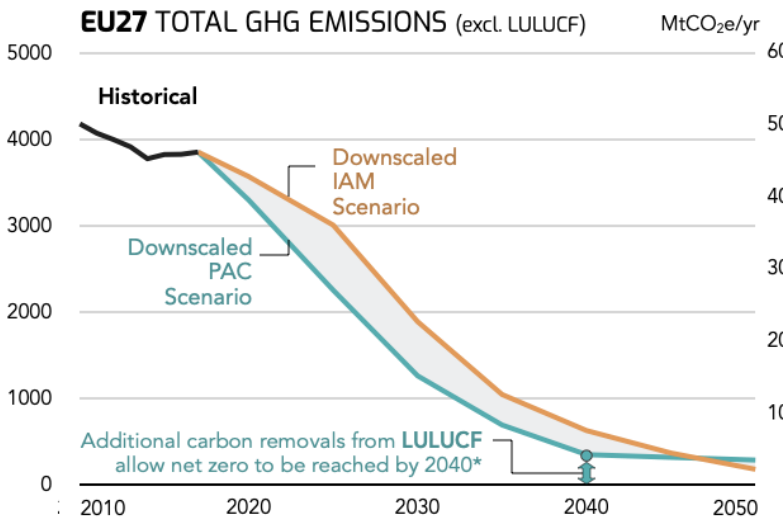


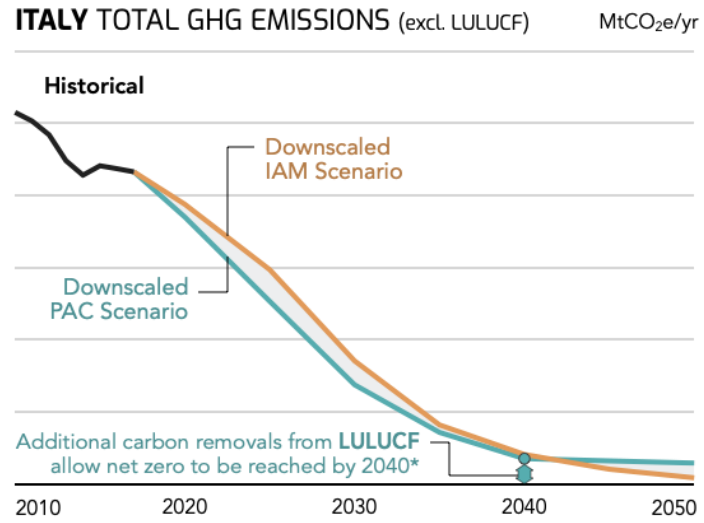
Regional 1.5°C pathways to national

Downscaling using SIAMESE tool

- REMIND and PAC scenarios chosen provide results at the EU28 level – aim is to provide results for EU27 and Member States
- Simplified IAM and Energy System Emulator (SIAMESE), a tool developed by Climate Analytics is used to downscale EU28 emissions and energy mix pathways – mimics energy-system dynamics of IAMs
- Key inputs to SIAMESE tool are national GDP and population growth projections, and energy mix data from the chosen base year (2017)







REFLECTION: IPCC AR6 CONTEXT

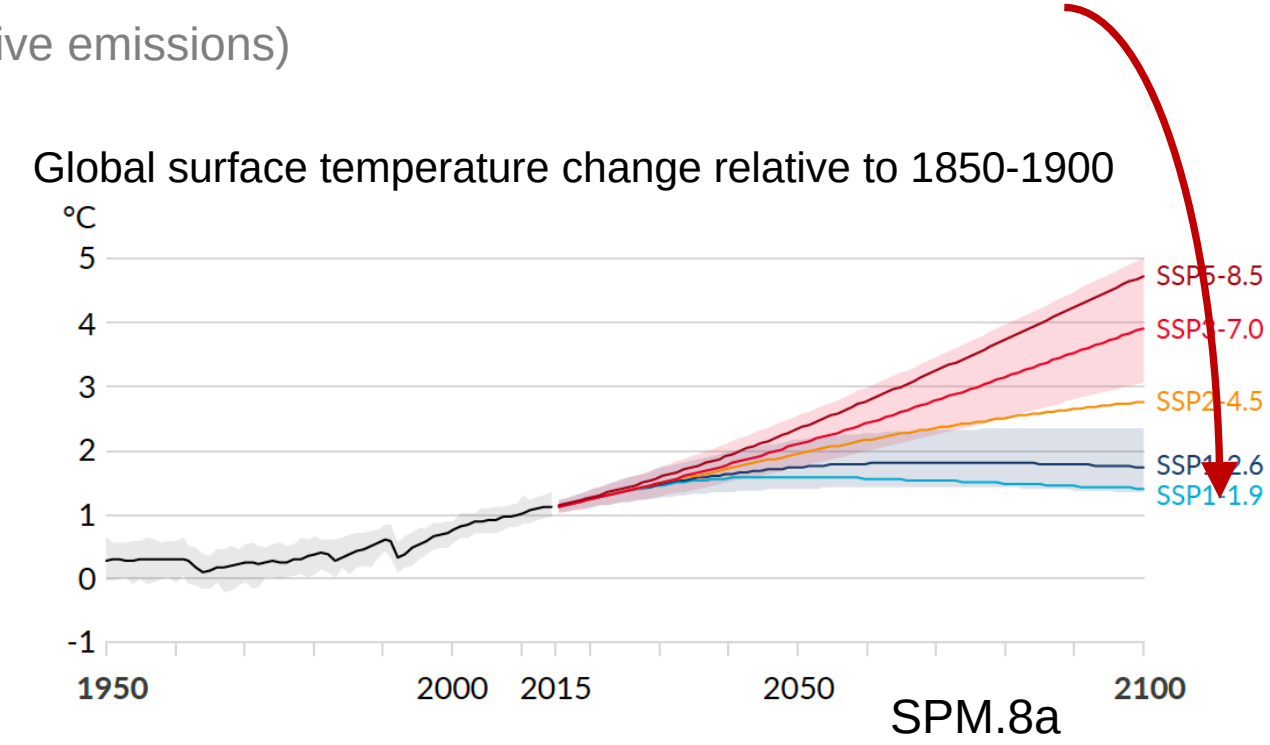
"From a physical science perspective, limiting human-induced global warming to a specific level requires limiting cumulative CO_2 emissions, reaching at least net zero CO_2 emissions, along with strong reductions in other greenhouse gas emissions. Strong, rapid and sustained reductions in CH_4 emissions would also limit the warming effect resulting from declining aerosol pollution and would improve air quality."

- AR6 is consistent with the 1.5°C report and previous AR5 with respect to the carbon budget (1.0-2.3°C warming per 1000 PgC emitted – updated from 0.8-2.5°C in AR5)
- The lowest emissions scenarios in AR6 show that we can still limit global warming to 1.5°C
- Global emissions must be reduced immediately and reach net zero by 2050

REFLECTION: IPCC AR6 CONTEXT

Under lowest scenario, 1.5°C is reached in the mid-2030s: This is very close to previous estimate

- **AR6:** **2025-2044 under the very low GHG emissions scenario (Table 4.5)**
- **SR1.5**: **2033-2036** under "low-overshoot" 1.5°C emissions scenarios (Table 2.SM.2)
- Scenarios show similar global warming trajectories: global warming reaches 1.5°C, approaches 1.6°C and drops down to 1.4°C by end of century (under global net-negative emissions)
- **The physics assessed in WGI therefore confirms that SR1.5 can continue to guide the world in its efforts to limit warming to 1.5°C and on the required transformations of the energy and land systems**
- **More updates on required and feasible mitigation options for 1.5°C can be expected from AR6 WGIII in the 1st half of 2022**

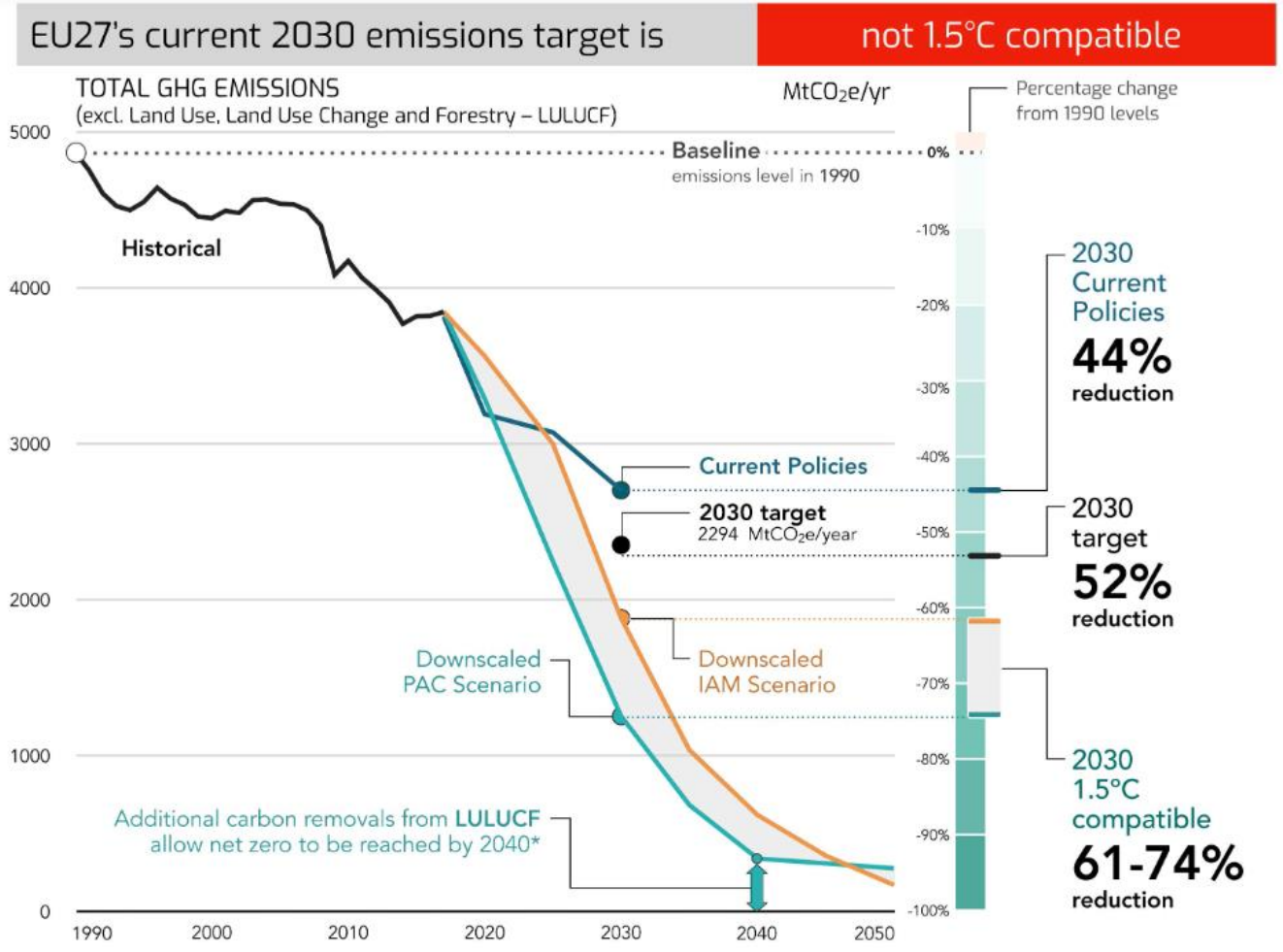


Headline results for EU27 and Member States

EU27 Results

1.5°C Compatible Economy-wide GHG Emissions Pathways

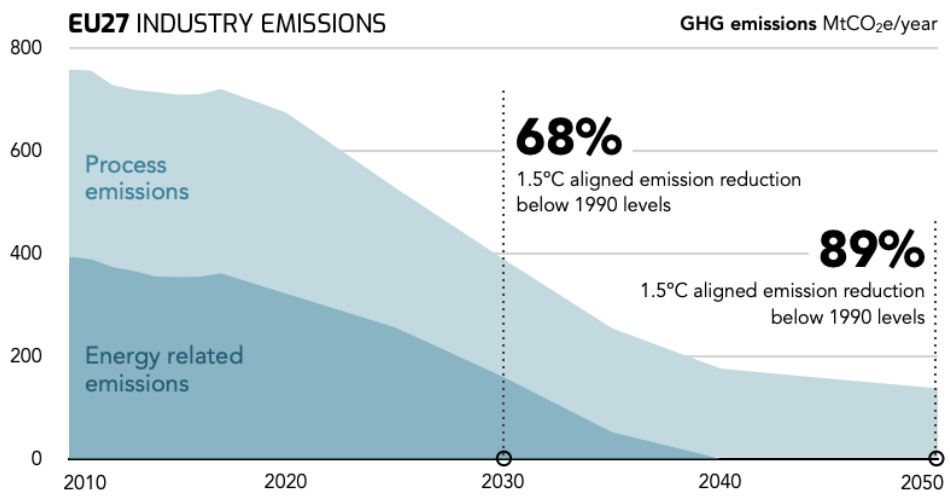
- Range of emissions in 2030 from downscaled PAC and IAM scenarios is 61-74% below 1990 levels (excl. LULUCF)
- Updated EU target and current policies fail to achieve this level of ambition
- Using the EU's BAU LULUCF projections, downscaled PAC scenario shows that net zero emissions can be reached by 2040; downscaled IAM scenario shows between 2040 and 2050

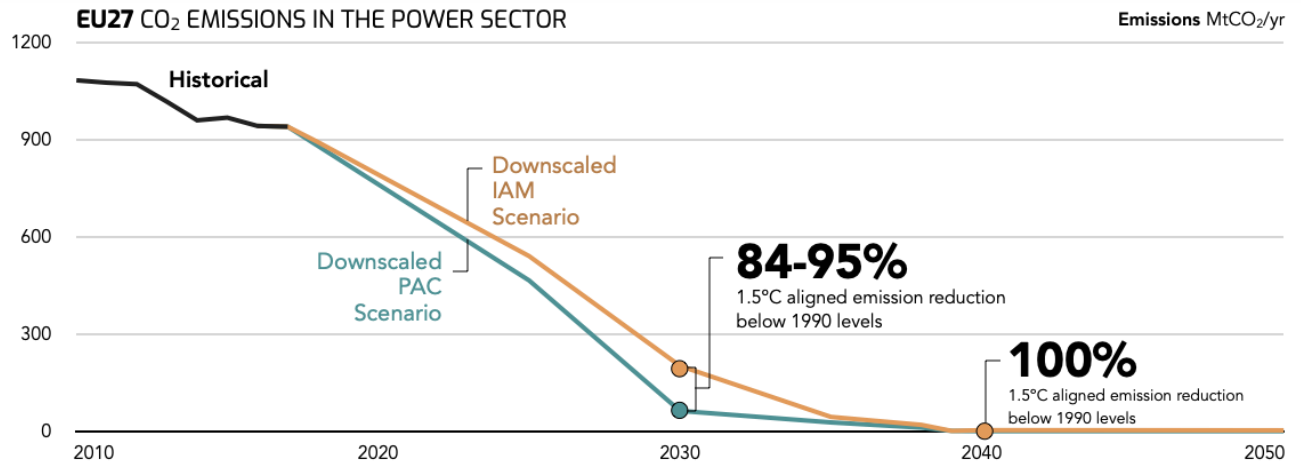


EU27 Results

1.5°C Compatible Sectoral Pathways

- More than doubling of renewable power generation in 2030 to at least 76%
- Power sector emissions reach near zero by 2035
- Fossil fuel combustion in industry mostly phased out by 2035
- Low level of industrial process emissions remain in 2050

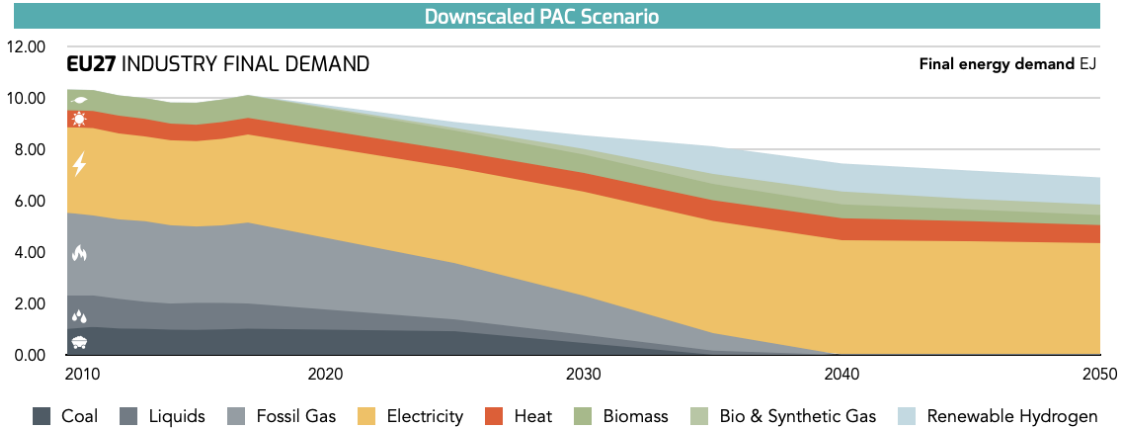




1.5°C Compatible 2030 power sector fuel mix

	2017	2030
Renewables incl. biomass	31%	76-90%
Coal	23%	0-2%

	2017	2030
Fossil gas	18%	3-8%
Nuclear	26%	7-14%

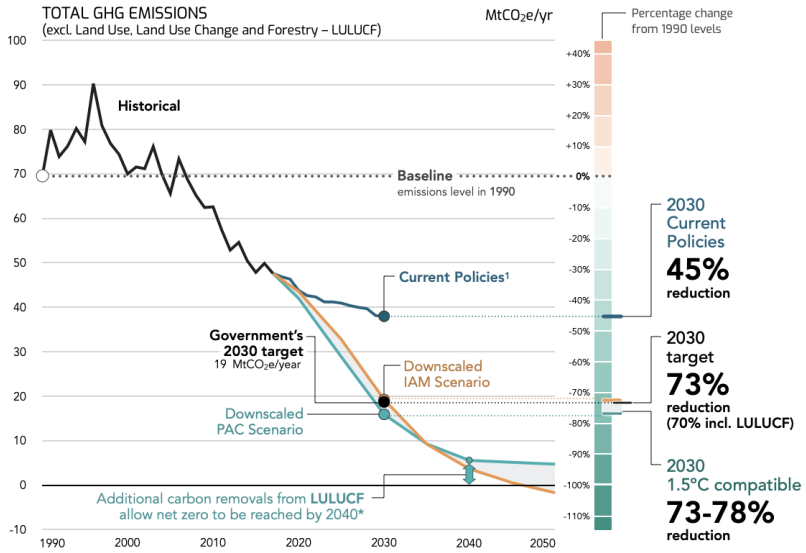


National Results

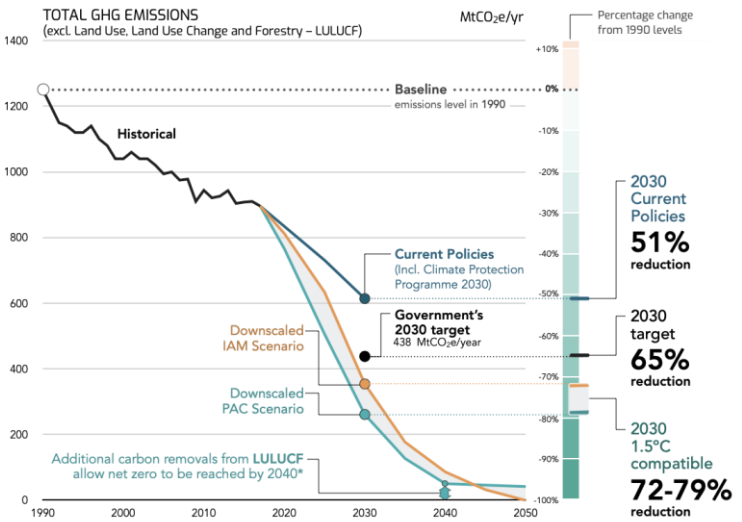
1.5°C Compatible Economy-wide GHG Emissions Pathways and Targets

- Of nine countries assessed, only Denmark has a 1.5°C compatible 2030 emissions reduction target
- No country, including Denmark, will achieve a 1.5°C compatible emissions level in 2030 under current policies
- National Energy and Climate Plans (NECPs) from all countries assessed fail to outline planned policies that achieve a 1.5°C compatible 2030 emissions level
- Update to NECPs due in 2023 is crucial time for Member States to ratchet up policies to align with 1.5°C target

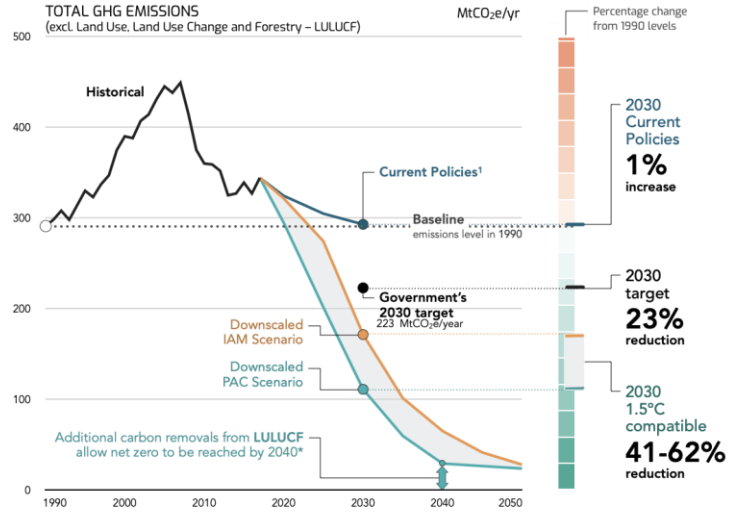
Denmark's current 2030 emissions target is **1.5°C compatible**



Germany's current 2030 emissions target is **not 1.5°C compatible**



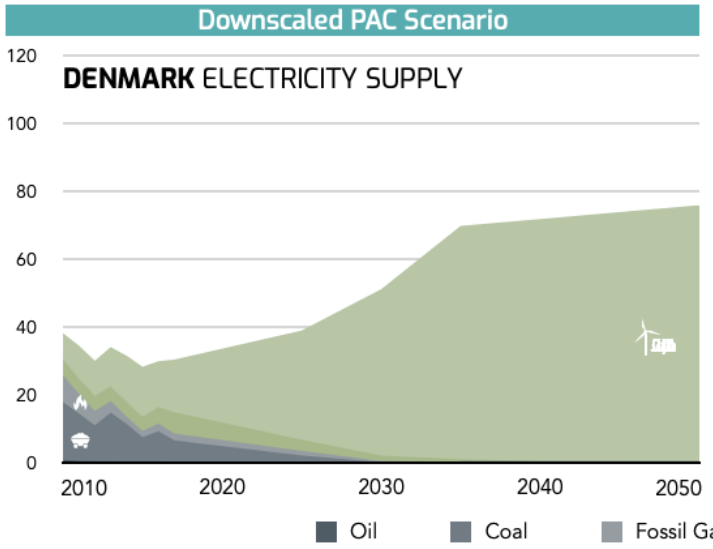
Spain's current 2030 emissions target is **not 1.5°C compatible**

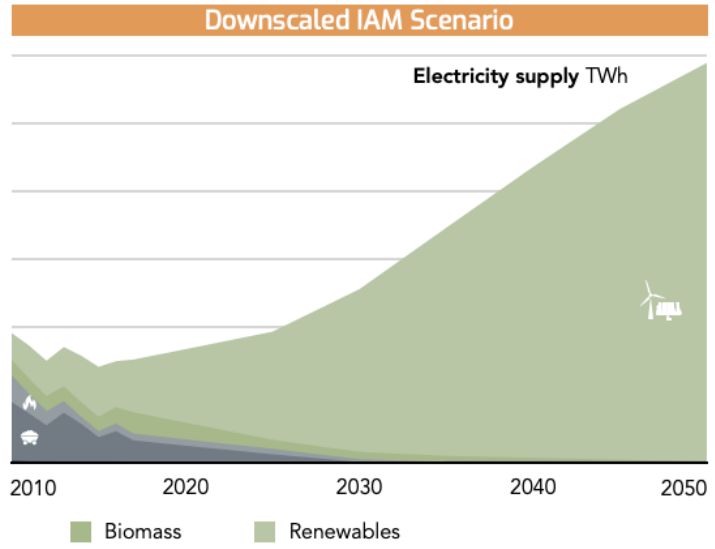


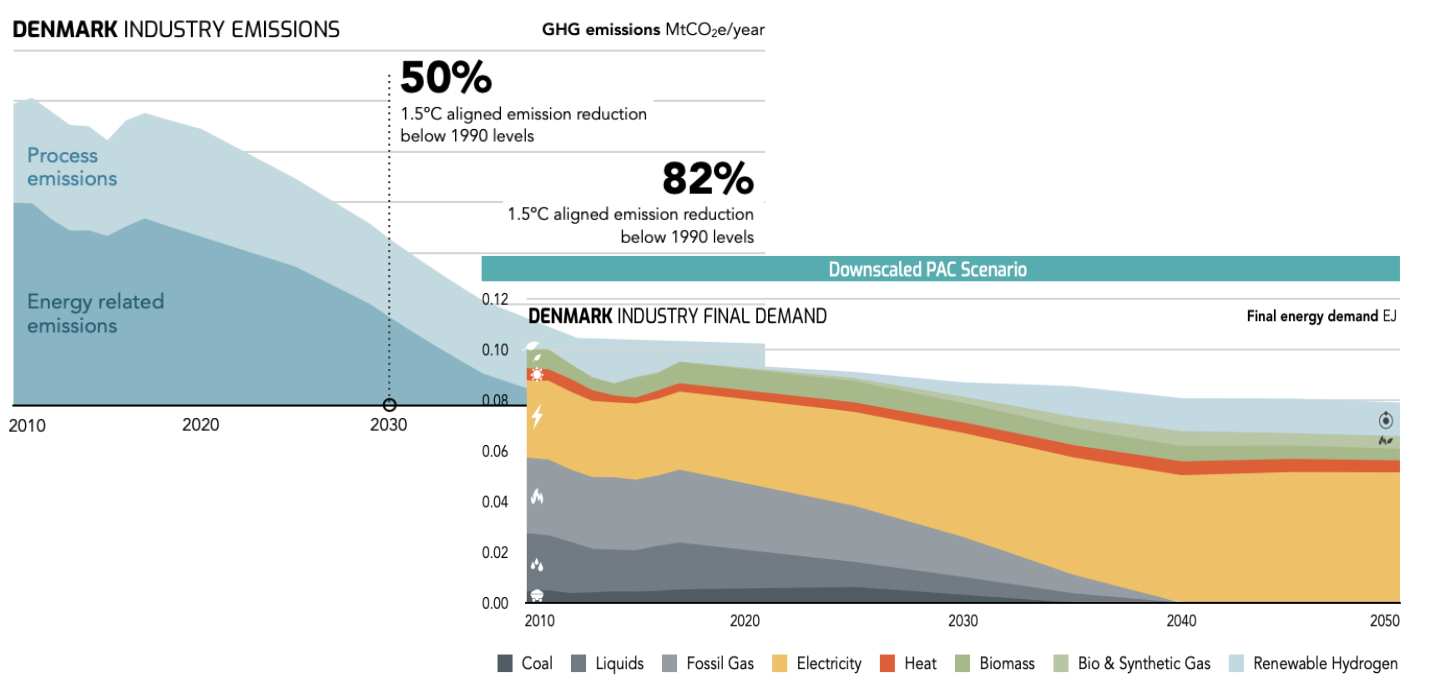
National Results

1.5°C Compatible Sectoral Pathways

- Denmark, Portugal, Spain have adopted 1.5°C compatible coal phase out targets (Sweden has already closed its last coal plant)
- No commitments to phase out unabated natural gas use despite downscaled 1.5°C pathways showing the need to eliminate it by around 2035
- Industry energy-related emissions reach zero by 2040
- Electrification of industry final energy demand reaches above 50% for most countries by 2030





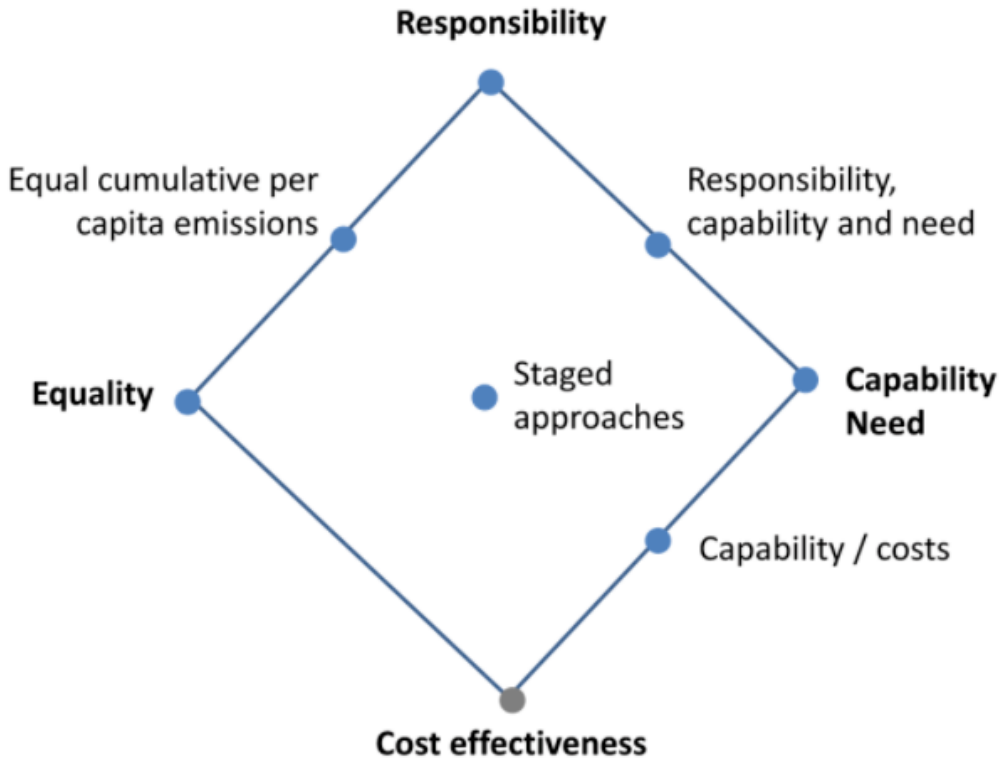


Modelled pathways vs equity considerations

Modelled pathways vs equity considerations

Equity considerations are not addressed by modelled 1.5°C pathways

- IAMs are mostly produced under idealised policy conditions which assume that climate change mitigation measures are undertaken where they are most effective and at the lowest cost
- Such assumptions underpin these ‘least-cost’ or ‘economic welfare maximisation’ models, but missing are adjustments for various equity considerations
- Downscaling from these pathways to the national (and EU27) level therefore omits such equity considerations



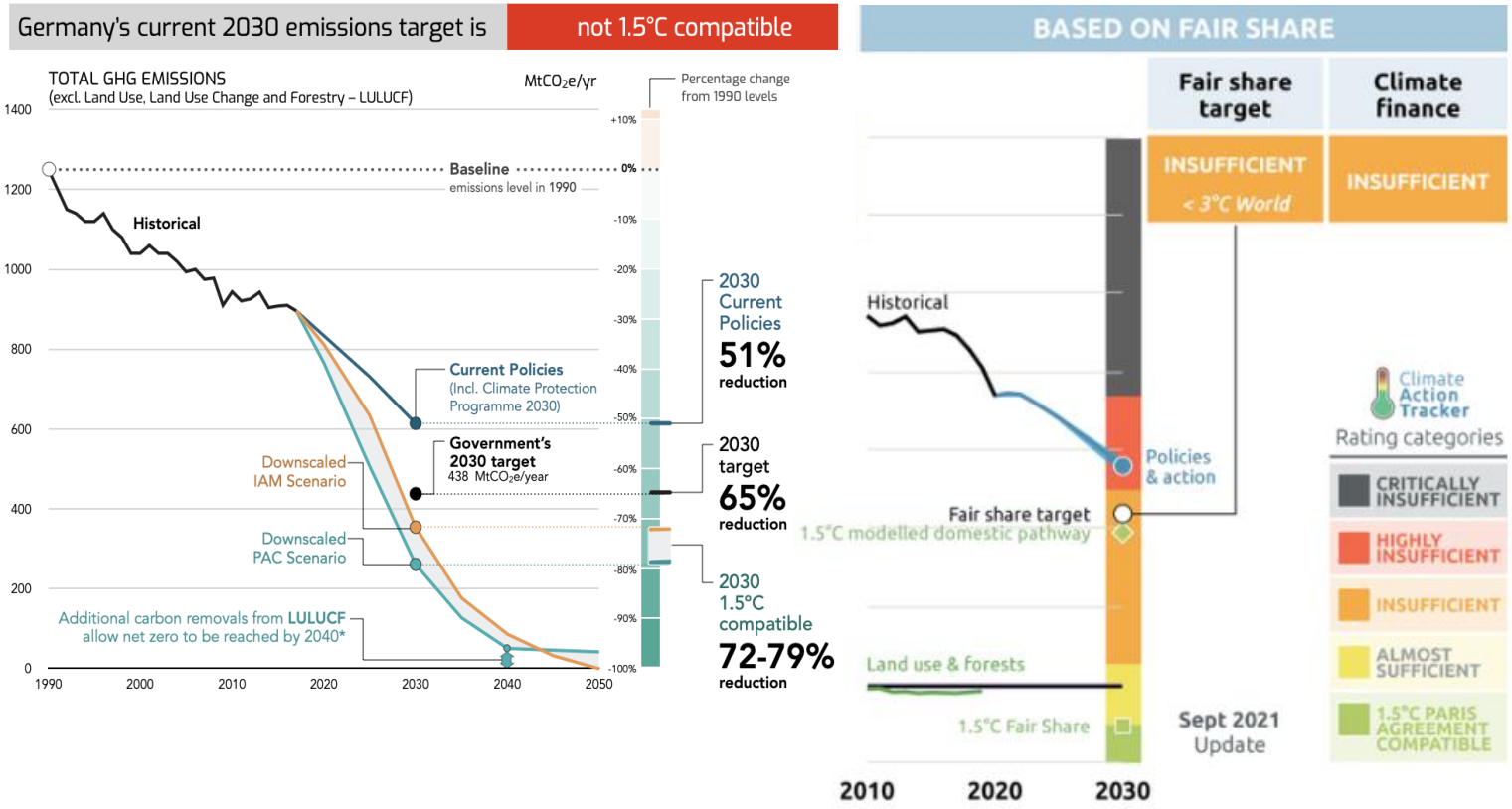
Categories of effort sharing approaches (Höhne, den Elzen, & Escalante, 2014). Note: cost effectiveness is a concept included in the capability/costs category, but isn’t a stand-alone category.

Modelled pathways vs equity considerations

Wealthy European countries must do more in addition to these derived 1.5°C pathways

- Platforms like Climate Action Tracker seek to account for these equity considerations, deriving national ‘fair-share’ contributions
- All countries assessed in the 1.5°C Pathways for Europe project except Romania (Annex II parties to UNFCCC) should provide financial support to developing countries to help them reduce their emissions

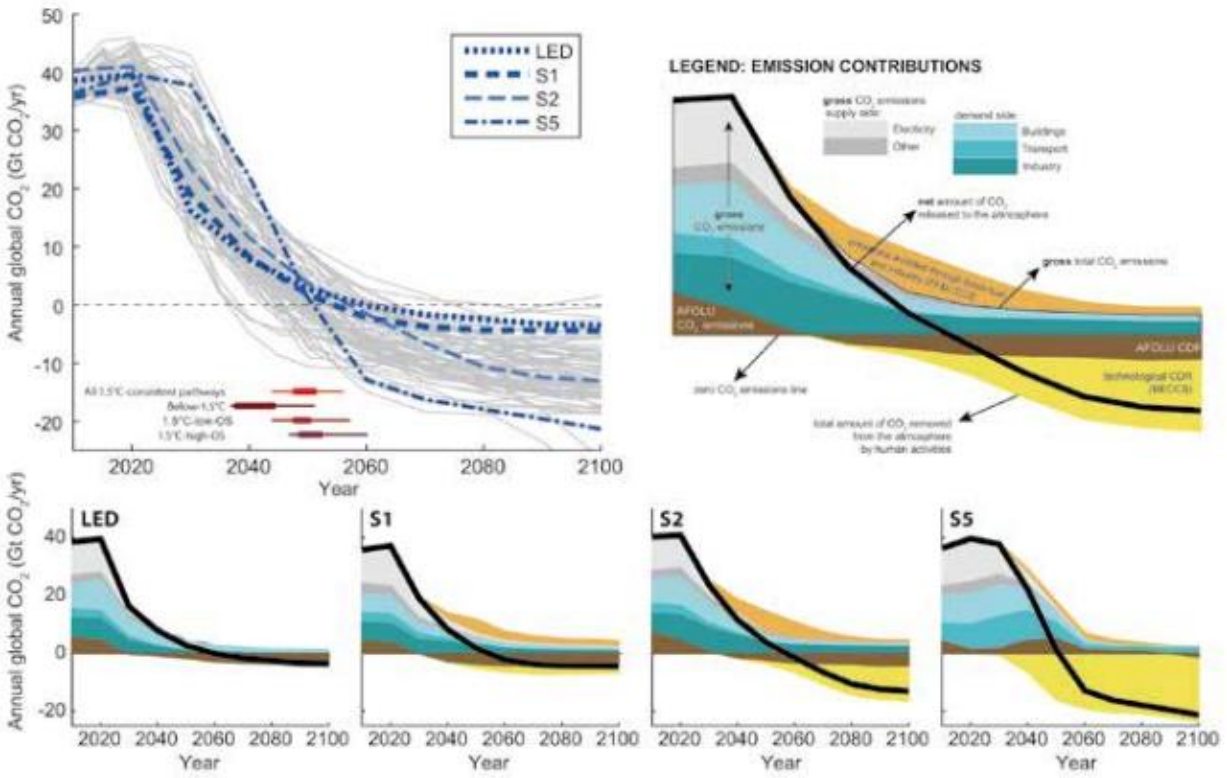
Germany



Limitations & outlook towards updated global pathways

Limitations of downscaling approach

- Allocation of downscaled energy mix and resulting emissions pathways is affected by initial energy mix, and GDP and population growth projections, but fundamentally limited by dynamics of regional scenario it is downscaled from
- Choice of only two scenarios does not give comprehensive representation of the wide variety of 1.5°C scenarios and their varied characteristics
- Simplistic mechanics of energy demand allocation in SIAMESE tool does not give as nuanced results as full-scale energy system modelling



Examples of varied dynamics of 1.5°C climate scenarios

Source: IPCC SR1.5 Chapter 2

Looking ahead to updated global pathways

- Collaboration between Climate Analytics and PBL modelling team will produce an updated global IAM that incorporates recent key technological and economic trends
- Second phase of 1.5°C Pathways for Europe project is to utilise this model to derive EU27 and national pathways
- Discussions ongoing as to how these results will be presented in Spring 2022

CLIMATE ANALYTICS

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Thank you!

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