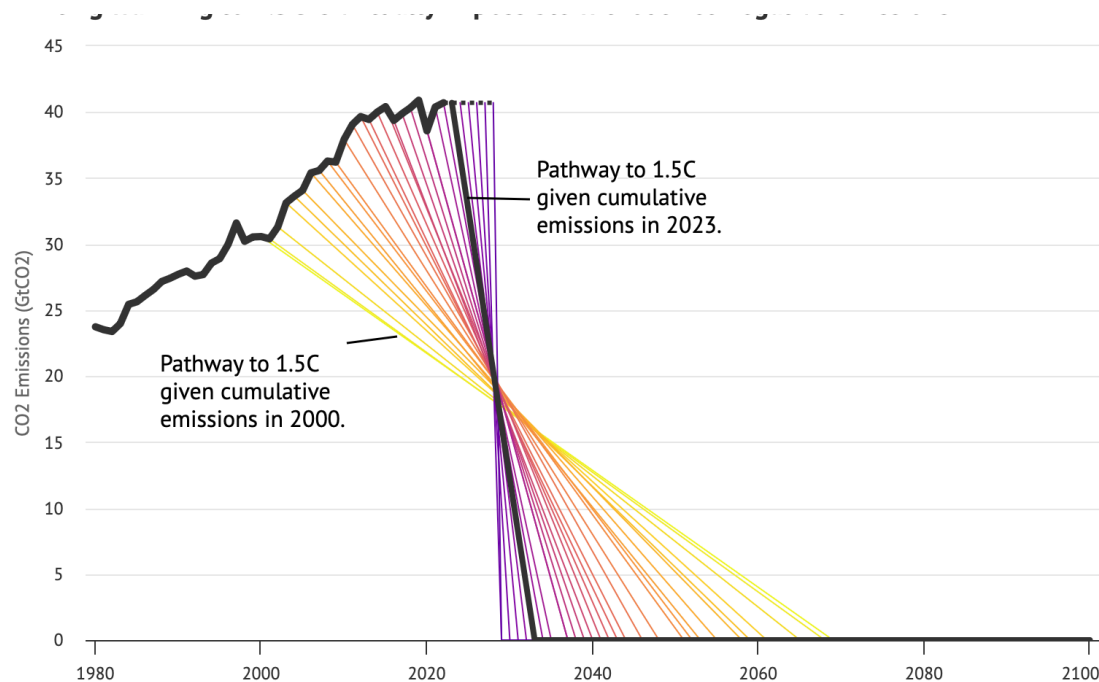


Depicting behaviour change in long-term energy scenarios

5th International Forum on Long-Term Energy Scenarios
IRENA, September 10th, 2024

Prof. Hannah Daly, University College Cork

The remaining carbon budget for 1.5°C is tiny .. Or Zero



Source: UNEP Gap report.

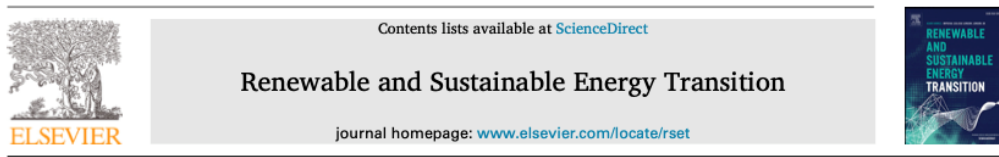
CarbonBrief
CLEAR ON CLIMATE

The inescapable calculus of carbon budgets:
Equitable 1.5°C scenarios require some combination of:

1. Even faster energy transition,
2. Rely on costly and unproven carbon removal measures (overshooting),
3. Manage and reduce final energy consumption

Emission reduction trajectories associated with a 50% chance of limiting warming below 1.5°C, without a reliance on net-negative emissions, by starting year. Solid black line shows historical emissions, while dashed black line shows emissions constant at 2023 levels. Source: Historical CO₂ emissions from the Global Carbon Project. 1.5°C carbon budgets based on [Lamboll et al 2023](#). Chart by Carbon Brief, adapted from a figure originally designed by [Robbie Andrews](#).

Low Energy Demand scenarios



Low energy demand scenario for feasible deep decarbonisation: Whole energy systems modelling for Ireland

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Low Energy Demand scenarios...

- ❖ Increase the feasibility of meeting Paris-aligned carbon budgets:
- ❖ Lower reliance on speculative Carbon Dioxide Removal
- ❖ Lower the necessary speed of technological transitions
- ❖ Can bring broader benefits

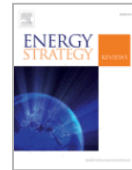
Energy demand growth has diverse drivers

e.g., dispersed settlement patterns









Energy Strategy Reviews

Volume 51, January 2024, 101296



Dispersed settlement patterns can hinder the net-zero transition: Evidence from Ireland

Ankita Gaur ^{a b}  , Jason McGuire ^{a b} , Vera O'Riordan ^{a b} , John Curtis ^{c d a} ,
Hannah Daly ^{a b} 

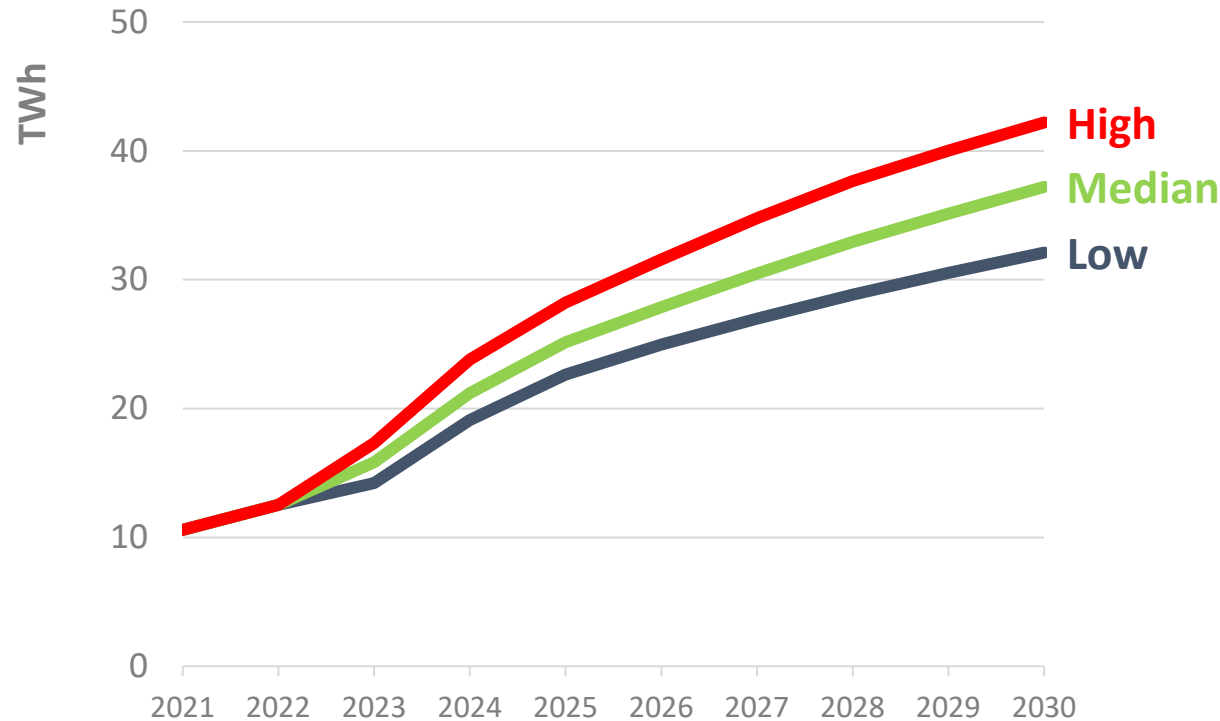
Dispersed settlement pattern drive:

- ❖ Increased energy service demands
 - Longer driving distances
 - Larger dwellings
- ❖ Undermine low-carbon infrastructure
 - Public transport
 - District heating networks

Running to stand still:

Data centers threaten Ireland's carbon budgets

Total renewable electricity generation required under
Alternate Data Centre growth scenarios



- ❖ Data centers account for more than 20% of Ireland's electricity consumption
- ❖ Growth in DC demand has matched growth in renewables generation since 2016
- ❖ DC are seeking to connect directly to gas network for on-site power generation to overcome power system limits

Energy scenarios frame the future





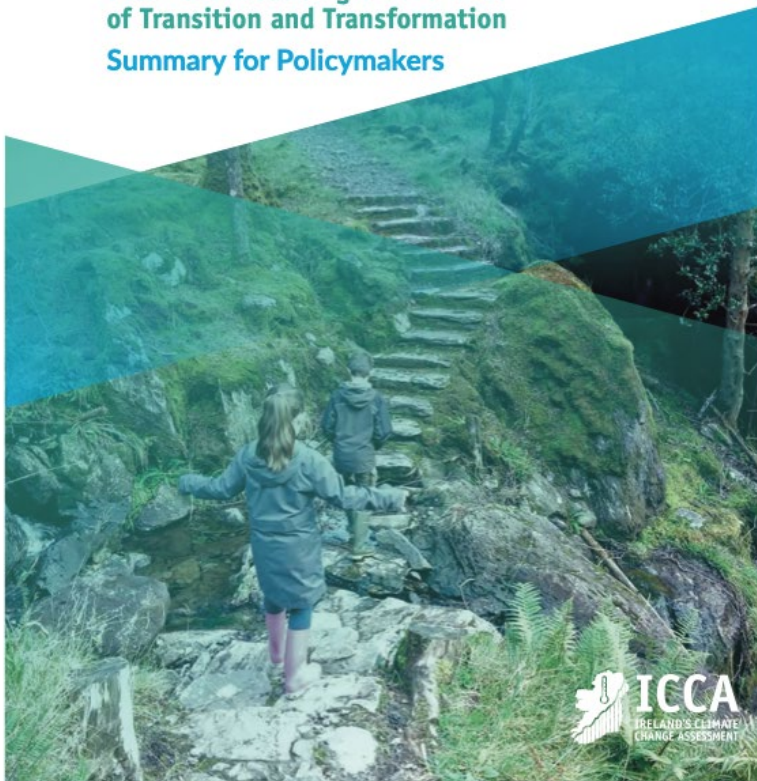
Rialtas na hÉireann
Government of Ireland



IRELAND'S CLIMATE CHANGE ASSESSMENT

Volume 4: Realising the Benefits
of Transition and Transformation

Summary for Policymakers



UCC

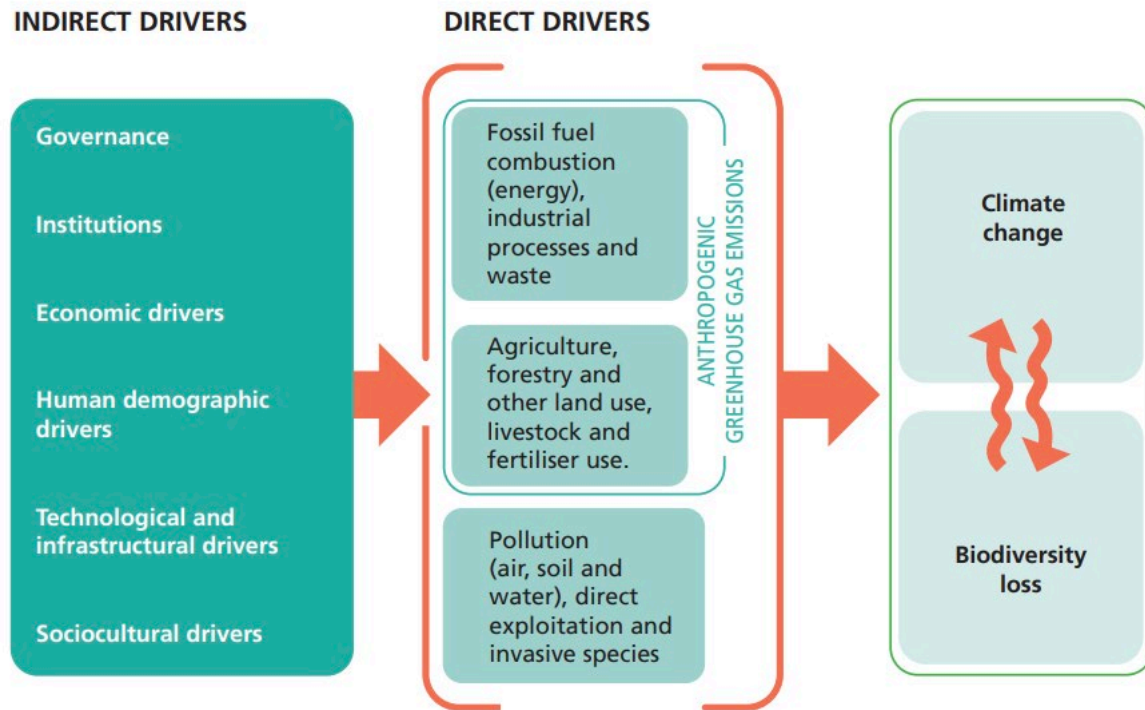
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Transformative change

Transformative change is a fundamental, system wide reorganisation across technological, economic and social factors, including paradigms and goals, and valuing the climate, the environment, equity and wellbeing within decision making.

Technology switches alone will be insufficient

A change in approach is required to achieve transformation



- ❖ Address indirect drivers, which act as barriers to transformation
- ❖ Tackle climate & biodiversity loss together
- ❖ Mobilise all actors
- ❖ Re-evaluate economic paradigm
- ❖ Prioritise just transition
- ❖ An integrated, long-term vision

Expand the range of solutions

- ❖ Carbon budgets aligned with PA temperature goal **requires a transformative approach** that goes beyond technological transitions alone
- ❖ Broaden the question: **how can we depict transformative change** in long-term energy scenarios, which addresses multiple dimensions of sustainability?
- ❖ Energy demand “behaviour” is driven by cultural norms, information, infrastructure, inertia: each can be influenced by policy: **learn from past transformations**
- ❖ Even though **models tend to be ill equipped** to map out the levers of transformative change, there is still a strong case for depicting them at a high level
- ❖ The implications of these scenarios places a spotlight on lifestyles, consumption and inequality and **challenges vested interests**

Thank you

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UCC Energy Policy and Modelling Group: <https://www.ucc.ie/en/epmg/>