

Technology Review for Carbon Neutrality

Perspective

How the UK's governance regime and its use of carbon budgets/emission caps has driven progress towards Carbon Neutrality

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ABSTRACT

The UK has successfully halved its territorial emissions since 1990, it has had consistent climate policies for over 18 years and continues to be seen as a climate leader internationally while other nations are considering reducing their climate commitments. In this perspective, I argue that the legislated Climate Change Act and the independent Climate Change Committee (CCC) has had a lot to do with the success by building trust, guiding progress and giving businesses confidence to invest. Around 75 countries now have similar climate framework laws with many similar to the UK model. However, we are moving to a world where future progress is becoming politically contested and geopolitical pressures are mounting. This perspective reflects on 18 years of UK progress under the Act and presents thoughts on the future and the benefits of international cooperation.

KEYWORDS

Climate Action; climate policy; emission caps; UK Climate Change Committee

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Received: 03 November 2025

Revised: 16 December 2025

Accepted: 16 December 2025

<https://doi.org/10.26599/TRCN.2025.9550017>

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1. Introduction

The UK passed the Climate Change Act in 2008¹. When established, the Act set a 2050 emission reduction target of 80% compared to 1990 emissions and a provided a framework for determining interim five-year carbon budgets get us towards the 2050 target. These budgets cap the greenhouse gas emissions over the five-year periods between 2008 and 2050.

The Act also established the Climate Change Committee (CCC) to independently advise Government on the interim target level and report to the UK Parliament on progress. On the advice of the CCC, the act has been amended once, in May 2019, to strengthen the 2050 target from an 80% reduction to a 100% reduction (Net Zero)—this is equivalent to setting a carbon neutrality target for all greenhouse gases.

The Act was established in a period of good cross-party political support for climate action. Although the UK started to reduce its emissions since the 1990s, the Act has accelerated progress—the UK has now halved its greenhouse gas emissions relative to 1990, and, since the Act was passed into law, the rate of decarbonisation has doubled due to the phase out of coal and the increase in renewable energy generation². Over the same time the UK economy has grown and climate action has received wide support from different political parties and the public. As a result, the legislation is widely regarded as being very successful with many other countries now adopting similar policies, including China. Around 75 countries now have climate framework laws with either advisory bodies and/or carbon budgeting approaches integrated into their climate governance system³. The International Climate Councils Network (ICCN) was launched in 2021 to support and amplify the work of a growing network of climate councils. The ICCN now has 28 members, having welcomed Brazil, Malta, and Vanuatu—plus New South Wales (Australia) and Maryland (USA) in 2025. Today, there are nearly triple the number of councils as there were when the Paris Agreement was signed in 2015.

2. Reasons for past success

2.1 Trust building

Trusted advice from the CCC has proved crucial in driving progress. In the UK, since the Act was passed and until recently, there has been good political support for climate action from different political parties and the public. The recent shift in attitude is driven by the rise of a populist party in the UK that denies the evidence of climate science. Previous UK governments have trusted the independent expert advice from the CCC and they have set six carbon budgets in line with the CCC evidence—deferring to their expertise, even when they have found it challenging. The first five carbon budgets were set against an 80% emission reduction target compared to 1990,

the first three have been met and the fourth and fifth carbon budgets are on course to be met (Fig. 1, Table 1). In 2018 the Intergovernmental Panel on Climate Change (IPCC) published its Special Report on 1.5 °C (IPCC, 2018)⁴. The CCC responded by strengthening its advice, publishing a report in early 2019 that recommended that the UK adopt a 2050 Net Zero greenhouse gas target⁵, consequently, the Government amended the Act in May 2019, making the UK one of the first countries in the world to adopt a Net Zero goal in legislation.

The Act itself supports trust (see Appendix). Under the Act, the CCC is required to consider not only evolving climate science, but also economic and societal developments. Therefore, the expert committee of the CCC has experts in climate science, energy, business, economic and political dimensions and the CCC undertakes extensive stakeholder consultations including running citizens panels to support recommendations about demand measures that involve people making green choices, such as reducing demand for meat consumption or car travel². The CCC reports are widely scrutinised by parliamentarians, civil servants, businesses, academia and the media. The quality and comprehensiveness of the reports give governments and businesses the confidence to act. The CCC has also adapted its approach to build trust: it openly publishes its data and consults on its methods. It has increased its stakeholder engagement, especially with regional governments, and it has decreased the policy prescriptiveness of its advice to remain as politically neutral as possible⁶.

Making the economic case has proved particularly important to the CCC's success in getting the Government to adopt ambitious Carbon Budgets. Figure 2 shows our cost benefit

analysis for the Seventh Carbon Budget advice². It shows that the costs come from an initial capital spend in building a renewable energy system, electrifying industry and changing our buildings. But there is also an immediate operational cost saving from electric vehicles being cheaper to run. From about 2040, the transition is benefiting the economy. Overall, the cost of the transition is small – around 0.2% of Gross Domestic Product (GDP) over the 2025–2050 period. Very little of this investment, around 15%, needs to come from direct public investment: most is private investment by households and businesses.

2.2 Carbon Budget setting characteristics

Setting Carbon Budget levels 12 years in advance of when they need to be met has proved ideal. Twelve years is beyond the timescale of the typical political cycle in the UK. This allows Parliament to have a more evidenced debate when deciding the level of the budget. Yet the period is close enough to have a meaningful debate on the feasibility of delivery. This helps set a fair budget level. Both the CCC and Government are required to publish pathways that deliver the budget which also helps ensure they are feasible. The targets become legally binding when set and this adds to the overall Parliamentary scrutiny.

The 12-year period also gives time for Government to introduce, and revise, policies to reach the budget (see progress monitoring below). Having certainty in the trajectory for the country has also helped drive business and industry investments in the knowledge that they will be operating within a consistent regulatory environment so can predict future revenues. Business federations often come out in support of the carbon budget framework and cite them beneficial for procuring investment. They often

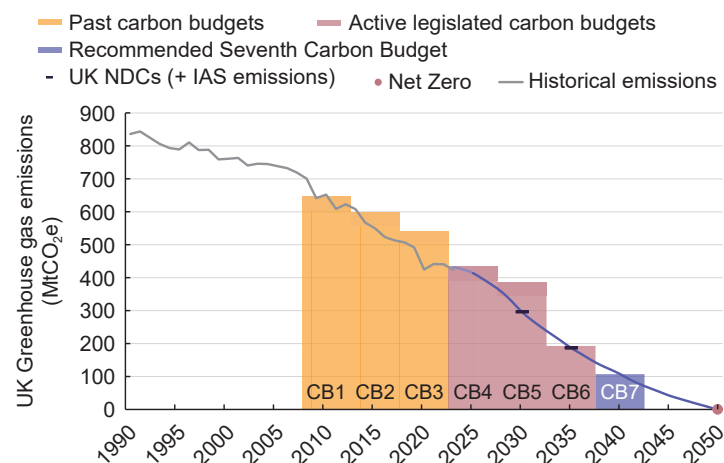


Fig. 1. The UK's carbon budget framework and the UK's progress towards its Net Zero (Carbon Neutrality) goal. The UK's contribution to international aviation and shipping (IAS) is included in the emission values and explicitly in targets from the sixth Carbon Budget (CB6, onwards). The seventh Carbon Budget (CB7) has not yet been set in law; the figure shows the CCC recommended value. CB6, CB7 and the two Nationally Determined Contributions (NDCs) are set on the CCC's balanced pathway transition to Net Zero. Previous Carbon Budgets are set with respect to the 80% reduction in emissions by 2050 target which was given in the original 2008 Climate Change Act. Reproduced with permission from Ref. 2, © Climate Change Committee 2025.

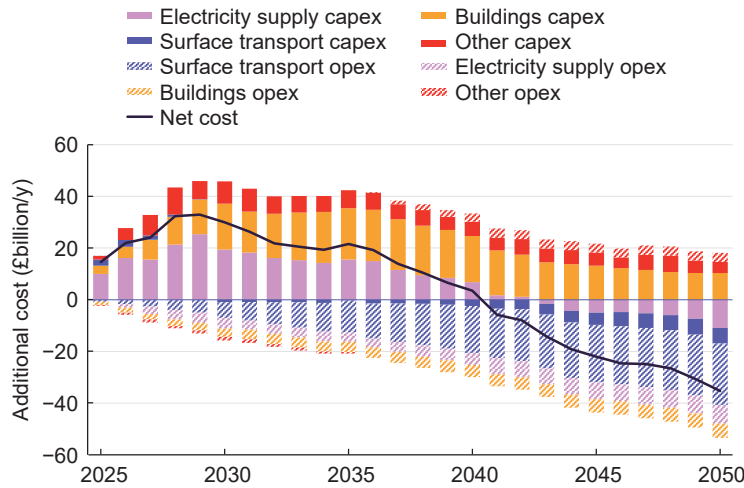


Fig. 2. The whole economic costs of the UK Climate Neutrality transition relative to a current policy baseline. Until 2040 the capital expenditure (capex) on electricity supply and buildings is more than the operating cost (opex) savings. From 2040 the economy benefits. Over the 2025-2050 period the net cost equates to around 0.2% of UK GDP. Reproduced with permission from Ref. 2, © Climate Change Committee 2025.

write complimentary reports, detailing the benefits of Net Zero to jobs and the economy (e.g. Energy and Climate Intelligence Unit (ECIU), 2025⁷).

Setting budgets as five-year averages rather than single year targets has proved helpful. Annual budgets are more susceptible to economic fluctuations or external influences such as the Covid-19 pandemic. When Scotland set ambitious annual targets into law, against the advice of the CCC, they were unable to meet these budgets and this led to their Government's collapse and the law had to be changed⁸. Their budget approach has now been revised for 5-year targets in line with CCC recommendations.

2.3 Progress monitoring

Progress has been supported by a requirement of the Government to respond to the CCC advice within a specified timeframe. Annual monitoring and reporting on progress have proven vital—this keeps climate action on the political agenda and encourages the Government to revise and improve its policies where needed⁹. The CCC has established a monitoring framework and policy tracking

mechanism to track how the sectors of the UK are delivering to the Government's own climate plan¹⁰. The CCC publishes a report to Parliament in June each year⁹. This reports on progress in each sector and gives policy recommendations to improve delivery of the Government plan. The Government needs to publish a response by October each year.

Progress monitoring allows for policy revisions. For example, the previous Government introduced a Zero Emission Vehicle (ZEV) mandate, where car manufacturers are obliged to sell a set proportion of electric cars each year. This proportion is set to rise each year between now and 2030 to drive new electric car sales. However, CCC evidence showed that the purchase of new cars has slowed, due to overall pressures on the economy. Therefore, to simulate sales and drive more electric cars into the market, a subsidy has been introduced for small electric cars, to encourage wider take up and faster sales.

Independent analysis has shown that only around 23% of the CCC's recommendations are acted on by the Government, many are ignored.

However, the most persistent and repeated recommendations are taken up. This shows that the process of independent advice can influence Government policy direction¹¹.

3. Discussion

As introduced in Section 2, key aspects instrumental in the success of the UK's framework have proven to be: i) the way the Government is required to respond to its independent advice from the CCC; ii) UK carbon budgets are set 12 years in advance, which means that they can be largely met through private sector investment and market forces, rather than regulation; iii) progress is independently monitored and reported on by the CCC—this encourages Government to revise policies where needed; iv) setting 5-year average emission targets has worked better than setting annual targets which are more prone to being met by chance and/or manipulation.

However, with the rise in geopolitical tensions and a focus on economic growth, the UK legislation is now coming under increasing political challenge, particularly around cost. To address this, the economic aspects on the transition will be increasingly a focus of the CCC's work (see Fig. 2). We are looking to do a detailed distributional cost-benefit analysis to understand better how different groups in society are affected by the transition. We are also increasingly confident in the role of renewable energy and electrification has the main drivers of the transition. Over 60% of the remaining transition is based on electrification². We rely far less on hydrogen, carbon capture and storage and carbon removals than we did in our previous advice. We expect this trend to continue, with more efficient and cheaper electric products and services displacing old fossil fuel technologies. These should prove cost effective and help stimulate economic growth.

The UK shut down its last remaining coal-fired power station in 2024. The electricity supply sector is now only the sixth largest emitting sector of the UK (Fig. 3(a)). The immediate challenge for the UK is to

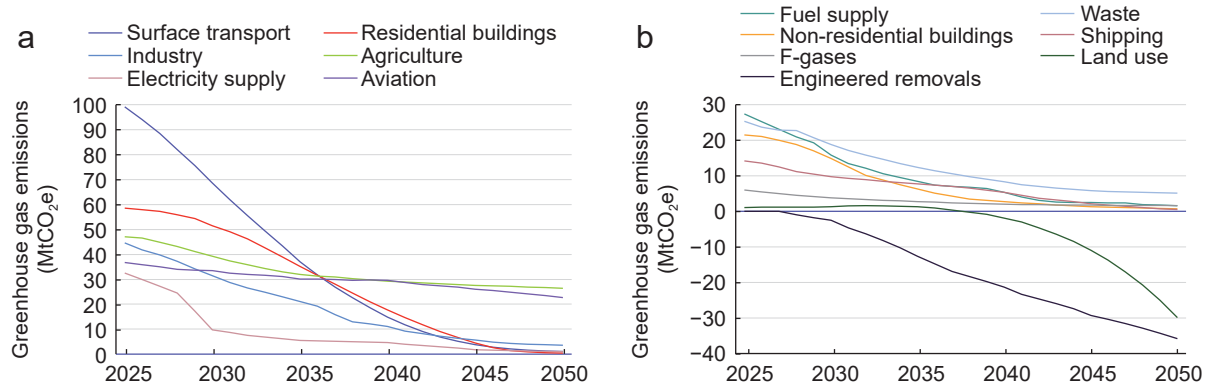


Fig. 3. UK sectorial emissions in the CCC's Balanced pathway for (a) today's six highest emitting sectors and (b) other sectors. In 2050 technological removals largely offset aviation emissions and nature-based removals largely offset emissions from agriculture. Reproduced with permission from Ref. 2, © Climate Change Committee 2025.

decarbonize its surface transport, emulating the transition that has occurred in China (Fig. 3). We are already seeing signs that this transition is accelerating in the UK. We also need to replace gas heating in our residential buildings with either air source heat pumps or heat networks. This will be more challenging and take investment and time. We further need to grow our tree cover and technological carbon removal sector to displace the residual emissions that are expected to persist from agriculture and aviation (Fig. 3(b)).

The energy transition is well underway, in the UK and around the world. But there is still a lot to do against geo-political headwinds. However, the path forward has become a lot clearer. Renewables and electrification are cost effective and clean. With shared learning between countries, we can use the carbon budget framework of consistent policy direction to drive the roll out of clean technology and course correct as necessary to support economic growth. Using evidence effectively can help countries decide the most cost-effective path to decarbonisation.

The UK Government has supported shared learning by establishing and supporting the ICCN (see above). Additional UK Government funding has meant that CCC staff have been able to provide direct support to other governments to help establish and train their climate councils.

The UK Climate Change Act was designed well and with enough flexibility to cope with a changing political environment. Although countries have different political structures and institutions, I am hopeful that with 75 climate framework laws in place, many countries will start setting ambitious interim caps on emissions to drive real progress and cooperation towards our Carbon Neutrality goals.

Appendix

A1. The UK Climate Change Act

When giving its advice the Climate Change Committee (CCC) is statutory obliged to consider the latest scientific evidence on climate change; the economic impacts of mitigation measures on growth, competitiveness, and public finances; and the social implications, such as how climate policies affect employment, living costs, and the distribution of benefits across different communities. This helps ensure that Carbon Budgets are both scientifically credible and socially and economically sustainable. A summary of the CCC's framework and approach is given in a set of insight briefings available here: <https://www.theccc.org.uk/publication/insights-briefings-sharing-the-uk-approach-to-addressing-climate-change/>.

A1.1 Mitigation

The Climate Change Act 2008 grants the UK Government a suite of statutory powers and

duties: it mandates that five-year emissions "Carbon Budgets" be set in law, obliges the Government to publish policies and proposals to meet them, and requires independent monitoring and reporting. Under section 34 the CCC must advise on each budget's level; once the Government accepts the advice and sets the budget in secondary legislation, the Government must publish a report on how it will meet that budget. The CCC is required to recommend a level for each future carbon budgets over 12 years in advance of when it needs to be met. The Government is then required to respond to this recommendation within a statutory time limit to set the level of the budget though parliamentary debate and legislation.

The CCC's recommended budget is accompanied by a detailed carbon budget report. This assesses both what level of mitigation is needed from an international climate science perspective of climate risk, and also uses evidence as to what pace of emission reduction is feasible. The pace of transition is evaluated though a technological and cost-benefit assessment for each sector. The energy needs are then evaluated to estimate the size of the energy sector and how quickly it needs to decarbonise. Carbon Budgets are also recommended for the three devolved regions of the UK (Scotland, Wales and Northern Ireland). For each region, by evaluating their specific governance frameworks and laws, the CCC additionally considers which actions are the responsibility of the regional governments and which are the responsibility of central government—see CCC (2025)² for full details of the method.

In addition, each year the CCC must publish a progress report to Parliament assessing how well the UK is doing in delivering the budgets. Government needs for formally respond to this progress report. Hence the Act creates a legally binding limit on UK emissions over each five-year period, a legal duty to set policies and report on them, and independent oversight of progress. The Carbon Budgets set in law are shown in Fig. 1.

A1.2 Adaptation

The Climate Change Act 2008 assigns two main statutory roles to the CCC on adaptation: first, to advise the UK Government on the climate risks facing the country; and second, to evaluate progress in delivering the Government's National Adaptation Programme (NAP) for England.

Under the Act, the Government must publish a UK Climate Change Risk Assessment (CCRA) every five years, assessing current and future climate risks. In response, it must then prepare a National Adaptation Programme, outlining how these risks will be managed.

Acknowledgements

None.

Author contribution statement

Piers Forster is solely responsible for this article.

Data availability

The data that support the findings of this study could be downloaded from <https://www.theccc.org.uk/publication/the-seventh-carbon-budget/#publication-downloads>.

Use of AI statement

None.

Declaration of competing interest

The author has no competing interests to declare that are relevant to the content of this article.

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