

NET ZERO ROADMAP



Getting to Net Zero by 2050 – or sooner

13th December 2021

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CHAIR'S FOREWORD

The Net Zero All Party Parliamentary Group (NZ APPG) was created to embed net zero solutions and help accelerate Government action to meet the UK's legally binding obligation to reach net zero by 2050. It brings together a great number of passionate and energetic MPs and Peers from all political parties and provides a powerful forum to build cross-party consensus on how to realise net zero ambitions and scale-up decarbonisation plans.



COP26 in Glasgow was the most significant climate conference since Paris. It was an important time for the UK to show leadership and to take action to deliver its net zero policies and ambitions.

In the words of The UN Secretary-General António Guterres in the recent IPCC report, the need to tackle climate change is *"a code red for humanity. The alarm bells are deafening, and the evidence is irrefutable"* and *"we must act decisively now, to keep 1.5 alive."*

Tomorrow's generation will ultimately judge whether COP26 was the game changer it needed to be if we are to deliver decisive action to limit warming and keep the target of 1.5C alive.

Today, we know that those alarm bells are still ringing post-Glasgow and there are clarion calls for the UK to scale-up and go further and faster if it is to reach Net Zero by 2050 – or sooner.

The Net Zero APPG's main focus is to look at what the UK needs to do to accelerate and unlock a low carbon future. Our Net Zero Roadmap lays the foundations for the UK to embed net zero policies. Our findings and recommendations have been forged from the evidence we heard from Parliamentarians - of all parties- academic experts and business leaders. We want our report to lead the way on what needs to be done now to accelerate net zero solutions, behaviour change and decarbonisation.

Our Net Zero Roadmap report builds on the series of thought leadership sessions we held throughout 2021, building on the APPG's Sessions held in 2020, which culminated in our ['Decarbonisation Report: Putting net zero at the heart of UK policy'](#) and 10 Point Net Zero Action Plan. Our Net Zero Roadmap goes even further, setting out what more can be done - post COP26 - to get to Net Zero; achieve a green economy, greener cities and regions and decarbonise the hard to abate sectors.

We believe that our Net Zero Roadmap shows how the UK can go faster to achieve the post-pandemic green recovery and get to Net Zero sooner.

Our recommendations provide a Roadmap for the UK Government to:

- deliver the post-Brexit jobs and skills needed to build back better and level-up
- incentivise and scale up the transition to a green economy
- boost UK industry and agriculture
- empower local leaders and communities to make greener and healthier choices

Together, our 2021 Net Zero Roadmap and the Net Zero APPG's Decarbonisation Report reflect the scale of the challenge before us and focuses on a set of deliverable short- and long-term actions that the UK needs to take to accelerate progress

to Net Zero by 2050 or sooner. Given the level of all-Party support from MPs and Peers across Parliament, I call on the Government to adopt our recommendations in full and put the necessary urgency and finance in place to achieve them.

I would like to take this opportunity to thank all those who contributed to this landmark Net Zero Roadmap. From our industry sponsors, academic partners and peer reviewers, who delivered high-quality and insightful presentations and feedback, through to the MPs and Ministers, who provided such constructive and robust engagement throughout.

I would also like to thank the Chancellor and the Secretary of State for Business, Energy and Industrial Strategy, for providing written responses to letters I sent to them outlining our initial findings.

Achieving net zero will not be without its challenges. But with bold leadership and vision, the UK can lead the way on the road to Net Zero. We need to enhance our collective prosperity and resilience. Now is the time to act.

A handwritten signature in dark ink, reading 'Alex Sobel'.

Alex Sobel MP
Chair of the Net Zero All Party
Parliamentary Group

EXECUTIVE SUMMARY

The Net Zero APPG and stakeholders welcome the Government's stated commitment to net zero emissions by 2050, but are profoundly concerned about the lack of immediate action, debate, planning and investment commensurate with the scale of the challenge.

In addition to immediate emission reductions, planning and investment needed the Government must address the “*final 25%*” challenge of emissions in hard-to-abate sectors if it is to ensure a smooth, just and socially inclusive transition. The Net Zero APPG remains concerned that many in government and wider society have yet to appreciate the scale of the changes ahead. There are huge opportunities for UK business to grasp. There is great potential to deliver win-win solutions, notably including increased energy independence and food security and improved public health and air quality. But there is also a growing risk of a catastrophic backlash in public opinion against poorly designed or badly justified climate policies, as illustrated by the ongoing energy crisis and resurgence of fossil fuels around the world.

The panel sessions we held on the Economy, Net Zero Cities and Regions, Hard-to-abate sectors and Delivery and Implementation broadly confirmed the **Net Zero APPG 10-Point-Plan** published in November 2020. This called for government, above all, to develop a clear and systematic **Net Zero roadmap** combining both concrete near-term targets with a clear vision of how achieving these targets contributes to delivering an inclusive, fair and sustainable Net Zero UK. It further called for an expansive and ambitious **Covid-19 green recovery package**, including making government **support to industry conditional** on both a commitment and demonstrated progress towards Net Zero (including both the Covid Corporate Financing Facility and the response to the current energy price crisis).

The 10-point plan identified clear and cost-effective opportunities for immediate emission reductions through enhanced **whole system efficiency**, including **electricity demand response** tools and incentives at both grid and consumer levels, **energy storage** to accommodate intermittency in both supply and demand, investment in **vehicle electrification** and improved **public transport**, and **improved building standards**, including **decarbonising home heating**. We recommend that the option of Ofgem being

mandated to review net zero transition planning should be considered.

Incentives for emissions reduction and enhanced carbon dioxide uptake through **nature-based solutions, sustainable land management and agricultural practices** provide for both short- and long-term opportunities. In the longer term, the plan called for an ambitious **green hydrogen** strategy and the establishment of a **Carbon Takeback Obligation** on fossil fuel suppliers to progressively dispose of the carbon dioxide generated by their activities and products, driving development of long-term CO₂ storage and greenhouse gas removal technologies. A deep and sustained **communications and awareness campaign** will be essential to maintain public support.

Some elements of our Net Zero 10 Point Plan, such as the ban on internal combustion engines, have been reflected in subsequent government announcements, and the Net Zero APPG naturally welcome this. But a recurrent concern is **Government's failure to engage with the public on more challenging and long-term decisions**.

On the **Economy**, while the panel noted the need to immediately scale up public funding for the transition to match the UK's ambitious climate goals, a whole-economy approach is needed, developing in particular long-term funding models that minimise the burden on the taxpayer while at the same time maximising opportunities and minimising burdens on **small and medium-sized enterprises (SMEs) and disadvantaged regions**. The Net Zero transition cannot and should not be paid for with taxpayer handouts to large corporations.

Among **Hard-to-Abate** sectors, panels addressed energy-intensive industries, agriculture and aviation and shipping. A common theme to emerge was the need for **product-level thinking**: the world needs to use less steel, but to achieve net zero, it will also need decarbonised steel, which will not be delivered simply by reducing the size of the UK steel industry.

Hence, for **energy-intensive industries**, while near-term reductions will primarily be delivered through efficiency and electrification, this must not detract from rapid scale-up of carbon capture and storage and the development of greenhouse gas removal and storage technologies. For agriculture, the Department for Environment, Food and Rural Affairs urgently needs a plan for a net zero transition for **agriculture**: the current agriculture bill provides an opportunity for real and immediate gains through **subsidy reform**. Reforms need to recognise the particular emissions profile of agriculture, dominated by methane and nitrous oxide rather than carbon dioxide, and integrate into the UK's broader strategy for **regenerative land management** and a transition to **healthier and more sustainable diets**.

For **aviation and shipping**, tools such as **frequent-flyer levies** can be an effective and progressive means to reduce aviation emissions in the near term, while **eliminating indirect subsidies for online retail** (which also penalise the UK high street and many SMEs) would address rapidly-growing emissions associated with global supply chains. As we approach Net Zero, however, the focus will need to shift to **decarbonising aviation and shipping fuels**, either through substitution with carbon-free energy carriers (e.g. batteries for short-haul flights and ferries, hydrogen or ammonia for longer distances), or compensating for any carbon dioxide still generated through direct air capture and permanent storage. In all these areas, a focus on **net zero products** would help ensure a level international playing field and **prevent the export of emissions** at the expense of UK farming and manufacturing. Carbon border adjustment mechanisms have a role to play, but must be designed to **decarbonise supply chains** rather than as crude protectionist measures.

On **Net Zero Cities and Regions**, the panel emphasised the opportunities for regional leadership, for example in the rollout of electric vehicle infrastructure, particularly noting the complementarity between the Net Zero and levelling up agendas. **Skills training** is essential to ensure a just and inclusive transition and best delivered at a local and regional level. **Retrofit** is essential to decarbonise existing buildings, and must be responsive to unique local circumstances. Many of the actions crucial to achieving

Net Zero are under the control of local authorities: regions and cities must be empowered to deliver, in the context of a long-term detailed roadmap from the UK government. Finally, in the panel on **delivery and implementation**, the Net Zero APPG noted the vital importance of **public support** and **behaviour change** in the transition. **Coordinated communication and action** at all levels of central, regional and local government is essential to maintain public support. **Transparency** is key: policies must be not only effective, but seen to be effective, in delivering our Net Zero goal.

Our Net Zero Roadmap demonstrates that there remains a recurrent concern over Government failure to engage with the public on the more challenging and long-term decisions. The Net Zero APPG do not believe that effective climate policy can simply depend on just hoping for the best.



To reach Net Zero by 2050 or sooner the Net Zero APPG's 10 Point Net Zero Action Plan called on the Government to:

- 1 Develop a clear and systematic Net Zero Roadmap** for sustainable delivery of net zero at scale that clarifies urgent short-term priorities, sets interim (5-year) targets, and includes robust implementation, review, and governance arrangements;
- 2 Develop an expansive and ambitious Covid-19 green recovery package that:** is guided by economics; focusses on **green job creation** and **workforce reskilling**, especially in disadvantaged areas; prioritises energy efficiency; incentivises scaled-up green technology and infrastructure development, including renewable and firm zero-carbon energy, energy storage, low emissions heating, clean industry; and maximises local impact through coordination with local government and industry;
- 3 Overhaul building standards and incentives** to ensure that **existing** and **new buildings** are brought in line with net zero, including by encouraging, and, where necessary, mandating, the use of low carbon materials, low emissions heating, retrofits to existing homes, energy efficient design and construction, and circular economy thinking;
- 4 Establish a strategic communications and civic engagement programme** that is championed by a cross-departmental group of Cabinet members and galvanises industry, community, and individual action for meaningful economy-wide emissions reductions;
- 5 Accelerate the decarbonisation of the transport sector** by bringing forward the planned ban on the sale of new internal combustion engine vehicles to 2030 (from 2040), setting interim EV sales targets, accelerating the deployment of charging infrastructure, expanding rail networks, and including international shipping and aviation in the net zero target;
- 6 Develop an ambitious net zero hydrogen strategy** to position the UK to capitalise on opportunities for green and blue hydrogen (with full CCS) production, and provide a pathway for decarbonising international transport, heavy goods vehicles, and heavy industry;
- 7 Enhance electricity demand response tools and incentives** for consumers and industry to increase grid management flexibility, improve efficiency, and allow higher renewable energy penetration;
- 8 Support the commercialisation of carbon capture and storage and carbon removal technologies**, including through the establishment of a 'Carbon Takeback Obligation' (CTBO) for fossil fuel extractors, importers, and airlines, requiring them to permanently store an increasing percentage of the CO₂ generated by the products and services that they sell, rising to 100% by 2050;
- 9 Align the Government's corporate finance programmes with net zero**, including by making access to the Covid Corporate Financing Facility conditional upon clear corporate net zero business plans,³ and giving any new Government-backed infrastructure bank a net zero mandate; and
- 10 Use post-2020 UK carbon pricing architecture and forthcoming Environment Bill to strengthen incentives for nature-based emissions reductions and enhanced CO₂ uptake activities**, with particular potential to offset short-lived climate pollutants from agriculture (e.g. methane).



In addition, and based on the body of evidence we heard, we recommend that following actions are needed to further embed and accelerate net zero policy in the UK.

The Net Zero Economy

- There is an immediate need to scale up public funding for the transition to match the UK's ambitious climate goals.
- A whole-economy approach is required. Developing, in particular, long-term funding models that minimise the burden on the taxpayer while at the same time maximising opportunities and minimising burdens on small and medium-sized enterprises (SMEs) and disadvantaged regions.
- The Net Zero transition cannot and should not be paid for with taxpayer handouts to large corporations.

Hard-to-Abate Sectors

- **Energy-intensive industries:** We conclude that while near-term reductions will primarily be delivered through efficiency and electrification, including the production of green hydrogen, this must not detract from urgent development and scale-up of carbon capture and storage, identified by the Climate Change Committee as the policy area furthest behind schedule in delivering the Net Zero transition, supporting in turn the development of greenhouse gas removal and storage technologies
- **Agriculture:** We recommend that DEFRA urgently needs a plan for a net zero transition for agriculture. The new Agriculture Act provides an opportunity for real and immediate gains through **subsidy reform**. We would encourage the Government to urgently adopt reforms and to recognise the particular emissions profile of agriculture, dominated by methane and nitrous oxide rather than carbon dioxide, and integrate into the UK's broader strategy for **regenerative land management** and a transition to **healthier and more sustainable diets**.

- **Aviation and shipping:** Our evidence suggests that **frequent-flyer levies** can be an effective and progressive means to reduce aviation emissions in the near term, while **eliminating indirect subsidies for online retail** (which also penalise the UK high street and many SMEs) would address rapidly growing emissions associated with global supply chains. We conclude that as we approach and get closer to Net Zero the focus will need to shift to **decarbonising aviation and shipping fuels**, either through substitution with carbon-free energy carriers (e.g. batteries for short-haul flights and ferries, hydrogen or ammonia for longer distances), or compensating for any carbon dioxide still generated through direct air capture and permanent storage: R&D support to UK universities and industry should be the immediate focus here. In all these areas, a focus on **net zero products** would help ensure a level international playing field and **prevent the export of emissions** at the expense of UK farming and manufacturing. Carbon border adjustment mechanisms have a role to play but must be **designed to decarbonise supply chains** rather than as crude protectionist measures.



Net Zero Cities and Regions:

- The Net Zero APPG found that there is a definite complementarity between the Net Zero and levelling-up agendas which can be led by cities and regions.
- The UK Government should support regional leadership and give greater powers to Metro Mayors and Civic leaders if it is to tackle climate change and lead the way on Net Zero. For example, to meet targets on the rollout of electric vehicle infrastructure.
- **Net Zero Skills training and innovation** is essential in our cities and regions to ensure a just and inclusive transition. Skills, training and innovation must be invested in and is best delivered at a local and regional level.
- **Retrofit** is essential to decarbonise existing homes and buildings. Green retrofit must be responsive to and reflect unique local circumstances. Many of the actions which are so crucial to achieving Net Zero are under the control of local authorities. Therefore our regions and cities must be empowered to deliver, in the context of a long-term detailed roadmap from the Government.

Delivery and implementation of all net zero policies:

- The Net Zero APPG **concludes that if the UK is to meet Net Zero by 2050 or sooner the Government needs to invest in incentives and communication to trigger public support and behaviour change. The UK cannot lead the way to Net Zero unless it secures public support and behaviour change** in the transition.
- Coordinated communication and action at all levels of central, regional and local government is essential to maintain public support.
- Transparency is key: policies must be not only effective, but seen to be effective, in delivering our Net Zero goal.



OUR ROADMAP RECOMMENDATIONS

What's needed to get to Net Zero by 2050 - or sooner?

	2020 NZAPPG Decarbonisation Report 10 Point Action Plan	UK Policy Progress And 10-Point Plan	What's missing?	Delivering Net Zero NZ APPG Roadmap calls for:
STRATEGY	Develop a clear and systematic Net Zero Roadmap for sustainable delivery of net zero at scale that clarifies urgent short-term priorities, sets interim (5-year) targets, and includes robust implementation, review, and governance arrangements;	10-point plan & strategy show all proposed measures are required with no room for slippage, making lack of shortterm progress a concern.	Reliance on established incentives mechanisms (e.g. CfDs) and supplyside measures that have delivered initial emission reductions at the margin, but may fail to deliver the transformational changes required for net zero.	Greater clarity on long-term net-zero vision and frank public discussion of trade-offs, particularly between higher-cost supply-side options and technology based solutions versus demand reduction and behaviour change.
SKILLS & JOBS	Develop an expansive and ambitious Covid-19 green recovery package that: is guided by economics; focusses on green job creation and workforce reskilling, especially in disadvantaged areas; prioritises energy efficiency; incentivises scaled-up green technology and infrastructure development, including renewable and firm zero-carbon energy, energy storage, low emissions heating, clean industry; and maximises local impact through coordination with local government and industry;	While the UK has earmarked funds for several meaningful green investments, the nation has missed more green recovery opportunities than it has taken. 13.5% of UK recovery spending is green, while the global average hovers at 20%, and some peers in Northern Europe significantly higher.	A labour force and contractors without the requisite skills to implement green policies at the scale required. Case in point is the Green Homes Grant Scheme, which in its first pandemic iteration encountered a situation where demand for renovations dramatically exceeded contractor capacity.	Investment in human capital, particularly green skills programmes, including re-training and associated enablers (both at the individual and community level), must be given highest priority. This is a gap in pretty much every country. Involve cities and regions in skills delivery.
HOUSING	Overhaul building standards and incentives to ensure that existing and new buildings are brought in line with net zero, including by encouraging, and, where necessary, mandating, the use of low carbon materials, low emissions heating, retrofits to existing homes, energy efficient design and construction, and circular economy thinking;	New-build standards still below international best-in-class. Limited progress on retrofit. Delays with the Green Homes Grant and skills shortages risks setting back investment in retrofit.	Policy still very focused on new-build standards: most homes in 2050 have already been built. Decarbonisation of home heating is a particular concern, especially if an exclusively supply-side approach is adopted. Policies lacking on reducing embodied carbon in building materials.	Open discussion of the Decarbonisation options for buildings (efficiency, electrification, local area heat networks, hydrogen, etc.), encouraging regional solutions rather than a single national option.

COMMUNICATION	<p>Establish a strategic communications and civic engagement programme that is championed by a cross-departmental group of Cabinet members and galvanises industry, community, and individual action for meaningful economy-wide emissions reductions;</p>	<p>Substantial progress in raising the climate issue in the build-up and implementation of COP26, particularly acknowledging the contribution of the COP President.</p>	<p>Over-reliance on detailed micro-management of public, community and corporate behaviour through the transition, coupled with reluctance to encourage policy experimentation.</p>	<p>Covid has revealed the limits to dirigiste policy. We need a public conversation about trade-offs, including back-up options if promised technological solutions fail to deliver.</p>
TRANSPORT	<p>Accelerate the Decarbonisation of the transport sector by bringing forward the planned ban on the sale of new internal combustion engine vehicles to 2030 (from 2040), setting interim EV sales targets, accelerating the deployment of charging infrastructure, expanding rail networks, and including international shipping and aviation in the net zero target;</p>	<p>Phasing out new internal combustion engines by 2030 is welcome, but clarity needed on plug-in hybrids and trucks phase-out. Ambitions to encourage walking, cycling etc. are welcome but need to be backed by policies.</p>	<p>Link transport Decarbonisation with the levelling-up agenda (e.g. ensuring EV charging does not become regressive). Need clear targets for managing demand, including aviation, and incentivising mode shifts to rail and other public transport. Build scaleable sustainable aviation fuel solutions while investing in new solutions.</p>	<p>An equitable transport Decarbonisation strategy encompassing a fair deal for rural road users and urban users without access to driveway charging. A realistic, scalable and progressive plan for decarbonising aviation by 2050, avoiding overreliance on nature-based solutions.</p>
ENERGY	<p>Develop an ambitious net zero hydrogen strategy to position the UK to capitalise on opportunities for green and blue hydrogen (with full CCS) production, and provide a pathway for decarbonising international transport, heavy goods vehicles, and heavy industry;</p>	<p>A lot of projects are being developed in the UK and, with the hydrogen strategy published in 2021, this is very promising</p>	<p>Secure long-term funding to stimulate the development of the first set of infrastructure, including both hydrogen and CO2 transport and storage. Ongoing R&D funding into making new forms of hydrogen production more efficient and affordable.</p>	<p>Hydrogen is not necessarily low carbon from a life cycle perspective: Standards & regulation on low-carbon hydrogen production, efficiency and how to estimate it are required.</p>
TRANSITION	<p>Enhance electricity demand response tools and incentives for consumers and industry to increase grid management flexibility, improve efficiency, and allow higher renewable energy penetration;</p>	<p>The Government's 10-point plan is largely dependent on supply side initiatives. Energy efficiency initiatives have been more effective at reducing greenhouse gas emissions than all other measures combined over recent decades. A supply side dominated approach is unrealistic. Yet energy efficiency programmes were severely cut back 2012 and have not been restored.</p>	<p>The most obvious gap in the lack of a serious programme for demand reduction. Plans to electrify cars and heating will make it easier to manage demand response, but a more comprehensive programme could reduce energy demand, and therefore energy-related emissions, by 50% by 2050, with minimal overall impact on energy-based services. Policies required to support flexible and smart grid infrastructure, including a smooth transition to green hydrogen production.</p>	<p>The early priority should be the development of an overarching Government strategy for energy demand reduction, linked to the levelling-up agenda. Communications need to be clear that demand will outstrip supply, and this could result in inequality of supply and impact on consumer cost.</p>

CARBON REDUCTION	<p>Support the commercialisation of carbon capture and storage and carbon removal technologies, including through the establishment of a ‘Carbon Takeback Obligation’ (CTBO) for fossil fuel extractors, importers, and airlines, requiring them to permanently store an increasing percentage of the CO2 generated by the products and services that they sell, rising to 100% by 2050;</p>	<p>Announcement of Carbon Capture and Storage Infrastructure fund and two initial cluster projects is welcome progress, but after 15 years of procrastination. New licensing requests for fossil fuel extraction provide opportunities for a world-leading supply-side policy: make licensing conditional on secure storage of all-scope CO2 emissions.</p>	<p>Current projects are still heavily reliant on taxpayer support, with CfDs needed until the ETS price reliably exceeds the full cost of capture and storage. Funding for the development of CO2 disposal remains contingent on direct Treasury support, through CfDs, or the ETS. Instead, it could be made the responsibility of all fossil fuel vendors and their customers. Policies required to fast-track second tranche of CCUS clusters.</p>	<p>Unified policy to scale up capture and storage from any CO2 source, including from the atmosphere: current separation of CCUS and CDR policy is unhelpful. Set clear targets to phase-out biomass-fired generation without CCS by 2030, and agree a deadline for gas. De-risk deployment by requiring a progressively increasing fraction of CO2 is permanently stored in the meantime.</p>
ECONOMY	<p>Align the Government’s corporate finance programmes with net zero, including by making access to the Covid Corporate Financing Facility conditional upon clear corporate net zero business plans and giving any new Government-backed infrastructure bank a net zero mandate;</p>	<p>Net zero conditions were not applied to the CCFF, but this is now moot. Increasing use of climate “scoring” of investments is welcome.</p>	<p>The main policy gap is lack of a consistent and effective net zero test of any new investment. Portfolio Decarbonisation risks simply changing ownership of high-carbon assets rather than improved management and eventual phase-out.</p>	<p>All UK government investments, including those in Export Finance, should be subject to a test of consistency with our commitment to net zero emissions by 2050. Consider expanding the scope of Contracts for Difference to incentivise a broader range of solutions and diversify sources of support.</p>
LAND	<p>Use post-2020 UK carbon pricing architecture and forthcoming Environment Bill to strengthen incentives for nature-based emissions reductions and enhanced CO2 uptake activities, with particular potential to offset short-lived climate pollutants from agriculture (e.g. methane).</p>	<p>Emphasis on nature regeneration is welcome, but lack of clarity of climate targets in the current Environment Act is a concern, given the emphasis on land- and nature-based solutions in the net zero strategy.</p>	<p>Greater clarity needed on the role of regenerative land management and nature-based solutions in meeting UK’s net zero goals, and the policy instruments to be used for delivery, including a transition to healthier and more sustainable diets.</p>	<p>Integrated climate and environmental policies consistent with net zero economy and climate stabilisation. Report impacts of emissions on global temperature as well as conventional “carbon footprint”.</p>

Additional points raised in 2021 sessions:

HARD TO ABATE	<p>Develop specific strategies for hard-to-abate sectors:</p> <p>energy-intensive industries, agriculture and aviation and shipping are not addressed by Decarbonisation of electricity, requiring sector-specific solutions.</p>	<p>Welcome recognition of the importance of the “net” in net zero, the role of carbon dioxide removal and disposal in dealing with “final 25%” emissions, and the importance of hydrogen for industrial Decarbonisation.</p>	<p>Current over-reliance on nature-based carbon dioxide removal for all hard-to-abate sectors is clearly unsustainable. We need a reliable and predictably priced source of low carbon energy to allow hard to abate sectors to decarbonise.</p>	<p>Sector-level net-zero plans, ensuring appropriate balance of reductions and removals over complete supply-chains, backed by measures to prevent the export of emissions. Establish a “hydrogen hierarchy” to focus on areas where hydrogen usage is unavoidable rather than uncompetitive such as industrial decarbonisation.</p>
CITIES & REGIONS	<p>Support Net Zero Cities and Regions:</p> <p>Many of the actions crucial to achieving Net Zero are under the control of local authorities, who need to be empowered to deliver them.</p>	<p>Recognition of the link between the devolution, net zero and levelling up agendas is welcome, but needs to be translated into policy.</p>	<p>Skills training and innovation are essential to ensure a just and inclusive transition, and best delivered at a local and regional level. Integrate R&D support through universities with regional development.</p>	<p>Greater powers and resources for metro mayors, devolved administrations and civic leaders to deliver innovative net zero policies, especially in developing human capital.</p>

INTRODUCTION

The Net Zero APPG works to accelerate and unlock a low carbon and affordable future by generating debate, shaping, informing and influencing future policy direction. Our mission is to:

“Secure a low carbon and clean industrial and economic future for the UK; embed zero carbon solutions and accelerate the UK’s commitment to deliver net zero growth and innovation AND a net zero carbon economy”

2020 was an incredibly challenging year but the Net Zero APPG were quick to make progress and put decarbonisation on the agenda. Our series of evidence sessions delivered the [10 Point Net Zero Action Plan](#) and the [‘Decarbonisation Report: Putting Net Zero at the heart of UK Policy’](#) which were welcomed by parliamentarians of all parties and which worked to demonstrate industry collaboration and influence government thinking on how to rebuild the UK economy, create green jobs and significantly reduce carbon emissions ahead of COP26 in November.

The Net Zero APPG has brought together key opinion formers and decision makers including the Climate Change Committee, parliamentarians from across the political spectrum and high-level support from industry leaders and academic experts to contribute to the Net Zero Roadmap and further influence policy to help accelerate progress and embed net zero solutions for business and consumers alike.

In the context of Covid-19 and unprecedented Government spending, the UK’s recovery must be intrinsically linked to green jobs, skills and decarbonisation. Net Zero must be at the heart of all future policy if we are to deliver a zero carbon economy and level-up, create jobs for the future, economic stability and ultimately recovery.

With many local authorities declaring climate emergencies and varying local and regional net zero targets emerging across the UK there is a clear and present need for the Government to deliver a comprehensive and coherent road map which deliver the cultural change required and works to accelerate net zero ambitions and to demonstrate how the Government can support a net zero future and ensure that no city or region is left behind.

The Net Zero APPG was launched with a mission to meet the scale of the net zero challenge. We conducted a series of evidence sessions with the purpose of developing a coherent roadmap and a long-term vision to deliver a zero-carbon economy. The Net Zero Roadmap reflects the evidence we heard in a series of evidence sessions which looked at the key challenges the UK faces on the road to Net Zero ahead of COP26. Each workstream looked at how to embed and accelerate Net Zero policies in the UK to reach Net Zero by 2050 - or sooner. The Net Zero Roadmap looked at:

DECARBONISATION SERIES 2020:

Generating Net Zero Energy: Power and Industry
Accelerating decarbonisation and transition

Decarbonising Transport
Accelerating net zero transition, innovation and infrastructure

Building Net Zero Homes and Communities
Accelerating net zero transition across the UK economy

THE NET ZERO ECONOMY: CHALLENGES & OPPORTUNITIES

What do we need to make the zero carbon economy and green recovery happen?

DELIVERING NET ZERO CITIES AND REGIONS
Will devolving power accelerate Net Zero ambitions in our cities and regions?

How Do We Decarbonise the ‘Too Hard’ Sectors? Energy Intensive Industries, Agriculture, Aviation And Shipping

The Net Zero Roadmap represents a significant body of evidence and sets out genuine policy pointers for consideration by Government.

1. NET ZERO ECONOMIC REPORT: THE UK'S ECONOMIC CHALLENGES

Industry experts gave evidence on the UK's progress, or otherwise, towards a net zero carbon economy and a green recovery from the Covid-19 pandemic. Overwhelmingly, regret was expressed regarding the about the lack of long-term climate goals being incorporated into this crucial moment of policy making. The Government's Budget was more focused on near-term economic and social recovery from Covid-19. Whilst the latter points are undeniably important to society, so is the impact of climate change, and this must be simultaneously and appropriately addressed.

Key Questions

- What do we need to make both the Net Zero economy and green recovery happen?
- To align the Government's corporate finance programmes with net zero, should access to the Covid Corporate Financing Facility be conditional upon clear corporate net zero business plans, and give any new Government-backed infrastructure bank a net zero mandate?
- As the net zero transition accelerates, what opportunities are there to grow the economy and create jobs, notably in some of the more economically disadvantaged regions of the country?
- What investment incentives are needed to harness new and existing technologies to boost business confidence and accelerate decarbonisation?
- Would the establishment of a 'Carbon Takeback Obligation' (CTBO) for fossil fuel extractors, importers, and airlines, help to accelerate the transition to a net zero economy?
- What kind of funding is needed to drive net zero innovation and deliver a green industrial revolution and level-up economic growth?

A key point expressed, related to the disappointment surrounding the Budget, was that Government action is critical to the UK meeting its 2050 Net Zero target. The UK Government must give clear, confident, and legislated-for direction to businesses, to provide the certainty to justify investments in low carbon technology, which is costly in the short-term. For instance, a business looking to establish a green supply chain will not do so unless it is confident in the Government's commitment to rewarding those who take green steps, whilst ensuring that those who do not meet their climate obligations are required to do so. Supply chain security for the precious metals required in batteries and other low carbon technologies should be a priority as the pandemic has demonstrated that nations will introduce national security legislation to protect their citizens first, or restrict the supply of energy.

Government action must also change in style. No longer are lofty long-term goals sufficient to drive climate action. Short-term and medium-term goals are vital in focusing minds and delivering climate progress as we recover from Covid-19. Whilst a long-term strategy remains imperative, short-term goals and policies drive action now by directly incentivising businesses and consumers to undertake green actions. A plan with short-term goals, interim targets, and robust implementation arrangements is argued for in the Net Zero APPG's 10 Point Plan.

Of course, there are many challenges to reaching net zero. Firstly, time is short. The United Kingdom must act quickly and has an economic incentive to do so, yet businesses are struggling financially in the wake of the pandemic. In addition, the transition to net zero will have knock-on effects to other areas of Government policy. The current inattentiveness to how the net zero transition will impact communities and regions differently provides a barrier to the Government's goal of levelling-up, whilst initial spending on green aims will also hamper the Government's ability to rein in spending after the huge outlays resulting from the pandemic.

Despite these challenges, the net zero transition also presents an abundance of opportunities. Acting quickly can allow the United Kingdom to be a global leader in the race to net zero, a position furthered by hosting COP26. The United Kingdom has a competitive opportunity to succeed early in a global green economy given our high clean energy potential, and the jobs created in green industries can both help to level up and aid in the recovery from Covid-19.

Yet, the panellists generally agreed that the United Kingdom is not fully on track for the 2050 Net Zero target. There are abundant opportunities there for the taking that can benefit the UK both socially and economically, but further Government action is required to drive forward change and offer incentives for businesses and consumers to change habits.



NZ ROADMAP POLICY POINTERS:

- **Public funding for the net zero transition must be considerably scaled up** to match the ambition of the UK's climate goals.
- The finance sector has substantially moved towards net zero projects in recent years, but **Government spending has not matched this stricter alignment with net zero intentions.**
- **A whole economy approach is needed.** The different Government departments must be coordinated so that all the arms of Government are used. Cash funding is not all that is needed, with improving climate awareness and policies and regulations supporting the transition, equally crucial for success.
- **Small and Medium-sized Enterprises (SMEs) are critical to the success of the net zero transition,** due to their involvement in the supply chains of larger firms, their capacity for innovation, and their role in providing end-of-the-chain consumer goods.
- SMEs are also facing the challenges of pandemic-induced debt and often lack internal environmental expertise. **SMEs need assistance in the securing of funds to finance green projects.**
- **The net zero transition must be a just transition, with regional disparities needing to be acknowledged and concerns around economic and environmental equity and justice needing to be addressed.**
- **Net Zero policies and incentives also need to address the danger of "offshoring emissions":** policy-makers need to think long-term about the transition to net zero products, rather than focussing exclusively on delivering net zero industries, sectors or activities. We need net zero steel, not just lower emissions from the UK steel industry. Decision should be made on a 'Whole Life Carbon' basis to include embodied carbon as well as operational carbon. Carbon Border Adjustment Mechanisms have a role to play here, but must not conflict with the government's objective of an open and global UK economy

2. NET ZERO DECARBONISATION REPORT:

In November 2020 the Net Zero APPG published its Net Zero Decarbonisation Report, with the aim of putting Net Zero at the heart of UK policy. The section above highlighted some of the general economic challenges that the UK faces in transitioning to net zero. Yet, the economic challenges and costs clearly vary by sector, so a more specific focus is useful. The below section highlights some of the key findings of the Decarbonisation Report, grouped by key sectors in the UK economy – energy, transport, housing, and land.

DECARBONISING ENERGY

NZ ROADMAP POLICY POINTERS:

- **There is an unprecedented opportunity to build back better** in the response to Covid-19. The Government's Covid-19 response must be aligned with its net zero ambition, with meeting the net zero target providing significant opportunities for domestic job creation and economic benefits, both in the short-term and long-term. Maximising the necessary insulation, energy efficiency and clean technologies from a domestic and commercial perspective is still not complete. This alone could support levelling up, job creation, community regeneration and reduce energy consumption through better practices.
- This is particularly notable as clean energy infrastructure is particularly labour intensive, creating twice as many jobs per pound of investment as fossil fuel-related investments.
- **Unprecedented electricity system transformation is required.** Whilst the UK has made great progress in recent years, with carbon dioxide emissions from the energy supply sector down 63% on 1990 levels in 2019, we must replace existing carbon intensive generation with net zero alternatives, whilst increasing overall capacity to allow for a greater electrification of other sectors, such as transport.
- **The successes of both offshore wind and nuclear energy need to be acknowledged in the context of providing a platform to build green energy in the UK**, as well as for their contribution to accelerating decarbonisation.
- **Flexible system management is crucial** as reliance on renewable energy sources increases. Consumer cooperation will help, but leadership from Ofgem and Government is imperative to send the appropriate market signals to incentivise behavioural change, investment, and market reforms. As a potential furthering of Ofgem's role, Ofgem could potentially be mandated by the Government to consider net zero.



- **Improving energy efficiency is often the lowest-hanging fruit in energy climate-related policy.** Yet this avenue remains underutilised, particularly in the context of housing, and may provide opportunities for reducing pressure on capacity build rate. Energy efficiency retrofits are a clear shovel-ready, job-creating, local green investment.
- **Net zero hydrogen has significant potential and could be the key to decarbonising many industrial processes, heavy transport, and the gas network.** There is scope to manufacture green hydrogen from renewables, zero carbon hydrogen from nuclear, and blue hydrogen from gas with full carbon capture and storage.
- **Carbon capture and storage (CCS) is a critical technology,** recently identified as badly behind schedule by the Climate Change Committee and requiring major investment now from the Government and private sector to ensure that we achieve the scale required. The establishment of the £800 million CCS Infrastructure Fund in the 20200 Budget was a welcome development, with there being a need to further develop long-term sustainable funding models for CCS.
- Despite needing to scale up CCS, **the priority must be the reduction, rather than removal, of emissions.** Electricity generation using renewables – wind, solar, geothermal – is crucial.
- In the longer term, **the development of greenhouse gas removal and storage (GGRS) will be critical to achieving net zero,** not primarily to address emissions in the energy sector itself, but for other harder-to-abate sectors. Nevertheless, methods of decarbonising the energy sector should consider the benefits of supporting GGRS technology development as an important co-benefit.
- Our connection with the rest of the world, particularly Europe, is of upmost importance. **Interconnecting the energy supply chain with European supply chains plays an important role in creating flexibility, providing energy export opportunities, and gives operators the critical tools they need to manage rapid changes in supply and demand.** This is particularly important with the growth of intermittent renewables, and has been starkly illustrated by the recent energy price crisis.
- Underpinning the above is the necessity of community buy-in. **The Government can legislate and encourage behaviour change, but majority support for net zero in the community is needed for effective change.** Key strategies to increase community support could include promoting change through education, school and university environments, and by highlighting innovation through public competitions.



DECARBONISING TRANSPORT

Summary of key ideas and suggestions:

- Transport is now the UK's biggest source of carbon dioxide emissions, comprising of 34% of total UK CO₂ emissions in 2019.
- **Decarbonisation progress has also been slow for transport**, with emissions only down 3% from 1990 levels in 2018. Therefore, a larger acceleration of pace is needed if the UK is to reach net zero by 2050.
- The decarbonisation pathway for private vehicles, light commercial vehicles, and buses is clearly electrification. Many electric vehicles (EVs) are already at price parity on a life cycle cost basis with internal combustion engine vehicles (ICEs), with the expectation that the number of **EVs on the road will grow from a few hundred thousand today to as many as 36 million by 2050**. Price parity however is an illusion at present as fuel duty will need to be replaced with road taxation, which may tip the equation back towards combustion engines. Car tax should be focused on energy intensity to deliver the shift to renewable driving and alternative transport solutions.
- The decision to bring forward the ban on the sale of new ICEs to 2035 is a welcome step, with the price decline trajectory of EVs potentially allowing the date to be further brought forward to 2030. However, to facilitate this, **charging infrastructure must be scaled up as its presence and reliability is critical to building consumer confidence – ease of access is imperative**.
- The rollout of charging infrastructure requires collaboration between local and national authorities, as well as with local communities, to ensure that charging points are easily accessible and cater to the needs of local communities. This is a challenge due devolved and siloed funding. Where there is a collective need and ambition, the funding supplied should be ring-fenced to ensure widespread implementation. Transport networks operate in a wider system, however, this is not factored in.
- For EVs to assist with the decarbonisation goal, the electricity source must be clean. Furthermore, EVs are not the total solution for transport – **expanding rail networks should make a major contribution**.
- **Decarbonising private transport must occur in tandem with improved low-carbon public transport** – including buses, trains, and trams. Further expanding the bus fleet is one way of achieving this.
- However, expanding public transport will be a challenge as we emerge from Covid-19 due to changed travel habits, but in the longer-term this problem may not persist. Encouraging people to use public transport, such as by reducing fares relative to the cost of private transport, can help to increase the level of public transport usage back towards pre-pandemic levels.
- Some **positive transport changes have resulted from Covid-19, though, with more people walking and cycling**. E-scooters and e-bikes have also proved popular. The public are aware of the health benefits, both directly – in terms of physical and mental health – and indirectly – through reduced air pollution – of using a green method of transport. Furthermore, the pedestrianisation of many streets in town and city centres seems to have been “locked in” after the worst of the pandemic, cementing behavioural changes for the medium and long-terms.
- Regarding aviation, as is mentioned in the hard to abate sectors section below, **offsets will likely play a major role due to the very long-term nature of addressing emissions from long-haul flights**. Other long-term solutions include improving high speed rail connections, to replace a large portion of domestic aviation.



DECARBONISING HOUSING

NZ ROADMAP POLICY POINTERS:

- Included in the Net Zero APPG's 10 Point Plan is the recommendation to **launch a cross-departmental review of building standards**, to ensure that regulation and enforcement serve as a catalyst towards achieving Net Zero, low carbon materials, circular economy thinking, and emerging technologies.
- **Shortages in technician and installation roles**, including of low-carbon heating solutions, are predicted to become worse. Workforce skills need to be cultivated to ensure that shovel-ready projects can be carried out at pace, with a long-term Government commitment needed to deliver this boost in skills.
- **Every new house must be built with the aim of meeting net zero** as soon as possible with, for example, high fabric standards minimising building emissions and reducing energy needs. The electrification of heat, including the use of heat pumps and other technologies, is also an important option. Further, new homes should cater for EV charging and be better insulated.
- **Substantial resources are needed for energy efficiency programmes to retrofit existing inefficient houses**, for fabric and heating technology improvements, as well as the need to build new houses to a high standard. Retrofitting is crucial, with existing homes comprising the overwhelming majority of the housing stock, relative to new builds.
- **The electrification of homes and buildings is required in many parts of the country**, including the electrification of home heating and cooking. Britain can seize this opportunity and be a global leader in the electrification revolution.

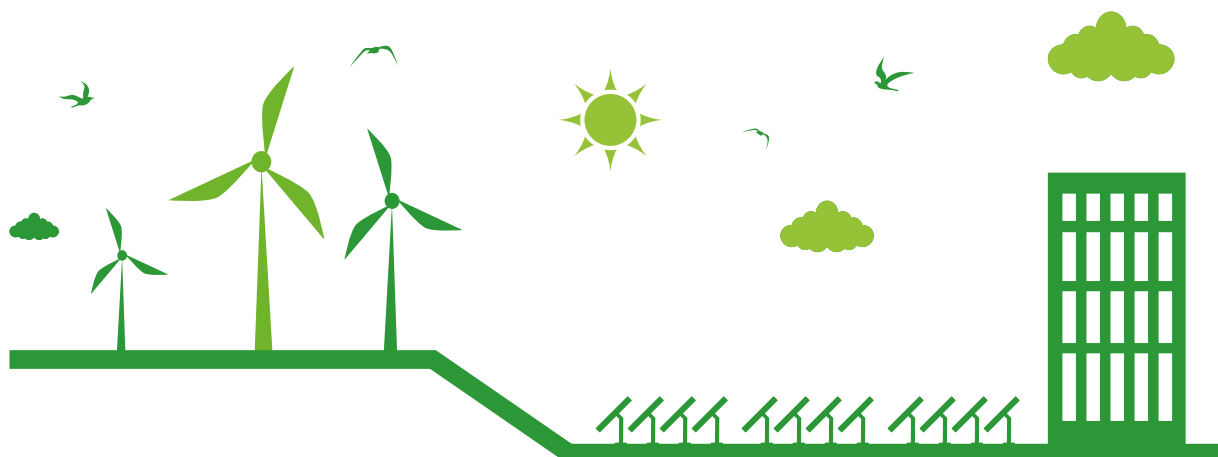


- **Regulatory standards are key in ensuring the building of low-carbon houses, with a national planning policy framework for new development** – that embeds net zero – required from the Government. Regulatory and planning systems should ensure that high quality homes meet local needs and are delivered to a high and consistent national standard and contribute to net zero, at present the standards can do better.
- Hydrogen may have an important role to play in decarbonising home heating and cooking, and Britain can be a global leader in the hydrogen revolution. **Coordinating the hydrogen strategy with the challenges of both CO2 capture and storage (blue hydrogen) and energy storage (green hydrogen) will be critical.**
- **Clear and high national standards must support strong, local decision-making, allowing the market to deliver consistent standards across different areas and regions.** Planning and decisions made at the local level are often more effective.
- There is also a need for public awareness and the support of the domestic customer. Taking planning decisions at a local level can help with this, engaging local communities to promote behaviour change and public education on the benefits of decarbonisation.
- One of the biggest hurdles is the cultural change required in the population. This is particularly important for the decarbonisation of our existing 27 million homes, as the impact of trying to introduce 200 – 300mm of insulation on people's dwellings will be massively disruptive, alongside the upgrade to heating systems if air source is to be introduced.
- The net zero transition must be a just and inclusive transition, so must address the housing crisis. Net zero homes, whether new or existing, should be available to all and not determined by ability to pay.
- Circular economy considerations in development is key, with the utilisation of reusable and recycled materials in construction important.

DECARBONISING LAND

NZ ROADMAP POLICY POINTERS:

- The land sector is a major source of the United Kingdom's emissions (12% in 2017), with livestock comprising the biggest share.
 - **Nature-based solutions can make a valuable contribution** to achieving net zero, particularly for offsetting short-lived greenhouse gases such as methane. They are readily available and have been trialled by government agencies such as the Environment Agency yet there is still a gap in its mandating this requirement before hard engineering solutions are undertaken.
 - To enable these nature-based solutions to flourish, **the Government should create market-based policies that mobilise capital towards nature-based solutions.** For example, these solutions include the restoration of ecosystems. Public funding is often reactive and capital-based, which results in revenue, operations and maintenance opportunities being downgraded. This needs to be revisited so that nature-based solutions are available and in place before a community is significantly 'at risk'. This would also assist with community engagement and understanding.
- **Nature-based solutions can often be carried out at relatively low costs, whilst also providing a multitude of different benefits for both people and nature.** As an example, restoring forests in upper catchments helps to protect communities downstream from flooding, whilst also increasing carbon sequestration and protecting biodiversity levels.
 - Whilst nature-based solutions should be a priority, they should not be viewed as a substitute for the phasing out of fossil fuels or urgent decarbonisation processes. **Nature-based solutions should also be more diverse than simply planting trees – especially avoiding low-diversity plantations – and also include solutions to protect naturally occurring ecosystems in other land settings and at sea.**
 - Net zero carbon farming (see below for comments on the agriculture industry) should be encouraged through public funding and support schemes, to help farmers decarbonise.
 - Alongside this support, on-farm emissions, food waste, and **supply-chain management need to be regulated by the Government.** This will ensure that the incentives to decarbonise are backed up with restrictions for those who do not.
 - **Carbon sinks, such as trees, have a crucial role to play** in regulation the net change in carbon emissions. It is crucial to preserve these carbon sinks, for example by ceasing deforestation.



3. DECARBONISING HARD TO ABATE SECTORS

Following on from the publishing of the decarbonisation report, three further mini summits were held concurrently on 13 July 2021, focusing on other hard to abate sectors in the economy. Despite the differing specific takeaways for each industry, there were some overlapping central points relevant to all. Firstly, there was an overarching recognition of the need for ambitious and detailed plans from Government, backed up by concrete commitments. These plans and commitments catalyse investment by the private sector, due to the reduction in risk associated with them.

It is also key that an international perspective is maintained. In one vein, this means the UK innovating and being a world-leader in decarbonising the hard to abate sectors. By doing so, the UK can increase its global competitiveness and accelerate its recovery from the Covid-19 pandemic. In another vein, the international perspective is important because reducing carbon emissions and minimising future planetary warming are inherently global issues, such that what occurs abroad must be considered when devising UK policy.

Notably, ‘carbon leakage’ should be avoided. If UK policy simply adds to the costs of the hard to abate sectors, leading to chunks of such sectors being driven offshore, this achieves little for global emissions and potentially worsens them. It is critical that UK emissions, for example in food production, are not simply exported abroad with the products of the emitting processes then imported back to the UK. As well as worsening global emissions, due to potentially importing food from nations with less efficient land usage or less stringent climate regulations, this is also bad for the UK economy as it would likely result in lost jobs.

Whilst the UK must design its own policy to avoid emission leakage, we must also work with our European and international partners to facilitate this.

NZ ROADMAP POLICY POINTERS:

- For the hard to abate industries, **it is crucial to think about how we make the products of the industries net zero**, rather than just focusing on how the activities and systems of these industries can be made net zero.
- This product-level thinking will become more important the closer we get to net zero. For example, **how do we decarbonise ‘aviation fuel’ rather than ‘aviation’, and how do we decarbonise ‘cement’ rather than the ‘cement industry’?**
- Rather than focusing on industries, as a whole, we can **look at decarbonising services**, such as education, and end-use products, such as buildings, since this facilitates the consideration of demand-side methods including sufficiency – using only what we need and nothing more.
- **A lifecycle approach is important in reducing carbon emissions**, shifting the focus away from point source emissions.



- As noted in the Net Zero APPG's 10 Point Plan, **establishing a carbon takeback obligation for fossil fuel extractors and importers, and airlines, would shift leadership to the hard to abate sectors and increase investment in carbon storage**, facilitating net zero emissions in these sectors by 2050.
- **The economic context of Covid-19 must be recognised.** Economic disruption as a result of the pandemic has impacted almost all industries, including hard to abate industries such as aviation, so the Government will need to provide additional capital to fund decarbonisation initiatives.
- **The hard to abate sectors must be firmly on the agenda**, rather than side-lined at the expense of easier decarbonisation opportunities, such as rolling out electric vehicles.
- Many hard to abate sectors, including agriculture, will never – or not for a very long time – reach net zero. Thus, whilst carbon emissions must be minimised, extra-industry solutions to compensate for emissions, including carbon capture, utilisation and storage (CCUS), should be considered. Emissions reductions should be prioritised in the first instance, though.



AGRICULTURE

A key issue inhibiting progress in the decarbonisation of agriculture is that the Department for Environment, Food & Rural Affairs – one of the two departments officially responsible for the reaction to climate change – currently lacks a plan for the decarbonisation of agriculture. This is stunting investment in agriculture's decarbonisation progress, with those in the industry unsure as to which actions will be rewarded, and which punished or restricted, by the Government in future. A long-term plan can guide farmers in the right direction, rewarding farmers for sequestration, and adding clarity about land-use policies.

Key Questions

- What are the challenges and barriers? How can we accelerate more sustainable farming and decarbonise agriculture?
- How can we mitigate the impacts of climate change on agriculture and better protect and manage land, wildlife, air, soil and water?
- What policy levers and incentives are required to decarbonise the food chain, reduce food waste and change consumer behaviour?
- How do we reduce resource intensive processes in food production and reduce packaging?

NZ ROADMAP POLICY POINTERS:

- **The international context is crucial.** The UK cannot allow the importation of meat, on a level-playing field, with a higher carbon footprint than if it were produced in the UK. British farmers should not be undercut by foreign suppliers that can adhere to less stringent environmental standards, though enforcement of this is difficult given it is hard to measure, report, and verify the carbon inputs to meat production. The Government must collaborate internationally to agree on a uniform way of measuring carbon intensity.

- Agriculture differs from the conventional net zero discourse as methane and nitrous oxide emissions – the former as a byproduct of the digestive processes of cows and sheep, the latter from fertilisers not taken up by plants, and transport – are the key challenges.
- **Methane stays in the atmosphere for a much shorter time than carbon dioxide, requiring different benchmarks to be worked out for agricultural emissions** to accurately quantify their impact on global temperatures. Meanwhile, nitrous oxide must be included as part of the accounting of net zero due to it being a highly potent greenhouse gas – 265 times as potent as carbon dioxide over 100 years.
- **Changes to farming processes and distribution should happen in tandem with dietary changes**, to smooth the transition both for those working in the agricultural sector and for consumers. If land is stripped for grazing, or for growing soya for livestock feed – as we see in the Amazon – that's a major contributor to deforestation and thus to climate change. Also, soil depletion is another factor – soil can be highly effective for carbon sequestration, but not when land is over-farmed. So one of the main ways in which farmers can help the UK get to net zero is to be rewarded for looking after their soil, through the new Agriculture Act subsidies.
- The required level of dietary change from a climate perspective is not well-defined, and there may be significant political challenges in driving dietary changes and putting the onus on individual consumers. **A better way to induce change might be altering the incentive structures of the industry.** While the potential for surprisingly rapid changes in consumer behaviour should not be underestimated, the danger of climate policy being seen to affect personal choices like diet and thereby fuelling a potential backlash of public opinion should also be recognised.
- The Government has made some progress with the new Agriculture Act – **encouraging farmers to adapt to new ways of farming – and there is increasing consensus over the level of dietary change required, for example as is advocated for in the National Food Strategy.**

ENERGY INTENSIVE INDUSTRIES

The discussion of energy-intensive industries highlighted the need for both a collaborative and comprehensive approach to decarbonisation. The transition to Net Zero must be collaborative in that Government, industry, academics, regulators, and society as a whole must all be involved to harness their collective power. The transition must be comprehensive in that a multitude of different solutions – CCUS, hydrogen, renewable power, reliable low-price electricity – must be used to reach net zero by 2050. No one group of people, nor no one method of reducing net carbon emissions, will facilitate energy-intensive industries reaching net zero.

Key Questions

- What barriers and gaps exist for energy intensive industries on the road to Net Zero?
- How can heavy industries which use high temperatures for production and heat generation which is carbon-intensive truly transition to low carbon alternatives and decarbonise?
- What are the low carbon alternatives? Are CCUS, hydrogen, electrification and renewable power just part of the solution or can they cut industrial emissions significantly?
- Where can heavy industries work together - cross-industry - to reduce carbon and scale-up greener and more efficient manufacturing processes?
- What skills, investment and innovation are needed to accelerate decarbonisation – and what skills and processes will be lost?

NZ ROADMAP POLICY POINTERS:

- **A life-cycle approach is important.** Rather than just focusing on point source emissions, it is important to also think about how to decarbonise the inputs and outputs of high-carbon industries.
- **We must maintain focus on decarbonising UK industries rather than offshoring our emissions.** For example, two-thirds of sawn wood in the UK comes from overseas, so using timber as a substitute product to decarbonise construction is not the promising solution it may appear initially to be.
- To avoid emissions leaking abroad, a strong mechanism – such as a carbon border tax – must be in place to avoid UK industries being undercut and maintain public support for the transition.
A Carbon Takeback Obligation imposed on all fossil fuel importers and extractors could work to the advantage of carbon-intensive industries by creating a market for carbon dioxide from point sources that does not depend on taxpayer support: in effect, spreading the cost of decarbonising heavy industry in the UK across all fossil fuel users.
- Whatever policies are used to incentivise it, **CCUS needs huge expansion before 2030**, to facilitate energy-intensive industries reducing their net emissions whilst in the process of decarbonisation. Further, hydrogen and electrification are also viable options for industrial decarbonisation, as highlighted in the Climate Change Committee's Sixth Carbon Budget.



AVIATION AND SHIPPING

For aviation and shipping, decarbonising the fuels used is the overwhelming challenge. Whilst the construction of aircraft and ships must also be considered, emissions from carbon-intensive fuels will not be able to be offset, so the source of the emissions must instead be confronted to make these industries sustainable. This difficult issue is also in the context of continually rising demand for aviation pre-pandemic, though the future trajectory of demand is still uncertain, as Covid-19 travel restrictions slowly ease.

Key Questions

- What are the challenges and barriers? How can we accelerate more sustainable aviation and shipping?
- How can ports and airports unlock the green recovery and unlock the transition to greener more sustainable transport, travel and trade?
- What trade and based measures – such as emission trading – would work deliver more sustainable aviation and shipping?
- What can the UK do to incentivize innovation, design efficiencies and scale-up the use of alternative more sustainable fuels – such as hydrogen?
- Given the importance of aviation and shipping to international trade, travel and investment what more should the Government be doing to accelerate Decarbonisation and how can the UK lead the way to Net Zero in this hard to abate sector?

As with agriculture, the technology to decarbonise aviation does not exist yet. What sets aviation apart, is that this technology will not exist at a commercial level for the foreseeable future. In any meaningful timeframe, battery-powered aircraft will only be able to offer very short-haul flights and commercial hydrogen-powered flights are a long way off. Given that 70% of emissions result from long-haul flights, and such flights are not amenable to being battery or hydrogen powered in the foreseeable future, other solutions are needed.

Potential options include CCUS to offset emissions from flying, as well as the use of sustainable fuels. Currently, sustainable fuels cost five times the price of oil-based fuels, meaning that airlines have an incentive to opt for the latter. UK Government action must follow the lead of the clear policies of the EU and the US on sustainable fuels, subsequently attracting inward investment into their sustainable fuels industries. The Government can either raise the price of fossil fuels – it can already do this for European and domestic flights, should it wish to – or subsidise sustainable fuels; either option would reduce the price differential between fossil fuels and sustainable fuels.

NZ ROADMAP POLICY POINTERS:

- **An international approach is vital** as, clearly, aviation and shipping are of an inherently international nature. UK aviation emissions comprise 4% of global aviation emissions, so solving problems in the UK does not solve them globally.
- The UK's aviation sector has been significantly harmed because of Covid-19, despite Government support, including the Job Retention Scheme. Thus, **additional support will be needed from the Government to facilitate investment in decarbonisation.**
- **A just transition is needed.** Reducing emissions by pricing out those on lower incomes through higher aviation taxes is not a just solution, whilst job losses from changing industry sizes must also be considered.
- **A frequent flyer levy could instead be** applied, to discourage regular business travel, but not disproportionately harm those who perhaps take one foreign holiday every few years.
- Ships have a long lifespan. Therefore, it is vital that action is taken now to reduce future emissions. Meanwhile, **old, high-emitting ships need to be retired more quickly if net zero ambitions are to be accelerated.**
- International shipping comprises approximately 2% of global carbon dioxide emissions and, as with so many other areas of climate policy, will not be significantly reduced by UK Government action alone.

4. NET ZERO CITIES AND REGIONS REPORT

Not only is a sector-specific focus important during the transition to Net Zero, but a region-specific focus is also key, especially given the Government's focus on levelling up. On 17 May 2021, a joint summit was held with the Greater Manchester APPG, focusing on how devolving power could accelerate net zero ambitions in our cities and regions. The overarching idea emerging from this session was that devolving power is crucial for success on the road to net zero. Local people know the needs of their local areas. Giving them the power to act on this local knowledge and insight, as well as the skills they possess, allows them to devise region-specific solutions. This is preferable to central Government imposing blanket measures across the country, when clearly these measures will work better in some places than others. Local people can power local change, and local change is imperative for the United Kingdom collectively to hit its 2050 Net Zero target.

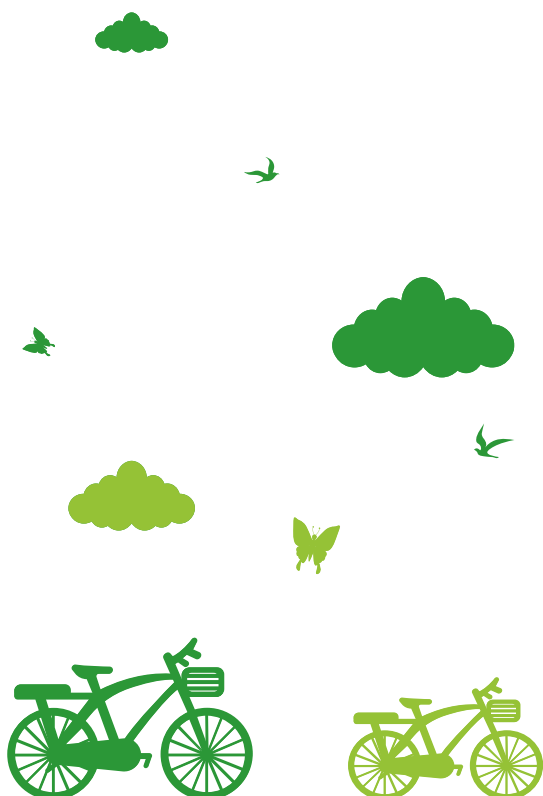
Key Questions

- What more can Government do to support a green recovery and deliver regional net zero targets?
- How can innovation drive zero carbon investment in new technologies and help Smart Cities lead the way to a net zero future?
- What additional investment is needed to scale up zero carbon innovation and R&D in our cities and regions?
- What needs to be done to boost green jobs and skills to deliver net zero targets in our cities and regions?
- Are setting local and regional net zero targets the best way to drive clean growth, deliver zero carbon affordable energy and a just transition?
- How can UK cities and regions secure investment in zero carbon infrastructure projects?
- How can local and regional spatial plans work to ensure resilience across the energy network?
- Does our regulatory framework need to be more flexible to support the UK's cities and regions ambitions to reach net zero by 2050 or sooner?

Cities and regions, with their local expertise, can lead local pilots and rollouts to facilitate the scaling up of national policy. Whilst Government-led direction is critical for the net zero transition, blanket impositions will not work. Devolution can help to avoid this, allowing cities and regions to be adaptable and adjust their responses in ways that best match up with the needs of their local areas. Notably, progress on the rollout of electric vehicle charging points, and improving public transport arrangements, need the involvement of local stakeholders to ensure success. Local authorities have detailed insight on issues such as where and how to roll out charging points and the desires of the local population regarding public transport, so involving them means that net zero action can be targeted correctly. Thus, the actions of local authorities are crucial in the scaling up, rollout, and piloting of new initiatives.



Given the benefits of devolution, it is important that cities and regions receive Government support to utilise their competitive advantages. A long-term, detailed roadmap from the UK Government would enable cities and regions to devise effective and detailed strategies of their own. This commitment in the form of a roadmap must be backed up by sufficient funding, that can be used flexibly, for local authorities. Empowering local authorities to make local changes by way of devolution is an empty policy if it is not backed up with the financial support that truly allows cities and regions to put their knowledge into practice. The beginning of local long-term changes to move towards net zero are often costly, such as the electrification of public transport, retrofitting of existing homes, and installation of electric vehicle charging points.



NZ ROADMAP POLICY POINTERS:

- **The Government's Net Zero and levelling-up agendas are not exclusive but rather intrinsically linked**, and both can be achieved simultaneously through greater devolution of climate-related policy. Cities and regions are in a unique position, with the ability to harness the UK's climate agenda for better jobs, homes, and transport in their local area.
- Many actions already identified as crucial to reach net zero are in the control of local authorities. The opportunities include **building low-carbon homes, developments in the electrification of public transport, and shovel-ready carbon-reduction projects for existing buildings**.
- Local authorities' actions impact around one-third of local emissions. Furthermore, local authorities are prominent landowners and local councils have the ability to lower the carbon footprint of publicly owned buildings, such as libraries and schools.
- **Coordination and collaboration is key** – both between national, combined, and local authorities and between business, industries and cities. The link between local and national strategies is fundamental, so that both local and national policies are operating in tandem.
- **Cities and regions should couple their climate goals** with their economic targets. A green recovery from the Covid-19 pandemic can accelerate growth in local economies, helping to spread opportunity around the UK and improve standards of living whilst making necessary climate-related changes.
- Local authorities have detailed insight and also more local trust than central Government on implementing climate policy. **Local authorities have a large role to play as decarbonisation is scaled-up** in a way that more directly impacts the lives of the public, including retrofitting and the installation of heat pumps.

5. NET ZERO: DELIVERY AND ACCELERATION REPORT

This additional workstream ran throughout 2021 with a series of thought-leadership policy roundtables, alongside a programme of parliamentary outreach to build cross party support for the Net Zero APPG's 10 Point Net Zero Action Plan, Decarbonisation Report, and the findings from the other above workstreams. Both a private Conservative roundtable and a private Labour roundtable contributed to the findings below, with the key questions focusing on turning net zero carbon from a vision to a reality for consumers and businesses.

Key Questions:

- How do we make zero carbon a choice for business, consumer and communities?
- What do we need to make the zero-carbon economy and green recovery happen?
- As the net zero transition accelerates, what opportunities are there to reboot the economy and create jobs, notably in some of the more economically disadvantaged regions of the country?
- Will devolving power accelerate net zero ambitions in cities and regions?
- How is the Energy White Paper programme (potentially to the value of a trillion pounds) going to be managed, particularly when considering the increasingly complex interdependencies and interfaces of the evolving system?
- What investment and incentives are needed to accelerate low carbon energy infrastructure?
- How can Government and industry collaborate to develop an engagement campaign to have a high-impact shift in consumer behaviour, consistent with the scale of the climate challenge?
- Looking at the Prime Minister's 10 Point Plan, Climate Change Committee's Sixth Carbon Budget & Net Zero APPG Decarbonisation Report – where are the policy gaps?

The crucial issue at stake is attempting to decarbonise our economy whilst minimising the damage incurred, particularly in terms of jobs and living standards, in order to get businesses, consumers, and communities on-side and making climate conscious choices. Whilst minimising damage will garner support, further public engagement is needed. One potential solution is for the Government to run a public information campaign about Net Zero, similar in style to that of the Covid-19 campaign, to highlight key details about why it is urgent that the UK takes action and how this will affect all of us. This suggestion is contained within the Net Zero APPG's 10 Point Plan, arguing for a major communications campaign that can build popular support for the green recovery – including education and self-assessment tools, as well as highlighting climate leadership – galvanising community and individual action.

As mentioned in the economic challenges section, clarity from Government is crucial. A clear net zero plan is needed to not only set goals for where we are going but tells us how we are going to get there. A plan with interim targets and a detailed roadmap – as argued for in the Net Zero APPG's 10 Point Plan – would give companies the confidence to invest in low carbon infrastructure. Given the immediacy of COP26, and the desperate urgency of the climate situation, there is a need for detail to back-up headline policy announcements, to get the public on board and deliver on targets. The overall 'Net Zero' aim is insufficiently specific to motivate action from communities, businesses, and industries at large, yet local and sector-specific carbon budgets could help to achieve a more robust and quicker transition. If the Government sets a clear regulatory stance over the private sector, to incentivise the taking on of greater

climate obligations – and penalise those lagging behind on their environmental responsibilities – then this can facilitate strong communication and cooperation between the Government and private sector, crucial for achieving net zero.

Onward reported, as part of their Greening the Giants report, that just 12 industries make up 62% of the UK's emissions, 23% of UK output, and 21% of British jobs. These carbon-intensive industries are therefore necessary, but difficult, to decarbonise and they are also predominantly located in the Midlands, the North of England, and Scotland. Thus, a regionally sensitive approach to national and local regulation is required. As noted in the cities and regions section, devolution can help on the road to net zero, whilst also maintaining the Government's commitment to levelling up. The regional disparities in the location of high-emitting industries and the creation of low-carbon jobs must be accounted for to achieve a just net zero transition.

NZ ROADMAP POLICY POINTERS:

- Onward's *Greening the Giants* report suggests many actions that the Government should take to meet the UK's 2050 Net Zero commitment, including: establish a Net Zero Delivery Taskforce; **introduce a Carbon Takeback Obligation**; publish regional carbon budgets; and use the UK's global climate leadership to champion the idea of the Green7 at COP26.
- **Coordination and collaboration is crucial to accelerate the delivery of net zero.** This includes the coordination of regulations and programmes across regions, localities, industries, and departments as well as addressing regional disparities. Furthermore, climate goals must be embedded into all aspects of Government, not just key departments such as HM Treasury and DEFRA. Any plans for reaching net zero must be cross-departmental.

- **Consumers must be incentivised to change their buying habits.** For consumers to switch to low-carbon technologies, the technologies must be both affordable and desirable.
- Issues over who should pay for the transition are likely to emerge as the transition accelerates. **There could be support for levies based upon principles of accountability for high-emitting practices**, such as frequent flyer taxes, whilst the Government must regulate and support green finance to ensure the creation of virtuous cycles of hiring for green jobs and funding for green projects.
- **Outlining a detailed Net Zero Roadmap sooner rather than later will improve UK competitiveness in global low-carbon technology** and jobs. Clear regulatory and financial incentives for low-carbon innovations will encourage such projects to take place in the UK, with the competitive advantage of introducing stringent climate-friendly regulation now outweighing the costs of doing so.
- **The Government must give clear, confident, and legislated-for direction to businesses**, to provide the certainty to justify investments in low carbon technology, which is costly in the short-term. The need for immediate change is largely left to goodwill, social consciousness and the recognised commercial benefits from going net zero. The current 'carrot and stick' options are not robust enough. All UK Government contracts and projects should have an inherent net zero plan.



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APPENDIX

Link: <https://netzeroappg.org.uk/wp-content/uploads/2020/11/Decarbonisation-Report-Putting-Net-Zero-at-the-heart-of-the-UK-policy.pdf>



Net Zero
All-Party
Parliamentary
Group

THE NET ZERO DECARBONISATION REPORT PUTTING NET ZERO AT THE HEART OF UK POLICY

Key Findings and Recommendations



November 2020

APPENDIX

Link: <https://netzeroappg.org.uk/wp-content/uploads/2020/11/Decarbonisation-Report-10-Point-Net-Zero-Action-Plan.png>

10 Point Net Zero Action Plan

Based on the findings of its Decarbonisation Series, the NZ APPG recommends the Government urgently adopt and implement the following '10-Point Net Zero Action Plan' to put the country on track to meet its net zero commitment:



- 1 Develop a clear and systematic Net Zero Roadmap** for sustainable delivery of net zero at scale that clarifies urgent short-term priorities, sets interim (5-year) targets, and includes robust implementation, review, and governance arrangements;
- 2 Develop an expansive and ambitious COVID-19 green recovery package that:** is guided by economics; focusses on **green job creation** and **workforce reskilling**, especially in disadvantaged areas; prioritises energy efficiency; incentivises scaled-up green technology and infrastructure development, including renewable and firm zero-carbon energy, energy storage, heating, clean industry; and maximises local impact through coordination with local government and industry;
- 3 Overhaul building standards and incentives** to ensure that **existing** and **new buildings** are brought in line with net zero, including by encouraging, and, where necessary, mandating, the use of low carbon materials, low emissions heating, retrofits to existing homes, energy efficient design and construction, and circular economy thinking;
- 4 Establish a strategic communications and civic engagement programme** that is championed by a cross-departmental group of Cabinet members and galvanises industry, community, and individual action for meaningful economy-wide emissions reductions;
- 5 Accelerate the decarbonisation of the transport sector** by bringing forward the planned ban on the sale of new internal combustion engine vehicles to 2030 (from 2040), setting interim EV sales targets, accelerating the deployment of charging infrastructure, expanding rail networks, and including international shipping and aviation in the net zero target;
- 6 Develop an ambitious net zero hydrogen strategy** to position the UK to capitalise on opportunities for green and blue hydrogen (with full CCS) production, and provide a pathway for decarbonising international transport, heavy goods vehicles, and heavy industry;
- 7 Enhance electricity demand response tools and incentives** for consumers and industry to increase grid management flexibility, improve efficiency, and allow higher renewable energy penetration;
- 8 Support the commercialisation of carbon capture and storage and carbon removal technologies,** including through the establishment of a 'Carbon Takeback Obligation' (CTBO) for fossil fuel extractors, importers, and airlines, requiring them to permanently store an increasing percentage of the CO₂ generated by the products and services that they sell, rising to 100% by 2050;
- 9 Align the Government's corporate finance programmes with net zero,** including by making access to the Covid Corporate Financing Facility conditional upon clear corporate net zero business plans,³ and giving any new Government-backed infrastructure bank a net zero mandate; and
- 10 Use post-2020 UK carbon pricing architecture and forthcoming Environment Bill to strengthen incentives for nature-based emissions reductions and enhanced CO₂ uptake activities,** with particular potential to offset short-lived climate pollutants from agriculture (e.g. methane).



³ See, for example, UNFCCC Race To Zero criteria (<https://unfccc.int/climate-action/race-to-zero-campaign>)

