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Submitted to Call for evidence on Net Zero review
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Where are you/your organisation based?

Please expand on your answer here:
Lancaster, Lancashire; with partners in Teesside and Liverpool City Region

What sector do you/does your organisation operate in?

Please expand on your answer here:
Universities/academia/higher education; with partners in local government

Are you happy for your response to be published?

Yes

Would you like to be contacted when the consultation response is published?

Yes

How did you hear about this consultation?

Where did you hear of this consultation?:
Email from elsewhere

Other (please specify):

Overarching questions

1 How does net zero enable us to meet our economic growth target of 2.5% a year?

Answer here:

Far from being a potential obstacle to the growth target of 2.5% a year (in the short-, medium- and potentially long-term), net zero is an essential precondition of its realisation. The scientific evidence, as exemplified by the IPCC's Sixth Assessment Report, is incontrovertible. For our globally interconnected economies to continue to function in a recognisable fashion, global CO2 emissions must be radically and rapidly reduced. Acting quickly on this imperative has the potential to confer huge economic benefits by achieving market leader status in technologies, products and processes that respond to this most critical of economic drivers across all sectors. The past decade has seen a globally accelerating ratchetting up of policy and action on decarbonisation. This trajectory will continue to accelerate as the impacts of already locked-in climate change continue to grow and intensify. A growth strategy that does not have net zero at its heart would represent a stark failure of future-proofing and evidence-based policy making. Conversely, only a growth strategy that embraces decarbonisation and seeks to position the UK as a world leader in net zero innovation and implementation has the potential to secure the jobs and investment necessary to drive the technological and social change required to achieve the 2.5% growth target.

This is graphically illustrated by the challenge of transition to net zero within the freight/hub sector (including ports, rail depots, motorway warehouses etc...), which is the backbone of the economy and the proverbial coal-face of the increased economic activity and circulation presupposed by a 2.5% annual growth rate. Even as economic gains dematerialise, and value-added grows in other sectors, the freight and distribution sector will remain crucial and cannot be exempted from the net-zero goal. The freight sector currently faces a perfect storm of pressures. Having already juggled the challenges of the changes in regulatory regimes from the UK's EU-exit and the personnel shortages and supply-chain interruptions of Covid, the surge in fossil fuel

prices has pushed much of the sector to its limits. The ongoing transformation of the sector by digitalisation is also adding to pressures of competition and demands for significant investment. Moreover, the UK freight sector contains a large number of small businesses operating on very tight margins.

In this context, it is no surprise that major freight operators, such as Maersk, regularly describe the freight/hub sector as now having a 'burning platform'. What this serious situation reflects, though, is a freight/hub industry that has taken its current shape premised upon the cheap and abundant availability of fossil fuels. In this context there have been numerous niches for small road-based hauliers and freight forwarders, all in cut-throat competition with each other, while the freight sector as a whole has assumed a form that has systematically excluded from its own balance sheets various externalities arising from their operations (including noticeably GHG emissions, air quality and infrastructural prerequisites). Yet all these conditions are now rapidly disintegrating.

Fossil fuels are becoming systemically more expensive and subject to volatile price changes due to the challenges of global fossil fuel geopolitics, and the fluctuating value of the pound. Those high prices will likely increase further if supply reduces in line with demands (e.g. from the IPCC) that most remaining fossil fuel reserves remain in the ground. Digitalisation is disrupting freight operations and putting an increasing premium on the capacity to collaborate and share data, or even consolidate businesses, in order to meet the highest levels of efficiency demanded by customers. And those shipper customers are also increasingly demanding transparency and aggressive action by freight/hub businesses on GHG emissions, regardless of government policy (e.g. regarding 'scope 3' emission reporting, increasingly demanded by the bigger shippers, such as Amazon or Tesco). Finally, with changing geographies of supply chains (e.g. 'onshoring', 'nearshoring', 'friendshoring' etc...) and place-based political pressures to improve air quality through modal shifts off road, there is clear and growing demand for new infrastructures even as the fragmented freight industry is poorly structured to deliver them. In short, therefore, the intense challenges facing the freight sector emerge, at root, from its current dependence on fossil fuels, and the fast-disintegrating business models premised upon that.

Net zero may appear to be simply one further pressure on the sector – potentially one too many for many of these small businesses. But this is to read the situation backwards. It is undoubtedly extremely challenging for many smaller freight businesses to spare the human resources and business time to begin to tackle net zero seriously. Yet the choice before these companies is not between decarbonising their operations and not doing so, but between beginning to decarbonise seriously now (preferably with appropriate support from policy and government) or failing to do so, and so being completely unable to meet growing business expectations on these issues in due course. In other words, the freight sector has to embrace net zero as the only possible route out of the current intense challenges it faces and, in fact, a medium-term opportunity for the wholesale rationalisation of the industry in ways that will contribute significantly to rebooting growth for the UK economy as a whole.

Finally, while there are, in principle, 5 ways to reduce emissions from the freight sector (see below), pressure on those that directly target the decarbonisation of operations will be even higher where one of these – reducing the demand for freight – is directly countered by strong growth in that demand instead. As such, expedited transition to net zero in the freight/hub sector – and associated innovative sectors, such as zero-emissions HGVs or shipping, hi-tech data-based freight solutions, renewable-generated electricity/hydrogen and charging infrastructures... – is a precondition and major pillar of the dynamic, globally competitive and innovative 21st-century economy that could meet these growth targets. Conversely, without net zero transition, the freight sector will continue to struggle with its significant challenges, acting as an enduring brake on the UK economy.

The five ways to reduce carbon emissions from freight transport are:

• Reducing the demand for freight
• Optimising vehicle use and loading
• Increasing the efficiency of conventional freight vehicles in design
• Reducing the carbon content of fuel/power
• Shifting freight to low carbon-intensity modes

2 What challenges and obstacles have you identified to decarbonisation?

Answer here:

Research conducted at the Lancaster Environment Centre of Lancaster University with partners – with Sefton Council, regarding net zero transition in freight associated with the Port of Liverpool (funded by the LGA/UCL Net Zero Innovation Programme); and with Teesside University, on maximizing the potential contribution of Freeports to delivering place-based net zero, with specific focus on the Liverpool City Region (LCR) and Teesside Freeports (funded by the EPSRC project 'DecarboN8') – has been exploring precisely such challenges and opportunities regarding the key domains of business/freight mobilities, regional regeneration and the construction of world-leading innovative clusters. This response to the BEIS Net Zero Review draws on this research.

For freight transition generally (as for many challenges of decarbonisation) there appears to be a 'you move first' stalemate, even between the freight businesses and government. Both parties are showing increasingly clear signs of commitment to tackling freight decarbonisation, and to do so together, even if from a low starting point (e.g., only 28% of freight operators have made any changes at all to their operations on decarbonisation, and 38% have taken no action, not even researching options, according to Logistic UK's Logistics Report Summary 2022.) Yet government still expects that the freight sector takes the lead in choosing which technological options to back, while the sector meanwhile says it cannot invest in any new technologies without a clear steer from government – and not least regarding infrastructures. In short, resolving the complex challenges involved is not possible through a business-as-usual approach where each of the stakeholders simply takes care of their own operations or concerns. Instead, a new and different approach is needed if meaningful progress is to be made on this agenda. (Cf, the "Ten Principles for Policy Making in the Energy Transition" https://eeist.co.uk/eeist-reports/, which likewise emphasises that targeted policy interventions are needed to ensure decarbonisation of specific sectors rather than allowing the market to decide, as seen ares such as solar and LED lighting

Similar challenges also pertain to realising the significant potential win-wins, for economic regeneration and net zero, from the Freeports. Stakeholders of the Freeport interviewed in our research also commonly identified a chicken-and-egg deadlock that creates carbon lock-in: that without a government steer on the types of low-carbon transport technology and supporting infrastructure available (e.g. electric vehicles, hydrogen etc.) a broader sector-wide

transition will not happen, but government is reluctant to 'pick winners' and so looks to the private sector on which technology to support.

Moreover, the Freeports were obligated to provide details of their contributions to localized net zero in their submissions for funding. As such, they have developed clear strategies to incorporate net zero as a key element of the operations. Yet for them to achieve these goals, the Freeports will need to collaborate with a wide range of local stakeholders, not just from business (already local and potentially investing in the region) but also from consumers, civic groups and local authorities. This is because place-based decarbonisation is inescapably a complex and multi-factorial challenge, demanding joined-up strategy and collaboration. Simply opening the doors to business investment has not to date, and will not in future, support the level of expedited decarbonisation of the economy needed to reach legislated net zero targets. Such increased investment, rather, must be carefully selected and guided. The challenge for the Freeports, therefore, is that while they have the potential to be key platforms enabling the kind of collective agency and stakeholder collaboration needed, this is not their primary remit and nor, conversely, can it be their responsibility alone. A broader policy context supportive of the Freeports delivering this role is therefore needed.

These challenges and obstacles, in turn, create additional challenges in relation to funding and to time. The provision of the infrastructure necessary to support decarbonisation will require significant investment across the industry. In an environment where current operating costs are increasing and there is considerable uncertainty about the future, it will inevitably be difficult to secure the significant investment that will be needed for low carbon technology, infrastructure and vehicles.

None of these things can be implemented quickly either. There is a time imperative on decarbonising because of the impacts of climate change that are already happening and the imperative to try to reduce potential future catastrophic impacts. The challenges summarised above simply add to the time that it will take to introduce the changes necessary to decarbonise the freight industry. The over-riding challenge will be to find a way of accelerating the necessary changes.

3 What opportunities are there for new /amended measures to stimulate or facilitate the transition to net zero in a way that is pro-growth and/or pro-business

Answer here:

Regarding freight transition, our research has explored and test-run the importance of place-based and participatory approaches, convening diverse stakeholders who, often, have not worked together or encountered each other in the past. To reiterate, these are needed because existing approaches, of expecting individual business actors to deliver on net zero alone, are increasingly understood by those very actors as incapable of achieving the complex processes of transition.

Meaningful decarbonisation of freight, associated with central trade hubs like ports, is inseparable from complex, potentially costly and intrinsically place-based decisions on the upgrade and transformation of associated infrastructures. The transformation of specific commercial operations (usually the remit of those businesses themselves alone) and of infrastructures affecting multiple localised stakeholders (usually the separate remit of government, local and national, serving the public interest) are thus inseparable and must happen in parallel. Indeed, many types of infrastructures are implicated in freight transition: of transport itself (e.g. roads, rail, tunnels etc...), but also of associated services (e.g. of maintenance, warehousing, digitalised data monitoring, or driver/worker roadside facilities); of (renewable) energy (production, storage and recharging); and of other valued services (e.g. of green space, pollution monitoring and minimisation, or institutions of skills & training).

In our research on freight transition associated with the Port of Liverpool, such place-based and participatory approaches have proven capable of stimulating significant collective interest. Such an approach can also ease the stalemate noted above by building localised momentum backing specific practical measures to deliver locally-appropriate transformation of the freight/hub system, thereby bridging the perspectives of the freight sector and (national) government. This learning could also then even be scaled up across the country, enabling a clear and bottom-up (hence robust) national momentum towards specific technological options for decarbonising freight, and to a broader national rationalisation of freight mobilities. For instance, this could include: more significant modal shifts to rail and inland/maritime intra-national shipping, with ports 'the most under-used infrastructure in the country' (Peel Ports, at Multimodal 2022) on this island nation; the shift away from medium-sized vehicles, such as trucks, to larger and smaller vehicles, for longer- and shorter-distance movements respectively; or incentivising international trade movements to service the north of England and Scotland from more northern ports.

Meanwhile, regarding Freeports, our research has observed widespread support for the potential of Freeports to seed localised progress towards competitive clusters in net zero and other cutting-edge industries. Freeports were identified as having the scope to drive joined-up local thinking and planning around the skills, infrastructure, energy, mobility, investment, clustering and innovation universally acknowledged as necessary for a pro-growth net zero transition. Embedding rapid decarbonisation in Freeport development is particularly important given their association with increased demand for freight and commuter transport, and with traditionally high-emitting industries. Local stakeholders in the private, public and third sectors in Liverpool City Region and Teesside highlighted the need for regional economic regeneration driven by Freeports to contribute to a 'just transition', e.g. with skills programmes to ensure that local populations were able to take advantage of growing opportunities in low-carbon industries and increasing local productivity.

Indeed, our research suggests that the best-case scenario is for the resulting Freeports to be the proverbial 'grit in the oyster'. According to this metaphor, Freeports, in the estimation of many significant stakeholders, hold potential to be the new matrix or kernel introduced into their respective regional economies around which a new systemic vision and dynamism (i.e., the proverbial 'pearl'), needed for deep and place-based decarbonisation, could yet form. As comparatively new, still-forming, composed of small, close-knit teams with an experimental 'start-up' culture and yet also enjoying a significant regional profile, Freeports are also potentially well-placed to play this convening role. Completing the metaphor, the (uncertainly) changing broader circumstances – of global trade and manufacturing, digitalisation of industry etc.– may also here be the novel environment of the 'oyster' without which, reciprocally, the grit has little chance of such positive transformation.

Different means have been proposed for Freeports in this regard, some of which are apparently already being taken up by the Freeports themselves. For example, it was noted in our research that Freeports could host key technological system demonstrator projects, enabling expedited decisions on

technological choice amongst various options currently in play. Here, for instance, it seems that several Freeports, including LCR, are collaborating in hydrogen freight vehicle testing. Alternatively, Freeports across England could become better coordinated themselves, collectively acting as a crucial bridge for action between national & regional government on climate change.

Finally, bringing together the Freeport and freight transition, one of the key issues is procurement of new vessels, and infrastructures for shipping and land-freight, and associated stalemate or chicken-and-egg problems, as noted above. If Freeports can prove successful in aggregating a systemic regional strategy for freight transport decarbonisation, this might then scale upwards to changing national transport policy strategy in other sectors beyond the bounds of the Freeport sites. Ensuring higher standards in Freeport locations for emissions could also drive wider uptake across the region, and thence the UK.

Moreover, as a collection of nationally-significant sites for decarbonising transport (infrastructure) and industry, and one that already has the ear of central government, – and hence a crucial intermediate layer between national government and individual private sector businesses – the collective influence of the Freeports and their experimentation with technologies could considerably ease the stand-off of these two actors, each waiting for the other to move first. That there are only 8 such Freeports also is potentially positive, both easing the collaboration amongst themselves, and increasing their voice in Whitehall, given the concern and interest of DLUHC and the Treasury is more concentrated than it was, say, for previous enterprise zone policies involving dozens of (often small) projects. In this regard, though, we note the potential risks to the win-win contributions of Freeports through dilution of the policy by the newly announced Investment Zones, if these survive the recent change of Prime Minister (see below).

In these ways the Freeports could thus have significant impact through incubating a multi-scalar transformation, generating whole new regional economies and dynamic place-based socio-technical trajectories oriented to a growing momentum of broader regional (and thence national) decarbonisation – even though this goes beyond their original purpose and stated remit in the Freeport policy.

4 What more could government do to support businesses, consumers and other groups to decarbonise?

Answer here:

The further support that (national) government could provide to decarbonise in our sector of freight/hub operations and regional innovation clustering includes:
- To support local processes and powers, enabling wider engagement with Freeport governance for local business and civil society, convening such groups as triple wins (for business, citizens/consumers and government) to ease existing stalemates on net zero collective action, e.g. regarding infrastructural redesign.
- To maintain existing support and medium-term policy certainty for the Freeports policy, not diluting them and their potentially positive impact on growth and net zero, whether in number (and consequent attention from the relevant central government department) or policy brief (viz. watering down net-zero expectations), as proposed in the new Investment Zones policy.
- To provide and/or leverage specific incentives for the location of low-carbon industry / R&D on Freeport sites, and for the low-carbon design and operation of Freeport sites (e.g. new buildings and infrastructure and transport between sites) held to industry-leading emissions standards.

5 Where and in what areas of policy focus could net zero be achieved in a more economically efficient manner?

Answer here:

See other responses – targeted initiatives supporting regionalised, place-based and participatory initiatives would likely have a greater impact than policies that seek only to pull supply-side economic levers, and which are diluted across as many areas of the country as possible.

6 How should we balance our priorities to maintaining energy security with our commitments to delivering net zero by 2050?

Answer here:

It is clear that in the medium-term the best strategy to ensure energy security is to make the UK as independent as possible from fossil fuels, with the mass conversion to electricity as default source of energy, supplemented in relevant niches/sectors by green hydrogen. This includes the significant continued upscaling of both a diversity of renewable electricity generation and storage infrastructures in the UK and the capacity for creation of green hydrogen (with CCS/blue hydrogen a poor second choice given its expense in both finance and energy). It is clear that the Freeports (and now potentially Investment Zones) have the potential to be leaders in supporting such infrastructure projects as part of their broader strategies for delivering high-quality regional regeneration that is actively driving net zero in their regions. This is the case even where some of the relevant decarbonised energy programmes are not formally or administratively within the ambit of the Freeport projects, but rather sit alongside them. For instance, the Mersey Tidal Project and plans for green hydrogen in Teesside are both not entirely delimited within their respective Freeports, but both have clear potential for complementary gains, incubating positive feedback clustering dynamics around high-innovation, decarbonised sectors.

In the short-term, it is clearly crucial that energy bills are kept manageable for both citizens and businesses, but it is a false dilemma to imagine that slowing down net zero efforts will alleviate the energy security pressures exposed by Putin's war in Ukraine. To the contrary, without continued concerted commitment to net zero, the energy security challenges will simply be prolonged and likely worsened, as businesses and consumers fail to make the expedited switch away from fossil fuel-dependent technologies that is needed. Painful as it undoubtedly is, the clear opportunity is to use the existing pressure on fossil fuel-based energy costs to expedite decarbonisation of the grid, not to slow it down.

7 What export opportunities does the transition to net zero present for the UK economy or UK businesses?

Answer here:

As the Freeports again evidence, there is considerable excitement in British business sectors and major regions regarding the potential for world-leading clusters of net zero, hi-tech sectors to be incubated in the UK. The transition to net zero is now the only medium-term trajectory being seriously

entertained in all sectors of the (global) economy, and so British businesses will need to be on this pathway too if they are to remain competitive. Specific sectors in which the UK, and specific regions thereof, could become major global competitors, with associated export opportunities, include amongst many others low-carbon shipping, hydrogen for vehicle (fuels) (especially ships and HGVs), hi-tech (digital/AI-assisted) freight data services, advanced manufacturing (e.g. automotive supply chains, bio-pharma and chemical manufacturing), and clean energy generation and storage technologies.

Questions for businesses

8 What growth benefits/opportunities have you had, or do you envisage having, from the net zero transition?

Answer here:

N/A

9 What barriers do you face in decarbonising your business and its operations?

Answer here:

N/A

10 Looking at the international market in your sector, what green opportunities seem to be nascent or growing?

Answer here:

N/A

11 What challenges has the net zero transition presented to your business?

Answer here:

N/A

12 What impacts have changing consumer choices/demand had on your business?

Answer here:

N/A

13 What impacts have decarbonisation/net zero measures had on your business?

Answer here:

N/A

14 What more could be done to support your business and/or sector to decarbonise?

Answer here:

N/A

15 Do you foresee a role for your business within an expanded UK supply of heat pumps, energy efficiency, electric vehicles, hydrogen or clean power?

Answer here:

N/A

16 For clean power industry: what barriers to entry have you found in deploying clean energy?

Answer here:

N/A

17 How many green jobs do you estimate will be created in your sector by 2030?

Answer here:

N/A

Questions for the public

18 Have you or are you planning to take personal action to reduce your carbon emissions (for example through how you travel, what you buy, how you heat your home)? If so, how?

Answer here:

N/A

19 Do you face any barriers to doing this? What are they?

Answer here:

N/A

20 What would help you to make greener choices?

Answer here:

N/A

21 What is working well about the measures being put in place to reach net zero?

Answer here:

N/A

22 What is not working well about the measures being put in place to reach net zero?

Answer here:

N/A

23 Do you have any further comments on how efforts to tackle climate change are affecting you?

Answer here:

N/A

Questions for local government, communities and other organisations delivering net zero locally

24 What are the biggest barriers you face in decarbonising / enabling your communities and areas to decarbonise?

Answer here:

Amongst the biggest barriers in expediting decarbonisation is the challenge of convening appropriately diverse groups of stakeholders (i.e. from resident businesses, the freight/hub sector, citizens/consumers, civic groups/NGOs, think tanks and academics as well as local government) coupled then with having the powers and resources to support follow-up actions emerging from such consultations. As noted above, decarbonising localised economic activities is a hugely complex and multi-agent process, and it is often the case that those that need to be involved have little experience or capacity for the extended participation in processes that could work through practical interventions and solutions. Local government itself also faces significant challenges regarding such personnel resources, time and finances to support and/or convene these crucial discussions, and often lacks necessary powers then to implement recommendations. This, in turn, can make it hard to sustain support and momentum for these initiatives. Funding for relevant projects is also often only available in small and opportunistic pots of money from Whitehall, with considerable resource investment needed upfront in applying for it. In short, the biggest obstacle is the lack of a supportive regulatory environment from central government to enable a clear medium-term strategy by local government to support place-based decarbonisation initiatives as a clear priority.

25 What has worked well? Please share examples of any successful place-based net zero projects.

Answer here:

As noted above, the NZIP project 'Delivering Port of Liverpool- Associated Road-freight Zero Emissions (DePoLARiZE)' has successfully convened a panel of diverse stakeholders exploring how to reduce carbon emissions from freight transport in/out of the Port. With the support of the exceptional funding programme of the Net Zero Innovation Partnership, run by the Local Government Association and UCL, and its programme of regular guidance, the DePoLARiZE project brought together over 20 stakeholders in a series of 3 online workshops and 1 closing in-person workshop (concluding very recently, in October 2022) to identify collectively key next steps to open up what remains a significant and largely deadlocked challenge regarding net zero freight transition in Liverpool and associated major infrastructural redesign. These stakeholders were drawn from the Port itself, its tenant businesses, the freight sector (large and small businesses), transport think-tanks & academic, local civic groups, residents and local government (at LA and CA levels).

Through a carefully curated and then professionally facilitated process, the group has drawn up a set of key recommendations for practical next steps. These include:
- the introduction of a clean air zone covering the major trunk roads that access the Port of Liverpool at Seaforth docks;
- the active exploration and siting of a new inland hub at which adequate EV charging, driver facilities, container parking and logistics training could be provided; and

- ongoing concerted collaboration in new relevant fora, involving also major shippers and potential investors in the city region.

The agenda for this work is thus explicitly both pro-regional economic regeneration and pro-net zero, seeing these two as inseparable sides of the same coin.

26 How does the planning system affect your efforts to decarbonise?

Answer here:

The planning system has a key role to play in facilitating the construction of the infrastructure needed to support decarbonisation. As indicated above, a new inland freight facility hub, with refuelling/charging infrastructure, driver welfare and vehicle parking could make a significant contribution to decarbonising freight transport to and from the Port of Liverpool. Identifying a suitable site and securing the necessary approvals will depend on the planning system. Similarly, where other infrastructure is required, planning approval is likely to be required.

The planning system therefore has a key enabling role to play in the provision of the facilities and infrastructure needed to support decarbonisation. It can also make a significant contribution to the process by requiring new developments to include the infrastructure necessary to support decarbonisation.

27 How can the design of net zero policies, programmes, and funding schemes be improved to make it easier to deliver in your area?

Answer here:

As noted above, from a local government perspective, a key issue would be arranging funding schemes and programmes such that they deliver a regular, sizeable and secure flow of financing without the need to be reapplying constantly for small pots of funding tied to fast-changing priorities. A programme that offers this while also explicitly supporting experimentation in new place-based and participatory approaches to decarbonisation (and thereby building local government capacity for such work) would be particularly helpful. Best of all would be where these are associated in turn with opportunities to apply for bigger ring-fenced budgets where, for instance, major infrastructural redesign has been identified and agreed upon with strong consensus across local stakeholders – ultimately, there is no possibility of meeting net zero targets without such investment.

28 Are there any other implications of net zero or specific decarbonisation projects for your area that the Review should consider?

Answer here:

N/A

Questions for academia and innovators

29 How can we ensure that we seize the benefits from future innovation and technologies?

Answer here:

It is tempting to focus upon the potential upsides of net zero purely in terms of the new openings for high-profit businesses dominating future innovation and technologies. Of course, innovation and technology, and associated firms, are indispensable in the transition to net zero. Yet in many ways focusing purely on such techno-economic gains is to put the cart before the horse, and hence is likely to prove disappointing as a policy approach, no matter how ambitious it may be in these regards. The emerging economy dominated by highly innovative and digitally/technologically-advanced businesses is actually sustained and kept competitive, and in specific places, not primarily by fiscal/monetary policies offering supply-side freedoms to individual businesses, but by policies that support the broader conditions for provision and attraction of high-quality (and young) workforces. This thus inevitably involves investment in excellent institutions for skills & training (across the range of STEAM subjects and wider critical thinking skills); high-quality, affordable and 'first modal choice' public transport; clean, attractive local environments with plenty of green and blue space and affordable housing and good local services; and, most nebulously but also crucially, a local 'buzz' of can-do dynamism that is clearly manifesting in changes to the local/urban environment.

In short, seizing the benefits from future innovation and technologies demands a policy model supportive of the investment in, and creation of, inclusive places demonstrably at the forefront of net zero transition, since this is what will excite and attract high-quality workforces and high-value investment into the medium-term future. While ostensibly analytically distinct, then, net zero and hi-tech competitiveness are increasingly convergent in practice and mutually supportive. Delivering net zero to Britain's cities, towns and rural areas is thus not only in need of such innovation, but also itself directly supportive of it.

One broad lesson from the above is the reminder that the vast majority of the innovation and technological action in delivering net zero will come from decarbonisation, and relatively little from the development of carbon removal techniques. In previous work (see: http://wp.lancs.ac.uk/amdeg/) we have identified significant economic and climate risks associated with over reliance on carbon removal, especially relating to delays in the phasing out of fossil fuels. These have subsequently been starkly emphasized by the impacts of the war in the Ukraine. The potential of net-zero for future economic growth and wellbeing will be maximised by prioritising decarbonisation and ensuring maximum clarity about the scale of the role for carbon removal. Clear separate targets and accounting for emissions reduction and carbon removal would help ensure such a focus.

30 Is there a policy idea that will help us reach net zero you think we should consider as part of the review?

Answer here:

Our research supports the following list of policy agendas as supportive of net zero and local economic dynamism, going hand-in-hand:
- Spatial (to local / combined authority level) and sectoral carbon budgets, with transparent allocation and accounting mechanisms (e.g. re consumption

vs. production emissions / source, destination or route allocation for transport emissions), and concomitant devolution of powers, responsibilities and funding to enable achievement of budgets in ways that respond to place-specific opportunities and challenges;
- Greater local devolution, especially of powers and funding to support decarbonising infrastructural investment and redesign;
- Statutory responsibility for local and combined authorities to contribute to national net zero targets and to deliver local targets / carbon budgets;
- Review national guidance (e.g. the Green Book, the National Planning Policy Framework), which, despite recent amendments, unintentionally continue to favour high-carbon solutions e.g. for transport investment decisions;
- Connect tax and regulatory incentives in Freeports, Investment Zones and any future related policies to the delivery of enhanced environmental / decarbonisation standards (e.g. simplified planning processes and tax reliefs will apply only if new buildings exceed building regulations requirements on energy efficiency and vehicles servicing the sites achieve better emissions performance than the fleet as a whole);
- Tighter air quality regulation, including greater support and powers for the introduction of Clean Air Zones;
- Creation by appropriate government departments (e.g. DfT, BEIS) of evidence-based scorecards for net-zero freight options, to assist investment decisions by individual freight sector businesses;
- Broader support for the upgrading of the freight industry, including appropriate infrastructures (e.g. for EV/hydrogen charging, driver facilities, overhead charging on specific roads, etc…) and training institutions (e.g. apprenticeships, dedicated FE college courses etc…);
- Establishing a central freight-data clearing-house or open platform for the sector to share logistics data in good faith, neutralizing the current risk for individual businesses in bilateral trust relationships;
- Better horizontal and vertical integration of policy across Whitehall and between national and local governments, esp. regarding support, across the country not just in the south east, demanding that all infrastructure projects be net-zero future-proofed, e.g. against the massive reduction in fossil-fuelled road traffic that must happen in the next decade;
- Support for freight transition, including through multi-stakeholder and place-based projects and fora, since the freight industry (and especially its numerous small businesses, facing so many other pressures) cannot do this alone, nor even just with the support of government;
- Adopt progress towards carbon budgets as a headline indicator of government achievement, alongside a modified growth indicator (such as New Zealand's Wellbeing Budget) to provide a more meaningful indication (and therefore driver) for what sectors of the economy are growing, and who is benefitting, enabling more directive and impactful policy responses than a simple focus on aggregate growth.