Embedding green industrial policy in a growth strategy for the UK

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How to make the economy stronger, more resilient and sustainable

The major long-run economic challenge facing the UK is slow productivity growth. In 2023, the UK economy is about a quarter smaller than it would have been if output per hour had grown at the same rate after the global financial crisis as it had in the previous three decades. This stagnation of productivity has led to a flatlining of real wages and living standards.[1]

> "**The major long-run economic challenge facing the United Kingdom (UK) is slow productivity growth**"

We believe that restoring growth requires a more active and strategic approach to the economy, involving a key role for government working with industry to generate investments that build economic security and resilience. Part of this relates to improving productive capacity in areas seen as crucial for enabling the transition to net zero greenhouse gas emissions by 2050.

In this article, we consider the role of a modern industrial strategy – coordinating a range of 'industrial policies' – in shaping such an approach. How can the UK, an open and service-based economy with a small domestic market (relative to the US, the EU, and China) but with significant strengths in areas of high-value manufacturing and clean-tech innovation, design and implement an industrial strategy that can generate much-needed productivity growth, boost resilience and deliver against its ambitious net zero targets?

THE NEED FOR SUSTAINABLE AND PRODUCTIVE INVESTMENT

Delivering net zero requires significant increases in investment and innovation across infrastructure, transport and urban systems this decade. Investment needs are estimated to rise to an additional £50 billion per annum by 2030 – much of which is expected to come from the private sector.[2] Improving the UK's productivity performance also requires increased investment in innovation, infrastructure and skills, with a key role for business investment.[3] On aggregate, business investment in the UK is around 10 per cent of gross domestic product (GDP), compared with over 12 per cent on average across France, Germany and the US – and the UK has performed poorly versus these comparators and a broader set of advanced economies for some time.

Net zero investments are attractive because in addition to addressing the climate crisis, they will improve energy security (by reducing reliance on imported fossil fuels with volatile prices) and generate a variety of other economic and health-related co-benefits (for example, through improved

1 Teichgräber A and Van Reenen J (2021) 'Have productivity and pay decoupled in the UK?', *International Productivity Monitor*, 41: 31–60. https://www.productivity.ac.uk/wp-content/uploads/2021/12/IPM_41_Teichgraber.pdf

2 See Carbon Change Committee (2020) 'Sixth Carbon Budget Dataset', Carbon Change Committee; and Office for Budget Responsibility (2021) *Fiscal risks report 2021*, OBR. https://obr.uk/fiscal-risks-report-2021-2

3 Brandily P, Distefano M, Shah K, Thwaites G and Valero A (2023) *Beyond boosterism: Realigning the policy ecosystem to unleash private investment for sustainable growth*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/beyond-boosterism

resource efficiency, opportunities for innovators serving new markets, and cleaner air). Globally, there is no route towards long-run growth without addressing the climate crisis – which unabated will have devastating consequences for people's lives and livelihoods.[4] Indeed, the net zero transition is "the growth opportunity of the 21st century".[5] There are reasons to be optimistic. Socioeconomic tipping points – where new clean solutions consistently out-compete incumbents – have already been achieved in electricity, and the evidence suggests that these can soon be achieved across a broader range of clean technologies with increased investment in research, skills, development and deployment.[6]

> "**Globally, there is no route towards long-run growth without addressing the climate crisis**"

But there are immediate costs that need to be met, and this will involve short-term trade-offs and difficult choices for government, businesses and households – particularly in resource-constrained times. Significant fiscal constraints heighten the need to ensure that public resources are used productively to catalyse private sector investment, and that policies are evidence based – addressing market failures and other barriers.

DEFINING GREEN INDUSTRIAL POLICY

Industrial policy encompasses interventions that seek to change the structure of the economy in order to achieve a key, typically growth-related, goal.[7] Such interventions span a range of policy instruments (including subsidies, regulation, public investment, innovation support and skills programmes) that create incentives for businesses to invest in ways that are consistent with that goal.[8] Within this framework, green industrial policies seek to steer investment and growth towards environmental sustainability. Such approaches are increasingly being adopted given the urgency of tackling the climate crisis, the large-scale investment it requires, and the reality that, for security and resilience purposes, certain domestic capabilities are needed. In the US, the Inflation Reduction Act has committed large-scale and long-term government support for specific clean technologies and sectors seeking to crowd in substantial private sector investment, while the EU is responding with its Green Deal Industrial Plan.[9]

THE ECONOMIC JUSTIFICATION FOR GREEN INDUSTRIAL POLICIES

The presence of numerous market failures and path dependencies in innovation systems (in both the invention and deployment of new technologies) implies that strong policies are needed to enable net

4 IPCC (2023) *Sixth assessment report: Synthesis report*, IPCC. https://www.ipcc.ch/assessment-report/ar6

5 Skidmore C (2023) *Mission zero: Independent review of net zero*, GOV.UK. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1128689/mission-zero-independent-review.pdf. See also, for example, Stern N (2021) *G7 Leadership for sustainable, resilient and inclusive economic recovery and growth: An independent report requested by the UK prime minister for the G7*, London School of Economics and Political Science. https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2021/06/G7_leadership_for_sustainable_resilient_and_inclusive_economic_recovery_and_growth_full_report.pdf

6 SYSTEMIQ (2023) *The breakthrough effect*, SYSTEMIQ. https://www.systemiq.earth/wp-content/uploads/2023/01/The-Breakthrough-Effect.pdf

7 See Juhász R, Lane NJ and Rodrik D (2023) 'The new economics of industrial policy', NBER working paper 31538, NBER website, August 2023. https://www.nber.org/system/files/working_papers/w31538/w31538.pdf

8 While industrial policies are traditionally related to manufacturing, a broader definition that is more relevant for service-based knowledge economies such as the UK also includes support for services and research and development.

9 European Commission (no date), 'The Green Deal Industrial Plan', European Commission website. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan_en

10 For a summary of literature on 'directed technical change and the environment', see Stern N and Valero A (2021) 'Innovation, growth and the transition to net-zero emissions', *Research Policy*, 50(9). https://www.sciencedirect.com/science/article/pii/S0048733321000949. See also Aghion P, Antonin C and Bunel S (2021) 'Green innovation and sustainable growth' in *The power of creative destruction: Economic upheaval and the wealth of nations*, Harvard University Press.

zero investment and innovation in the required timeframes.[10] The obvious market failure is the greenhouse gas externality whereby the costs of emissions are not captured in market prices. This provides the economic justification for crucial environmental policies such as carbon taxes, regulation and standards. While such levers are necessary for the net zero transition, experience shows how they can be politically difficult to implement at the required scale and pace.

> "strong policies are needed to enable net zero investment and innovation in the required timeframes"

Policymakers therefore turn to other instruments that are justified for economic reasons as well as political realities. In particular, there is evidence that a range of market failures that justify public support for innovation in general[11] apply in particular for clean technologies. A central market failure is associated with the existence of 'knowledge spillovers', which imply that innovators are unlikely to be able to capture all the financial returns from their investments in research and development (R&D): there is evidence that the spillovers associated with clean technologies are higher than their 'dirty' counterparts.[12] Further market failures arise due to imperfections in capital markets that may limit investment in 'risky' projects,[13] or from information frictions that prevent investors, as well as consumers and workers, making sustainable choices. It is also clear that there is a role for government coordinating the rollout of interconnected technologies in the net zero transition (for example, electric vehicle charge points and grid infrastructure). Finally, markets do not fully capture the societal co-benefits associated with the net zero transition via cleaner air, improved natural capital and increased resilience.

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While different market failures point to different instruments across regulation, investment subsidies, information provision, skills programmes and public investment, ideally these should be coordinated as part of an overarching and lasting strategy that provides a clear sense of direction for the private sector.[14] In light of the generous financial incentives being provided in the Inflation Reduction Act, many cite concerns over a 'subsidy race' or policy competition between governments, leading to waste and misallocation of public resources. Indeed, such concerns call for carefully designed policies and international collaboration as well as some elements of competition to attract mobile capital.[15] But a more positive view – given the global and urgent nature of tackling the climate crisis – is that these forces

11 Bloom N, Van Reenen J and Williams H (2019) 'A toolkit of policies to promote innovation', *Journal of Economic Perspectives*, 33(3): 163–184.

12 Dechezleprêtre A, Martin R and Mohnen M (2014) 'Knowledge spillovers from clean technologies: a patent citation analysis', CEP discussion paper 1300, Centre for Economic Performance. https://cep.lse.ac.uk/pubs/download/dp1300.pdf

13 There is evidence that net-zero technologies have been viewed as particularly risky by investors. See, for example, Gaddy BE, Sivaram V, Jones TB and Wayman L (2017) 'Venture capital and cleantech: the wrong model for energy innovation', *Energy Policy*, 102(C): 385–395.

14 Stern N, Unsworth S, Valero S, Zenghelis D, Rydge J and Robins N (2020) 'Strategy, investment and policy for a strong and sustainable recovery: an action plan', briefing paper 005, London School of Economics and Political Science.

15 Van Reenen J (2023) *The case for green industrial policy*, ProMarket.

16 Indeed, recent research that analyses innovation spillovers via patenting finds that the EU benefits strongly from US clean-tech innovation spillovers. See Martin R and Verhoeven D (2023) 'Knowledge spillovers from clean innovation: a trade-off between growth and climate?', CEP discussion paper 1933, Centre for Economic Performance. https://cep.lse.ac.uk/pubs/download/dp1933.pdf

will ultimately spur an increase in global investment, innovation and associated spillovers,[16] bring the prices of key technologies down and boost resilience within countries or broader trading blocs.

GREEN INDUSTRIAL POLICIES FOR THE UK

It is too early to fully evaluate the impact of the Inflation Reduction Act, but a range of indicators point to increased investment and building momentum.[17] While the UK can learn from the incentives provided in the Inflation Reduction Act – their scale, longevity and how they involve support on both the supply and demand side – its response must be tailored to its context. Support should be targeted towards technologies where the UK has actual or latent strengths, mindful of its smaller economy and greater fiscal constraints. On the positive side, the UK has greater political ability to use regulatory levers and carbon pricing at the national level.[18] Key short-term priorities should include:

- removing policy barriers to investment (in particular planning restrictions, which hold back not only net zero infrastructure but also growth more generally)
- examining the broad-based incentives for innovation and capital investment
- considering where to enhance tax incentives for net zero-aligned investments (including in skills) or use other government levers to de-risk them.[19]

Government can further mobilise private sector investment into priority areas such as net zero via increasing the use of 'blended finance' approaches, for example with financial instruments such as first-loss capital or pure grants, co-investment to create scale in underinvested markets or guarantees.[20]

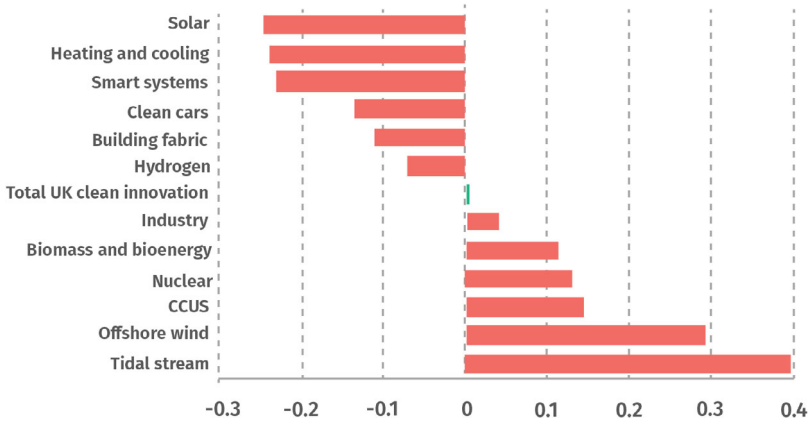
How can support best be targeted to specific sectors or technologies? For advanced economies such as the UK, the challenge relates not just to supporting the investments needed to achieve domestic net zero targets, but also to capturing growth opportunities where domestic firms and innovators are able to create products and services competitively and meet growing global demand. An effective and credible industrial strategy for the UK needs to be informed by a hard-headed understanding of what sort of economy it is and can plausibly be.

> **"An effective and credible industrial strategy for the UK needs to be informed by a hard-headed understanding of what sort of economy it is"**

Such an approach must recognise and build on the UK's overall comparative advantages in services (extending beyond finance to professional and business services and the creative sectors), and its

17 Boushey H (2023) *The Economics of Public Investment Crowding in Private Investment*, The White House Briefing Room.
18 Murphy L (2023) 'Winning the global green race: lessons from the UK form the US' Inflation Reduction Act', IPPR website, 14 March 2023. https://www.ippr.org/research/publications/winning-the-global-green-race
19 For more detail on these areas and a broader discussion on how to improve the investment ecosystem in the UK to unleash investment for sustainable growth, see Brandily P, Distefano M, Shah K, Thwaites G and Valero A (2023) *Beyond boosterism: Realigning the policy ecosystem to unleash private investment for sustainable growth*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/beyond-boosterism
20 Gordon S and Valero A (2023) *Finance for the future: Practical solutions for the UK Government to mobilise private investment for economic, environmental and social priorities*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/finance-for-the-future
21 De Lyon J, Martin R, Oliveira-Cunha J, Shah A, Shah K, Thwaites G and Valero A (2022) *Enduring strengths: Analysing the UK's current and potential economic strengths, and what they mean for its economic strategy, at the start of the decisive decade*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/enduring-strengths
22 Panjwani A (2023) *Industries in the UK*, briefing, House of Commons Library. https://commonslibrary.parliament.uk/research-briefings/cbp-8353/

Figure 1: The UK's relative strengths in clean technologies, 2015–18 [Color figure can be viewed at wileyonlinelibrary.com]



status as one of the major green finance hubs, and as a knowledge economy with significant strengths across its research system – particularly in its world-class universities.[21] Manufacturing is a small, but very productive, part of the UK economy, accounting for around 7 per cent of employment and 9 per cent of output.[22] While the UK has comparative advantages in a number of goods, including pharmaceuticals and certain green products,[23] analysis of patenting highlights areas of innovative strength that the UK could leverage through building domestic supply chains in a more purposeful way.[24] In particular, as shown in figure 1,[25,26] the UK is specialised in technologies such as offshore wind, carbon capture, usage and storage (CCUS) and tidal stream – all of which also generate relatively high estimated returns from government support for innovation (including private returns for the innovator as well as direct and indirect knowledge spillovers).[27]

Understanding the potential for support for clean technologies to generate meaningful growth and jobs in the UK requires insights from a range of datasets and consultation with key stakeholders in order to understand where strengths and opportunities are located, as well as the specific

23 The UK ranks ninth globally on 'green' exports, accounting for 2.5 per cent of global export volume of such products. This share is similar to that of France. Moreover, the UK is specialised in a number of green products, including those relating to environmental monitoring and pollution control and low-carbon energy generation. See Curran B, Martin R, Muller S, Nguyen-Tien V, Oliveira-Cunha J, Serin E, Shah A, Valero A and Verhoeven D (2022) *Growing Clean: Identifying and investing in sustainable growth opportunities across the UK*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/growing-clean

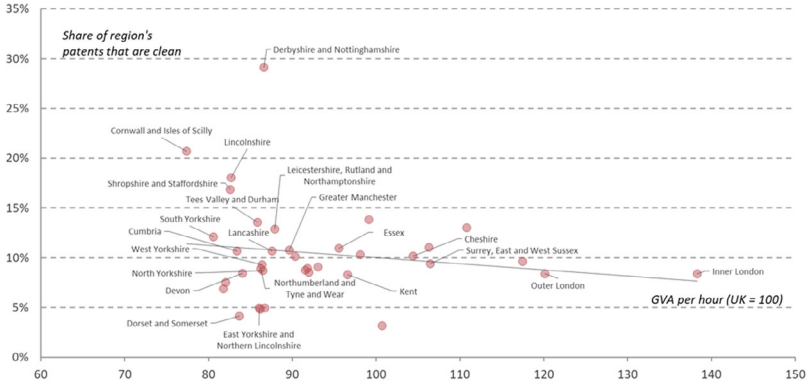
24 Curran B, Martin R, Muller S, Nguyen-Tien V, Oliveira-Cunha J, Serin E, Shah A, Valero A and Verhoeven D (2022) *Growing clean: Identifying and investing in sustainable growth opportunities across the UK*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/growing-clean

25 Source: This chart is based on figure 4 in Curran B, Martin R, Muller S, Nguyen-Tien V, Oliveira-Cunha J, Serin E, Shah A, Valero A and Verhoeven D (2022) *Growing clean: Identifying and investing in sustainable growth opportunities across the UK*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/growing-clean

26 Notes: This chart plots the UK's revealed technological advantage (RTA) for selected green technologies. RTA compares a country's share of total innovation in a particular technology area to the global share for the same category. Positive values above zero indicate that the UK is specialised in that area. These measures are built from the 'Y02' class of patenting relating to climate change mitigation and adaptation technologies.

27 Analysis in Curran B, Martin R, Muller S, Nguyen-Tien V, Oliveira-Cunha J, Serin E, Shah A, Valero A and Verhoeven D (2022) *Growing clean: Identifying and investing in sustainable growth opportunities across the UK*, Resolution Foundation, https://economy2030.resolutionfoundation.org/reports/growing-clean; building on Martin R and Verhoeven D (2022) 'Knowledge spillovers from clean and emerging technologies in the UK', CEP discussion paper 1834, Centre for Economic Performance, 2 March 2022. https://cep.lse.ac.uk/_NEW/PUBLICATIONS/abstract.asp?index=9256

Figure 2: Clean patents intensity (clean patents as a percentage of total regional patents) and regional productivity (gross value added per hour), 2019 [Color figure can be viewed at wileyonlinelibrary.com]



barriers that policy can address. Recent 'deep dives' on sustainable growth opportunities in CCUS and tidal stream provide examples of this type of approach, highlighting areas of technological specialisation as well as relevant products that the UK already exports competitively.[28] And the UK must learn from previous experiences where a more strategic approach to building supply-side capabilities might have led to a different outcome. Offshore wind provides a case study – while the UK has led in its deployment and is specialised in related innovation, it is not specialised in the trade of relevant products overall.[29]

> "**the UK must learn from previous experiences where a more strategic approach to building supply-side capabilities might have led to a different outcome**"

An effective industrial strategy will have both national and regional elements, and clean-tech specialisation has an important role to play in both. Interestingly, while the overall volume of innovation in low-productivity geographical areas tends to be low, such areas are often more specialised in clean technology innovation (see figure 2)[30,31] as well as firms providing net zero goods and services.[32] Examples of technological specialisms in the UK's core cities include clean cars in Birmingham and tidal-stream technologies in Newcastle.[33] These findings imply that

28 See Serin E, Andres P, Martin R, Mealy P, Shah A and Valero A (2021) *Seizing sustainable growth opportunities from carbon capture, usage and storage in the UK*, London School of Economics and Political Science, https://www.lse.ac.uk/granthaminstitute/publication/seizing-sustainable-growth-opportunities-from-carbon-capture-usage-and-storage-in-the-uk; and Serin E, Andres P, Martin R, Shah A and Valero A (2023) *Seizing sustainable growth opportunities from tidal stream energy in the UK*, London School of Economics and Political Science.

29 Curran B, Martin R, Muller S, Nguyen-Tien V, Oliveira-Cunha J, Serin E, Shah A, Valero A and Verhoeven D (2022) *Growing clean: Identifying and investing in sustainable growth opportunities across the UK*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/growing-clean

30 Source: Analysis of PATSTAT and the Office for National Statistics. Weighted-average gross value added per hour indices (using hours) are shown for London's regions given a more aggregated regional mapping available in the patents data. This chart is based on Figure 12 in Curran B, Martin R, Muller S, Nguyen-Tien V, Oliveira-Cunha J, Serin E, Shah A, Valero A and Verhoeven D (2022) *Growing clean: Identifying and investing in sustainable growth opportunities across the UK*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/growing-clean

31 Note: Clean patents by NUTS 2 region (2015–18) and regional gross value added per hour at ITL 2 level (2019).

32 As defined using The Data City's mapping of firms based on website text.

33 See Figure 2.15 in UK Urban Futures Commission (2023) *Unleashing the potential of the UK's cities*, RSA. https://www.thersa.org/reports/uk-cities-unleashing-potential

supporting innovation in green technologies could disproportionately boost low productivity areas in the future.

A holistic view of the UK's innovation system is needed. Building on the excellence in the 'golden triangle' of London, Oxford and Cambridge will also be a crucial part of a green industrial strategy, and UK innovation policy more broadly. An analysis of the estimated returns to public investment in innovation suggests that innovation in clean technologies in the golden triangle generates particularly high returns in that same region, as well as in the rest of the country via knowledge spillovers.[34]

> "A holistic view of the UK's innovation system is needed"

Analysis of current specialisations can take us only so far. There are also areas where the UK is not specialised in terms of innovation or trade, but where domestic capabilities are necessary for security and resilience purposes. An example is battery technologies, where investments in gigafactories are seen as crucial for the future of the UK's automotive industry. An effective green industrial policy must therefore find the right balance between the need for domestic supply capabilities and openness to trade – particularly with China, which now dominates in many areas. It is clear that the UK, post Brexit, should seek to build 'friend-shoring' relationships with key allies in priority areas. As the post-Brexit regulatory landscape evolves, it is important to remain aligned with the EU on emerging technologies to ensure that UK firms can trade as seamlessly as possible with our largest and nearest trading partners.

WIDER REFORMS FOR LONGEVITY AND IMPACT

A stronger institutional framework governing growth policy can help to ensure the longevity of green industrial policies as part of a broader growth strategy.[35] An attempt to strengthen institutions for growth and productivity – the establishment of the independent Industrial Strategy Council in 2018 (which had a focus on clean growth as one of its 'grand challenges') – was short-lived, though the Labour party has proposed relaunching it and placing it on a statutory footing.[36] Properly designed, a new growth institution will help to:

- inform evidence-based, targeted and coordinated policies
- monitor government progress against key objectives
- provide investors with confidence to make the long-term investments that are needed for sustainable growth.[37]

Crucially, it could highlight where synergies or trade-offs between growth and net zero objectives exist, and how these can best be managed.

Finally, the support of citizens, consumers and workers is necessary for the delivery of net zero policies. The experience of Ultra Low Emission Zone (ULEZ) expansion in London shows how

34 Curran B, Martin R, Muller S, Nguyen-Tien V, Oliveira-Cunha J, Serin E, Shah A, Valero A and Verhoeven D (2022) *Growing clean: Identifying and investing in sustainable growth opportunities across the UK*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/growing-clean

35 Brandily P, Distefano M, Shah K, Thwaites G and Valero A (2023) *Beyond boosterism: Realigning the policy ecosystem to unleash private investment for sustainable growth*, Resolution Foundation. https://economy2030.resolutionfoundation.org/reports/beyond-boosterism

36 Labour Party (2022) *Prosperity through partnership: Labour's industrial strategy*, Labour Party.

37 Valero A and Van Ark B (2023) *A new UK policy institution for growth and productivity: a blueprint*, Productivity Agenda Chapter 10, The Productivity Institute; and Programme on Innovation and Diffusion (POID)

opposition voices in specific areas can be very prominent and shape the national debate on broader net zero policies, even when public support overall is high. It is therefore crucial that the distributional aspects of a green industrial strategy (and net zero policies in general) are understood, managed fairly and perceived to be so. This is particularly the case for households that need to make upfront investments in low-carbon heat, energy efficiency and decarbonising transport, which can be unaffordable for many (despite leading to significant savings later), particularly in a cost-of-living crisis.[38] In the labour market, the net zero transition is expected to lead to net job creation overall,[39] but it will involve a lot of change for many workers and disruption for some. Effective education and skills policies will therefore be needed not only to deliver the net zero transition, but also to ensure that opportunities are accessible and that the transition for workers is a smooth one.[40] A clearer national vision and communication of net zero and green industrial policies and how these fit into an overall economic strategy, accompanied by more participatory decision-making at the local and community level,[41] are likely to help to achieve lasting support for policies that can make the economy stronger, more resilient as well as more sustainable in the years ahead.

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38 See Corlett A and Marshall J (2022) *Shrinking footprints: The impacts of the net zero transition on households and consumption*, Resolution Foundation, https://economy2030.resolutionfoundation.org/wp-content/uploads/2022/03/Shrinking-footprints.pdf; and Anis-Alavi A, Judge L, Marshall J, McCurdy C and Tomlinson D (2022) *Hitting a brick wall: How the UK can upgrade its housing stock to reduce energy bills and cut carbon*, Resolution Foundation, https://economy2030.resolutionfoundation.org/reports/hitting-a-brick-wall

39 Climate Change Committee (2023) *A Net Zero Workforce*, Climate Change Committee. https://www.theccc.org.uk/publication/a-net-zero-workforce

40 See Broome M, Cellini S, Henehan K, McCurdy C, Riom C, Valero A and Ventura G (2022) 'Net zero jobs: the impact of the transition to net zero on the UK labour market', briefing paper, Resolution Foundation, 20 June 2022, https://economy2030.resolutionfoundation.org/reports/net-zero-jobs; and Costa R, McNally S, Murphy L, Valero A and Ventura G (2023) *Learning to grow: How to situate a skills strategy in an economic strategy*, Resolution Foundation, https://economy2030.resolutionfoundation.org/reports/learning-to-grow

41 Institute for Community Studies (2023) *Understanding household and community participation in the transition to net zero*, Institute for Community Studies. https://www.nuffieldfoundation.org/wp-content/uploads/2021/09/Net-Zero-summary-report-ICS-Nuffield-final.pdf