Sustainable growth in the UK

Seizing opportunities from technological change and the transition to a low-carbon economy

EXECUTIVE SUMMARY

Special report for the

LSE Growth Commission

CENTRE *for* ECONOMIC PERFORMANCE

Centre for Climate Change Economics and Policy

Grantham Research Institute on Climate Change and the Environment

Foreword

Improving productivity and achieving sustainable, inclusive growth are priorities for the UK government. At the same time, the UK is being reminded of the immense risks from unmanaged climate change. The authoritative new report by the Intergovernmental Panel on Climate Change sets the world a clear target: reduce emissions of greenhouse gases to net zero by the middle of this century to have a reasonable chance of limiting global warming to 1.5 degrees Celsius. It makes it clear that the difference between 1.5 and 2 degrees Celsius in terms of impacts is very powerful, showing that the Paris Agreement was wise to strive to go well below 2. Every government is encouraged to read that report and recognise the clear choice we now have: accelerate the transition to clean and sustainable growth or suffer the mounting damage from sea level rise, floods and droughts, which will severely hinder efforts to tackle poverty, raise living standards and improve prosperity.

We have to achieve these emissions reductions over a period during which the world's economy will experience a radical transformation. Global infrastructure will more than double between 2015 and 2030. The global economy will double within two decades or so if it continues to grow at about 3 per cent each year on average. And the population living in cities, where most emissions occur, will likely double in the next four decades.

The UK has a responsibility to set a strong example for the world: as a global leader on climate change action in the past, and as a country at the forefront of developing innovative plans to improve productivity and sustainable growth for the future.

The UK Government's *Industrial Strategy* and *Clean Growth Strategy* amount to a promising start but future strategy needs greater coherence and ambition if economic growth is to be sustainable over the long term. It is not sensible to promote a narrowly defined 'low-carbon sector' that contributes around 1 per cent to UK GDP while the rest of the economy gets on with a business-as-usual high-carbon path. Technical advances and policy innovations are opening up opportunities for improvements to labour and resource productivity, and sustainable growth, everywhere across the economy. This is a far more attractive way to manage the growth and environmental challenges the UK is facing.

Strong institutions and sound policies can unlock investments in infrastructure, innovation, skills and cities, driving productivity improvements and sustainable growth across the nation. Well-designed policies can foster entrepreneurship for all, deliver coherent incentives, enable greater access to opportunities and empower local communities, which are the foundation of prosperity in the UK.

The 2013 and 2017 LSE Growth Commission reports set out the institutional and policy frameworks required to stimulate investments in innovation, infrastructure and skills and to return the UK to long-run and inclusive growth. This report is a very valuable illustration of how the Growth Commission is still contributing to these central themes and, in so doing, considering how to build sustainable, stronger communities, and a new role for the UK in the world.

Tim Besley[1] **Stephen Machin**[2] **Nicholas Stern**[3]

December 2018

[1] School Professor of Economics and Political Science and W. Arthur Lewis Professor of Development Economics, Department of Economics, LSE
[2] Professor of Economics and Director of Centre for Economic Performance, LSE
[3] IG Patel Professor of Economics and Government, LSE, and Chair, Grantham Research Institute on Climate Change and the Environment, LSE

Summary of recommendations for policymakers

The recommendations in this report provide a framework and strategy for sustainable growth in the UK. They are built around four policy priority areas: innovation, infrastructure, skills and cities. The UK has existing advantages and strengths across these areas, in particular in the development of advanced technologies such as robotics, and finance for low-carbon investments. We draw attention to these throughout the analysis.

Innovation

- ***Bring together existing growth and green innovation strategies***, in particular the innovation priorities in the *Industrial Strategy* and *Clean Growth Strategy*, to ensure low-carbon and resource-efficient innovation is embedded throughout the economy.
- ***Develop UK research priorities based on a range of metrics, including positive technology spillovers***, rather than comparative advantage alone. This approach suggests high productivity benefits from R&D support for areas such as efficient aviation and marine technologies.
- ***Create a clear and credible carbon price across the economy***, both to replace the less efficient and long established patchwork approach to reducing emissions that currently exists, and to increase the coherence of incentives to help shift and align expectations towards low-carbon innovation.
- ***Work together with hard-to-decarbonise sectors to create roadmaps for achieving a circular economy by 2050***, which are designed to deliver substantial increases in resource productivity.

Infrastructure

- ***Bring together the* Industrial Strategy *and* Clean Growth Strategy *to create one coherent strategy for sustainable infrastructure investment across the economy***.
- ***Develop and publish a pipeline of clean and sustainable infrastructure investments***. The pipeline would contribute to meeting the UK's 2050 decarbonisation targets, avoid locking into capital assets that could render the UK uncompetitive or require scrapping/retrofitting, and be consistent with the recommendations of the National Infrastructure Commission and other relevant statutory bodies.
- ***Establish a National Infrastructure Bank, with an explicit sustainability mandate***, which can both signal the scale and type of sustainable finance needed from the private sector and use a range of financial instruments to 'crowd in' private finance.
- ***Develop a governance structure for infrastructure that joins up and empowers local authorities***, enabling coordination of infrastructure investments across regions and cities, in particular across housing and related infrastructure investments. ***Prioritise regions where productivity would be most responsive to higher capital intensity***.

Skills

- ***Bring together the* Industrial Strategy *and* Clean Growth Strategy *to create a single forward-looking and coherent plan for strengthening the UK's human capital for the low-carbon transition***. There should be a particular focus on improving outcomes and opportunities for disadvantaged students.

- ***Devise targeted employment transition policies in areas at high risk of disruption*** from the forces of change, such as Northeast England and South Wales, to improve the resilience of local communities.
- ***Ensure education institutions are responsive and flexible as the low-carbon transition accelerates and the demand for skills shifts***, by working closely with other economic, environmental, technological and social institutions. This will require ***better data and metrics for assessing employment changes and shifting demand for skills***.
- ***Help firms overcome barriers to in-house*** training through tax credits and partnerships with education providers.

Cities

- ***Commit to investment in smart cities across all UK regions. This commitment could be supported by a national smart city strategy***, which sits at the heart of government and is overseen by a high-level cross-ministerial committee.
- ***Foster deeper partnerships between universities, business and local policymakers***, to help build on local strengths or address local weaknesses.
- ***Devolve greater policy and fiscal autonomy to cities and regions, while concurrently building their fiscal capabilities***, building on the Cities and Local Government Devolution Act 2016, and other recent moves to empower cities.
- ***Encourage creativity and experimentation*** around policies for productivity and sustainable growth and ***improve evidence, evaluation and data collection*** to gain a better understanding of what works.

The recommendations have strong relevance for a number of areas of government. For example, all are relevant for Her Majesty's Treasury and the Department for Business, Energy & Industrial Strategy (BEIS), as they relate to growth. Recommendations at the local level apply to the Ministry of Housing, Communities & Local Government, and recommendations around education policy apply to the Department for Education. The recommendations also apply to the Department for International Development (DfID), which can export the UK's sustainable growth model through its international private and public sector development activities.

Executive summary

Sustainable and inclusive growth is a priority

Promoting strong, sustainable, balanced and inclusive growth is a priority for G20 governments, including the United Kingdom's, reflecting the need to drive improvements in labour and resource productivity through more and better investments in innovation, infrastructure and skills. This summary report shows why it is sensible for environmental sustainability to be at the heart of the UK's growth strategy and how this can be achieved.

This report builds on the reports of the LSE Growth Commission (2013, 2017), which laid out a blueprint for boosting growth in the UK and its inclusiveness via institutional and policy reforms to drive investment in these complementary areas. It embraces, deepens and strengthens the previous reports in light of technical advances, a stronger understanding of environmental issues, and the changing politics and economy of a UK that is building a new role in the world. It recognises the challenge of managing global trends, powerful forces that are transforming the UK economy, including the impacts of technological progress, including artificial intelligence and robotics, and globalisation. Such forces are impacting regions and communities in different ways, with the North of England facing particularly challenging adjustments.

The pursuit of sustainable growth and the low-carbon transition provides opportunities for investment that are likely to improve labour and resource productivity across the UK's communities and regions. At its essence, this report is about managing change and shifting resources from low-productivity, slow-growing sectors to high-productivity sectors with strong prospects for future growth. It is not about costs and burdens, but investments with attractive returns. The report does not attempt to predict whether the future will be high- or low-carbon, nor how much the various pathways will cost: it is about setting out a strategy that minimises the risks associated with a low-carbon transition and puts the UK in the best position to capitalise on its existing strengths and seize the opportunities.

The transition to a low-carbon economy and sustainable growth is highly likely. Action is urgently needed to avoid lock-in to high-carbon investments, institutions and behaviours, and future climate impacts: the longer we wait, the costlier the transition will be, due to both higher economic costs and climate change. The rapid pace of technological change today, for example the falling cost of renewable energy, and lessons from the history of past technological transformations, make it clear that achieving a net-zero-carbon economy is entirely consistent with continued strong growth in gross domestic product (GDP).

This does not mean action on climate change will all be win-win. Achieving net-zero and a full decoupling of scarce environmental resources from output will require some tough decisions and trade-offs involving material consumption. The extent and cost of these trade-offs will depend, in part, on how well the Government manages the transition. While important discussion of these trade-offs continues, the UK can and should get on with the up to 90 per cent or so reductions in levels of greenhouse gases that the New Climate Economy work argues can be achieved at net zero cost (or even positive gains) to GDP, relative to achieving a target of limiting global warming to 2°C. The case for early and strong growth-enhancing action is strong.

The UK government recognises the economic opportunities from 'clean growth' and a net zero-carbon economy, as evidenced by its *Industrial Strategy* and *Clean Growth Strategy*. However, it is essential that these are integrated into one coherent strategy that considers *sustainable growth everywhere*. Policies need to go beyond a static focus on a single,

narrowly-defined 'low-carbon' sector that contributes around 1 per cent of UK GDP today, while the other 99 per cent of the economy gets on with the real business of growth. Future growth is about sustainable growth and a net-zero-carbon economy that is resilient to the changes that are likely to characterise the 21st century. It will involve all economic sectors and regions, and has the potential to empower local communities, foster entrepreneurship and improve living standards across society.

Challenges for UK policymakers

Recent developments have increased policy uncertainty and called into question the extent of government's overarching commitment to sustainable growth and a net-zero-carbon economy. Examples include the possible relaxation of fracking rules, the continued freeze on fuel duty, uncertainty around the future of carbon pricing, and the end of hybrid vehicle subsidies, to name just a few.

While government wavering increases policy uncertainty and hinders investment, technological progress and other advances are accelerating, presenting new opportunities for enhanced labour and resource productivity and sustainable growth. Few anticipated the rapid technological transformations and other changes we have seen over the past decade. For example, innovations like the iPhone have enabled new disruptive business models such as Uber's. The latest wave of innovations, including artificial intelligence, automation/robotics and other emerging technologies, where the UK has many strengths, as they integrate with the information and communications technology (ICT) revolution and the low-carbon transition, could lead to further unanticipated productivity surprises. Technological, economic and social tipping points could be reached sooner than anticipated as old networks and technologies are replaced by new.

There is great potential in the UK, for example, for electric vehicles to integrate self-driving technologies and car-sharing ownership models, cutting congestion and vehicle emissions. The UK is looking to lead on electric and autonomous vehicles, and is particularly strong here, but for it to do so cities and transport systems have to be recast and its strengths in finance used to ensure that the necessary investments are made. The work of bodies like the Green Finance Initiative, and the work on green finance that has come before, including from the United Nations Environment Programme (UNEP) Inquiry into the Design of a Sustainable Financial System and the New Climate Economy, can ensure the UK strengthens its leadership in green finance.

If the transition is managed poorly it is likely to generate social disruption, powerful resistance to change and lead to erosion of the UK's technology and finance leadership. Investing in institutional capital to help take advantage of change and insure against its worst effects will be vital to ensuring a successful and 'just' transition.

The challenge for UK policymakers is to design effective, clear and supportive institutional and policy frameworks, with coherent incentives that drive improvements in labour and resource productivity and sustainable growth across the economy, while also limiting the risks of disruption and dislocation from the low-carbon transition. These institutions and policies should encourage investment across a diverse set of complementary assets; for example, investment in educational or research institutions located next to transport hubs (think of science hubs locating next to Cambridge rail station or the Crick Institute locating near St Pancras International). They should also promote economic flexibility and the capacity to diffuse and absorb knowledge and innovation.

A well-managed transition to a low-carbon economy, which includes clear and credible institutional and policy reforms, can take advantage of the opportunities for investments in innovation, infrastructure, skills and cities. These investments have attractive returns which can help to reduce or eliminate economic costs and drive productivity improvements and

sustainable growth across the economy. The report provides evidence that shows, with well-designed, coherent policy frameworks, there is greater potential for a sustainable growth path to deliver higher productivity and GDP than a high-carbon counterfactual scenario, while making the UK's cities and regions better places to live in.

The UK is likely to face risks and powerful forces of change over the coming decades. No future growth path can be guaranteed with certainty. However, it is possible to develop a resilient, diverse and flexible asset base with which to manage that change and improve prospects for achieving a prosperous UK in the 21st century.

There is no existing empirical database to use in an assessment of how best to manage a coordinated, global low-carbon transition. Nevertheless, this report develops a range of specific recommendations, which are based on similar periods of change in the UK's past, during which innovative institutions and policies were developed in response to the challenges of those times. It also draws conclusions based on an understanding of the dynamic interaction of key social, economic and technological drivers of change.

Four policy priority areas

Consistent with the focus of the reports of the LSE Growth Commission (2013, 2017), this report examines institutional and policy priorities in four key mutually-supportive areas. The right investments in these areas can drive labour and resource productivity, resulting in a growth path that is both sustainable and inclusive. They are: innovation, infrastructure, skills, and smart cities – all areas that are home to the UK's key assets, are recognised as crucial drivers of productivity growth, and are also likely to be determinants of the UK's success at managing the low-carbon transition. Moreover, they are areas where many of the UK's strengths apply and can be leveraged, including the development of cutting-edge technologies and financial services, but where the UK can also do better than it has in the past.

Below we summarise our core recommendations in each area.

1. Innovation

Innovation is fundamental for productivity and growth, and for getting the most out of the resources we have. However, innovation is in general underprovided by the private sector because of knowledge spillovers: innovations by one firm 'spill over' and provide valuable information that leads to new inventions in other firms. This market failure justifies government intervention to increase the rate of innovation, via direct investment and policies to incentivise private sector investment. Moreover, government can influence the direction of new innovations, such that they are consistent with sustainable growth.

UK spending (public and private) on research and development (R&D) as a share of GDP is consistently lower than its major peers'. R&D on energy technologies is particularly low by historical standards, at under 0.02 per cent of GDP today, compared with around 0.1 per cent in the early 1990s. Recent evidence suggests that spillovers generated by low-carbon innovation may be significantly higher than for high-carbon technologies, increasing the potential for low-carbon R&D to raise productivity and growth relative to a high-carbon counterfactual scenario. For example, evidence suggests that spillovers from low-carbon innovation in the energy production and transport sectors are over 40 per cent greater than from conventional technologies. Innovation spillovers are therefore a useful metric for assessing where government R&D support should be targeted, and could be more effective and forward-looking than metrics based on comparative advantage alone.

The analysis of innovation in this report, based on patent data, seeks to assess which sectors have a comparative advantage in the UK and which are prone to productivity-boosting domestic technology spillovers. It finds that some sectors, such as marine energy, fulfil both criteria and yet are subject to diminishing support by the UK government. Others, such as

support for clean vehicles, must be carefully considered as they are unlikely to have as many benefits for UK productivity.

Beyond innovation, promoting the diffusion and uptake of low-carbon technologies requires carefully designed policies to tackle the market failures that hold them back, including unpriced greenhouse gases, finance constraints and incomplete information. A priority area for reform is carbon pricing. As the UK redefines its relationship with the EU and the rest of the world, it would be sensible to revisit carbon pricing and adopt a broader and more effective domestic policy. Innovations are also increasing the potential for circular economy business models that radically improve resource productivity. Extensive expansion of circular economy activities in the UK could create around half a million jobs (gross), reduce unemployment by over 100,000, and potentially offset close to 20 per cent of the expected loss in skilled employment over the next decade from globalisation and industrial change in the UK.

Innovation – summary of recommendations for policymakers:

- Bring together existing growth and green innovation strategies, in particular the innovation priorities in the *Industrial Strategy* and *Clean Growth Strategy*, to ensure low-carbon and resource-efficient innovation is embedded throughout the economy.
- Develop UK research priorities based on a range of metrics, including positive technology spillovers, rather than comparative advantage alone. This approach suggests high productivity benefits from R&D support for areas such as efficient aviation and marine technologies.
- Create a clear and credible carbon price across the economy, both to replace the less efficient and long-established patchwork approach to reducing emissions that currently exists, and to increase the coherence of incentives to help shift and align expectations towards low-carbon innovation.
- Work together with hard-to-decarbonise sectors to create roadmaps for achieving a circular economy by 2050, which include measures such as lower taxes on reused materials, and which are designed to deliver substantial increases in resource productivity.

2. Infrastructure

Infrastructure creates networks that spur creativity, innovation and productivity across key economic assets and systems, thereby linking cities and regions. It is an essential input for sustainable and inclusive growth. For example, evidence suggests that a 10 per cent increase in the broadband penetration rate in OECD countries from 1996 to 2007 resulted in a 0.9 to 1.5 per cent increase in annual per capita growth.

Infrastructure is long-lived and locks in emissions and resilience patterns for decades. Infrastructure is also likely to be underprovided by the private sector due to market failures around finance and coordination, in particular due to the long-term, large-scale and high-risk nature of infrastructure projects.

The UK's infrastructure is not fit for the 21st century due to years of underinvestment. Public investment in infrastructure, as a share of GDP, is lower than in the United States, France, Canada and Switzerland and has been since the late 1970s, and the perceived quality of UK infrastructure assets is below that of other G7 nations. This is constraining aggregate growth and regional development.

Government action to strengthen the relevant institutions and policies would crowd in investment in sustainable infrastructure. Investing in the right institutions is key; investing in the wrong institutions or underinvesting in the right ones can leave institutional assets stranded. Scaling and shifting private finance for sustainable infrastructure investments is also needed and is likely to require systemic transformation of the finance sector. The work of bodies like the

Green Finance Initiative is crucial here. Now is the time to invest. With positive social returns on these investments and historically low real interest rates, there is strong evidence that such investments will pay for themselves in the long run.

While sustainable infrastructure may require higher upfront capital – these investments will not be costless and not all will pay off quickly – in most cases the social payback period will be fast and the dynamic benefits to the UK economy significant. By contrast, the risks associated with delaying such investment, including lock-in to high-carbon assets and institutions, are high.

Infrastructure – summary of recommendations for policymakers:

- Bring together the *Industrial Strategy* and *Clean Growth Strategy* to create one coherent strategy for sustainable infrastructure investment across the economy.
- Develop and publish a pipeline of clean and sustainable infrastructure investments. The pipeline would contribute to meeting the UK's 2050 decarbonisation targets, avoid locking into capital assets that could render the UK uncompetitive or require scrapping/retrofitting, and be consistent with the recommendations of the National Infrastructure Commission and other relevant statutory bodies.
- Establish a National Infrastructure Bank, with an explicit sustainability mandate, which can both signal the scale and type of sustainable finance needed from the private sector and use a range of financial instruments to 'crowd in' private finance.
- Develop a governance structure for infrastructure that joins up and empowers local authorities, enabling coordination of infrastructure investments across regions and cities, in particular across housing and related infrastructure investments. Prioritise regions where productivity would be most responsive to higher capital intensity, and where network and agglomeration effects can be exploited to support low-carbon innovation hubs.

3. Skills

Workforce skills, or more broadly, 'human capital', are a key driver of labour productivity and crucial for improving economic opportunities and social mobility. As the low-carbon transition intertwines with emerging technologies such as artificial intelligence (AI), the nature of work and skills needed could change radically and rapidly. If the transition is managed badly, there is potential for disruption and hardship for workers, and constraints on growth. Poor policy decisions will mean locking individuals and communities into outdated skills and human capital, which can be left stranded or devalued as the world moves on.

A key role for government is to create a strong institutional framework and sound policies for flexible labour markets and a 'just transition' for workers. This will be necessary during a process of creative destruction whereby the demand for some existing occupations or skills might disappear and demand for new low-carbon jobs will emerge. Universities, colleges, schools and employers have key roles to play in equipping workers to deal with and embrace inevitable change throughout their lives. Equipping people with the right skills and resilience to changing labour markets can limit the harm to people's lives and livelihoods from potential and actual job displacement. Investors and financial markets, as stewards of assets and allocators of capital, can also make a valuable contribution to achieving a 'just transition'. This can help to maximise productivity gains from the low-carbon transition.

Skills – summary of recommendations for policymakers:

- Bring together the *Industrial Strategy* and *Clean Growth Strategy* to create a single forward-looking and coherent plan for strengthening the UK's human capital for the low-carbon transition. This would coordinate investments across all levels of government and institutions, including across all education levels, with the aim of maximising adaptability to technological change, fostering entrepreneurship, and increasing the ability of workers

to re-skill or up-skill through lifelong learning. There should be a particular focus on improving outcomes and opportunities for disadvantaged students.
- Devise targeted employment transition policies in areas at high risk of disruption from the forces of change, such as Northeast England and South Wales, to improve the resilience of local communities.
- Ensure education institutions are responsive and flexible as the low-carbon transition accelerates and the demand for skills shifts, by working closely with other economic, environmental, technological and social institutions. This will require better data and metrics for assessing employment changes and shifting demand for skills.
- Help firms overcome barriers to in-house training through tax credits and partnerships with education providers.

4. Cities

Cities are central to the UK's economic and social success. Around 55 per cent of UK residents, around 35 million people, live in cities and the four largest UK cities (London, Birmingham, Manchester and Glasgow) are home to almost a quarter of the total UK population. London alone accounts for around 23 per cent of total UK gross value added (GVA). Cities are areas where physical and human capital combine to spur creativity and innovation, which is particularly important in the UK's service-driven 'knowledge economy'. As hubs of productivity and economic growth the Government has rightly positioned them at the centre of UK growth strategy.

The UK's cities face considerable sustainability challenges, including congestion, air pollution, urban sprawl and climate change impacts such as flooding. The nature of these challenges implies a crucial role for local and national government in tackling them. Well-planned and governed cities that are compact, efficient, interconnected and make appropriate use of technology – so-called 'smart cities' – can maximise agglomeration economies, benefitting the flow of people, ideas, creativity and low-carbon innovation.

Developing smart cities across the UK is crucial for improving the performance of the regions. Progress on development in the North, for example, can be accelerated through further devolution of political and fiscal powers. This would enable local residents to have a greater say in investment plans for the smart cities where they will live. There is no trade-off between sustainability and growth at the urban level: polluted, congested, unattractive cities create alienation and fail to attract skilled labour and capital.

Cities – summary of recommendations for policymakers:

- Commit to investment in smart cities across all UK regions. This commitment could be supported by a national smart city strategy, which sits at the heart of government and is overseen by a high-level cross-ministerial committee. This should be coordinated and aligned with local industrial strategies, local city development and decarbonisation plans, and aligned with national emissions reduction commitments.
- Foster deeper partnerships between universities, business and local policymakers, to help build on local strengths or address local weaknesses.
- Devolve greater policy and fiscal autonomy to cities and regions, while concurrently building their fiscal capabilities, building on the Cities and Local Government Devolution Act 2016, and other recent moves to empower cities. This will enable local communities to have a greater say in future investment plans for the smart cities where they will live.
- Encourage creativity and experimentation around policies for productivity and sustainable growth and improve evidence, evaluation and data collection to gain a better understanding of what works.

There are no guarantees that investing in a coordinated set of policies to manage a low-carbon future will boost the UK's productivity performance. And economic models are of limited help as they were never designed to estimate the costs and benefits of long-run policies for large non-marginal transformations. However, the evidence suggests that a more sustainable and inclusive growth path will bring great opportunities, and that the alternative of investing in high-carbon, resource-intensive infrastructure, behaviours and institutions will be an economically and socially risky proposition, potentially to the detriment of the economy and UK citizens. The risks of inaction go well beyond climate change, and could see the UK left behind in a rapidly changing world.

This report finds that although there are uncertainties with every option, a rigorous risk management and hedging strategy should acknowledge the likelihood that the future will be resource-efficient and low-carbon, and therefore the UK should capitalise on its strengths in the development of cutting-edge technologies and financial services, and grasp the opportunities from sustainable growth.

Acknowledgements

The authors thank the following for their insightful comments: Tim Besley, Russell Bishop, Josh Burke, Alex Bowen, Alon Carmel, Ben Combes, Sam Fankhauser, Nick Godfrey, Cameron Hepburn, Stephen Machin, Mirabelle Mûuls, Alexander Pfeiffer, Nick Robins, Philipp Rode and Bob Ward. Georgina Kyriacou edited the report. Funding from the ESRC for the Centre for Economic Performance 'Informing the Industrial Strategy' project (ESRC ES/S000097/1) is gratefully acknowledged. This work contains statistical data from the ONS which is Crown Copyright. The use of ONS statistical data does not imply the endorsement of the ONS in relation to the interpretation or analysis of the data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

Lead authors

James Rydge, Policy Fellow, Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science

Ralf Martin, Associate Professor of Economics, Imperial College Business School and Programme Director, Centre for Economic Performance, London School of Economics and Political Science

Anna Valero, ESRC Innovation Fellow, Centre for Economic Performance, London School of Economics and Political Science

Contributing authors

Samuela Bassi, former Policy Fellow, Grantham Research Institute on Climate Change and the Environment

Sandra Bernick, Occasional Research Assistant, Centre for Economic Performance, and Economics PhD candidate, Imperial College Business School

Arlan Brucal, Research Officer, Grantham Research Institute on Climate Change and the Environment

Maria Carvalho, Policy Analyst, Grantham Research Institute on Climate Change and the Environment

James Hamilton, PhD candidate, Sustainable Gas Institute, Imperial College London

Tobias Kruse, Occasional Research Assistant, Grantham Research Institute on Climate Change and the Environment, and PhD candidate in the Department of Geography, LSE

Karlygash Kuralbayeva, Lecturer in Economics, Department of Political Economy, King's College London

Myra Mohnen, Assistant Professor, Department of Economics, University of Essex

Misato Sato, Assistant Professorial Research Fellow, Grantham Research Institute on Climate Change and the Environment, and Deputy Director, CCCEP

Nicholas Stern, IG Patel Professor of Economics and Government, LSE, and Chair, Grantham Research Institute on Climate Change and the Environment

Dimitri Zenghelis, Visiting Research Fellow, Grantham Research Institute on Climate Change and the Environment

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The recommendations provide a framework and strategy for sustainable growth in the UK. They are built around four policy priority areas: innovation, infrastructure, skills and cities.

The recommendations have strong relevance for a number of areas of government, including Her Majesty's Treasury and the Department for Business, Energy & Industrial Strategy, as well as the Ministry of Housing, Communities & Local Government, the Department for Education, and the Department for International Development.

Download the full report at:

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