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A series of background briefings on the policy issues arising from the Covid-19 pandemic

Strategy, investment and policy for a strong and sustainable recovery: An action plan

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A CEP Covid-19 analysis

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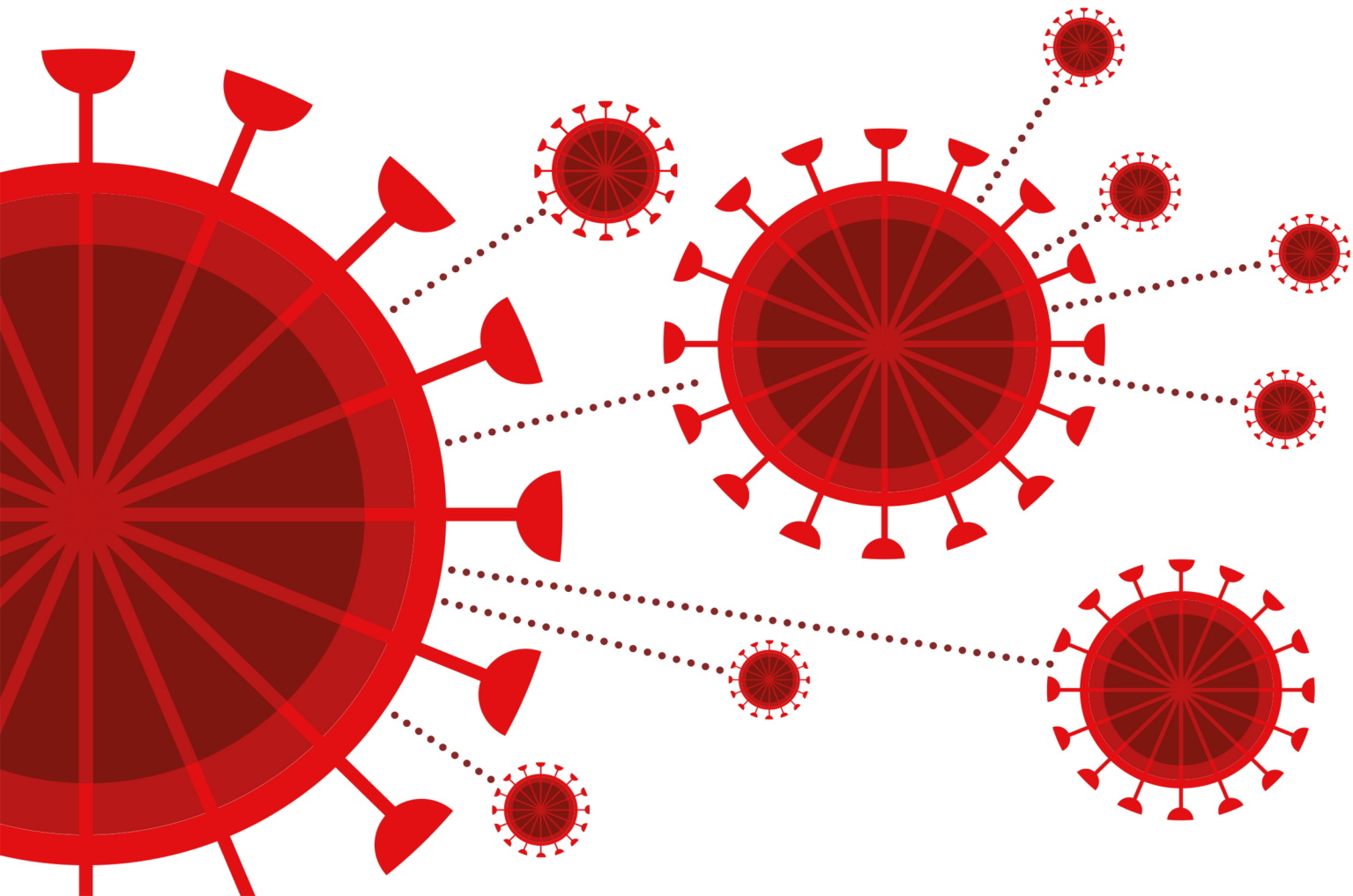

CENTRE *for* ECONOMIC PERFORMANCE

Strategy, Investment and Policy for a Strong and Sustainable Recovery: An Action Plan[1]

CEP COVID-19 ANALYSIS

Nicholas Stern, Sam Unsworth, Anna Valero, Dimitri Zenghelis, James Rydge, Nick Robins

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Summary

The UK and the world have suffered disruption and hardship from the COVID-19 pandemic on an immense scale. Together with the tragic consequences of the health crisis, there is now a real risk of protracted global depression. Strong and timely action can increase confidence, steer expectations and channel productive private and public investment into a sustainable, inclusive and resilient recovery across the UK.

Such a recovery should be guided by a clear vision and strategy involving both the public and private sectors, and can be framed by and embody the government's previously stated goals of levelling up across the UK; boosting productivity; investing in infrastructure; reaching net-zero greenhouse gas emissions by 2050; and forging a new role for 'Global Britain'. This should be embedded in an understanding of, and commitment to, 'building back better'.

Several critical actions by the government are needed to deliver a strong and sustainable recovery. These do not form an exhaustive list, but should be at the core of a coherent strategy and policy framework driving towards these goals across the entire economy. Furthermore, these actions and priorities are key to sustainable, resilient and inclusive growth in the UK beyond the recovery over the next few decades.

- **A clear macroeconomic vision to restore confidence, create jobs and grow the economy out of post-COVID recession and debt** by supporting activity in the short term and expanding productive capacity in the medium term. There will be a need to ensure fiscal and monetary policy work together to guide liquidity and savings towards the growth of productive sectors.
- **Institutional reform to expand capacity, build back better, create new opportunities for all and manage long-run risks**. This requires building a credible industrial strategy to drive the economy forward, rolling out new networks and ensuring all investment is compatible with a resource efficient, low-carbon economy. Policy reform is required, both to deal with the UK's other pre-COVID challenges, and in order to make investments as productive and sustainable as possible. Measures should cover pricing and regulation, industrial policy, innovation, labour markets, skills and education, competition policy, and foreign policy. This programme of reform will also require devolution to deliver greater policy and fiscal autonomy to cities and regions, building on the Cities and Local Government Devolution Act 2016.

[1] This note builds upon the discussions in the Royal Economic Society webinar series which took place in May, 2020. Andy Haldane, Tim Besley and Gus O'Donnell provided valuable guidance and participated in the seminars. The note has benefited from the insights shared by all of the webinar participants, listed here. Capucine Riom, Gonzalo Nunez-Chaim, Joshua Hardman and Katharina Ziegler provided invaluable research inputs regarding investments made under the net-zero programme. We are grateful to the following for their helpful comments on the draft: Bob Ward, Stephen Machin, Henry Overman and Helen Ward. We are grateful for support from STICERD, the Grantham Research Institute on Climate Change and the Environment, and the CCCEP/ESRC at the LSE. Financial support from the ESRC via the Centre for Economic Performance, and in addition under grant ES/S001735/1 is gratefully acknowledged.

- **Build capacity and resilience by investing in vital assets** necessary for an innovative, prosperous and competitive economy. These are mutually enhancing and include:
    - **Physical capital, boosted by leveraging private finance through creating new markets and establishing a new National Investment Bank**. The Bank could crowd in private finance and bring forward sustainable infrastructure projects at scale. Strategic investments in projects, such as retrofitting buildings to make them more efficient and resilient, can create new jobs now and build capacity, for instance in broadband infrastructure, for a smart, digital future. It could be established quickly and play an important part in the extensive refinancing necessary as we move into the recovery phase.
    - **Human capital, enhanced by creating the skills and jobs necessary for the 21st century.** This means reskilling workers to enable those affected by change to participate in the new economy – thereby 'levelling up' opportunities and regions by investing in people. This also includes avoiding labour market scarring by providing job guarantees - including in sustainable projects - for those at risk of unemployment, alongside investment in further education and lifelong learning. A strong focus on disadvantaged students, who risk falling further behind, should be central.
    - **Knowledge capital and innovation, fostered by accelerating the drive to reach a target for R&D investment of 2.4% of GDP through a mixture of increased funding and further incentives for business innovation, including enhanced incentives for clean innovation.** The government should accelerate the establishment of a clean innovation mission through a revised Industrial Strategy. It should also strengthen the UK's research and development capabilities and collaboration between universities, industry and local policymakers. The UK's research is a vital element in its comparative advantage and future as 'Global Britain'. It is essential to enhance R&D and take more of it through to innovation.
    - **Natural capital, strengthened directly through carefully designed ecosystems creation, preservation and restoration projects**. This means investing in land restoration, trees and water management and curbing pollution. This must be supported indirectly through projects such as active and accessible travel infrastructure which result in cleaner air, improved health and expanded green spaces. Reforms to agricultural support will play an important role.
    - **Social capital, enhanced by developing a vision and strategy for an inclusive and sustainable recovery that can gain support from businesses and communities and creates opportunities for all**. There cannot be a return to austerity based on cuts in public spending and undermining the quality and resilience of public services. To achieve this, it will be important to involve local Mayors and key stakeholders with local knowledge in the design of the recovery package and to utilise the latest innovations in public participation, such as Citizens' Assemblies. Consideration must be given to embedding sustainable behaviour such as virtual working and pedestrianisation of streets. Participation, equity and opportunity are interwoven with social cohesion.
- A well-designed package for a sustainable recovery should help to redefine and strengthen the UK's place in the world. As the UK assumes the leadership of the G7 and works to deliver a successful and ambitious COP26 in 2021, a domestic economic recovery that is strong, sustainable, inclusive and resilient will provide added credibility to foster and lead collaborative efforts to build global sustainability and resilience, and accelerate the transition to zero-carbon economic growth.

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Introduction

Compared to the global financial crisis of 2008-9, the COVID-19 crisis has already had both a deeper and broader economic impact, alongside the tragic direct consequences of the health crisis. Between February and April, the UK economy shrunk by a quarter, a contraction three-and-a-half times as big as the 6.8 % decline (peak-to-trough) in the 2008 crisis (Office for National Statistics, 2020). Moreover, this is a truly global crisis, both in terms of the collapse in output and the collapse in demand. This raises questions about the vision and strategy for investments and policies to drive a strong and sustainable recovery. The UK can now contribute to global efforts to avoid a depression, while delivering on overarching governmental objectives including reaching net-zero emissions by 2050 and reducing inequalities across and within regions.

A recent study identified over 300 policies for economic stimulus of significant magnitude that have already been implemented in G20 countries (Hepburn et al., 2020). The vast majority of these are 'rescue' rather than 'recovery' policies, including significant compensation schemes for workers and businesses which protect livelihoods. An example is the UK's Coronavirus Job Retention Scheme (UK Coronavirus Act, 2020). Thus far, such policies have paid limited attention to sustainability and resilience, but the UK is doing better than many other countries in supporting decarbonisation, reflecting support which goes to its lower-emissions service oriented economy (Vivid Economics, 2020).

While policies enacted in the rescue phase have been focused on protecting as many jobs as possible based on the current structure of the economy, policymaking for the recovery that aims to create good quality and future-proof jobs should seize this opportunity to build back better. A continued commitment to a net-zero emissions trajectory will be critical to the UK's economic and environmental wellbeing in the long term. In order that a sustainable recovery is also inclusive, it should include policies that can enable a 'just transition' for those that will be displaced by both the transition to zero-carbon growth and the broader structural transformations already underway such as automation.

In the recovery phase, borrowing for productive investment in long-term assets can be distinguished analytically from immediate and highly necessary spending on public services and general packages of support for businesses, which will continue to be required for some time given the severity of the shock. There is now the opportunity to form a new implicit social contract which recognises the need for higher public debt and equitable taxation. It must be emphasised that the finance raised through these means will provide material benefits to citizens in relation to the critical social issues highlighted most acutely during the crisis, such as deep and widening inequalities. Investments in productive and sustainable assets will enable the UK to service its increased debts via the tax revenues resulting from economic growth.

This briefing paper sets out the key areas where strong economic policies will be needed to boost investment in physical, human, knowledge, natural and social capital in order to avoid a protracted global depression and to allow the government to meet its strategic objectives. This paper builds on the discussions that took place in the Royal Economic Society's webinar series on a 'Strong and sustainable recovery from COVID-19', chaired by Professor Lord Stern. Full recordings of the webinars can be found on the Grantham Research Institute website (Grantham Research Institute, 2020).

The overarching strategic challenge - restoring confidence

Imbalances in the global economy predate the pandemic: for more than a decade, there has been too much global saving alongside too little productive investment (Lukasz and Smith, 2015). This has resulted in the price of borrowing - the real interest rate - falling close to zero, and an increase in corporate borrowing. The global stock of non-financial corporate debt was at record levels of $74tn in Q3 2019 (Tiftik et al., 2020).

Increasing indebtedness of firms and banks has heightened financial sector vulnerability to the systemic risk of default. Instead of going into productive new investment, global savings have been channelled into existing assets, inflating their price. For many companies, amassing debt has been a deliberate strategy aimed at maximising returns through share buybacks and large dividends (McCrum, 2018).

In the UK, this lack of productive investment has resulted in productivity growth that has been particularly weak by international standards (Valero and Van Reenen, 2019) and stagnant real wages (Costa and Machin, 2019). Moreover, inequality and underinvestment in public services has undermined the social contract, contributing towards popular discontent and a further rise in saving because the rich who benefit save relatively more (Eggertsson and Mehrotra 2017, Bofinger and Scheuermeyer, 2016).

Moving the economy onto a sustainable and inclusive growth path, and avoiding risks of a downward spiral into depression, will require careful management. Even after lockdown measures have been fully lifted, uncertainty and lack of confidence in the economic outlook will likely persist. Many viable businesses might not survive, while skills will have atrophied, and a continued lack of confidence will hold back investment. Fear of economic depression, or of continued recession, can all too easily become a self-fulfilling prophecy as banks cut lending, businesses trim jobs, and investment and individuals curtail spending (DeLong and Summers 2012).

A key objective of any recovery package is to stabilise expectations and channel surplus desired saving into productive investment (on channelling savings into investment, see for example Zenghelis, 2016). A strong and sustainable recovery requires strategy, policy and investment to stimulate demand in the short run together with boosting investments in productive, environmentally sustainable assets that expand capacity, foster productivity growth and build resilience in the medium to longer term. This will require public spending, together with sound policies and incentives which encourage all stakeholders to collectively build back better. Previous studies have highlighted opportunities associated with sustainable growth (Rydge et al., 2018; Unsworth et al., 2020a), and the need for urgent action (Unsworth et al., 2020b). The severity of the COVID-19 crisis and the scale of the economic response required in the rescue phase and into recovery make the need for a new economic model all the more pressing.

Fiscal policy: borrowing, spending and a carbon price

Fiscal policy to restore confidence and stimulate growth

Public borrowing to fund investment can get people back to work and stimulate demand in the short run, while building capacity and supply into the medium and long run. It has been shown that GDP multipliers of government purchases are larger in recession (see, for example, Auerbach and Gorodnichenko, 2012; Blanchard and Leigh, 2013). Each percentage point of GDP spent on investment can be expected to increase GDP ultimately by around 2% to 3% (Hepburn et al., 2020).

There may be concerns about the growing public sector debt required to pay for these investments; and in the medium term, higher government spending is likely to crowd out private investment. If lenders fear that the government may renege on repaying public-sector debt in full, default risk premia and inflation premia on government bonds may rise sharply, tightening credit conditions and increasing the cost of public investment. However, none of these conditions are likely to apply for the foreseeable future. To the extent that fiscal sustainability requires moving towards current budget balancing over the medium term, this is best achieved through private net investment increasing, allowing public borrowing to be reduced. Carbon pricing and environmental taxation can help to shift incentives towards green recovery strategies and generate valuable revenues while increasing economic efficiency (Burke et al., 2020).

A premature tightening of public budgets is likely to damage growth and hence make debt sustainability even harder to achieve. Into the medium term, provided recovery plans avoid depression, higher debt remains historically affordable. The fact that the market expects yields on government bonds (gilts) to remain below zero (see Bank of England, 2020) reflects abundant investor appetite for public debt to support increased investment. The standard equation for debt dynamics helps to illustrate this (see for example Turner and Spinelli, 2012). The key message is that, for a given primary balance (public borrowing after interest payments) and initial net debt ratio, the rate of increase in the debt-to-GDP ratio is positively related to the interest rate-growth differential. Therefore, if a country's nominal GDP growth is higher than the rate of interest charged on its stock of debt, its debt-to-GDP ratio will fall.

If the UK's recovery plan can restore the nominal growth rate to around 4%[2] and the interest rate is around 2%, this suggests the UK can run a primary deficit of the order of 2% of GDP while keeping the debt-to-GDP ratio unchanged. Such a deficit can be spent on public investments in green infrastructure (Zenghelis, 2016), R&D, education and skills – all of which provide a boost for growth. Once interest payments are included, the medium-term sustainable deficit in the UK is of the order of 4-5% GDP.

But the returns to targeted public sector investment go further still. Higher growth not only reduces the debt-to-GDP ratio by expanding GDP, it also slows the rate at which debt is likely increase. For example, if targeted investment generates a multiplier of 3, then 1% of GDP in extra borrowing can be expected to raise GDP by 3% thereby generating public revenues sufficient to reduce the public deficit by around 1% of GDP. This combined effect on both the numerator and denominator of the debt-to-GDP ratio explains why, under the right conditions, borrowing to invest can be more sustainable in terms of public debt management than seeking to directly target balanced budgets. Moreover, growing out of debt and the post-COVID recession has the additional merit of generating more jobs, boosting productivity and wages and contributing towards a more content electorate.

The importance of generating productive and sustainable investment

The UK has lagged behind other major economies on investment over the past 25 years. Gross fixed capital formation (GFCF) averaged 17% of GDP in the UK over 1995-2018, compared with 21% and 22% in Germany and France, respectively, and 24% for OECD countries as a whole (World Bank, 2020). The need for increasing investment in productive assets has been highlighted by many (see for example, LSE Growth Commission, 2013, 2017).

[2] The average annual nominal GDP growth rate the UK over 2010-2019 was 3.6%.

There is a strong case for ensuring that such investments are made in sustainable assets (see, for example, Rydge et al., 2018, and Unsworth et al., 2020b). At the time of the 2008 financial crisis, analysis demonstrated the improved economic returns from clean energy infrastructure over fossil fuel investments, estimating that they would create twice as many jobs per dollar spent (Pollin et al., 2008). Over time, the case for investment in clean energy infrastructure has been further strengthened by the falling costs of key technologies relevant for the UK energy system such as offshore wind. In the long term, the economic multipliers are also estimated to be high, as the operation and maintenance of more energy efficient technologies makes them less labour-intensive, and energy cost savings are passed on to the wider economy (see for example, Blyth et al. 2014 and Hepburn et al., 2020). Clean innovation is particularly effective at generating productivity gains from discovery (Aghion et al., 2016), as already witnessed in the dramatic declines observed in the costs of renewable energy, battery storage and electric vehicles. Credible public policy plays a central role in guiding investors (Van der Meijden and Smulders, 2017). An alternative strategy of using public money to support fossil-fuel intensive infrastructure with limited productivity potential is likely to prove wasteful.

Over and above power generation infrastructure, there are a broad range of net-zero aligned investments to choose from which now have a stronger evidence regarding their economic benefits than was the case in 2008. For instance, construction projects like insulation retrofits (or active travel infrastructure, installing broadband networks, planting trees and restoring wetlands) are less import intensive than many traditional stimulus measures and may lower long-term energy costs (Committee on Climate Change, 2020). The speed of implementation – and extent of 'shovel readiness' - varies between types of investment, but this is primarily a function of government commitment and willingness.

In light of the COVID-19 crisis and the urgent requirement to generate both employment opportunities and boost growth, potential investments can be assessed based on a set of key criteria including speed of implementation, labour intensity (and hence job creation potential), evidence on multipliers and consideration of how investments may deliver broader benefits to growth and wellbeing. The government's net zero programme, consistent with meeting the UK's carbon budgets, provides a number of specific investment-focused plans that meet these criteria. Three examples - building energy efficiency retrofits; active travel infrastructure and natural capital investments - are set out in Annex 1.

The evidence gathered in Annex 1 supports the strategic case for net-zero aligned investments in the recovery, which – due to the localised nature of many of these projects – could also help government deliver on the levelling up agenda. Furthermore, it builds on broader evidence that sustainable investment policies perform well in terms of fiscal multipliers in comparison with 'brown' investments (Wei et al., 2010). The third-party evidence gathered indicates that these types of investment could spur a combination of direct economic benefits in the short and long run – such as multipliers and productivity gains. Further work is planned in the coming months to evaluate analyses of the economic and societal impact of investments which align with the UK's net-zero commitment, and which are likely to play a part in the UK's recovery from COVID-19.

Alongside direct economic benefits, Annex 1 also indicates broader benefits such as reduced air pollution, improved health outcomes and wellbeing. These broader benefits can be framed as bolstering the UK's natural, social, human and physical capital, which could contribute to the long-term sustainability of growth (Bennett Institute, 2020). For instance, natural capital investments could create employment opportunities in remote and marginalised areas of the UK, and energy efficiency

improvements could make homes more liveable for energy poor households. The COVID-19 crisis has reminded the world of the urgent need to strengthen the quality and resilience of natural assets. Economic activity that leads to unsustainable use of natural capital can contribute to pandemics, and lockdown has revealed inequalities in access to clean air and green space. Moreover, restoration of natural capital is a key component of the UK's net-zero pathway. Investing in natural capital means investing in land restoration, trees and water management, as well as curbing pollution, which can deliver a range of broader benefits. As Annex 1 demonstrates, investments such as active travel infrastructure can indirectly catalyse natural capital benefits such as cleaner air, alongside other investments which directly seek to protect and promote natural capital and the economically valuable ecosystems services provided by them. Sustainable investment must also be fostered by reforming the policy frameworks which govern the UK's natural capital at present, such as agricultural policy.

Investments in human capital (via effective policies on education and skills), social capital and direct investments in innovation will also be central to a sustainable recovery package, and these are discussed further below. Moreover, increased investments in communications infrastructure will also be necessary, seeking to lock in the climate-positive temporary changes in working habits brought about by COVID-19. In this area, capacity for a smart, digital future in the form of broadband infrastructure should be a key priority for investment.

It is important to note that public investment alone cannot deliver the structural changes the economy requires, but it can act as a catalyst to leverage in private finance. Stronger institutions - including the establishment of a National Investment Bank - will be required to extend the reach of private investment (see further discussion below).

Pricing carbon

Tax receipts in April 2020 were 42% lower than in April 2019 (Tew, 2020). Adjustments to taxes into recovery should consider where it is possible to both create positive incentives and raise revenues at a time of fiscal pressure. A robust carbon price is critical for reaching net-zero emissions (Carbon Pricing Leadership Coalition, 2017). Current low oil prices present an opportunity to introduce this and build incentives to shift to cleaner sources of energy (Burke et al., 2020). It will be important to ensure innovation and technological change continues to be directed towards zero carbon, recognising that fossil fuels will remain an attractive option so long as their prices remain low. A politically feasible carbon price could start at around £40 per tCO_2 and rise to £100 per tCO2, or more, in 2050 (Burke et al., 2019).

Furthermore, on the revenue side of the public finances, an equitably designed, economy-wide carbon tax could raise additional revenues of up to £15bn (Burke et al., 2020b) to be distributed across the UK economy, such as to support key public services, while still sending a price signal to decarbonise. It will be important to ensure that the impact of carbon pricing is harmonised with COVID-19 support mechanisms to ensure it does not exacerbate the vulnerability of companies on the edge of collapse or passthrough to low-income consumers. This could be managed by announcing a net-zero-aligned carbon price now so that it can begin informing company investment decisions, but not levying the tax until a future date – such as 2025 – to avoid it having short term impacts on business cash flows during a challenging period (Martin and Van Reenen, 2020).

Monetary policy, liquidity and finance

Minimising business failures and job losses, as well as maintaining liquidity, are key priorities for monetary policy following a sharp increase in market volatility and reductions to credit supply during

the initial impact of COVID-19 on financial markets (Tenreyro, 2020). The Bank of England has reduced the cost of credit via interest rate adjustments, providing assistance to increase cash-flow for borrowers during this immediate disruption and increased liquidity in the system by re-starting quantitative easing. This can be seen in the Bank of England's recent decision to increase the size of its bond-buying programme by £100bn. However further measures may be required for liquidity and to boost demand through the recovery, counterbalancing some of the underlying weakness in inflation, should that persist.

Moving from rescue to recovery will require action simultaneously to restore demand and bolster supply. Close coordination between monetary and fiscal policy will be critical to this. Boosting demand will be particularly challenging in the current environment. The slowdown comes at the end of a long period of slow productivity growth and surplus desired saving pushing global policy real interest rates close to zero (Rachel and Smith, 2015). With policy rates so low, and desired saving likely to rise further, the limitations of monetary policy are prompting ever more unorthodox approaches, while also putting an emphasis on fiscal support (see above), with the prospect - in some countries at least - of at least some direct monetisation of public debt.

The Bank of England, like other central banks internationally, has been buying up new issues of government bonds by issuing reserves. As the Bank's balance sheet grows, it can cancel the debt or keep interest rates low to assist debt sustainability even if that causes inflation (which then erodes the real value of nominal public debt). Yield curve control is also being considered whereby the Bank buys up longer-term bonds to lower long-term interest rates. All options including negative interest rates are being considered, with the policy under 'active review' (Giles, 2020).

However, fears of debt monetisation may be overstated (Blanchard and Pisani-Ferry, 2020). Inflation and credibility are determined by the operational independence of Bank of England, based on a lack of government interference, rather than the instrument in use. Provided an operationally independent central bank can modify its stance in accordance with its objectives, in the form of a transparent reaction function, there is no reason why anti-inflationary credibility should be undermined. With inflation undershooting, radical measures are justified provided these are temporary. There remains the need to account for biases in the Bank's purchases of financial instruments which may favour carbon intensive sectors (Matikainen et al., 2017).

There are grounds for optimism that monetary policy responses to the crisis will not favour fossil fuel industries, provided the appropriate policy and regulatory frameworks are in place. Measures taken so far in response to the COVID-19 crisis offer a rich set of options that could be calibrated by the Bank of England, alongside other central banks, to take account of climate and wider sustainability factors. These range from collateral frameworks, open market operations and asset purchase programmes to micro- and macro-prudential measures as well as specific sustainable finance initiatives. Prior to the crisis there was already debate about the extent to which central banks would be able to use such instruments when facing climate risks. The precedent in this current crisis can now be built upon into recovery.

Monetary and financial authorities can take immediate steps that will both contribute to sustainable crisis responses and prevent a further build-up of climate risks in the balance sheets of financial institutions. Key actions, set out in more detail in Dikau et al., (2020), include; amending collateral frameworks to better account for climate change-related and other environmental risks, aligning asset purchases and refinancing operations with Paris Agreement goals; and adjusting prudential measures to avoid a manifestation of transition risks on the balance sheets of financial institutions.

With regard to private finance, the UK's banking sector has played an integral part in the economic rescue to date, acting as the main transmission mechanism for the government's emergency programmes. COVID-19 will leave the economy weaker and more indebted than it has been for decades, requiring an intense focus on the recapitalisation. A range of private finance instruments and the public sector's involvement are likely to be needed to facilitate debt for equity swaps. It is imperative that finance for the recovery plan is geared towards sustainability with a system-wide financial response from national to local level which strengthens capacity of local, regional and devolved governments to attract and deploy capital. Such a plan would be welcomed by the growing number of pension funds, insurance firms, commercial banks as well as individual savers wishing to direct their capital towards companies that are aligned with a green, inclusive and resilient future.[3]

With regard to public finance, as Bhattacharya et al. (2020) explain, the short-term focus of bailouts has rightly been on stabilisation and protection of jobs. However longer-term support is also likely to be needed as we move into the recovery. At this point, bailout conditions could be linked to sustainability objectives, including climate, to support a strong and sustainable recovery. Longer-term support packages can seek to encourage firms to embrace emerging standards and business models alongside spurring cost-effective investments in existing technologies. Such support packages should not be used to burden firms with costly and onerous conditions. They should instead emphasise diffusion of the technologies which have fallen in cost and improved in quality since the 2008 recession, alongside directing innovation in line with societal goals and fostering collaboration. This can work through existing frameworks, drawing lessons from Canada's usage of the Taskforce for Climate-related Financial Disclosures in their government support packages.

Regulation and design

Regulation has an important role to play in a coherent policy package for a strong and sustainable recovery. A particular area to highlight is the potential for effectively designed regulation (alongside economic incentives including taxes) to direct innovation in line with the government's long-term objectives, conceived as 'missions' (Mazzucato, 2014). With regard to the UK's net-zero goal, the theoretical and empirical evidence asserts that a carbon price is necessary for deep decarbonisation, but not sufficient (see section 1.3.3 above). From an environmental policy perspective, it can be combined with regulation and standards to provide clear direction from government, in order to direct innovation and investment.

Ensuring that regulation in key decarbonisation areas is growing more ambitious through the crisis – as opposed to becoming side-lined or loosened - could help to protect against low oil prices delaying the speed of the transition. For example, government could introduce minimum energy efficiency standards to bring new and existing buildings to EPC band C by 2035 (2025 for low-income households), and bring forward the phase-out date for petrol, diesel and hybrid vehicles to 2030 or soon thereafter. Such regulatory changes can be accompanied with supportive policies to ensure an orderly transition for those displaced.

There are other areas where it will be necessary for regulation to keep pace with rapid change. For example, the accelerated usage of technologies such as teleconferencing, AI and machine learning during the pandemic gives rise to heightened concerns with respect to data, privacy and security. At a strategic level, government can seek to revise and/or introduce standards and regulations in line with

[3] More in depth analysis of finance for a sustainable recovery will be set out in a forthcoming briefing note to be released as part of the CEP COVID-19 analysis paper series (Centre for Economic Performance, 2020).

its overarching objectives and where market failures reduce responsiveness to prices. This can promote efficiency and drive innovation in areas where it is needed.

Innovation policy[4]

Innovation is crucial for enabling the global community to both deal with the COVID-19 crisis and plot a course out of it. Digital technologies have been utilised alongside innovations in medicine and medical equipment to provide solutions to the challenges presented by the pandemic. More broadly, innovation is required for achieving sustainable long-run growth in advanced economies such as the UK (LSE Growth Commission, 2013, 2017) where in fact it has lagged behind international peers for some time.[5] Innovation is also crucial for transitioning to net-zero greenhouse gas emissions and for addressing other societal challenges. It follows that innovation policy needs to go beyond fixing specific market failures to be 'mission-driven', building knowledge capital and generating and directing demand for innovation. The importance of this approach has been evident during the current crisis, with resources being directed towards R&D and diffusion across a range of sectors to protect health and to enable economies to function.

In the case of zero-carbon goods and services, the UK can continue to build on its innovative strengths via consistent policies and incentives on both the demand and supply side, and benefit from growing global demand into the future (Rydge et al., 2018; Unsworth et al., 2020). The same arguments apply across other technology areas (e.g. pharmaceuticals or biotech) where the UK has comparative advantage, where the social benefits can be large, and where global demand is likely to grow.

Innovation policies such as R&D tax credits and grants can seek to direct research and development towards addressing climate change and other societal challenges – improving also the UK's capabilities in key areas that the crisis has revealed are lacking. Support for clean innovation can take the form of grants and enhanced tax breaks for research, development and deployment, as well as subsidies, and can be coupled with effective regulation, obligations and other mechanisms (such as feed-in tariffs for clean energy generation). Diffusion of innovation is also crucial, and has been an area of policy focus for some time. Positive innovation responses since the onset of the crisis – for example increased digital adoption and remote working – can be encouraged into recovery where they increase labour and resource productivity, together with increased flexibility and job satisfaction.

The role of the UK's world class universities will be central for a strong and sustainable recovery via their impacts on innovation and human capital, and it is crucial that they continue to be adequately resourced and are able attract talented students and researchers (Azmat et al., 2018). The most recent QS world rankings have shown that the performance of UK universities is worsening due to uncertainty following the Brexit vote, and budget cuts. As anchor institutions making strategic contributions to local economies, and as hubs of innovation, universities create enormous potential when working in partnership with industry and ambitious local leaders. Such interactions can be strengthened in order to maximise positive spillovers.

To formalise this commitment to the role of innovation in the recovery, government can accelerate the drive to 2.4% R&D as a share of GDP via 'mission-driven' incentives in the tax system (including

[4] More in depth analysis of innovation policy for a sustainable recovery will be set out in a forthcoming note to be released as part of the CEP COVID-19 analysis paper series (Centre for Economic Performance, 2020).

[5] The UK's investment in R&D has been lower than its main peers as a share of GDP. Gross R&D expenditure (GERD) averaged 1.6% of GDP over the period 1995-2017, compared with 2.6% and 2.2% in Germany and France, respectively, and 2.2% for OECD countries as a whole (OECD STAN).

effective carbon pricing and R&D tax credits), support for research universities, appropriate regulation and demand side mechanisms. Furthermore, the clean growth mission can be reinvigorated through a relaunched Industrial Strategy and by honouring the election commitment for £800 million to fund an equivalent institution to the US Advanced Research Projects Agency.

Labour markets and skills[6]

The economic shock caused by COVID-19 has hit the young and lowest paid the hardest (Adams-Prassl et al., 2020) and is expected to deepen labour market inequalities (Bell et al., 2020). The impacts of ongoing disruptions to education will also be uneven (Burgess and Sievertsen, 2020), with school closures exacerbating pre-existing gaps for students from disadvantaged backgrounds. The unprecedented downturn that we face appears likely to create long-term scarring where businesses become insolvent, individuals suffer periods of unemployment, and learning losses are likely to damage future educational trajectories (Elliot Major and Machin, 2020). Furthermore, the transition to net-zero will also have complex and multifaceted impacts upon labour markets. The jobs which will be affected are broader than those within the energy sector and will include complex interrelated supply chains and secondary industries such as the supply chain upstream and downstream of both conventional and electric vehicle production (Unsworth et al., 2020a). Looking forward, the transition to net-zero risks negatively impacting specific jobs and local areas, leading to further potential labour market dislocation. However, with the right mix of proactive policies to enable a 'just transition', these risks can be managed and this structural shift may generate new employment opportunities in emerging areas.

As shown in Annex 1, a number of investments in physical and natural capital will create job opportunities, even in the short term. Part-time work and short-term measures, together with job guarantees – including in sustainable projects - should play a key role in the recovery. Consideration should be given to the opportunities for women and men of new jobs created in such programmes, as well as the broader gender dimensions of the crisis for the workforce (see for example Hupkau and Petronoglo, 2020 and McKinsey, 2020). Based on current labour market structures, jobs in zero carbon infrastructure construction, for example, would most likely be male-dominated.

In addition, efforts to address educational gaps for students from disadvantaged backgrounds, likely to be exacerbated by the current crisis, will be needed (Elliot Major and Machin, 2020). For those permanently displaced by the current crisis, ongoing technological change or the zero-carbon transition, new approaches for adult skilling and lifelong learning are needed, including exploring the potential of human capital tax credits (LSE Growth Commission, 2017) to incentivise employers to train their workers.

Industrial policy

The policies and investments highlighted throughout this briefing note are in many areas inter-dependent and complementary. To be effective therefore, they should be coherent and part of an overarching strategy for sustainable and inclusive growth which can be more than the sum of its parts.

Given the response to COVID-19 and the extent of government support to industry it entails, there is now the chance to build industrial policy that represents a strong partnership between the private and

[6] More in depth analysis of labour markets and skills policies for a sustainable recovery will be set out in a forthcoming note to be released as part of the CEP COVID-19 analysis paper series (Centre for Economic Performance, 2020).

public sector, accelerating investments towards a low carbon, sustainable and inclusive economy. To build such a partnership, with clear direction and longevity that will help to reduce uncertainty for businesses, policies around innovation, labour markets, skills and place can be shaped by the UK's Industrial Strategy. Into recovery, this can be re-emphasised, updated and relaunched at the national and local levels - and be informed by the work of the Industrial Strategy Commission that is building data and evidence. At the same time, the institutions governing industrial policy can be strengthened further, putting it on a par with other areas of economic policy (LSE Growth Commission, 2017).

To ensure that net-zero is positioned at the heart of this, the existing 'Clean Growth' grand challenge, and the currently separate Clean Growth Strategy can be built upon and merged together. Evidence based on analysis of the USA's post-2008 package of green industrial policy measures shows the package to have been broadly successful in protecting jobs, boosting export competitiveness and restructuring industry towards green (Mundaca and Richter, 2015).

Competition policy

Flexibility in state aid rules are required during the crisis and into recovery, as reflected by the EU's temporary framework. However, the incentive and opportunity for vested interests to seek favours from the political system are greater than usual in an economic recession (Vickers, 2008), and it will be important to take into account competition-distorting effects of state aid.

There will also be forces towards increased market concentration which can harm innovation and productivity over time: either due to large liquid firms seeking to acquire small start-ups suffering financial difficulty; or via 'failing firm' mergers which are likely to increase in this period where transactions are justified on the grounds that bankruptcy of the target business will be more damaging to the competition than acquisition.

While the Competition and Markets Authority (CMA) has indicated that it will not relax the standards by which it judges these types of transactions as a result of COVID-19 (CMA, 2020), it will be challenging for the CMA to make informed judgements given the substantial uncertainties regarding the state of future markets. This could have a long-term impact upon competition by enabling firms with sufficient access to financing to annex firms facing bankruptcy; as evidenced by Amazon successfully making a minority investment in Deliveroo via the failing firm defence.

It is also important to consider perverse effects of support for high emissions firms, and explore the potential for attaching conditionality related to lowering emissions or, beyond the crisis, offering extended support packages for businesses transitioning their production to net-zero. From a competition perspective, it will be important to design these packages with consistently applied criteria or indicators where possible. This can reduce the likelihood of distorting markets by making one-off or arbitrary conditional packages. Third party evidence can be drawn upon for this, such as the Transition Pathway Initiative which maps the carbon performance and goals of companies relative to the targets of the Paris Agreement, via carbon intensity metrics.

Trade and internationalism

The UK could use a strong domestic green recovery programme as the foundation of credible international leadership and impetus for the global recovery. This leadership could be built through key diplomatic processes such as the UK COP26 Presidency and the G7 Presidency. In its negotiations with the EU, the UK should seek to remain close to its largest and closest trading partner on issues of trade and security.

Consistent with the aspiration for a 'Global Britain', the UK can lead an internationalist trade response to COVID. While there is a strong case for strengthened domestic supply chains in areas of national security (Tirole, 2020), open trade can still be a priority, allowing UK companies to enjoy the productivity benefits associated with being part of global markets. Furthermore, the economic case for UK decarbonisation is significantly strengthened by trade-enabled markets for zero carbon goods and services around the world.

An internationally coordinated response to COVID-19 is required, and this can be embodied in the UK's foreign policy – including on international development. This is highlighted in the recent letter to G20 governments (Berglöf et al., 2020). Such an approach will promote international recovery efforts that are based on sustainable investments, and reduce risks that disruptions to domestic production and associated economic hardships do not play into populist discourses.

Development and aid programming can seek to draw on lessons from dealing with COVID-19 in the UK, helping to strengthen fragile health and economic systems. For example, this could be through direct aid provision or additional capital for multilateral development banks, development finance institutions and bilateral institutions. Furthermore, it can emphasise both capacity and capability building to ensure a strong, country-led macroeconomic response to COVID-19 around the world (Chang and Velasco, 2020). The recent decision to merge the Foreign and Commonwealth Office with the Department for International Development could provide an opportunity to evaluate and refocus UK overseas development assistance to ensure all programming is aligned with Paris Agreement implementation. However, this process must also be managed carefully to ensure the UK's commitment to enabling climate-positive development outcomes is not diluted, recognising that UK GDP is already contracting. This means the funding envelope which the UK is obliged to spend on ODA under the 0.7% commitment is likely to suffer a sustained fall, while the economic fall-out of COVID-19 further increases the need for impactful development finance provision.

Institutions to deliver policies for a recovery

Strong, long-term institutions can boost confidence and reduce the cost of capital, by sharing and reducing risk (Baker et al., 2015) – and these institutions are needed for recovery. The UK can look to recognised institutional success stories – such as the Committee on Climate Change independently holding UK government to account (Fankhauser et al., 2018)– and replicate them in areas in need of better data, measurement and evaluation. These include education (e.g. the lack of institutions to independently monitor PISA test results) and industrial policy - the Industrial Strategy Council is a positive step in this area.

Most critically, the government can move quickly to establish a National Investment Bank (NIB). A UK NIB can help bring forward and prepare sound projects at scale. Such institutions can reduce and manage crucial early stage and political risks, both through their presence and financing instruments – hence helping to mobilise private sector investment. The NIB should have the size and breadth (across capitalisation, sectoral focus and geographic scope) required to make a major contribution to the UK's investment needs for a sustainable recovery and for the drive to zero-carbon emissions. Lessons in design and activities can be drawn from development banks such as the European Investment Bank, the International Finance Corporation, the European Bank for Reconstruction and Development and

KfW's schnellkredit.[7] A UK NIB could be established quickly and play an important part in the extensive refinancing necessary as we move into the recovery phase.

Valuing wealth via different types of capital (e.g. physical, social, natural, knowledge) should be at the core of institutional decision making. The current crisis is spurring a huge range of previously unprecedented changes, particularly in the scale and breadth of public spending. It is now even more necessary for institutions to value and measure public net assets as 'wealth' as opposed to merely revenue streams or liabilities, as a means of protecting against future austerity policies. This view, embedded into institutional processes, will help to justify spending and investment on diverse priorities such as healthcare and net-zero.

Decentralisation will continue to be a critical institutional trend in the UK, and regional / local governments can be empowered to lead locally-appropriate policy responses to COVID-19 alongside the government's broader objectives including net-zero and levelling up. The impacts of COVID-19 will be determined by a complex range of region-specific factors which are difficult to account for in decision making (Overman, 2020), as is the case with other processes of structural change such as decarbonisation and automation. The government can seek to devolve decision making and delivery mechanisms of the recovery package to the local level, utilising the latest innovations in public participation such as Citizens' Assemblies to ensure that recovery policies and projects are fair and focused on people and their local needs and perspectives.

Local policy makers can also take measures to lock-in positive changes from COVID-19 where politically feasible. To ensure this is possible, local governments need the appropriate resources, capabilities and capacity. For instance, across the government's objectives, local governments can be encouraged to adjust relevant national regulation on a regional basis e.g. setting higher building efficiency standards earlier to stimulate growth of zero carbon skills. Better resourced local bodies, or those that have already made progress on issues such as clean growth, are likely to want more powers devolved to them (Bulleid et al., 2019). For others, more resources and sharing of best practices will be important in the short term.

This is a truly global pandemic with a truly global economic crisis and there is an urgent need for an internationally coordinated response to avoid a global depression, strengthening resilience to future pandemics and enabling economies to build back better. There is clear need for stronger international institutions and multilateral action as the global economy seeks to recover from COVID-19. Institutions such as the IMF will be essential in servicing the fiscal needs of many countries in the rescue and recovery period, and the IMF will need the resources and capabilities to meet this demand. The UK can use its influence and role in international institutions and multilateral development banks such as the World Bank to step up lending to regions around the world which are vulnerable to the virus and its economic repercussions. This could also consider new instruments for rapid disbursements with low conditionality. Furthermore, the UK's leadership of the COP and G7 could be used to ensure these institutions are adequately capitalised. They have a significant role to play in emerging and developing country recovery plans and preventing a permanent slide in living standards.

[7] Further details regarding the case for a NIB will be set out in a forthcoming note to be released as part of the CEP COVID-19 analysis paper series (Centre for Economic Performance, 2020).

Political economy and behavioural change

Maintaining and enhancing popular support for decarbonisation and other government objectives in light of COVID-19 will be a critical challenge. The UK entered this crisis in a climate of erosion of public trust due to inequality and capture. The government's promise to level up the UK will be challenged by the fact that this crisis will have highly unequal effects across the economy. It will be important to emphasise that the lockdown-induced economic impacts are the result of a *disorderly transition*, and to ensure that the public do not perceive this to be akin to what might be expected from an orderly zero carbon transition. Delivering on the substantial job creation potential (National Grid, 2020) and co-benefits of decarbonisation could help to ensure that climate policy is perceived as being an integral part of a strong and sustainable recovery from the impacts of COVID-19.

The reaction to the crisis has shown the possibility of rapid changes in ways of doing things. And it offers an opportunity to embed climate- and productivity positive behaviours (Reeves et al. 2020). This includes changes to travel routines, virtual learning and healthcare, the use of urban space and investment in the circular economy to reduce reliance on fragile supply lines, noting that independence does not equate to security. For essentials such as medical supplies or food or energy, global connectivity and collaboration enhances resilience (Stavins and Ji, 2014).

Promoting a persistence in positive behavioural changes in response to COVID-19, for example more remote working, could reduce travel related emissions and improve productivity, health and wellbeing through more flexible, family-friendly working habits. The UK can use policy to embed climate- and productivity-positive behaviours that were brought on by the response to COVID-19. Public sentiment is positive in respect to some aspects of the lockdown, including quieter roads and cleaner air and the associated reductions in time spent commuting and travelling for business. Spending decisions can help ensure 'stickiness', for instance by shifting focus from roads to broadband.

Finally, responses to COVID-19 should seek to avoid lock-in of negative behavioural and societal trends. For example, there is anecdotal evidence emerging of the possible hollowing out of cities, renewed desire for urban sprawl and a return to cars at the expense of public transport. Perceived risk can be informed by accurate, up-to-date information. This can avoid a perpetuation of undesirable norms, such as avoiding public transport due to fear of transmission (if unfounded).

Final Words

A strong and sustainable recovery package will boost investments across physical, human, natural and social capital. With the right level of commitment, the UK can move quickly to deliver these investments and simultaneously deliver on the government's stated objectives of levelling up across the UK; boosting productivity; investing in infrastructure; reaching net-zero greenhouse gas emissions by 2050; and forging a new role for 'Global Britain'.

A broad range of coordinated policies will be required to deliver this investment across areas such as industrial policy, innovation, skills, labour markets and education, competition policy, finance, foreign policy and regulation. The actions detailed in this document are not an exhaustive list, but should be at the core of a coherent strategy and policy framework driving towards the government's goals across the entire economy. These actions and priorities are key to strong, sustainable, resilient and inclusive growth in the UK over the next few decades.

Annex 1: Evidence on multipliers, labour intensity, skills requirements and speed of implementation for three key areas of sustainable investment: active travel, building energy efficiency retrofits and natural capital

Investment type	Sub-categories	Speed of implementation	Employment creation potential	Direct economic benefits	Broader benefits (including hard to quantify, indirect or non-economic)
Building energy efficiency retrofits	1. Loft insulation 2. Solid wall insulation 3. Cavity wall insulation (filling) 4. Floor insulation (draft proofing) 5. High efficiency glazing	Evidence from the 2009 US Recovery Act shows that in the year following the Act, the number of annual retrofits increased threefold from 97,965 to 340,158 following the increase in funding. Furthermore, a large portion of training requirements can be provided on the job (Carroll et al., 2015). Previous experience from the UK's CERT programme indicate that UK industry was largely successful in meeting increases in insulation demand driven by the policy, although lessons can be drawn - supply chain stakeholders reported that demand fluctuations raised issues including: labour management and short term workforce requirement changes, skills retention, business survival and cash flow (DECC, 2014b). Furthermore, lessons should be learned from the design of previous policies such as the Green Deal (BEIS, 2017) which generated lower demand for insulation services than expected (DECC, 2014c), or the	Energy efficiency investments have been found to be more labour intensive than additional fossil fuel energy infrastructure (Blythe et al., 2014). Reviews of various studies indicate a public investment of around EUR50-60k is required per job (see Copenhagen Economics, 2012, Ürge-Vorsatz et al., 2010). An ex-poste study of the US Recovery Act indicates an actual investment of $72k per job (US Department of Energy, 2015)	Evidence suggests a net positive impact of energy efficiency retrofits on public finances through energy savings, triggering short run productivity improvements through increased economic activities (Copenhagen Economics, 2012). Evidence from the UK CERT and CESP programmes indicate that recipients of energy efficiency measures in 2011 benefitted from 19.7% gas consumption savings (DECC, 2014b) which could translate into short run productivity gains. A typical short run multiplier resulting from increased employment would also be expected.	Improves physical capital through buildings using energy more efficiently, catalysing social capital benefits by reducing the vulnerability of energy-poor households and making homes more liveable - a majority of customers (72%) in the UK's CERT national survey agreed that their home felt warmer since they had energy efficiency measures installed. The evaluation emphasises that measuring impact on fuel poverty can be difficult to ascertain, although almost half of all CESP case study customers said they went from a position of struggling to afford their heating to being able to do so due to efficiency measures (DECC, 2014b). Improves human capital by fostering investment in the skills required to retrofit properties (Jennings et al., 2019). The UK CERT programme delivered a reduction of 296.9 Mt of CO2. This was 101% of its targeted reduction, and insulation measures contributed the greatest proportion (66%) of carbon savings from the programme (DECC, 2014b). Evidence from an evaluation of the LEAF programme indicates that funding to support energy efficiency projects with capacity building and community engagement has longevity after government

		Community Energy Efficiency Outreach Programme (DECC, 2014d).			funding has ceased, with 88% of projects continuing activities such as securing further funding and undertaking energy assessments, feasibility studies and installations. (DECC, 2014a).
Active travel infrastructure	1. Walking infrastructure schemes and networks 2. Cycling infrastructure schemes and networks 3. Traffic calming schemes 4. On-street cycle hire schemes	UK government has recently announced an emergency active travel fund to be distributed 'within weeks' (Department for Transport, 2020), demonstrating a recognition that spending on active travel infrastructure can begin immediately and indicating its scalability.	Evidence indicates that the employment effect of cycling infrastructure is 1.28 times higher than that of general transport infrastructure (Blondiau and Zeebroeck, 2014). This supports a general finding that pedestrian-only and bicycle-only infrastructure projects have higher labour intensity than road-only projects. (Garrett-Peltier, 2011)	Evidence indicates that high street retail footfall is higher in areas with improved cycling infrastructure than areas without (Transport for London, 2018). Short run productivity gains are expected due to reductions in absenteeism, drawing on evidence that, on average, cyclists missed fewer work days each year than non-cyclists (Hendriksen et al., 2010). With regard to long run multipliers, the mean benefit cost ratio for all cycle/walking schemes for the UK is estimated to be 5:1 (Davis, 2014), with a range of exchequer savings from improved health reducing costs to the National Health Service (Jarrett et al., 2012).	Evidence suggests substantial human capital benefits in the form of improved health outcomes from more active lifestyles (De Hartog et al., 2010). Further benefits result from improved wellbeing resulting from more active lifestyles (Martin et al., 2014). Cycling may strengthen the UK's natural capital through reduced air pollution from road transport, which supports the UK's net-zero ambition and catalyses further health benefits (Ibbetson et al., 2020).
Natural capital investment	Creating, maintaining	For investments such as afforestation, repurposing land mostly used for pasture which is a	Evidence across different types of investment indicate a	Evidence from Southern England indicates GVA increases around 4%	Natural capital adds around £78 billion to the value of homes within 500 meters of green space, provides £248 million of

	or restoring: 1. Non-woodland ecosystems (e.g. wetlands) 2. Woodland ecosystems 3. Saltmarshes and peatlands for carbon sequestration 4. Parks and urban green space 5. Sustainable drainage systems (SuDS)	neither priority habitat nor forested could more than double England's forest cover to 21% (Shrubsole and Gordon-Smith, 2020). The UK imports 80% of the forest products which it consumes (McAleenan, 2019), indicating latent demand for domestically produced forest products as part of afforestation.	labour intensity of investment of between $4.2k per job (based on peatland restoration projects) and water management projects which implies around $72k per job across direct, indirect and induced jobs (calculated from Forests Ontario 2019, Burn & Fleming 2011, IUCN 2014)	when considering the value of ecosystem service provision in comparison to scenarios without these services (Newton et al., 2019). Studies of the economic activity resulting from natural capital investments imply a multiplier on investment of between 1.8 (tree planting, see Forests Ontario, 2019) – 2.4 (urban green space, see NRPA, 2018)	cooling shading services by trees, and saves 27,500 life years annually, due to air filtration services provided by vegetation alongside sequestrating carbon (ONS, 2019). Natural capital such as green space can make cities more liveable, with greater access to green space associated with less depression (Cohen-Cline, 2015). Social capital and cohesion benefits in the marginalised and remote rural communities where natural capital investments are often suitable, also building human capital in these areas via skills building (Bateman, 2011). Furthermore, evidence suggests an improvement in cognitive development associated with surrounding greenness, particularly with greenness at schools (Dadvand et al., 2015).

References

Adams-Prassl, A., Boneva, T., Golin, M. and Rauh, C. (2020) Inequality in the Impact of the Coronavirus Shock: New Survey Evidence for the UK, Universities of Oxford, Zurich and Cambridge. https://www.iza.org/publications/dp/13183/inequality-in-the-impact-of-the-coronavirus-shock-evidence-from-real-time-surveys

Aghion P, Dechezleprêtre A, Hemous D, Martin R, Van Reenen J (2016) Carbon Taxes, Path Dependency, and Directed Technical Change: Evidence from the Auto Industry. Journal of Political Economy 124 (1) (February): 1–51. https://dash.harvard.edu/handle/1/27759048

Auerbach A and Gorodnichenko Y (2013) Measuring the Output Responses to Fiscal Policy. NBER Working Paper No. 16311. https://www.nber.org/papers/w16311

Azmat G, Murphy R, Valero A and Wyness G (2018) Universities and Industrial Strategy in the UK: Review of Evidence and Implications for Policy. Centre for Economic Performance : Paper IS06. http://cep.lse.ac.uk/pubs/download/is06.pdf

Baker S, Bloom N, Davis S (2015) Measuring economic policy uncertainty. NBER Working Paper 21633. http://www.nber.org/papers/w21633

Bank of England (2020) Yield curves. https://www.bankofengland.co.uk/statistics/yield-curves

Bateman I (2011) Chapter 22: Economic Values from Ecosystems. UK National Ecosystem Assessment. http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/04/economic-values-ecosystems.pdf

Bell B, Bloom N, Blundell J, Pistaferri L (2020) Prepare for large wage cuts if you are younger and work in a small firm. VOX CEPR Policy Portal. https://voxeu.org/article/prepare-large-wage-cuts-if-you-are-younger-and-work-small-firm

Bennett Institute for Public Policy (2020) Valuing Wealth, Building Prosperity. The Wealth Economy Project on Natural and Social Capital, One Year Report. https://www.bennettinstitute.cam.ac.uk/media/uploads/files/WER_layout_March_2020_ONLINE_FINAL_Pdf_1.pdf

Berglöf E, Brown G and Farrar J (2020) A Letter to G20 Governments. Project Syndicate. https://www.project-syndicate.org/commentary/a-letter-to-g20-governments-by-erik-berglof-et-al-2020-04

Bhattacharya, A., Rydge, J., Stern, N. et al. (2020) Better Recovery, Better World: Resetting climate action in the aftermath of the COVID-19 pandemic. Prepared for the Coalition of Finance Ministers for Climate Action. *Forthcoming.*

Blanchard O and Leigh D (2013) Growth Forecast Errors and Fiscal Multipliers. IMF working paper : WP/13/1. https://www.imf.org/external/pubs/ft/wp/2013/wp1301.pdf

Blanchard O and Pisani-Ferry J (2020) Monetisation: Do not panic. VOX CEPR Policy Portal. https://voxeu.org/article/monetisation-do-not-panic

Blyth W, Gross R, Speirs J, Sorrell S, Nicholls J, Dorgan A, Hughes N (2014) Low carbon jobs: The evidence for net job creation from policy support for energy efficiency and renewable energy. UKERC. https://d2e1qxpsswcpgz.cloudfront.net/uploads/2020/03/low-carbon-jobs.pdf

Bofinger P and Scheuermeyer P (2016) The link between inequality and saving. World Economic Forum. https://www.weforum.org/agenda/2016/10/the-link-between-inequality-and-saving/

Bulleid R, Fyans J, Newcombe G, Brandmayr C (2019) The route to clean growth: using local industrial strategies to drive change. Green Alliance. https://www.green-alliance.org.uk/The_route_to_clean_growth.php#accept

Burgess S and Sievertsen H (2020) Schools, skills, and learning: The impact of COVID-19 on education. VOX CEPR Policy Portal. https://voxeu.org/article/impact-covid-19-education

Burke J (2019) How to price carbon to reach net-zero emissions in the UK. London: Grantham Research Institute on Climate Change and the Environment. http://www.lse.ac.uk/GranthamInstitute/publication/how-to-price-carbon-to-reach-net-zeroemissions-in-the-uk/

Burke J, Fankhauser S, Bowen A (2020a) Pricing carbon during the economic recovery from the COVID-19 pandemic. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science. http://www.lse.ac.uk/GranthamInstitute/publication/pricing-carbon-during-the-economic-recovery-from-the-covid-19-pandemic/

Burke J, Fankhauser S, Kazaglis A, Kessler L, Khandelwal N, Bolk J, O'Boyle P and Owen A (2020b) Distributional impacts of a carbon tax in the UK: Report 2 – Analysis by income decile. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science, and Vivid Economics

Burn P and Fleming D (2011) Water Use Efficiency and Jobs. Economic Round Table. https://rewater.com/wp-content/uploads/2019/07/Water-Use-Efficiency-and-Jobs-2011.pdf

Carbon Pricing Leadership Coalition (2017) Report of the High-Level Commission on Carbon Prices. https://static1.squarespace.com/static/54ff9c5ce4b0a53decccfb4c/t/59b7f2409f8dce5316811916/1505227332748/CarbonPricing_FullReport.pdf

Carroll D, Berger J, Miller C, Johnson D (2015) National Weatherization Assistance Program Impact Evaluation Weatherization Staff Survey. Oak Ridge National Laboratory ORNL/TM-2014/323. https://weatherization.ornl.gov/wp-content/uploads/pdf/WAPRetroEvalFinalReports/ORNL_TM-2014_323.pdf

Chang R and Velasco A (2020) The Virus Turns South. Project Syndicate. https://www.project-syndicate.org/commentary/policy-response-to-covid19-in-latin-america-by-roberto-chang-1-and-andres-velasco-2020-03

Cohen-Cline H, Turkheimer E, Duncan GE (2015) Access to green space, physical activity and mental health: a twin studyJ Epidemiol Community Health 2015;69:523-529. https://jech.bmj.com/content/69/6/523.info

Committee on Climate Change (2020) Building a resilient recovery from the COVID-19 crisis. Letter sent to Rt Hon Boris Johnson MP, 6 May 2020. https://www.theccc.org.uk/wp-content/uploads/2020/05/CCC-to-Prime-Minister-Boris-Johnson-Covid-19-recovery-002.pdf

Competition and Markets Authority (2020) Annex A : Summary of CMA's position on mergers involving 'failing firms' April 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/880565/Summary_of_CMA_s_position_on_mergers_involving__failing_firms_.pdf

Copenhagen Economics (2012) Multiple benefits of investing in energy efficient renovation of buildings Impact on Public Finances. https://www.copenhageneconomics.com/dyn/resources/Publication/publicationPDF/8/198/0/Multiple%20benefits%20of%20EE%20renovations%20in%20buildings%20-%20Full%20report%20and%20appendix.pdf

Costa R and Machin S (2019) The Labour Market. Centre for Economic Performance: CEP Election Analysis. http://cep.lse.ac.uk/pubs/download/ea046.pdf

Dadvand P, Nieuwenhuijsen M, Esnaola M, Forns J, Basagaña X, Alvarez-Pedrerol M, Rivas I, López-Vicente M, De Castro Pascual M, Su J, Jerrett M, Querol X, and Sunyer J (2015) Green spaces and cognitive development in primary schoolchildren. PNAS June 30, 2015 112 (26) 7937-7942. https://www.pnas.org/content/112/26/7937.abstract

Davis A (2014) Claiming the Health Dividend: A summary and discussion of value for money estimates from studies of investment in walking and cycling. Department for Transport. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/371096/claiming_the_health_dividend.pdf

De Hartog J, Boogaard H Nijland H and Hoek G (2010) Do the Health Benefits of Cycling Outweigh the Risks? Environmental Health Perspective Vol. 118, No. 8. https://ehp.niehs.nih.gov/doi/full/10.1289/ehp.0901747

DeLong B and Summers L (2012) Fiscal Policy in a Depressed Economy. Brookings Institution : BPEA Article. https://www.brookings.edu/bpea-articles/fiscal-policy-in-a-depressed-economy/

Department of Energy and Climate Change (2014a) DECC LEAF Evaluation Undertaken by Databuild Research & Solutions Ltd. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/274956/LEAF_final_230114.pdf

Department for Energy and Climate Change (2014b) Evaluation of the Carbon Emissions Reduction Target and Community Energy Saving Programme: Executive Summary. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/350957/CERT_CESP_Evaluation_Exec_summary.pdf

Department for Energy and Climate Change (2014c) Research on the Green Deal Provider market, including use of the ECO Brokerage platform. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/331800/2014-07-17_GD_Provider_Market_Research_-_Final.pdf

Department for Energy and Climate Change (2014d) Learnings from the DECC Community Energy Efficiency Outreach Programme. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/274867/ceeop_eval_in_decc_formatingFINAL.pdf

Department for Transport (2020) £2 billion package to create new era for cycling and walking. UK Government. https://www.gov.uk/government/news/2-billion-package-to-create-new-era-for-cycling-and-walking

Dikau S, Robins N and Volz U (2020) A Toolbox for Sustainable Crisis Response Measures for Central Banks and Supervisors. INSPIRE Briefing Paper. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science and SOAS Centre for Sustainable Finance.

Eggertsson G and Mehrotra N (2017) Secular Stagnation and Inequality. 2017 Meeting Papers 1567, Society for Economic Dynamics. https://ideas.repec.org/p/red/sed017/1567.html

Elliot Major L and Machin S (2020) Covid-19 and social mobility. Centre for Economic Performance: A CEP Covid-19 analysis Paper No.004. http://cep.lse.ac.uk/pubs/download/cepcovid-19-004.pdf

Fankhauser S, Averchenkova A and Finnegan J (2018) 10 years of the UK Climate Change Act. Grantham Research institute Policy Report. http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2018/03/10-Years-of-the-UK-Climate-Change-Act_Fankhauser-et-al.pdf

Forests Ontario (2019) Economic Value of Tree Planting in Southern Ontario. https://www.forestsontario.ca/wp-content/uploads/2019/03/Green-Analytics-Report-The-Economic-Value-of-Tree-Planting-in-Southern...-1.pdf

Garrett-Peltier H (2011) Pedestrian and bicycle infrastructure: a national study of employment impacts. Political Economy Research Institute University of Massachusetts, Amherst http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.362.5819&rep=rep1&type=pdf

Giles C (2020) Bank of England pivots and starts to contemplate negative rates. Financial Times 21 May 2020. https://www.ft.com/content/ef3d2730-8aab-4cbd-896c-40b330eb9530

Grantham Research institute on Climate Change and Environment (2020) RES webinar series: A strong and sustainable recovery from COVID-19. Webinar recording. http://www.lse.ac.uk/GranthamInstitute/event/res-webinar-series-a-strong-and-sustainable-recovery-from-covid-19/

Hendriksen I, Simons M, Galindo Garre F, Hildebrandt V (2010) The Association Between Commuter Cycling and Sickness Absence. Prev Med. 2010;51(2):132-135. https://pubmed.ncbi.nlm.nih.gov/20580736/

Hepburn C, O'Callaghan B, Stern N, Stiglitz J and Zenghelis D (2020). Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change? Oxford Smith School of Enterprise and the Environment Working Paper No. 20-02 ISSN 2732-4214 (Online). https://www.smithschool.ox.ac.uk/publications/wpapers/workingpaper20-02.pdf

Hupkau, C. and Petrongolo, B. (2020). Work, care and gender during the Covid-19 crisis, A CEP Covid-19 analysis Paper, May 2020 http://cep.lse.ac.uk/pubs/download/cepcovid-19-002.pdf

Ibbetson A, Symonds P, Hutchinson E (2020) Data to support small area health impact modelling of air pollution in the United Kingdom. Data in Brief Volume 29. https://www.sciencedirect.com/science/article/pii/S2352340920300421

International Union for the Conservation of Nature (2014) Global Peatland Restoration — demonstrating Success. https://www.iucn-uk-peatlandprogramme.org/sites/default/files/2019-07/IUCNGlobalSuccessApril2014_0.pdf

Jarrett J, Woodcock J, Griffiths U, Chalabi Z, Edwards P, Roberts I, Haines A (2012) Effect of Increasing Active Travel in Urban England and Wales on Costs to the National Health Service. The Lancet : Jun 9;379(9832):2198-205. https://pubmed.ncbi.nlm.nih.gov/22682466/

Jennings N, Fecht D, De Mattheis S (2019) Co-benefits of climate change mitigation in the UK: What issues are the UK public concerned about and how can action on climate change help to address them? Imperial College London : Grantham Institute Briefing paper No 31. https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/Co-benefits-of-climate-change-mitigation-in-the-UK.pdf

LSE Growth Commission (2013) Investing for Prosperity: Skills, Infrastructure and Innovation. http://cep.lse.ac.uk/_NEW2018/_prototype2/our-work/lse-growth-commission/files/LSEGC-2012-report.pdf

LSE Growth Commission (2017) UK GROWTH A New Chapter. http://cep.lse.ac.uk/LSE-Growth-Commission/files/LSEGC-2017-report.pdf

Martin A, Goryakin Y, Suhrcke M (2014) Does active commuting improve psychological wellbeing? Longitudinal evidence from eighteen waves of the British Household Panel Survey. Preventive Medicine Volume 69, December 2014, Pages 296-303. https://www.sciencedirect.com/science/article/pii/S0091743514003144

Martin R and Van Reenen J (2020) The case for a COVID-19 carbon tax. LSE blogs. https://blogs.lse.ac.uk/covid19/2020/06/02/the-case-for-a-covid-19-carbon-tax/

Matikainen S, Zenghelis D and Campiglio E (2017) The climate impact of quantitative easing. Grantham Research Institute Policy Report. http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2017/05/ClimateImpactQuantEasing_Matikainen-et-al-1.pdf

Mazzucato M (2014) A mission-oriented approach to building the entrepreneurial state. Innovate UK. https://marianamazzucato.com/wp-content/uploads/2014/11/MAZZUCATO-INNOVATE-UK.pdf

McAleenan B (2019) Bigger, Better Forests. Policy Exchange. Policy Exchange. https://policyexchange.org.uk/wp-content/uploads/2019/12/BIGGER-BETTER-FORESTS.pdf

McCrum D (2018) Lex in Depth: the case against share buybacks. Financial Times, published January 30 2018. https://www.ft.com/content/e7fb2144-fbae-11e7-a492-2c9be7f3120a

McKinsey (2020), COVID-19 in the United Kingdom: Assessing jobs at risk and the impact on people and places, 11th May https://www.mckinsey.com/industries/public-sector/our-insights/covid-19-in-the-united-kingdom-assessing-jobs-at-risk-and-the-impact-on-people-and-places#

Mundaca L and Richter J (2015) Assessing ‘green energy economy’ stimulus packages: Evidence from the U.S. programs targeting renewable energy. Renewable and Sustainable Energy Reviews Volume 42, February 2015. https://www.sciencedirect.com/science/article/pii/S1364032114008855

National Grid (2020) Building the net-zero energy workforce. https://www.nationalgrid.com/document/126256/download

National Recreation and Park Association (2018) Economic impact of local parks : An examination of the economic impacts of operations and Capital spending by local park and recreation agencies On the united states economy. https://www.nrpa.org/siteassets/research/economic-impact-study-summary-2018.pdf

Newton A, Watson S, Evans P, Bullock J, McCracken M, Ridding L, Anger-Kraavi A (2019). Trends in natural capital, ecosystem services and economic development in Dorset. Bournemouth University, Poole, UK. https://valuing-nature.net/sites/default/files/documents/Reports/DorsetNatCapTrendsReport.pdf

OECD STAN (2020) STAN Database for Structural Analysis. https://stats.oecd.org/Index.aspx?DataSetCode=STAN

Office for National Statistics (2019) UK natural capital accounts: 2019. UK Government. https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapitalaccounts/2019

Office for National Statistics (2020) GDP monthly estimate, UK: April 2020. https://www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/gdpmonthlyestimateuk/april2020

Overman H (2020) How the UK government should respond to the unequal local economic impacts of COVID-19. VOX CEPR Policy Portal. https://voxeu.org/article/how-uk-government-should-respond-unequal-local-economic-impacts-covid-19

Pollin R, Garrett-Peltier H, Heintz J and Scharber H (2008) Green Recovery : A Program to Create Good Jobs and Start Building a Low-Carbon Economy. Center for American Progress.

Rachel L and Smith T (2015) Secular drivers of the global real interest rate. Bank of England : Working Paper No. 571. https://www.bankofengland.co.uk/working-paper/2015/secular-drivers-of-the-global-real-interest-rate

Reeves M, Carlsson-Szlezak P , Whitaker K, and Abraham M (2020) Sensing and Shaping the Post-COVID Era. BCG Henderson Institute. https://www.bcg.com/publications/2020/8-ways-companies-can-shape-reality-post-covid-19.aspx?utm_medium=Email&utm_source=esp&utm_campaign=covid&utm_description=featured_insights&utm_topic=covid&utm_geo=global&utm_content=202004_2&utm_usertoken=c1342655313ce5cb36100fa2980f946b30de38f4&redir=true

Rydge J, Martin R, Valero A (2018) Sustainable Growth in the UK: Seizing opportunities from technology and the transition to a low-carbon economy. London: Grantham Research Institute on Climate Change and the Environment. http://www.lse.ac.uk/GranthamInstitute/wpcontent/uploads/2018/12/Sustainable-Growth-in-the-UK_Full-Report_78pp.pdf

Shrubsole G and Gordon-Smith C (2020) Is there really space in the UK to double tree cover? And where's best to grow all those trees? Friends of the Earth. https://policy.friendsoftheearth.uk/insight/finding-land-double-tree-cover

Stavins R and Ji Z (2014) Chapter 13: International Cooperation: Agreements & Instruments. In IPCC Fifth Assessment Report. https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter13.pdf

Tenreyro S (2020) Monetary policy during pandemics: inflation before, during and after Covid-19. Online webinar, Bank of England. https://www.bankofengland.co.uk/-/media/boe/files/speech/2020/monetary-policy-during-pandemics.pdf?la=en&hash=FBE9F3BEFB5C224A3ECE2600431B97ECCD658B3B

Tew I (2020) Tax receipts have 'fallen off a cliff' amid lockdown. Financial Times Advisor. https://www.ftadviser.com/your-industry/2020/05/26/tax-receipts-have-fallen-off-a-cliff-amid-lockdown/#:~:text=Tax%20receipts%20took%20a%20%C2%A3,received%20in%20April%20last%20year.

Thomas Blondiau and Bruno van Zeebroeck (2014) CYCLING WORKS : Jobs and Job Creation in the Cycling Economy. European Climate Foundation. https://ecf.com/sites/ecf.com/files/141125-Cycling-Works-Jobs-and-Job-Creation-in-the-Cycling-Economy.pdf

Tiftik E, Mahmood K, Poljak J, Zhang R (2020) Global Debt Monitor Sustainability Matters. Institute of International Finance. https://www.iif.com/Portals/0/Files/content/Global%20Debt%20Monitor_January2020_vf.pdf

Tirole J (2020) Webinar presentation for the Royal Economic Society. https://www.res.org.uk/resources-page/prof-jean-tirole-webinar-presentation.html

Transport for London (2018) Walking and Cycling : The economic impacts. http://content.tfl.gov.uk/walking-cycling-economic-benefits-summary-pack.pdf

Turner D and Spinelli F. (2012) Interest-rate-growth differentials and government debt dynamics. OECD Journal: Economic Studies. https://www.oecd.org/economy/growth/interest-rate-growth-differentials-and-government-debt-dynamics.pdf

Unsworth S, Stern N, Valero A (2020b) Delivering strong and sustainable growth in the UK: A special decade for innovation and investment. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science. http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2020/03/Delivering-strong-and-sustainable-growth-in-the-UK_A-special-decade-for-innovation-and-investment.pdf

Unsworth S, Valero A, Martin R and Verhoeven D (2020a) Seizing sustainable growth opportunities from zero emission passenger vehicles in the UK. London: Grantham Research Institute on Climate Change and the Environment. http://www.lse.ac.uk/GranthamInstitute/publication/seizing-sustainable-growthopportunities-from-zero-emission-passenger-vehicles-in-the-uk/

Ürge-Vorsatz D Tirado-Herrero S, Fegyverneky S (2010) Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary. Centre for Climate Change and Sustainable Energy Policy. https://www.researchgate.net/publication/262048945_Employment_Impacts_of_a_Large-Scale_Deep_Building_Energy_Retrofit_Programme_in_Hungary

US Department of Energy (2015) National Weatherization Assistance Program : National evaluations: summary of results. https://www.energy.gov/sites/prod/files/2015/08/f25/WAP_NationalEvaluation_WxWorks_v14_blue_8%205%2015.pdf

Valero A and Van Reenen J (2019) The UK Economy: Policies for Investment and Productivity Growth. Centre for Economic Performance: CEP Election Analysis. http://cep.lse.ac.uk/pubs/download/ea049.pdf

Van der Meijden G, Smulders S (2017) Carbon lock-in : the role of expectations. International Economic Review : Volume 58, Issue 4. https://onlinelibrary.wiley.com/doi/abs/10.1111/iere.12255

Vickers J (2008) The Financial Crisis and Competition Policy: Some Economics. Competition Policy International. https://www.competitionpolicyinternational.com/the-financial-crisis-and-competition-policy-some-economics/

Vivid Economics (2020) Green Stimulus Index. Vivid Economics : Finance for Biodiversity Initiative. www.vivideconomics.com/wp-content/uploads/2020/05/200518-Stimulus-Green-Index-v2_shared.pdf

Wei M, Patadia S, Kammena D (2010) Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US? Energy Policy Volume 38, Issue 2, February 2010, Pages 919-931. https://www.sciencedirect.com/science/article/abs/pii/S0301421509007915?casa_token=f0daFIx4JFoAAAAA:3nO2Mq9BV7QqxM7PbI5WhummWRBhH34tfvAkb4X9Gsw4k3MJRqHpBrqiOFvf_n3JJUnyFMX7ig

World Bank (2020) World Development Indicators : GFCF as % GDP.

Zenghelis Z (2016) Building 21st century sustainable infrastructure : Time to Invest Part 1. Grantham Research institute. http://www.lse.ac.uk/GranthamInstitute/publication/building-21st-century-sustainableinfrastructure-part-1-time-to-invest/

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