

Decarbonisation of the UK economy and green finance

A submission to the UK's Treasury Committee by the Grantham Research Institute on Climate Change and the Environment

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About this submission

This written evidence was submitted on 26 July 2019 to the Commons Select Committee inquiry into decarbonisation of the UK economy. More information about the consultation can be found at: <https://www.parliament.uk/business/committees/committees-a-z/commons-select/treasury-committee/news-parliament-2017/decarbonisation-uk-economy-launch-17-19/>

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Key messages

1. **Her Majesty's Treasury (HMT) occupies a unique position in government to drive the transition towards net-zero greenhouse gas emissions while maintaining a focus on economic growth.** While other government departments have a role to play, none has the crosscutting, economy-wide focus of HMT. This focus can enable HMT to deliver complementary, growth-driving policies and investment under a coherent net-zero strategy. The Committee on Climate Change has signalled the pathway forward; now HMT needs to implement it.
2. **This is a global issue that the UK can lead on.** The UK has set out a vision of being a 'Global Britain', both in terms of responding to global challenges and capitalising on opportunities for the UK (HM Government, 2018). The challenge of decarbonisation fits both of these criteria. The UK has a responsibility to address climate change, given its historic emissions. Furthermore, by becoming a first or early mover for key zero-carbon products and services, it can derive economic opportunities from the global transition that is already underway. This could uncover new export markets for the UK, as well as bringing good jobs and boosting the productivity of UK firms.
3. **Innovation will be key to tackling the dual ambitions of achieving net-zero emissions while driving economic growth.** HMT can use a variety of policy levers such as R&D tax credits, targeted regulation and prizes to crowd private investment into R&D, steering companies towards innovation in zero-carbon products and services. However, to achieve this, incentives need to be aligned in support of recognised 'missions' across the economy, at both the national and local level, and addressing the supply and demand side.
4. **The UK has had success in 'greening finance' but needs to get better at 'financing green', particularly domestically.** The UK's Green Finance Strategy highlights both of these roles of green finance as being critical in the coming years. The UK has led the finance sector, both domestically and internationally, in mainstreaming green principles into financial processes such as due diligence and disclosure to investors. However, it has struggled to convert this leadership into investment for the infrastructure and innovation that the UK will need to fulfill its domestic decarbonisation ambitions. Investments for utilities in the National Infrastructure and Construction Pipeline are set to be £8.7 million in 2020/2021, compared with £15m for 2019/20, at a time when planned investment might be expected to be rising steeply (Infrastructure and Project Authority, 2018).
5. **A new National Infrastructure Bank established by HMT could be a critical tool to manage the transition to a zero-carbon economy.** Existing institutions may not have the capacity or the expertise to raise the significant amount of financial resources required for future zero-carbon infrastructure in the UK. Given constraints on public spending in the fiscal remit, private finance will be crucial for meeting the UK's infrastructure needs. A new, independent and dedicated institution should be created, such as a National Infrastructure Bank, to provide transparency and credibility around finance for sustainable infrastructure. This institution could align expectations on the future growth path and avoid a muddled path where the UK invests in both inefficient high-carbon technologies and sustainable infrastructure.

Decarbonisation of the UK economy and green finance: catalogue of consultation questions

The economic opportunity

1. What economic costs and benefits does decarbonisation present for the UK?

Comments on the costs of decarbonisation in the UK

The costs of decarbonisation have been a contentious topic in recent months. A recent letter from then Chancellor of the Exchequer Philip Hammond to then Prime Minister Theresa May conveyed concern that a net-zero transition could cost “in excess of a trillion pounds”, with cost estimates that appear to differ from those specified by the Committee on Climate Change’s recent advice to government on net-zero (CCC, 2019).

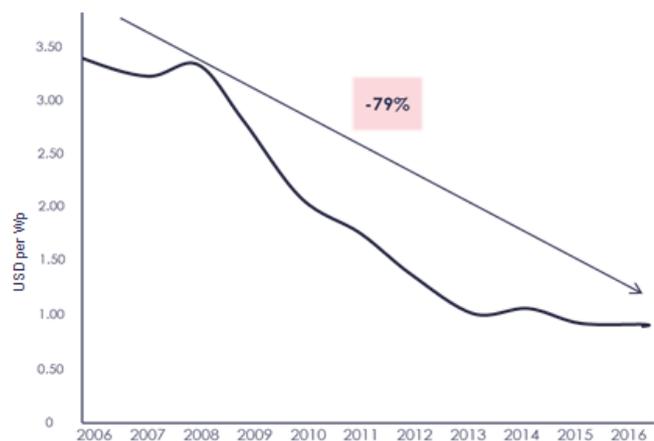
At the core of this debate is an understanding of what factors should be considered in the definition of ‘costs’, and the extent to which static rather than dynamic cost assumptions are valid. Dimitri Zenghelis of the Grantham Research Institute explains the concept of ‘resource costs’ as a measure of the real expenditures that are required to meet a net-zero emissions target, over and above those required to meet the Government’s previous emissions target. However, these costs should not be thought as static; rather, they are a function of the decisions we make now. The more coordinated our response to managing a zero-carbon transition, the cheaper it will be (Zenghelis, 2019). The costs will be largely determined by the extent of public support for zero carbon innovation, government working in partnership with business to develop and deploy the required new technologies at the necessary speed, and stimulating the consumer demand to pull these technologies through to markets at scale.

On a broader level, the Grantham Research Institute would like to emphasise that the costs of inaction are expected to outweigh the costs of action. This core cost/benefit ratio has been acknowledged since the Stern Review on the Economics of Climate Change was published in 2006. Today, the costs of inaction are better understood and there is consensus that they are likely to be higher than previously thought (highlighted most clearly by the IPCC’s Special Report on Global Warming of 1.5°C late last year). In contrast, the costs of action have gone down, with prices of critical low-carbon technologies such as batteries and solar PV falling by as much as 79% in under 10 years, outstripping forecasts (see graphs below). Thus, in high-level terms, the benefit/cost ratio of taking action is considerably strengthened.

Observed battery prices



Solar PV module prices



Going forward, it will be critical to consider costs to be investments that yield a range of benefits (summarised below) as opposed to sunk costs. For instance, establishing a National Infrastructure Bank to blend public and private finance could make HMT spending both more efficient and more impactful. There could be value in developing a replacement. Keeping the bank's investments and debt obligations off the Government's balance sheet could help to emphasise that this 'good debt' could be a long-term driver of growth and benefits, as opposed to being a sunk cost.

Finally, two points raised by the CCC's net-zero advice should be re-emphasised. The resource cost estimates of a net-zero transition are relatively small compared to business as usual (BAU), since many low- and high-carbon technologies are reaching resource cost parity. However, the structural change required to meet the targets is large (e.g. facilitating the switch from one technology to another). Furthermore, the costs that are incurred will not be distributed evenly across technologies or sectors. Decarbonising heat is expected to be considerably costlier than power and this will need to be managed (CCC, 2019).

Comments on the benefits of decarbonisation in the UK

This is a whole-economy opportunity. A range of growth opportunities and therefore benefits exist for products and services that could be capitalised on with the right policies and investment. These are summarised below:

A. A 'Global Britain' leading internationally on zero-carbon technological change and innovation

The UK could emerge as a global hub for innovation of zero-carbon technologies and services. By taking an economy-wide approach to supporting decarbonisation, the UK could capitalise on the extensive crossovers with other crosscutting disruptions such as AI and robotics. However, to realise this potential, as opposed to merely being a beneficiary of zero-carbon innovation, the UK will need a change of approach, with cross-government policy, R&D financed directly by government, and incentives for businesses to invest in R&D for clean technologies. The UK's Industrial Strategy sets out the ambition to be "the world's most innovative economy" (HM Government, 2017). However R&D spending (public and private) as a share of GDP in the UK is lower than its main international peers (Valero, 2017).

Mazzucato and McPherson. emphasise that the role of government is not simply to address isolated market failures or externalities, but rather to plot a course for innovation targeting economy-spanning 'missions' (Mazzucato and McPherson, 2019). The UK should adopt this approach, recognising an overarching mission of decarbonising the economy, and aligning policies and investment with this goal. In many cases the innovations required will involve different sectors working together, e.g. data scientists and engineers and designers.

The policies and investment underpinning this mission should be 'predictably flexible'. Industry needs to know the direction of travel and avoid changes in direction of policy; predictability is critical to set a clear growth trajectory and to encourage private investment. For instance, revoking the zero-carbon homes standard in 2015 raised concerns from industry about long-term policy direction for buildings decarbonisation. However, policy needs to be flexible and dynamic to change in response to technological and other developments, learning or economic shocks. This responsiveness can be underpinned by Rodrik's emphasis on industrial policy requiring government to work closely with industry to monitor and evaluate the success of policy, and to redirect as required (Rodrik, 2005). Constant, two-way engagement will be required between industry and HMT; radical shifts in attitudes and demand are likely to be needed to achieve change at the scale required.

B. Domestic and export markets for new green products and services

If the UK can take a leading role in innovating new technologies, new inventions or improved products could be developed in the UK that could generate both a domestic market, given low-carbon commitments, and export opportunities. The net-zero scenarios set out by the CCC contain critical technologies and services that the UK may be well positioned to capitalise on, such as low-carbon heating solutions, offshore wind, electric vehicles and demand-side management (CCC, 2019). Informed by current UK comparative advantage and levels of innovation, HMT could provide incentives to capture these growth opportunities.

Growth opportunities will not be uniform, and will require a nuanced approach to technology supply chains and regional competitiveness. For instance, while the UK may not have a leading position in the design of offshore wind, the size of the market makes the UK well placed for the manufacture and assembly of turbines, as demonstrated by the opening of the Siemens wind turbine factory at Greenport Hull (Siemens, 2019). These may become international export opportunities as the international market for low-carbon technologies and services grows.

However, targeted government intervention will be critical to create a market for these products and services, with a balance of support to both supply and demand side. Diffusion can be a stumbling block for technologies. Products and services may be on offer, but without sufficient uptake for a market to form. Techniques to improve demand could include corralling public support and buy-in for new products, but governments can also regulate to increase adoption, as the EU has done by banning halogen light bulbs in favour of LEDs. Stimulating diffusion will increase the market size for clean products and therefore help stimulate the innovation too.

C. Co-benefits associated with the net-zero transition

A net-zero transition in the UK will deliver a range of environmental and social benefits besides reductions in emissions and growth opportunities. Cleaner air, less noise, more active travel and a shift to healthier diets will all be positive changes. Changes to land use and farming practices that cut greenhouse gas emissions could also improve air and water quality, benefit biodiversity, improve resilience to climate change and bring recreational benefits. As well as these softer benefits, hard productivity benefits will also be delivered, including reduced waste, reduced resource costs, reduced commuting delays and improved logistics.

HMT's Green Book will be a critical tool for capturing these benefits in policy decisions. However HMT should support engagement on cost-benefit analysis practices with other government departments to ensure it is capturing the full range of co-benefits delivered in zero-carbon policies and investment decisions. For instance, new or previously unrecognised benefits may emerge through the convergence of zero-carbon products, services and behaviours across the economy.

More broadly, overall living standards are expected to improve as a result of the move to net-zero. Communicating these benefits to stakeholders could also help raise demand for zero-carbon products and services, and broader support for government to take a proactive role in stimulating innovation, as described above. While the responsibility for this communication may not lie with HMT, it may control budgets that influence the extent to which these benefits are communicated by other government departments.

D. Avoided global climate damages

While the UK's share of global emissions is proportionately lower than it was in the 19th and 20th centuries, reaching net-zero in the UK will still mean the country making what has been recognised to be an 'appropriate contribution' to a global trajectory to limit warming to 1.5°C above pre-industrial levels. When counting cumulative emissions between 1850 and 2007, the UK had the fifth highest historic footprint of any country. Most critically, demonstrating the feasibility of decarbonising a major economy without sacrificing economic growth could be a significant accelerator of global decarbonisation efforts. By limiting warming to 1.5°C, the climate damages that would occur at higher rates of warming, detailed extensively in the IPCC Special Report, could be avoided.

2. What benefits can growth of the Green Finance sector deliver for the UK, and does the UK hold a competitive advantage in this space?

A. The UK's world-leading green finance sector could be a critical driver of zero-carbon growth, both through jobs in financial services and as a capital provider for projects, but its competitive advantage may be threatened by leaving the EU.

As a service-based economy, the UK has a world-leading green finance centre, which is highlighted in the recently published Green Finance Strategy. The green finance sector can play a dual role, both as a means to deliver zero-carbon infrastructure via provision of flexible and/or patient finance as needed, and also as an engine of zero-carbon growth by creating good jobs in the service sector.

However, the UK's competitive advantage as a global provider and recipient of finance could be threatened by leaving the European Union. Brexit creates significant uncertainty for the banking and financial services industry. The University of Oxford has set out that the financial services sector employs more than one million people in the UK and accounted for over 7% of the value created in the UK economy in the second quarter of 2017, with a consistent rank at the top of the Global Financial Centres Index (Borchardt et al, 2018). Financial services continued to be the largest service product exported globally by UK businesses in 2017 (ONS, 2017), and this is where much of our comparative advantage with regard to the zero-carbon transition lies. Financial services therefore need to be at the core of the UK's negotiations and priorities for Brexit. Regulatory alignment with the EU, which is currently considering adoption of a net-zero target, could ensure that the UK's green finance sector remains a growth driver.

B. The UK has competitive advantage in financing green projects internationally, and in reforming investment practices.

The UK's deep and liquid capital markets, combined with a strong reputation for innovation, have led to UK firms financing green projects around the world. Furthermore, initiatives such as the Taskforce for Climate-related Financial Disclosures (TCFD) and the United Nations Principles for Responsible Investment (UNPRI), which have been led out of London, have cemented the City's position in driving the international finance community to align with the zero-carbon transition. The Green Finance Strategy recognises these two core strengths through its structural distinction between 'greening finance' and 'financing green'. We support this structural distinction, which can ensure UK government pays sufficient attention to both aspects of green finance.

C. The UK does not yet fully utilise this competitive advantage for financing domestic zero-carbon infrastructure, and policy frameworks and investment vehicles are not sufficient to capture growth opportunities.

The UK's green finance sector has had mixed success to date in investing in UK infrastructure. UK-based private equity houses focusing on renewable energy, such as Octopus Investments and Foresight Group, have demonstrated the domestic investment opportunity in the low-carbon transition. However, this is not yet a consistent story across the economy. For instance, finance is not yet mobilising at scale to decarbonise the UK's building stock. The recent Green Finance Strategy highlights existing policies such as the Energy Performance Certificate (EPC) standards targets and the Heat Networks Investment Project, but these do not provide sufficient long-term signalling to the private sector to mobilise finance at scale towards zero-carbon solutions. The Government's Heat Decarbonisation Policy due in 2020 will need to show a concrete pathway to which the private sector can align its investments. Lessons could be learned from British Columbia's Energy Step Code, which has phased increases in building standards towards being net-zero ready at a specified point in time.¹ This form of structured regulation could focus innovation and growth opportunities related to zero-carbon buildings.

The privatisation of the Green Investment Bank (GIB) in 2017 has left a gap in the institutional landscape across the economy, and there would be benefits to addressing this by establishing a National Infrastructure Bank. A key function provided by the GIB was public-private risk-sharing via co-investment, which protected investors from possible changes in policy support that could affect the expected risk adjusted returns. While the privatised bank, now known as the Green Investment Group, may be able to drive broader global decarbonisation efforts, it is not as well positioned to act as a 'first mover' in the UK market as the GIB was.

One of the leading rationales behind the privatisation of the bank, cited by GIB's head investor Edward Northam, was that the 'market failure' that led the UK government to set up the bank has disappeared, given that green technology such as wind and solar power have now matured. However, over the next 30 years it is likely that a range of 'firsts' will be required in financing nascent technologies such as bioenergy, carbon capture and storage, hydrogen production and demand-side management technologies, which will be necessary for net-zero as opposed to incremental decarbonisation.

¹ <https://www2.gov.bc.ca/gov/content/industry/construction-industry/building-codes-standards/energy-efficiency/energy-step-code>

Having a purpose-built investment vehicle could make HMT spending both more efficient and more impactful. It could share risk through a range of financing instruments, including loan guarantees and first loss insurance facilities, and work with international institutions. It would need an explicit sustainability mandate, which could take the form of an internal carbon price or other measures. Keeping the bank's investments and debt obligations off the UK government's balance sheet – or at least identifying it as 'good debt' that could drive economic growth – could help bolster support for such an investment vehicle.

However, establishing a new institution will be complex and may take a lengthy period of time to yield results. The GIB took over 3 years to establish from the initial proposition in 2009 through the GIB's CEO and Board announcement in 2012. This emphasises the need for the UK to move quickly in establishing such a replacement institution.

3. How might HMT deliver a regionally balanced and 'just' transition across the UK?

HMT needs to ensure its policies and spending support the transition in four broad focus areas to ensure it is 'just':

- A. **Workers:** Ensure that public spending and economic policies facilitate reskilling, preventing the zero-carbon transition adversely impacting workforces with specific skills sets and enabling the transition to generate additional high quality jobs. Grantham Research Institute analysis suggests 10% of UK jobs are likely to require reskilling. Increased investment in lifelong learning is required, coupled with improved incentives for firms to retrain their workers.
- B. **Communities:** Ensure that public spending and economic policies prevent the zero-carbon transition from adversely impacting specific geographic areas and the communities within them and use the transition to promote regeneration of cities, towns and communities across the UK.
- C. **Consumers:** Ensure that public spending and economic policies prevent the zero-carbon transition from adversely impacting vulnerable and low-income consumers (for example, those facing fuel poverty) and design measures to realise positive social impacts for consumers (for example, in their role as investors).
- D. **Growth:** Ensure that steady, sustainable growth is maintained across the economy in a manner that is sensitive to protecting both workers and communities. This will provide the industries and opportunities that workers can be reskilled into.

These focus areas will all be impacted by other economy-wide disruptions happening concurrently, most notably the technologies associated with the 'Fourth Industrial Revolution' (World Economic Forum, 2019). A joined up, forward-looking policy response that manages these various disruptions as part of a broader transition is therefore needed, which considers both young people who will enter the labour force in the future, and the stock of people already in the labour force. Both need to be resilient and adaptable.

There are multiple aspects to this unified policy response that HMT could take across the dimensions of workers, communities, consumers and growth. These could include:

- **Anticipating and responding to threats to workforces and/or communities:** A range of businesses may be impacted by the zero-carbon transition, and those employed by businesses. For instance, removal of policy support for a particular industry could impact a particular region or workforce. While large corporations have the capacity to anticipate and engage with these types of policy and market trends, it is small to medium-sized businesses that are likely to be most at risk of the transition due to their lack of capacity. HMT has a responsibility to 'scan' the economic landscape for these potential risks. HMT can then target public spending and economic policy to prevent specific adverse impacts, and remain responsive to changes.

This approach needs to be place-based, focused on bringing high value jobs to those communities that will lose carbon-intensive sectors as we move towards a greener economy. Central and local government policies will need to regenerate regions, ensuring no communities are left behind. To do this, they will need to understand their underlying strengths, or how to address the weaknesses

holding them back, in relation to the transition taking place. Communities that are highly dependent on carbon-intensive industries need to have plans for economic diversification to prosper in the future. Economic diversification can take many years to implement. Even if decarbonisation is not expected to have an immediate impact on a workforce, regions should start to plan now. Local Industrial Strategies could be a critical tool to achieve this.

- **Ensuring there is capacity to respond to identified threats at the local level:** A critical aspect of responding to threats to communities or workforces is the 'place-based' dimension, with policies and investment requiring a local focus. Local industrial strategies are currently under development, and national policies will need to interact with these in a complementary manner. While HMT could take different approaches to this, what is critical is that a plan and resources are in place to ensure capacity exists to respond to potential imbalances. HMT could deliver regionally targeted policies and investment from a national level, or it could make provisions available for local government to respond to threats within their locality. Regionalised innovation and employment drivers such as the Catapult centres have demonstrated how effective government investment can be in spurring both employment and innovation outside London.
- **Ensuring communities have a voice in how the transition unfolds:** From a safeguards perspective, the voice of affected workers and communities need to be central to the design of policy and implementation across the economy. The Citizens' Assemblies being established around the country in response to Extinction Rebellion's actions could be used to give a voice to communities in this dialogue.

From a positive, development perspective, the zero-carbon transition has the potential to deliver real improvements to living standards in communities via the co-benefits set out in response to Question 1 above. HMT therefore needs to positively involve them in decision-making related to the transition. LSE's Growth Commission emphasises the importance of obtaining local community consent for projects considered to generate an aggregate gain. There is a need for a more consultative process, involving communities early on, and designing of creative mechanisms (over and above monetary compensation) in order to share the gains of development (Growth Commission, 2017). HMT should ensure that funding is available to facilitate this form of dialogue.

- **Using revenues from the transition to strategically balance costs and benefits between different communities and demographics:** The Committee on Climate Change's recent advice on net zero highlights that the balance of costs for the zero-carbon transition are not expected to fall evenly across sectors and populations. As a result, a core recommendation is for HMT to undertake a thorough review of costs and benefits and their distribution, and the appropriate policy levers to achieve an efficient and fair transition. Through this, there are expected to be revenue streams generated, for instance via carbon pricing. Grantham Research Institute analysis indicates a potential £\$20 billion of additional annual revenue from carbon pricing until the early 2030s when emissions could then decline towards net-zero (Burke et al, 2019). This revenue could be strategically reinvested by HMT to support the short-term, high-cost investments required. For instance, support to low-income home-owners to retrofit homes – expected to be a high-cost upfront investment – could be funded in part by carbon pricing revenues.
- **Mobilising investors and banks to align with a just transition:** Financial institutions will play a critical role in supporting the just transition, connecting the environmental and social dimensions of sustainable finance. The incorporation of the need to deliver a just transition in the Government's recent Green Finance Strategy is an important signal of the importance of a joined-up approach that makes sure that clean growth is inclusive.

Around 30 UK-based investors have signed an international statement in support of a just transition; overall, 140 institutions with US\$8 trillion in assets have backed this commitment (TFAForms, 2019). Building on the Grantham Research Institute's guide for investor action on climate change and the just transition, published last year (Robins et al, 2018). The LSE has been working with the University of Leeds and in partnership with the PRI and the TUC, to identify practical ways in which investors can support a just transition. The work has highlighted how investors can connect the environmental and social

dimensions of the transition through investment strategy, shareholder engagement, capital allocation and policy advocacy, and an investor roadmap will be published in the autumn.

Banks will be particularly important in supporting the economy across the country through the transition. The LSE and the University of Leeds are partnering with UK Finance and a range of banks, other financial institutions and key stakeholders on a new 'Banking on a Just Transition' project (Robins, 2019). The project aims to identify how banking can support a just transition across the regions of the UK in which people and places are not left behind and transition involves broad social and economic participation and benefits. The project will involve consultative roundtables being held in Belfast, Birmingham, Bristol, Edinburgh, Leeds and Manchester.

HMT will have a key role to play in ensuring that investors and banks are incentivised to deploy capital in this way. Establishing a new National Infrastructure Bank could help steer private investors by acting as an investment vehicle that actively seeks out projects that ensure an equitable transition for communities and workers. Through an emphasis on blended public and private finance, such an institution could crowd private investors into pioneering zero-carbon projects around the country. HMT could also include encouraging existing institutions such as the British Business Bank to support SMEs in decarbonising their operations and designing innovative zero-carbon goods and services.

Another potential high impact option could be for HMT to support local issuances of green bonds by communities, local authorities and businesses that deliver environmental and social benefits. The Green Finance Strategy highlights some examples of regional projects that have facilitated low-cost finance flowing to small projects in specific localities, such as the Bristol City LEAP Project, which aggregates small projects into a single capital-raising prospectus (HM Government, 2019). Leeds City Council is also exploring the potential for a crowdfunded green bond. The Strategy does not, however, set out any particular recommendations to scale up these types of initiatives around the country; rather, "welcoming the action by local authorities and the private sector on these issues". While action can and should be initiated at the local level, HMT could also play an active role in facilitating the establishment of local green bond issuance as part of a wider UK plan to establish a thriving green and sustainable bond market.

HMT's strategy

4. What is HMT's current strategy, and approach to, UK decarbonisation, and is it fit for purpose?

Currently, HMT's strategy and approach to UK decarbonisation across the economy is not easy to define, with piecemeal successes and failures that are not clearly part of an overarching vision. HMT has mostly shown a preference for low or no regrets measures as opposed to costlier, riskier but potentially transformational policies and investments, evidenced by Philip Hammond's letter highlighting the potential costs of achieving net-zero.

This would suggest its strategy and approach are not fit for purpose, in light of growing awareness among the general public of the need for rapid decarbonisation. A recent poll demonstrated that a quarter (27%) of Britons now cite the environment in their top three issues facing the country, putting it behind only Brexit (67%) and health (32%) (YouGov, 2019).

HMT is in a unique position to lead this shift, given that it is a whole-economy issue. The CCC has highlighted the least-cost pathway to delivering net-zero by 2050. HMT now needs to make a long-term, apolitical commitment to decarbonisation as a core focus through policymaking and investment. There is a risk that the net-zero agenda could become politicised, with legacy policies and investment programmes prone to scrapping following changes in ministers or governments over the next 30 years. Other core demands for the attention of senior HMT leadership should be positioned alongside the core business of zero-carbon policymaking and investment.

Examples of successes and failures in recent years are highlighted below.

Success stories to date

- **The carbon price floor:** One of the major successes of energy policy in the UK has been the almost complete phasing out of coal power, and HMT has played a key role in this. A combination of good regulation and a modest carbon price have made a big difference. The Carbon Price Support

policy has been instrumental. A modest carbon price has already seen significant coal to gas switching as the Carbon Price Floor raises the variable cost of plant with higher carbon intensities; hence a carbon price changes the merit order from higher- to lower-carbon-intensive plant. This has been particularly effective when coupled with the Emissions Performance Standard, which effectively banned new power plants fuelled by coal unless they were equipped with carbon capture and storage technology.

The UK's Total Carbon Price has been high enough to tip the balance in favour of natural gas, meaning that coal power has almost disappeared completely, with one estimate suggesting that the Carbon Price Support policy alone caused 73% of the reduction in coal generation from 2012 to 2016. The amount of electricity generated from coal fell by 85% from 2012 to 2018.

This approach needs to be continued as further reductions in emissions are sought. Imposing a carbon price at £40/tonne would generate revenues of approximately £20 billion per year for at least the next decade (Burke et al, 2019). This creates enough fiscal headroom to enhance the public acceptability of carbon pricing through appropriate redistribution of the revenues, and will help fund research into and the development of low-carbon projects.

- **Contracts for Difference/Offshore wind:** Competitive reverse auctions compared to a general subsidy have been instrumental in driving down the cost of offshore wind. This shows the value of a predictable, stable and bankable policy framework that has lowered the cost of capital. Costs have almost halved in a period of five years to the point where the latest auctions will be almost subsidy-free. Based on BEIS projections, in the latest auctions the top-up on the wholesale price could be as little £2/MWh (BEIS, 2019). The frequency of the auctions could perhaps have been increased, for example to every six months, so that cost decreases can be better incorporated into the bids, lowering investor uncertainty and thus having a positive effect on costs. The exclusion of onshore wind from Government support must now be looked at (see below).

Lessons to be learned

- **Premature privatisation of Green Investment Bank:** As emphasised above in answer to question 2C, the 2017 privatisation of the Green Investment Bank leaves a gap in the institutional landscape that there would be benefits to addressing.
- **Backtracking on policies** e.g. zero-carbon homes and scrapping of Peterhead/Yorkshire White Rose carbon capture and storage (CCS) programme: HMT had a role in both incidences of policy reversal, which has done little to build private sector confidence. In 2015 the Government scrapped plans for a £1bn fund tipped for a cutting-edge CCS scheme, either in Peterhead (Scotland) or Yorkshire. This potentially set the UK back several years in developing a market for CCS in the UK. The recent net-zero advice from the CCC reiterates that CCS is likely to be a critical technology for the UK to reach net-zero emissions (CCC, 2019). This also represents a lost opportunity for regional economic growth: the proposed Peterhead development could have created up to 600 jobs and acted as a hotbed for innovation in CCS. Also in 2015, HMT revoked the planned zero-carbon homes standard. Similarly to the scrapped CCS scheme, this raised concerns from industry about the long-term policy support for buildings decarbonisation.
- **Disruption to renewable energy markets: onshore wind and solar:** The exclusion of onshore wind from government support must be looked at. The Government should urgently re-evaluate its position, particularly in light of a net-zero goal. It is the cheapest form of renewable energy in the UK and is likely to need very little government support to make viable.
- **Fuel duty freeze:** Fuel duty is a tax on fuel and currently stands at 57.95p per litre of petrol, diesel, biodiesel and bioethanol. It has been frozen at this level for the last nine years. While this policy has been acclaimed from a social perspective as reducing the burden on households, from a decarbonisation perspective it is providing a perverse incentive, encouraging high-carbon modes of transport. Grantham Research Institute research suggests this is likely to be driven by electoral considerations (Finnegan, 2018). This research suggests that the country political environment may have affected how governments gauge the political risk of potentially unpopular policies like fossil fuel taxes. While politically expedient, focusing solely on the short-term monetary costs of

fuel duty may miss significant benefits, now and in the future. Indeed, fuel duty should be thought of as a policy investment that transforms short-term costs into much larger long-term benefits – importantly, climate change mitigation. Former Chancellor Philip Hammond estimated the freeze to have cost HMT £46 billion in lost revenue since 2011. Conversely, the think tank Policy Exchange has suggested that the shift towards electric vehicles could lead to a cumulative impact on fuel duty receipts of as much as £170 billion between now and 2030 (Policy Exchange, 2017). Either way, freezing taxes render the Government unable to respond to changing external markets, resulting in inefficiencies and undermining the bankability of new projects. In keeping with the recommendation to make zero-carbon policymaking apolitical, new governance structures could be considered to ensure that critical policy levers such as fuel duty or Carbon Price Support do not become hijacked by political agendas.

5. How does HMT work with the Clean Growth Strategy and government departments to support decarbonisation? Is this working well?

The Clean Growth Strategy could be better coordinated with other government policy documents such as the Industrial Strategy, and HMT has had varied levels of buy-in and ownership of each document. For instance, the Industrial Strategy positions the low-carbon economy as a discrete economic sector, with potential to outperform the rest of the UK economy. 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 perceived ‘real’ business of growth.

The recent Green Finance Strategy, co-developed by HMT and BEIS, holds promise in that it describes itself as a “strategy to green the financial system as a whole”, and is owned by both departments. However, it is not clear how the strategy will be delivered in collaboration with other relevant departments (e.g. Ministry of Housing, Communities & Local Government for financing buildings decarbonisation) or how green finance will be used as a tool to implement other existing government strategies.

The UK should develop a single coherent strategy, which could be anchored by HMT with inputs from other government departments, to drive zero-carbon growth across the economy. This can ensure a more streamlined approach, bringing together the Industrial Strategy, the Clean Growth Strategy and other key documents, and incorporate the additional efforts required to meet the carbon budgets.

6. How should HMT’s approach evolve to ensure the Government meets the legally binding carbon budgets (and the net-zero targets, if applicable)

Views on the current proposed approach to meeting the carbon budgets

The report that the UK government is allegedly preparing to use previous over-performance in reducing carbon emissions when calculating its carbon budget for up to 2027 indicates a worrying willingness to game the system on meeting crucial climate change targets (Pickard et al, 2019). Such a move would go against the explicit recommendation of the Committee on Climate Change and would thereby throw into doubt the Government’s credibility on tackling climate change, in contrast to the leading international role the UK has taken so far, including bidding to host the 2020 UN climate change summit.

To have this characterised as an ‘insurance policy’ for the next government suggests that this government is prioritising political concerns over crucial emissions reductions. Carbon budgets are already set for five-year periods to make sure they reasonably take into account yearly fluctuations in carbon emissions, based on changes such as economic growth. The UK government is already off track to meet its carbon budgets for the late-2020s and early-2030s, let alone net-zero emissions by 2050.

Allowing more emissions in the future instead of making actual progress on cutting emissions is short-term thinking which is likely to be harmful in the long term. Instead, the Government should focus on creating incentives for industry to reduce carbon emissions, alongside specific measures such as rolling out energy efficiency for UK homes and encouraging investment in carbon capture technologies and systems.

Steps for evolving the current approach in order to meet the carbon budgets

It will be critical to translate the 2050 goal into shorter term milestones. The Government could ask the CCC to review implications for the Third (2018 to 2022), Fourth (2023 to 2027), and Fifth Carbon (2028 to 2032) Budgets. The Sixth Carbon Budget (2033 to 2037) is due in 2020. These revised budgets can then form the basis for subsequent policies and investment.

Robust carbon pricing with clear signals to industry about how pricing will change over time will be necessary to ensure the UK meets these revised budgets. The current carbon price floor is £18 until 2021, but recent Grantham Research Institute analysis indicates that the shadow carbon price used by HMT may need to start at £50 in 2020 and rise to £150+ by 2050 (Burke et al., 2019). While these figures should be revisited following the CCC review of carbon budgets, they give an indication of what may be necessary.

It is also important to emphasise that carbon pricing alone will not enable the UK to meet its budgets and a 2050 net-zero target, and will need to be accompanied by other complementary policies specific to sectors. Political realities necessitate a balance between carbon pricing and complementary policies, and government will therefore need to be sensitive to civil unrest similar to that seen in the *Gilets Jaunes* protests in France.

These risks could be mitigated through redistribution of carbon tax revenues. Grantham Research Institute analysis has indicated a tax of £40 a tonne would raise £20 billion a year. If fully redistributed, a 'carbon dividend' of £300 per person per year could be disbursed until the early 2030s when emissions could then decline towards net zero.

Establishing a clear timeline for phasing out fossil fuel subsidies will also be a critical tool for HMT to demonstrate its commitment to net zero. UK financial support to fossil fuels is currently the highest in the EU, at over €10 billion per annum (Carrington, 2019).

7. What role should the 2019 Comprehensive Spending Review play in UK decarbonisation? What projects or measures should receive additional funds through this process?

The 2019 Comprehensive Spending Review (CSR) needs to take an economically robust look at current UK spending that may be helping or hindering the zero-carbon transition. The review should focus on the critical levers of fiscal policy that could influence the decarbonisation rate, such as fossil fuel subsidies and carbon pricing. This could also be a critical opportunity to develop a Capital Raising Plan focused on innovations in key net-zero products and services such as green mortgages.

On p.245 of the CCC's net-zero advice, it highlights a number of critical areas in which the Government should carefully consider public spending (CCC, 2019), and should therefore be covered in the CSR. These include Exchequer spending on low-carbon heating and its support for the forthcoming Heat Roadmap; incentive schemes and regulation for industry; capital subsidies and taxation related to electric vehicles; subsidies to farmers; fiscal mechanisms for negative emissions; and customer bill payments for low-carbon electricity.

More broadly, the CSR will be an opportunity to examine the institutional framework and investment vehicles involved in spending. For instance, HMT should use the Review to define gaps in the investment landscape: the Grantham Research Institute's view is that a National Infrastructure Bank could be a suitable solution.

The CSR should also be used to test the extent to which last year's National Infrastructure Assessment's recommendations have been implemented with policies and investment. While the Assessment predates the net-zero target, there are a number of robust recommendations that are aligned with a net-zero trajectory (e.g. measures to improve the energy efficiency of building stock) but have not yet been adopted in policy. The Government has so far only published an interim response to the recommendations. The CSR could be used to allocate funds in support of its recommendations. Finally, the Government's ongoing Infrastructure Finance Review can also inform the CSR by assessing the scale of financing required for net-zero.

Green Finance

8. What role do UK financial services firms currently play in the decarbonisation of the economy, (for example, through stewardship, capital allocation to green projects, green financial products)? What more can they do?

UK financial services firms play a variety of roles in decarbonising the economy, including as capital providers for projects and as influencers of company decision making. Regarding the latter, UK firms are showing increasing engagement with companies about their greenhouse gas footprint and are using this engagement as a tool to drive decarbonisation. The Grantham Research Institute is providing analytics to support this form of engagement through the Transition Pathway Initiative (TPI). The TPI is a London-based initiative, led by asset owners and supported by asset managers, which assesses companies' preparedness to transition to a low-carbon economy. It was established in January 2017 as a joint initiative between the Church of England National Investing Bodies (Church of England Pensions Board, the Church Commissioners and CBF Funds) and the Environment Agency Pension Fund.

TPI analyses companies' transition risks based on (1) their management/governance of greenhouse gas emissions and the risks and opportunities arising from the low-carbon transition, and on (2) their Carbon Performance, which is a measure of companies' emissions pathways benchmarked against the international targets and national pledges made as part of the 2015 UN Paris Agreement on climate change. More than 45 investors globally fund and/or use the research to inform their investment decisions and/or to engage with companies among other things (TPI, 2019).

TPI analysis is primarily used by asset owners for such engagement. However, some asset owners use it to put more pressure on emission-intensive companies. For example, the Church of England has committed to use TPI's assessments to reduce holdings in companies that show a lack of responsibility to assist in the transition to a low-carbon economy from 2020 onwards. Moreover, they will divest from companies based on TPI outcomes. Other financial companies are doing the same. Investor engagement with TPI demonstrates the increasing role that UK financial services firms are playing. Looking ahead, the behaviours exhibited by investors such as the Church of England need to become mainstreamed; finance providers should seek to use robust climate analytics to underpin demands to their assets to decarbonise.

One area for further policy consideration and action is that of green and sustainable bonds. Green bonds ring-fence proceeds for activities that have environmental benefits, while sustainable bonds do this for activities that have environmental and social benefits. The UK has demonstrated strength in the growth of this market. However, according to the Climate Bond Initiative, the UK is ranked outside the top 15 countries in terms of green bond issuance, performing below expectations (CBI, 2019). To resolve this, the Government and the new Green Finance Institute could work with others to develop a plan to establish a thriving green and sustainable bond market in the UK. This would identify the barriers facing this market and highlight practical options to scale up issuance of community, corporate and public sector bonds, which accelerate flows of green and sustainable finance in a cost-effective manner.

One particular priority to stimulate more activity amongst UK financial services firms is sovereign bonds. In the Green Finance Strategy, the Government indicated that it does not plan to issue a sovereign green bond at present. The experience from other countries indicates that sovereign bonds can have an important demonstration effect both across the financial system and also within government, given the need to identifying qualifying areas of public spending. In addition, sovereign bonds (along with issuance from other public bodies) can also help to channel private savings to priorities that tend to be under-supplied by the market (such as research and development, SME finance as well as the just transition activities at the regional level).

9. What steps have UK banks, asset managers, and pension funds taken to 'green' their business models, investments strategies and balance sheets, taking in to account climate and transition risks?

10. Are there any barriers (regulatory or otherwise) preventing financial services firms from delivering green finance or investing in 'green' assets?

11. What prudential risks does climate change pose?

Climate change poses financial stability risks, transition risks and physical risks. The Bank of England's new policy expectations for insurers and banks from the Prudential Regulatory Authority cover governance, risk, scenario management and disclosure. For a detailed discussion of the prudential risks posed by climate change, please see the September 2018, Bank of England report "*Transition in thinking: The impact of climate change on the UK banking sector*".

The Bank of England's forthcoming Stress Test will shed further light on prudential risks. The design of this **stress test** will start in the autumn, and the tests will be completed in 2021. The stress test will reveal the UK financial system's ability to withstand the financial risks from climate change that arise from the increased frequency of weather events and from the transition to a carbon-neutral emission economy. The test could motivate firms to address data gaps and to develop cutting-edge risk management consistent with a range of possible climate pathways, ranging from early and orderly to late and disruptive. This test will be the first of its kind to integrate climate scenarios with macroeconomic and financial models.

The Bank will develop the approach in consultation with industry, including insurers, and other informed stakeholders including experts from the Network for Greening the Financial System and the PRA's Climate Financial Risk Forum. With this new supervisory approach, the Bank could help ensure that the financial system is resilient to the risks and can take full advantage of the opportunities in a carbon-neutral economy.

Beyond prudential policy, the shift to a net zero economy also has strategic implications for monetary policy. Another response to the last financial crisis was the introduction of quantitative easing, which was vital to sustaining demand and liquidity. But there were a variety of knock-on impacts for markets and inequality. One of these was a blindness to the environmental and social quality of bond purchases. This time around, central banks are winding down QE. But they can still play a vital role by sending clear signals that they will integrate environment and social factors into the management of their balance sheets and monetary operations (Monnin, 2018). The European Central Bank, for example, has announced that it will no longer make new bond purchase, but will buy new bonds as its existing stock come to maturity. As Paul De Grauwe has argued recently, this creates a "window of opportunities" for the ECB to replace the old bonds with new "environmental bonds" (De Grauwe, 2018).

In addition to these broader activities, there is growing focus on the relationship between decarbonisation considerations and risk / return profiles. The BOE recently produced work suggesting that the mortgages on energy efficient homes have a lower risk than those on energy inefficient homes. This result holds even after controlling for income at origination (Bank Underground 2019). This suggests that energy efficiency is a relevant predictor of mortgage risk. LSE Grantham are currently undertaking complementary research which will link the loan books of two large UK banks with the EPC database. A first step will be to understand to energy performance of the portfolios. The next step will be to quantify whether improvements in energy efficiency actually reduce mortgage risk. Providing this evidence could help the private sector mobilise finance towards energy efficiency.

12. What is the Financial Conduct Authority and the Prudential Regulation Authority doing to support decarbonisation and a 'greening' of the financial system?

(b) What expectations do (and should) they place on regulated firms about their role in the transition through their policy and supervisory activities?

13. What is the consumer demand for 'green' financial products?

The finance sector should prioritise greening of all financial products and making this the new normal, as opposed to bringing out green products as premium options alongside more traditional financial products. With regard to consumer demand, financial services firms are working with researchers to better understand green financial products and their benefits. As their benefits become better understood, this is likely to impact demand. The LENDERS project has shown that incorporating household energy costs into mortgage affordability calculations could allow households to borrow more capital upfront (LENDERS, 2017). If mortgages attached to energy efficient properties are indeed lower

risk, this may enable banks to also lend at lower rates. The combination of increased capital and lower rates could increase consumer demand for green products.

Previous research has shown that consumer demand for a range of green products and schemes such as electric vehicles, energy efficiency subsidies and rebates has tended to be concentrated amongst wealthy environmentalists (Hunt et al, 2015). For an initiative aiming to increase demand for green financial products, it will be important to ensure that they are marketed and available to all households and not solely targeted at wealthier consumers.

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