green alliance...

Climate for growth

Productivity, net zero and the cost of living

nesta

Climate for growth
Productivity, net zero and the cost of living

By Sam Alvis, head of economy, Green Alliance and Andrew Sissons, deputy director, a sustainable future mission, Nesta

This paper is a collaboration between Nesta and Green Alliance. The authors take equal ownership of the content and ideas throughout.

Acknowledgements
With thanks to Tom Sasse at the Institute for Government, Sophie Frew at the University of Greenwich and Anna Valero at the Centre for Economic Performance for their comments on the early draft of this work. Thanks also to the attendees of the Nesta and Green Alliance roundtable, held in January 2022, that helped to shape this work

We are grateful to our funders the Treebeard Trust and Gower Street for supporting this work

In collaboration with

nesta

Green Alliance
Green Alliance is an independent think tank and charity focused on ambitious leadership for the environment. Since 1979, we have been working with the most influential leaders in business, NGOs and politics to accelerate political action and create transformative policy for a green and prosperous UK.

The Green Alliance Trust
Registered charity no 1045395
Company limited by guarantee
(England and Wales) no. 3037633

Published by Green Alliance
May 2022

ISBN 978-1-912393-75-6

Designed by Howdy

Summary

> “Some immediate actions to tackle climate change will boost productivity at the same time as rapidly cutting emissions.”

Renewable energy is a parable for the government’s efforts to decarbonise. A decade ago, wind and solar generated the same electricity output as fossil fuels, but for a much higher price. While better for the climate, more renewables meant lower UK productivity, compounding a decade of stagnant productivity growth.

Today, even without considering its environmental benefits, renewable energy is now productivity enhancing. We get the same, good, electricity, for a much lower price than fossil fuels. What changed was the cost of the technology, driven by bold policies designed to foster innovation.

Productivity and actions to meet the net zero carbon goal have a complex relationship. Some immediate actions to tackle climate change will boost productivity at the same time as rapidly cutting emissions, notably electric vehicles and zero carbon power. For policy makers, the productivity challenge is to ensure these are taken up as quickly as possible.

Other areas are more ambiguous but reveal choices. Energy efficiency, for example, will result in productivity gains through healthier, cheaper to run homes. But high costs in the building industry, which has not raised its productivity in the past 20 years, mean that the deep energy retrofits that are right for the climate could be a drain on productivity.[1] If the UK can rethink how to retrofit buildings, it could align emissions savings with productivity gains. But, to do so, this must be a deliberate policy goal.

Other areas are more challenging. British innovation has the potential to spring surprises, but in a few sectors, like aviation, where sustainable fuel is likely to remain more expensive than fossil fuel, government policy will need to minimise the costs and negative

> There is clear value in considering net zero and productivity together."

impacts on productivity. It will also require weighting decarbonisation towards the technologies and processes more likely to be beneficial, for example in new aircraft designs that require much less fuel. The government should seek to keep productivity drains, like carbon capture and storage, to a last resort.

As with decarbonising energy, there is clear value in considering net zero and productivity together. Positive outcomes are not arrived at passively, the government will need to intervene to ensure they are realised. This report outlines a classification of net zero actions which can help the government to understand where and how it can increase productivity. Within sectors, policy will be required to enable this or, in a worst case scenario, minimise the risks. There are also actions that work across sectors, notably on improving green skills and reducing capital costs.

While the relationship between productivity and climate policy is increasingly clear, the institutional home for these decisions is not. With the Treasury overseeing the *Plan for growth*, it is likely that will remain the best mechanism for decisions which at least avoid harming productivity. Given the predictions of the Office of Budget Responsibility about future economic and productivity growth, both the Treasury and other government departments should see net zero not just in cost minimisation terms. When designed in the right way, climate policies will provide the productivity and, therefore, the economic growth that the Treasury is trying to stimulate.

Productivity, net zero and the cost of living

> “Net zero is not one thing but a series of different policies and changes, from renewables to decarbonising industry and agriculture.”

The UK is experiencing a cost of living crisis, with inflation likely to reach its highest level since the early 1980s. Real household incomes are set to fall steeply during 2022 and 2023. This has been caused mainly by rising prices, particularly the dramatic increase in the price of fossil fuels. Attempts to tackle the crisis have largely focused on inflation but the other side of the equation, the growth in wages, has been much less discussed.

The UK has seen exceptionally low growth in real wages since the 2008 financial crisis, largely driven by flatlining productivity. The UK’s median real wage was lower in 2021 than in 2008, a slowdown unprecedented since at least the 1920s. Wages today would be £195 a week higher if they had continued to grow at the pre-2008 rate.

By comparison, the Resolution Foundation estimates that the increasing cost of living, including energy bills and tax increases, will cost the typical, non-pensioner household around £20 per week. While inflationary pressures are acute, the slowdown in wage growth has had a much bigger impact on the UK’s prosperity than inflation.

As we show below, consumer price inflation has averaged 2.1 per cent a year since 2008, but nominal wages have grown even less than that. Slow wage growth, not inflation, has caused the huge drop in workers’ take home pay over the past decade and a half.

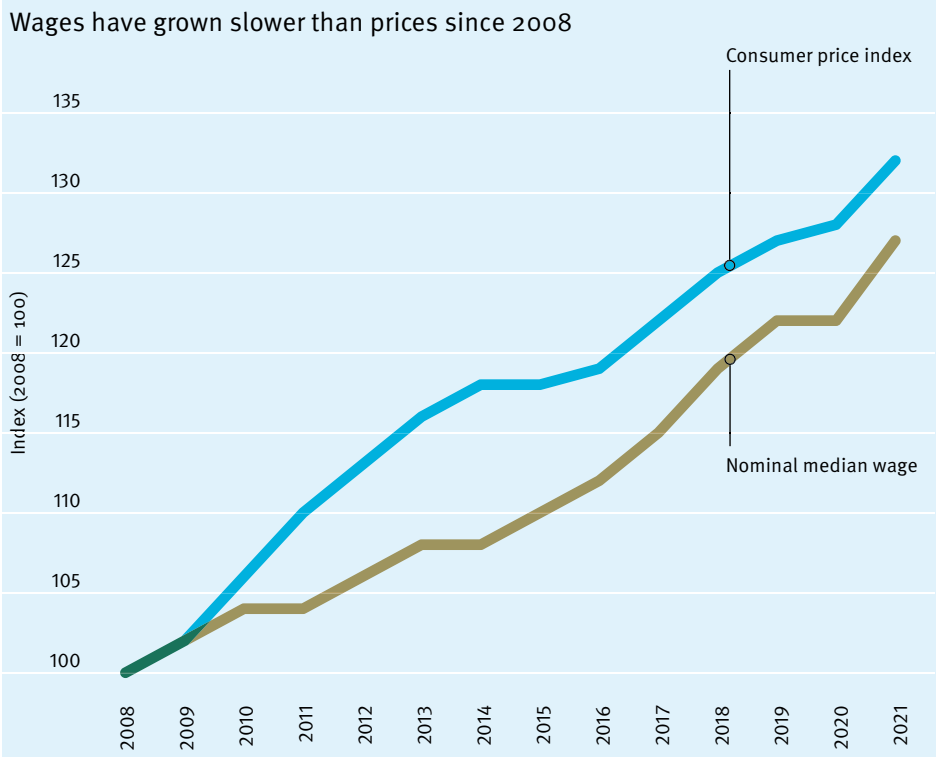
Alongside this challenge sits climate change, and the need to decarbonise all economies rapidly. Climate change and the net zero carbon economic goal to tackle it are closely entwined with productivity and the cost of living. The energy price crisis is making this salient: fossil fuels are the main cause of both emissions and high energy prices, but there are a number of other important interactions between net zero and productivity. Climate action offers some of the most important opportunities for growth over the coming decades, but it will also impose costs on some parts of the economy.

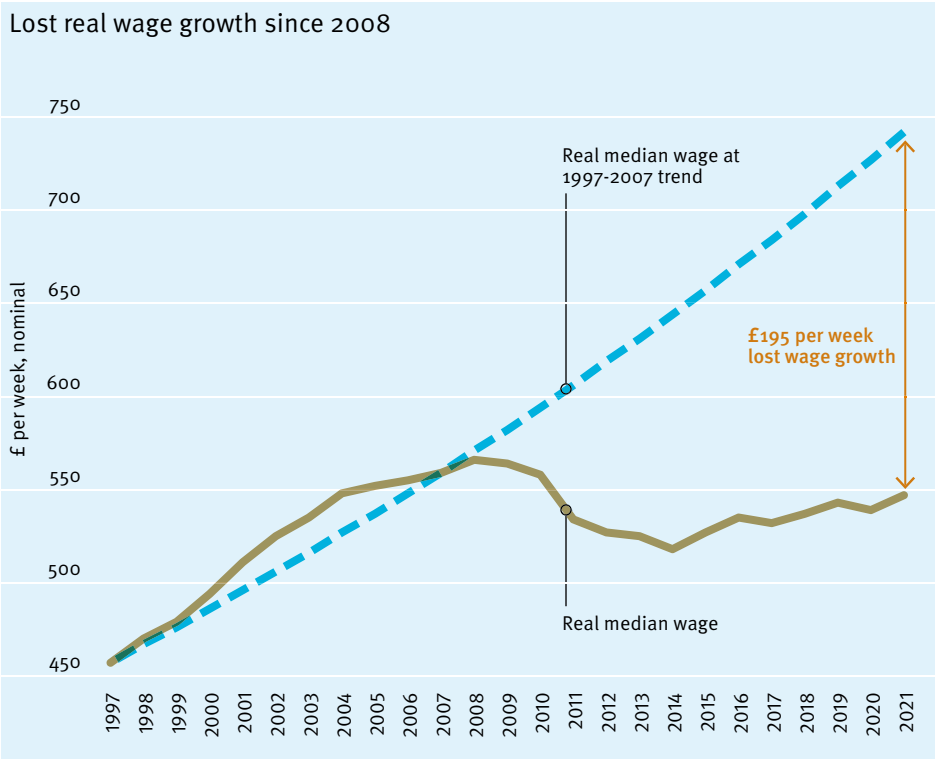
The question ‘will net zero be good or bad for productivity?’ is almost impossible to answer definitively. In reality, net zero is not one thing but a series of different policies and changes, from renewables to decarbonising industry and agriculture. Each of these will have quite different impacts on productivity.

Our aim here is to codify the links between the many different actions towards the net zero goal and productivity, both positive and negative. By setting out a broad framework for how net zero could help or harm UK productivity, we hope to inform the right choices, to make the low carbon transition as economically beneficial as possible.

“The UK has seen exceptionally low growth in real wages, largely driven by flatlining productivity.”

Wage growth has stalled since 2008[2]





Climate change is bad for growth, but net zero can be good

> “The costs of climate change increase the longer it is left unchecked.”

Climate change and productivity are linked in many ways, but there are two different types of connection worth clarifying. One is about climate change itself, which is unequivocally bad for productivity, and one is about action on net zero which, depending what it is, can affect productivity in a variety of ways.

Rising global temperatures, more extreme weather and extensive damage to nature all negatively affect productivity. As climate change intensifies, the disruption, scarcity of natural resources and pressure on land it causes will increasingly harm the economy. It is now well understood that efforts to mitigate and adapt, by reducing carbon emissions and making societies more resilient, are much less costly than inaction.

The costs of climate change increase the longer it is left unchecked, as the Intergovernmental Panel on Climate Change’s recent sixth assessment reports make clear. And the costs of a 3°C world will be disproportionately higher than the costs of a 1.5°C world.[3]

The link between UK productivity and action to reach a net zero carbon economy is less clear, not least because the country can influence, but not control, global action on climate change.

A good way to frame this is to ask: if the rest of the world moved towards net zero carbon economies but the UK did not, would that be good or bad for UK productivity? In addressing this, there are further questions to ask.

First, are the actions we need to take to reach net zero good or bad for productivity in isolation?

Second, what would happen to the UK economy if we did not take this action in a world economy that did?

Here, we focus mainly on the first of these questions, but we consider both where possible.

What net zero and productivity aims have in common

> “The innovation required to reach net zero is an opportunity to raise productivity directly.”

Actions to reach a net zero carbon economy and increase productivity have four factors in common.

Efficiency

First, both aim to make better use of resources. Productivity is defined by how well an economy turns its inputs: labour, capital and raw materials, into outputs. To achieve net zero, fewer material inputs should be used, most notably that means fossil fuels, but other natural resources and land, too.

Investment

Second, investment plays an important role. Many of the changes required: such as renewable energy, electric vehicles, greener home heating and industrial decarbonisation, require huge capital investment, some by the government but most by the private sector.

Investment in physical and intangible capital is a major driver of productivity, and an area where the UK has often lagged behind other advanced economies. For both net zero and productivity goals, it is not just the amount of investment that matters, it is also important to allocate it to the right technologies and businesses, which is not easy during a rapid transition.

Given the large and growing appetite for green finance, it is clear that net zero will be a leading driver of investment that should also influence UK productivity growth.

Innovation

Third, achieving both net zero and high productivity relies, above all else, on innovation. In terms of technologies, business models, processes etc, innovation is widely considered to be the basis for lasting productivity growth. Achieving net zero requires a huge amount of innovation in all these areas. Indeed, it is rare for an economy to get such a clearly specified, long term need for innovation signalled in advance.

The innovation required to reach net zero, to develop new technologies, adopt new processes, increase efficiency and save labour, is an opportunity to raise productivity directly and through spillovers to the rest of the economy.

Skills

Fourth, net zero and productivity both rely on changes in the labour market, in both new jobs and increased skills. Net zero will require more labour intensive activities in some areas (such as installing energy efficiency measures in buildings), but may reduce the number of jobs in others. It will also change the nature of the many jobs and the

skills required to do them across the economy, which will directly influence productivity.

Given these connections, and the links to the cost of living, it makes sense to look closely at how the aims of achieving net zero and higher productivity can reinforce one another.

Rather than take an overarching approach, we have instead focused on specific changes needed for the UK to become a net zero economy, each of which will have a different effect on productivity.

The Treasury's view of productivity and net zero

In October 2021 the Treasury produced a *Net zero review* to highlight the issues around its role and the economy as the UK decarbonises. While it states that "action to mitigate climate change is essential to long-term UK prosperity, productivity and competitiveness" the Treasury is concerned about the uncertainty of productivity gains.

The review refers to productivity gains in the following ways:

- GDP multipliers for green investments in renewables can be between 2.2 to 2.5 times larger than fossil fuel energy investment, depending on time horizons and specification.
- Where [environmental improvements] allow for a healthier and more productive workforce, they can support productivity improvements.

Higher productivity tends to reduce the unit costs of production, which would generally be expected to offset the negative competitiveness impacts of emissions mitigation policies. This, in turn, would help to mitigate the risk of carbon leakage in the economy.

On the negative side, the review highlights the impacts of climate change on productivity from higher temperatures and damage to UK capital stock. Where clean technologies are in development, the review says "the degree to which they lower operating costs and increase output compared to existing technologies" will be crucial to productivity.

> “In some areas of the economy, net zero policies should reduce running costs.”

Our classification sets out how productivity will be affected by the transition to a net zero carbon economy. The following concepts have helped to inform our judgment of the overall impact, whether positive or negative, of sectoral net zero policies around productivity. This includes both productivity within that sector and where action in one sector will spillover into others. We have considered the action of transition and, thus, the majority of impacts felt in the short to medium term, ie up to 2030. However, where relevant, we also note enduring impacts.

Transition costs

Transition costs, ie the upfront, sunk costs of shifting to new systems and processes, are typically bad for productivity, because they reduce output and divert investment from other, more productive, activities.

These costs include one off investments in new technology, infrastructure or organisational structures and processes, and are typically capital investment. However, we have excluded investments that generate a direct financial return and are already financially viable (such as in solar or wind generation), because these are not costs to the economy.

A useful test as to whether something is a transition cost is to ask whether anyone would make this investment if there was no pressure to meet the net zero goal? Pressures to invest can include legal or regulatory requirements, but also financial and reputational pressures, as well as self interest in avoiding the costs of climate change.

Transition costs are generally borne by businesses or government but may be passed on to consumers.

Running costs

In some areas of the economy, net zero policies should reduce running costs, especially where energy or resource uses decrease. In other cases, running costs will increase, due to more complex processes and labour requirements. This typically increases productivity directly, by reducing factors of production needed to maintain output and, therefore, boosting value added, and, indirectly, increasing aggregate demand. Running costs can accrue to businesses or consumers, depending on market conditions.

Opportunity costs

Where action towards net zero requires upfront investment, it is important to consider where the capital would otherwise have been spent. Although, under recent economic conditions, there has been a surplus of capital, this may not continue indefinitely. Net zero

> “Reducing imports of oil, gas and coal is likely to increase productivity in the UK.”

investments could crowd out some other investments if there’s a restriction of capital. Opportunity costs typically lower productivity by reducing the return on capital investment.

System costs

Some aspects of net zero policy will place extra strain or costs on other parts of the system. For example, the increased use of electric vehicles and heat pumps will increase electricity demand, putting more pressure on the power grid and electricity generation. These system costs reduce productivity by placing additional costs on businesses and the government, lowering the value added.

Imports and exports

Increasing exports, or reducing imports for some products or services, can increase productivity. For example, reducing imports of oil, gas and coal is likely to increase productivity in the UK, by boosting aggregate demand, lowering prices and reducing reliance on expensive factors of production from overseas. Likewise, boosting exports can also increase aggregate demand while exposing more industries to international competition.

New products and services

In some cases, net zero policies may create new opportunities for businesses. For example, the increase in cheap renewable energy may make new products or services possible. Commitments to net zero and related targets can encourage private investment in R&D and the development of products, growing national and global markets. New products and services usually increase productivity, although they could also decrease it, if the new activities are in low productivity sectors.

Making sense of the link between the green economy and productivity

The high level interactions between climate action and productivity suggest that looking at them together will increase the efficiency of policy making, helping the government to achieve two of its major priorities under one framework. To begin this process, Green Alliance and Nesta have developed a classification to help policy makers understand the impact of specific net zero investments on productivity.

This is divided up into the chief concrete actions required for the economy to reach net zero carbon. For each of these, we highlight their likely positive and negative impacts on productivity, as well as the transition (upfront) and resource (ongoing) costs of the change.

Greater understanding of these interactions allows for tailored policy responses to ensure productivity gains.

Impacts on productivity

This classification implies that, depending on whether there are positive, ambiguous or negative impacts on productivity, three different levels of response will be required from government:

1. Positive
Where there are clear and immediate productivity gains, policies required are predominantly regulating and market enabling. Where investment is needed it is moderate.

2. Ambiguous
In these cases, there are likely to be productivity gains, but they depend on the eventual state of the market. Policy should be more focused on innovation, both early and mid-stage, with transition and potential ongoing investment required.

3. Negative
Where the impact is clearly negative, productivity gains are unlikely and may never be realised. Government action will be vital to mitigate against negative outcomes, and continued support is likely to be needed to realise social goods. Sizeable and ongoing investment is required.

A classification of the impact of green economic activities on UK productivity

Action	Positive	Negative
Positive impact		
Renewable energy Investing in solar, wind and other renewable electricity generation Main transition period up to 2035	+ Cheaper electricity from lower inputs and higher efficiency frees up resources + Lower energy imports, boosting aggregate demand + Abundant cheaper energy may enable new products and services + Some extra high value jobs + New technologies invented in the UK can generate new products and improve access to export opportunities + Increased energy security and resilience reduces certainty	– Opportunity cost of initial capital investment – Variability of generation – Lower energy intensity
New low carbon buildings Higher quality construction of new buildings, with higher efficiency standards from the outset Main transition period from 2025	+ Reduced energy expenditure frees up resources + Improved health outcomes + Reduces the inputs required to deliver services + More comfortable work environments improve employee productivity + Offsite, modular construction is more efficient	– Higher upfront costs initially for developers – Uncertainty of changing and delayed standards
Electric vehicles (EVs) Sales of fully electric cars and goods vehicles Main transition period up to 2040	+ Lower running costs, more efficient fuel conversion + Lower asset depreciation	– Increased pressure on the electricity grid – Higher upfront vehicle costs and subsidies
Low traffic cities Reducing car use and promoting active travel and public transport in urban areas Transition likely to continue to 2050 and beyond	+ Health benefits from exercise and cleaner air + Lower cost travel + Lower fuel and energy use + Reduced congestion increases journey efficiency + Flexible timing can spread demand using fixed resources more efficiently + Parking and road use is an inefficient use of urban land	– May limit the labour market by restricting commutes – Requires state investment in public transport – Increased costs for those reliant on private transport

	Transition costs and who pays	Running costs and who pays	Key policy considerations
	Low Industry Transition costs are low because investments in renewables are already economically optimal.	**Reduced** Industry and consumers	Continue capacity auctions Create a supportive planning regime for onshore and offshore wind and solar Invest in upgraded grid capability to handle higher volumes of electricity and storage
	Medium Industry Industry will need to develop new processes and source potentially costlier materials	**Reduced** Industry and consumers	Timing and enforcement of the future homes standard Connection of low carbon homes to low carbon behaviours, eg public transport Regulation of technology choices within homes, eg heating solutions
	Medium Industry and consumers While some investments may be economically optimal, eg personal travel, some will happen earlier than is optimal, eg HGVs	**Reduced** Consumers	Reliable charging infrastructure rollout, both type and location Targeted support to low income groups Increase renewable electricity supply Support for the UK EV supply chain, notably areas of strong innovation in the UK, like batteries
	Medium Government Will require government funded or backed investment	**Reduced** Consumers **Increased** Government	Exclusion methods and coverage, eg low traffic neighbourhoods (LTNs), road pricing Alternative provision, eg car sharing, active travel and public transport Compensation or support for disproportionately impacted groups

Action	Positive	Negative
Positive impact		
Inter-town and city public transport Reducing car use and promoting public transport between towns and cities Transition likely to continue to 2050 and beyond	+ Reduced congestion + Reduced fuel costs per journey + Widens the effective working population of a given area + Health benefits from cleaner air	– Reduced individual journey efficiency – High government investment required, which could constrain spending elsewhere
Nature-based solutions Protection, restoration or management of ecosystems to mitigate climate change impacts Transition likely to continue to 2050 and beyond	+ Raises the productive output of land + Positive impacts on health and wellbeing	– Services may not generate revenue, just costs saved – Labour intensive – Increased competition for land with other uses (eg housing, agriculture and biofuels) may drive up land prices
Adaptation and resilience Moderating the impact of climate change and its effects Transition likely to continue to 2050 and beyond	+ Creating liveable environments maintains labour productivity + Stabilises investment cycles, reducing the impact of economic shocks	– Opportunity cost of capital otherwise used to mitigate global warming – Few, if any, technological spilllovers
Ambiguous impact		
Energy efficiency of existing buildings Improving insulation, material quality and construction methods Main transition period up to 2030	+ Reduced energy expenditure frees up funds for other purposes + Improved health outcomes + Reduced inputs required to deliver services + More comfortable work environment improves labour productivity	– Installation is labour intensive, and the installation sector has long-standing low productivity growth – Delivery is inconsistent and often tailored to homes, rather than standardised, hampering efficiency gains – Initial upfront household and business capital expenditure and long pay back times for some measures
Circular economy Reducing waste created by producers and consumers, through recovery, reuse, remanufacturing and recycling Transition likely to continue to 2050 and beyond	+ Lower resource use, hedging against volatile material prices + Retained value of materials in the economy for longer + Higher value outputs + Increased efficiency of waste sorting + Skilled jobs in repair + New technologies invented in the UK can generate new products and access to export opportunities	– Investment cost of adopting new processes – Increased production costs for some materials – Increased labour costs from repair

	Transition costs and who pays	Running costs and who pays	Key policy considerations
	High Government	**Unclear** Dependent on options	Supply and demand and, therefore, the capacity or regularity of public transport The degree to which the emphasis is on travel between cities or increasing networks within cities and their surrounding areas
	Medium Government and industry	**Reduced** Industry	Market creation in natural capital, support or regulation of the private finance sector Support for specific revenue streams, eg carbon sequestration, tree planting and identifying new revenue sources such as eco tourism
	High Government and industry	**Reduced** Industry	Risk tolerance, different considerations of preparing for 1.5°C or 2°C degrees of warming Where risk is felt, either through regulation of the private sector or government
	Medium Government, industry and consumers Some investments in energy efficiency will be economically optimal, some will not	**Reduced** Industry and consumers	Choices in delivery and the capacity to innovate in new techniques, eg the Energiesprong method Accessible financing mechanisms Connecting supply and demand, and developing supply chains Building markets and supply chains by focusing on lower cost renovations, or those in more urgent need, for example Target support to low income groups
	Medium Industry	**Unclear** Increased process costs versus resource savings	Digitalisation of waste sorting and recycling to improve outcomes Regulation of product standards, including design and repair Sharing of intellectual property to enable repair Extend focus to reusing products over recycling, and remanufacturing to reuse components and materials

Action	Positive	Negative
Ambiguous impact		
Smart electricity Optimising the electricity grid and helping consumers to switch time of electricity use Main transition period up to 2040	+ More efficient use of electricity + Lower electricity costs for some users	– Upfront transition costs
Heat pumps for homes Replacing boilers with electric heat pumps Main transition period up to 2045	+ Lower energy use and probably lower running costs + Higher skilled work + Reduced air pollution and increased health benefits	– Higher upfront costs for consumers – Pressure on the electricity grid – Requires insulation to work efficiently
Negative effect		
Decarbonising agriculture and food Either reducing emissions from agriculture or switching to lower carbon food sources Transition likely to continue to 2050	+ Opportunities for new businesses + Plant-based 'meat' has higher productivity than animal-based, with lower inputs per calorie + Health improvements from dietary change + Greater biodiversity on agricultural land may improve soil + Improvements in innovation, for example automated production or the more efficient use of fertilisers	– Likely to reduce yields from land – Increased process costs for farmers and food manufacturers – Reduced consumer choice
Decarbonising industry Switching to electricity or low carbon fuels, using carbon capture and storage, or process changes, to cut industrial emissions Transition likely to continue to 2050	+ Export opportunities + Increased resource and energy efficiency + Lower fossil fuel imports + New technologies invented in the UK can generate new products and access export opportunities	– High costs of carbon capture technologies – Electricity likely to be more expensive than fossil fuels – Risk of unfair competition from overseas
Aviation and shipping Increased use of alternative fuel types and reduced demand Transition likely to continue to 2050	+ Innovation spillovers of sustainable fuel research or efficiency gains in fuel use + Increased efficiency of digital replacements, eg Zoom	– More costly fuel types, eg sustainable aviation fuel – Falling demand lowers efficiency and economies of scale

Transition costs and who pays	Running costs and who pays	Key policy considerations
Medium Government (grid) and industry (digitalisation)	**Reduced** Consumers and industry	Encouragement of 'prosumers', ie contributing energy to, as well as taking from, the grid Storage options for periods when supply exceeds demand
High Consumers	**Reduced** Consumers	Reducing the cost of electricity Promoting skills development in the heating industry Enabling finance offers for heat pumps, for example the extent and growth of the Boiler Upgrade Scheme
Medium Industry	**Increased** Industry and consumers	As UK agriculture is already relatively unproductive, support for immediate comparable productivity gains. Encouraging more sustainable farming practices Promoting the development of low carbon food Supporting farmers and rural communities through the transition
Very high Government and industry	**Increased** Government and industry	Carbon border taxes, protecting against overseas competition Innovation support for UK industry and supply chains, including public procurement[4] Technology choices, for example between energy sources Emphasis on new industrial products versus increased retention and recycling of scrap materials, improving resource efficiency throughout supply chains
High Industry	**Increased** Industry and consumers	Innovation support for UK industry and supply chains, including public procurement

The economic impact of renewable energy

> “As well as national security, boosting low carbon energy generation could improve economic security.”

The gas price crisis, compounded by the war in Ukraine, has put energy policy front and centre for government. The recent energy security strategy highlighted the importance of producing more domestic low carbon energy, not only to reach net zero but to improve national security. Our classification indicates that, as well as national security, boosting renewable energy generation could improve economic security.

Energy plays a central role in the economy, and this is especially true during economic transitions. Because energy is used in every household and industry, it influences every part of the economy. Cheaper energy generally translates into lower inflation and higher productivity, while expensive energy acts as a drag on the economy.

Likewise, the availability of energy is a major constraint on the development of new products, services and productivity enhancing methods. It is widely accepted, for instance, that the UK’s Industrial Revolution could not have taken place without rapid expansion in the use of coal, to power steam engines, among other uses, while the rise of oil was a vital factor in 20th century economic growth.

A decade ago, renewables were thought to be bad for productivity, providing the same product at a structurally higher price. However, numerous studies have found that successful renewable energy policy interventions, like contracts for difference, have led to higher total factor productivity, in comparison to fossil fuels.[5] Renewable energy investment has resulted in multiple economy-wide productivity gains, with higher economic multipliers than non-green investment.[6]

Wind, water and solar energy are free, once the infrastructure is built, compared to the need to continually mine or purchase the commodities that underpin fossil fuel energy generation. Modern low carbon generation also converts energy to electricity more efficiently than fossil fuels.

Though employment levels tend to be higher for renewables-generated electricity, efficiency lowers the cost of inputs, making it cheaper for consumers and industry. Consistent prices also allow for more effective financial planning. This removes an opportunity cost, freeing up individual and business capital to flow elsewhere, generating spillover productivity effects.

The cost of capital in relation to renewable energy is also falling significantly, thanks to successful policy measures, particularly in offshore wind. Reducing these upfront costs further, especially for consumers, would increase productivity gains. Supportive investments in the grid and further innovation in electricity storage, through network scale batteries or more distribution across the system, would help to mitigate some productivity impacts from variable supply.

Is net zero the missing piece of the productivity puzzle?

> “The most immediate productivity gains from net zero are in the effective roll-out of proven technologies.”

Our classification highlights the cross cutting policies central to both reaching net zero and productivity growth. As we have discussed, both are systemic issues that cannot be solved through piecemeal action.

The following three priorities fit with the Treasury’s three pillars of economic growth: innovation, skills and infrastructure. Ensuring that policies designed for the wider economy, through the *Plan for growth,* are supportive of decarbonisation will be vital to increasing productivity.

1. Maximise the positives

Policy needs to maximise the positive externality of new technologies. The most immediate productivity gains from net zero are in the effective roll-out of proven technologies, notably low carbon energy, energy efficiency and electric vehicles. However, further improvements in these will also provide spillover knowledge benefits to those actions in our ‘ambiguous’ and ‘negative’ categories.

Continued public support for R&D, as well as favourable tax treatment for private research, leads to unexpected innovations central to both productivity and net zero, whether in new forms of battery or energy storage, efficiency of generation and transmission, or reductions in energy intensity.

There are other ways to spur innovation. These could include regulating the financial sector to reallocate capital towards green assets, regulating companies to meet production or other targets to stimulate innovation from competition.

The government can also use its sizable public procurement budget to buy only green products and services, for example 100 per cent electric vehicles for the NHS.

2. Provide the skills needed

Every action listed in this classification requires adequate skills provision. Skill level, using qualification level as a proxy, is clearly tied to regional productivity outcomes.[7] The UK suffers from long-standing under investment in human capital, driven by business concerns about losing employees in a flexible labour market, more favourable tax treatment of physical capital over skills, as well as industry complaints about low basic skill levels. As the government found with the failure of the Green Homes Grant, skilled labour takes time to train.

Green Alliance’s policy insight, *Closing the UK’s green skills gap,* demonstrates that a stable policy framework for green skills provision will have benefits across the economy, avoiding failures like the Green Homes Grant.

> The rapid and unexpected fall in the cost of solar is evidence that reducing upfront costs helps markets to grow faster."

Applying existing tax reliefs on capital investment to support businesses preparing workforces for the low carbon transition could be one way of doing that, preserving social and institutional capital within organisations, whilst avoiding future gaps between skills demand and supply.

3. Reduce upfront costs

Many productivity gains are held back by transition costs. The example of renewable energy has shown that smart policy design can reduce capital costs, turning a productivity drain into an uplift. The government's net zero strategy tries to reduce costs through regulations that push companies to produce more low carbon goods, for instance, through a promised Zero Emissions Vehicle mandate on car manufacturers. However, initially at least, prices for these new technologies remain out of reach for many.

Policy needs to address the demand side of the market. The rapid and unexpected fall in the cost of solar is evidence that reducing upfront costs through a variety of financing mechanisms helps markets to grow faster. Similar efforts, for example on heat pumps, will rapidly shift other markets.

Rather than focus on making high carbon behaviours costly when they remain inelastic, ie where people have limited choice to change, policy should focus on providing alternatives. In energy efficiency provision, this could come through direct grants, low to zero interest loans or by supporting the growth of the green mortgage market. Reducing VAT on low carbon products, announced in the chancellor's 2022 spring statement, was a good start in reducing costs. The faster markets grow, the faster productivity gains and spillover benefits will be realised.

Reversing sectoral slowdowns

> “The biggest challenge for productivity gain is found in sectors where carbon is integral to output, without a viable alternative.”

Our classification highlights that productivity is not just an economy-wide problem. As studies have shown, the UK’s productivity slowdown comes from within sectors, rather than reflecting a poor reallocation of labour between sectors.[8] Most notably, sub-sectors like machinery repair and installation, or transport and logistics, have experienced falling productivity. Others point to dwindling North Sea extraction as a major driver.[9] While partly driven by the uneven impact of Covid-19, they indicate the need for specific sectoral considerations to ensure productivity growth in the future.

The biggest challenge for productivity gain is found in sectors where carbon is integral to output, without a viable alternative. The UK has a comparatively small industrial sector, and one that has struggled to adapt to productivity enhancing measures like advanced manufacturing. The need to decarbonise industry provides an opportunity to improve its productivity record.

For many industrial processes, like carbon capture and storage, the aim will be cost minimisation. Capital costs will initially be very high, with high levels of technological uncertainty, as is the case in carbon capture and storage and green hydrogen development. These costs could meet with stiff competition from overseas, if other countries decarbonise faster.

> “New policy will need to avoid negative productivity outcomes by helping workers apply their skills elsewhere in the economy.”

However, there are rewards down the line. Tackling upfront costs could mean future market dominance for UK products, such as clean steel, with opportunities for export. Similarly, there is a chance to embed new industrial processes, like advanced manufacturing techniques that will increase productivity.

Greater electrification of industrial processes will mean higher efficiency and less reliance on volatile fossil fuel imports. To ensure the transfer to these productivity gains, policy should seek to protect UK businesses initially, reducing the cost of capital and early resource costs. This may be through tax treatment, public procurement or mechanisms, such as a strike price for industrial energy usage.

There are other areas where decarbonisation will shrink some industries, inevitably causing a drop in productivity. Decarbonising aviation and shipping is a two part process. Like industry, high energy intensity will require innovation in new fuel types, while increasing efficiency. These developments could have spillover benefits to other forms of transport or industry.

However, there is also a strong role for demand reduction. This could improve productivity elsewhere in the economy, for example, through the use of more efficient digital meetings rather than travel. In the interim, shrinking demand will affect prices and reduce efficiencies related to scale, as has been seen with supply chain disruption post-pandemic, as half full ships can contribute to rising costs.

New policy will need to avoid negative productivity outcomes by helping workers apply their skills elsewhere in the economy and, where possible, repurposing assets towards more productive uses.

A green plan for growth

> “When designed in the right way, net zero policies will provide the productivity and growth that the Treasury is trying to stimulate.”

The Treasury’s *Plan for growth*, the replacement for BEIS’s earlier industrial strategy, refers to net zero as a policy that will benefit from higher growth. Whilst it is true that growth will make spending upfront on the transition easier for government, this misses the point.

When designed in the right way, net zero policies will provide the productivity and growth that the Treasury is trying to stimulate. However, rather than being highlighted as drivers of growth, net zero policies have been confined to the net zero strategy and the prime minister’s *Ten point plan for a green industrial revolution*.

Given the dire predictions of the Office of Budget Responsibility about future economic and productivity growth, and the need to address concerns from some quarters that this should mean reducing spending on net zero, a new approach is needed.

Our classification should inform a new Treasury plan for green growth. Like its *Plan for growth* this would point to investments in infrastructure, skills and innovation, to accelerate the productivity gains we have described whilst also accelerating decarbonisation. It would go beyond the more passive approach of the Treasury’s 2021 *Net zero review* (see page seven) to show how active policy could support wider gains and mitigate against dampening productivity, especially in the areas we have categorised as negative and likely to reduce productivity.

Creating a growth environment: where next?

> “Getting more economic value from fewer resources should boost productivity.”

The net zero transition is not the only change facing the UK. Action on climate has facilitated a broader discussion about the economy’s impact on nature and biodiversity. While some of this will be addressed through climate action and is represented here, for example we have considered the impacts of sustainable agriculture and nature-based solutions, others, like biodiversity net gain policies, are not. Following the 2021 Dasgupta Review, which explored the relationships between biodiversity preservation and prosperous economies, looking at productivity growth is a logical next step.[10]

The second area with implications for economic growth is resource use. Keeping resources in economic use for longer through reuse, repair, recycling or remanufacturing lowers emissions. Less extraction also reduces environmental impacts. Some of this we address in our classification under ‘circular economy’. Getting more economic value from fewer resources should boost productivity. However, there will be broader impacts. New business models, such as servitisation (selling services instead of products to achieve an outcome), will alter the relationship between capital and labour.

Future work by Green Alliance will look at what a move to a more circular economy means for economic and productivity growth in the UK.

Endnotes

1 *PBC Today*, 2018, 'UK could save 15bn every year by lifting construction productivity',

2 Calculations are the authors' own, using consumer price inflation and the annual survey of hours and earnings, both from the Office of National Statistics

3 IPCC, 2022, Working Group II, *Sixth assessment report*

4 P Andres, R Martin, P Mealy, E Serin, A Shah and A Valero 2021, *Seizing sustainable growth opportunities from carbon capture, usage and storage in the UK,* Centre for Economic Performance

5 For example, S Unsworth, P Andres, G Cecchinato, P Mealy, C Taylor and A Valero, 2020, *Jobs for a strong and sustainable recovery from Covid-19*, Centre for Economic Performance

6 N Batini, M di Serio, M Fragetta, G Melina and A Waldron, 2021, *Building back better: how big are green spending multipliers,* International Monetary Fund

7 R Zymek and B Jones, 2020, 'UK regional productivity differences; an evidence review', research paper, Industrial Strategy Council

8 For example, D Coyle and J-C Mei, 2022, *Diagnosing the UK productivity slowdown: which sectors matter and why,* Bennet Institute for Public Policy

9 J Fernald and R Inklaar, 2022, *The UK productivity "puzzle" in an international comparative perspective*, The Productivity Institute

10 Professor P Dasgupta, 2021, *The economics of biodiversity: the Dasgupta Review,* HM Treasury

Green Alliance
18th Floor
Millbank Tower
21-24 Millbank
London SW1P 4QP

020 7233 7433
ga@green-alliance.org.uk

www.green-alliance.org.uk
@GreenAllianceUK
blog: www.greenallianceblog.org.uk