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Green Entrepreneurship

EAMONN IVES



EnterpriseTrust



A REPORT BY



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“Our research finds that the shift to a greener economy represents a host of opportunities for those businesses which are developing solutions to our environmental challenges.”

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“The Government should be unrelenting in trying to harness the ingenuity of the UK’s environmentally-minded entrepreneurial community.”

FOREWORD

This report demonstrates unequivocally the critical role British entrepreneurs play in reducing our impact on the environment every day.



HELEN BOOTH
Chief Executive Officer
The Enterprise Trust

They are developing intelligent solutions to food waste such as Jamie Crummie’s platform Too Good to Go; they are building systems to decarbonise public transport via new fuels such as hydrogen like Jo Bamford at Ryse Hydrogen; and they are offering natural, plastic-free alternatives to consumption via ethical retailers like Pawan Saunya’s Zero Waste Club.

Quietly, entrepreneurs are designing systems capable of reducing soil degradation and habitat destruction whilst at the same time dramatically increasing crop yield to feed a growing global population, like Birmingham-based Saturn Bioponics run by Alex Fisher.

And they are solving problems we hardly knew existed. Jo-Jo Hubbard’s

company Electron has designed a way to increase the amount of renewable energy into the grid to allow efficient local distribution. Dynamic self-starters like Magda Daniloia and Ieva Balcuite of Aequem are driving sustainable alternatives to our obsession with fast fashion and thoughtful producers like vegan skincare entrepreneur Katrina Borissova at Little Danube are tackling toxic, throwaway packaging.

But as incredible as all this is, what impresses me most is the fact that they are building profitable businesses from their environmental endeavors – they are making saving the planet pay.

And they are not alone.

The poll this report undertook amongst 500 UK SMEs found that over three-fifths (61%) believe the shift to a more sustainable economy presents opportunities for them to take. In fact, only eight per cent disagree.

It also showed how there is now increasing pressure from consumers and employees for businesses to go greener – and that there is a genuine consumer-driven concern for a diverse range of climate-related issues to be addressed.

Entrepreneurs can help alleviate some of those issues. The COVID-19 pandemic has shown just how innovative individuals can be when the incentives align. Think of the gin manufacturers like Didsbury Gin that

quickly turned their hand to produce hand sanitiser when demand suddenly outstripped supply.

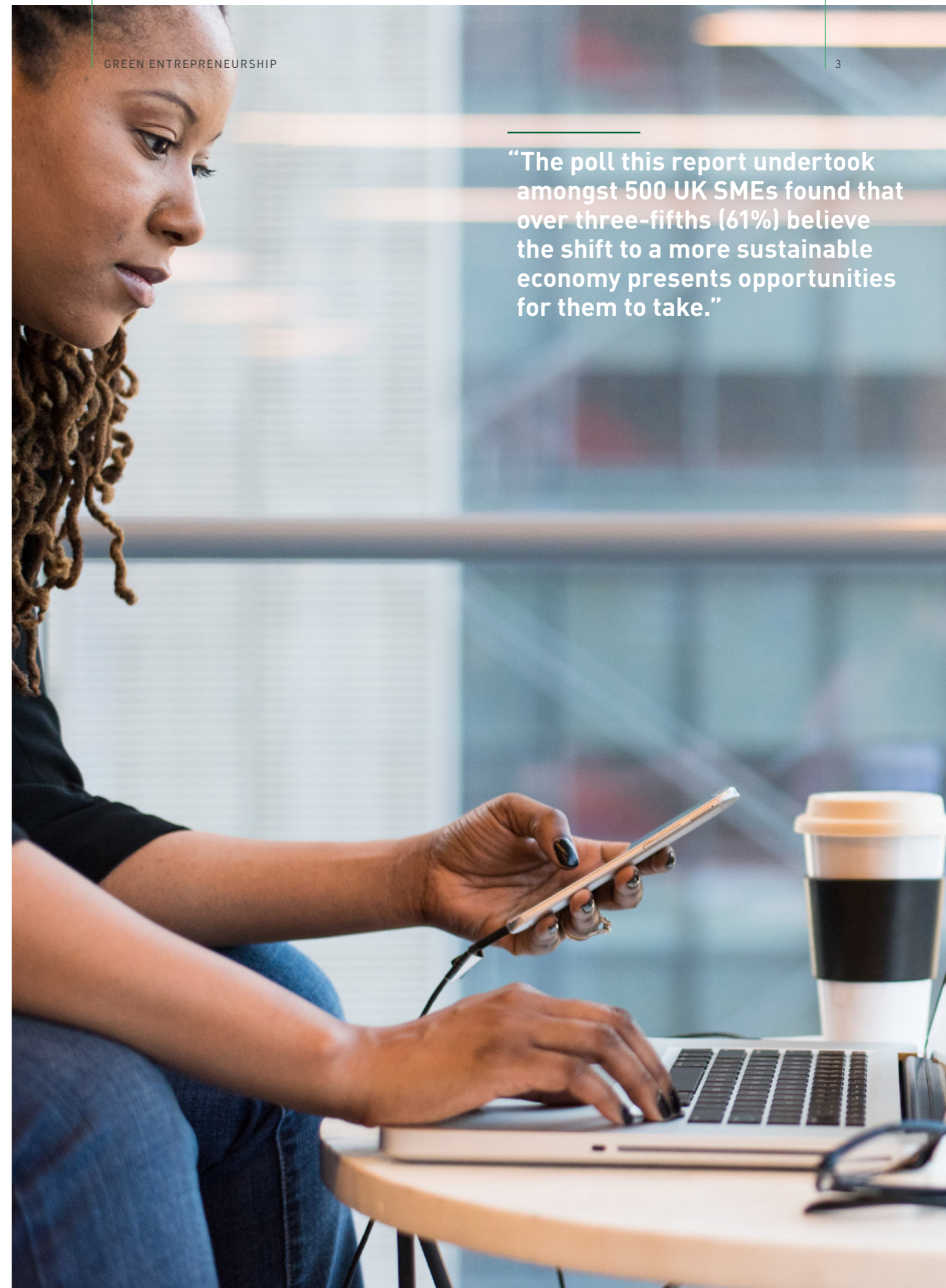
But what is also clear is that the Government has a vital role to play in removing some of the barriers for entrepreneurs and creating incentives for consumers to adapt to greener habits.

As this report shows, when the right conditions exist, important progress can be made. Thanks to innovators and the introduction of new regulations, the UK’s total greenhouse gas emissions have plummeted over recent years. Between 1990 and 2018, net emissions fell from the equivalent of 794 million tonnes of carbon dioxide to 449 million tonnes.

This report also demonstrates that climate change, air pollution, and resource misuse represent not only some of the most pressing environmental issues the world faces, but are also problems where entrepreneurial innovation guided by the right incentives and regulations can make a real difference.

The Government should be unrelenting in trying to harness the ingenuity of the UK’s environmentally-minded entrepreneurial community. The reality is, that it is only through the development of newer and better technologies that society will be able to overcome these pressing problems.

“The poll this report undertook amongst 500 UK SMEs found that over three-fifths (61%) believe the shift to a more sustainable economy presents opportunities for them to take.”



EXECUTIVE SUMMARY

This report is an examination of how entrepreneurs can help create a more sustainable economy that has less of an impact on the environment.

- It argues that harnessing the innovative products, ideas, and practices devised by Britain's flourishing entrepreneurial ecosystem will be critical to overcoming the environmental challenges facing the planet, while also providing an economic boost and positioning the United Kingdom at the forefront of the growth sectors of the near future.
- The report considers three environmental problems: climate change; air pollution; and resource misuse, such as unsustainable production practices and disposal associated with the goods we all buy.
- The above problems are caused by environmental market failures. Successive governments have neither sufficiently made polluters bear responsibility for the full costs of their actions, nor sufficiently rewarded those who develop solutions to environmental challenges.
- But there now appears to be the public and political will to go further than ever before to ensure that polluters are paying for the damages they cause, as well as an acceptance for the government to do what it can to foster the innovation and entrepreneurialism necessary to combat such damages.
- This willingness for the government to step up has only been redoubled by the economic fallout of the COVID-19 pandemic, which has thrust attention onto the need to 'build back better', and ensure that future growth is truly sustainable.

At the same time, entrepreneurs are innovating in countless different sectors, to make businesses and consumption more sustainable. Our research finds that the shift to a greener economy represents a host of opportunities for those businesses which are developing solutions to our environmental challenges, including increased profits. Indeed, polling for this report found over three-fifths (61%) of small and medium-sized businesses agreed that the move to a greener economy represented positive opportunities for businesses, while just eight per cent disagreed. This suggests that most small and medium-sized businesses think there are financial opportunities in a greener economy, and that they personally can benefit from them, challenging the assumption that pursuing sustainability is a hindrance to businesses and the economy.

The report identifies practical policy changes to create new incentives for entrepreneurs to create green products and for consumers to switch from polluting or unsustainable products whilst boosting the economy.

To inform the findings of the report, we commissioned polling of over 500 British small and medium-sized businesses, to understand their attitudes to various environmental issues. Our polling found that, among other things:

Over three-fifths (61%) of businesses think that the move to a greener economy presents positive opportunities for businesses – only eight per cent disagree.

- Fifty-four per cent of businesses agree they have tried to become more environmentally responsible in the past 18 months – only 15% disagree.
- Businesses are split on how well they think the government is doing in terms of helping them to address environmental problems – most (38%) think it is doing neither well or badly, while slightly more think it is doing badly (30%) than well (24%).
- Half of all businesses agree that their customers expect their business to be taking steps to be more environmentally responsible – only 15% disagree.
- Nearly half (47%) of all businesses think they could be doing more to reduce their environmental impact – only 23% disagree.
- Fifty-six per cent of businesses agree that employees increasingly want to work in businesses which are environmentally responsible – only eight per cent disagree.
- Businesses believe their customers are interested in their business tackling a range of different environmental issues – from making packaging more sustainable, to using sustainable transport and sourcing renewable energy.

“Entrepreneurs are innovating in countless different sectors, to make businesses and consumption more sustainable.”

Summary of policy ideas



ENERGY (USE AND GENERATION)

1. Ensure a significant portion of the recent uplift in public R&D spending goes towards projects seeking to address environmental issues.
2. Make the Annual Investment Allowance unlimited to encourage businesses to invest in as environmentally efficient equipment as possible.
3. Consult on reforming EPC regulations so that they do not bias against certain environmentally friendly technologies.
4. Reform the NPPF to facilitate greater deployment of renewables.
5. Remove large scale biomass from the RO, and consider reforming it for more nascent renewable technologies.
6. Cease all funding for fossil fuel projects through UKEF and ODA.
7. Use COP26 to showcase British entrepreneurial talent in environmental innovation.
8. Commit to simplifying, standardising, and broadening the carbon taxes which exist in the UK.



AIR POLLUTION

9. Liberalise regulations on e-scooter use.
10. Reform the BSOG to incentivise zero-emissions bus travel.
11. Reform the RTFO so that it focuses on promoting later generation renewable technologies.
12. Abolish the red diesel tax exemption entirely.
13. Reappraise regulations on electric vehicle batteries for 'second life' uses.



RESOURCE MISUSE

14. Fund research into tackling the most significant sources of plastic pollution and look at how departmental budgets could support the deployment of different solutions.
15. Consult on how to best promote new agricultural techniques such as vertical farming.
16. Ensure rules on agri-tech and drones allow farmers to best take advantage of them for environmental purposes.
17. Relax rules around genetic editing to foster innovation in the development of more environmentally friendly crops.
18. Liberalise regulations on how plant-based foods can retail themselves to promote shifts to greener diets.
19. Amend the Novel Food Regulation to allow for maximum innovation in new sustainable food trends such as clean meat and dairy alternatives.
20. Assess how government procurement rules could be amended to boost markets for environmental products in the public sector.

INTRODUCTION

COVID-19 has occupied the world's attention this year, and for understandable reasons. But it is easy to forget that before the crisis swept the globe, the focus on environmental issues had scarcely ever been greater.

As we tentatively emerge from the peak of the pandemic, we must ensure that the ambition to build a more sustainable economy is revitalised. On this front, positive steps are already being taken. A range of voices, from business to the government, have rallied around the message of 'build back better'.¹ Initiatives such as the £2 billion Green Homes Grant aim to replace lost jobs, while also delivering on environmental goals.² Encouraging fundraising data for cleantech companies indicates that investors remain confident in the sector.³

Indeed, a mixture of responses will be required to overcome the various environmental challenges with which society is currently faced. Governments at all levels will need to set clear standards and objectives, as well as levy taxes and award funding where necessary.

But entrepreneurs, of course, will play a critical role too. It will fundamentally be down to their innovation to develop the new technologies, business models, and ways of doing things which will bring about a more sustainable future.

There is good reason for why such concern about the planet abounds. Our understanding of the importance of the environment, and of how human actions can harm it, has never been greater – thanks to scientists, activists, and the media. We know categorically that the world is heating up, caused by the greenhouse effect.⁴ We know that air pollution is having an acute impact on our well-being, not least that of children and the elderly, and those with underlying health conditions.⁵ We know that excessive resource use threatens habitats, and is relentlessly driving countless species closer towards extinction.⁶

However, all hope is not lost. Practical steps which harness technological solutions are being made, and the results are

already showing. The ozone layer is recovering thanks to international action taken in the 1980s.⁷ Global mortality rates from air pollution may soon be half of what they were in the 1990s.⁸ The installed capacity of renewables around the world has more than doubled from around 1.2 terawatts in 2010 to 2.5 terawatts today.⁹

“As we tentatively emerge from the peak of the pandemic, we must ensure that the ambition to build a more sustainable economy is revitalised.”

Behavioural patterns, of course, are starting to change. Consumers are increasingly signalling their appetite for products with green selling points. Recent years have seen an uptick in more plant-based diets, and the rise of *flygskam*.¹⁰ At the company level, our polling found how over half of small and medium-sized businesses think that employees increasingly want to work in environmentally responsible firms – while just 15% of businesses we polled reported not having tried to become more environmentally responsible in the past 18 months. As time goes by, we might quite reasonably expect more and more people and businesses to voluntarily adopt more sustainable ways of living.

But entrepreneurs and innovators are also ensuring the transition to more sustainable ways of living is as smooth and painless as possible – reducing our environmental footprints without reducing our living standards. The taxi which gets you home after a night out is still a taxi, but it might now be powered by batteries instead of diesel fuel; the items in your

1 CBI (2020). *Sustainability will help UK build back better by powering a green recovery* – CBI.

2 BEIS (2020). *Green Homes Grant: make energy improvements to your home*.

3 Beauhurst (2020). *What is CleanTech and who are the Top Companies?*

4 NASA (2020). *Climate Change: How Do We Know?*

5 WHO (2020). *Ambient air pollution: Health impacts*.

6 NOAA (2020). *What are microplastics?*; Christina Nunez (2019). *Deforestation explained*.

7 Susan Strahan and Anne Douglass (2018). *Decline in Antarctic Ozone Depletion and Lower Stratospheric Chlorine Determined From Aura Microwave Limb Sounder Observations*.

8 Hannah Ritchie and Max Roser (2019). *Outdoor Air Pollution*.

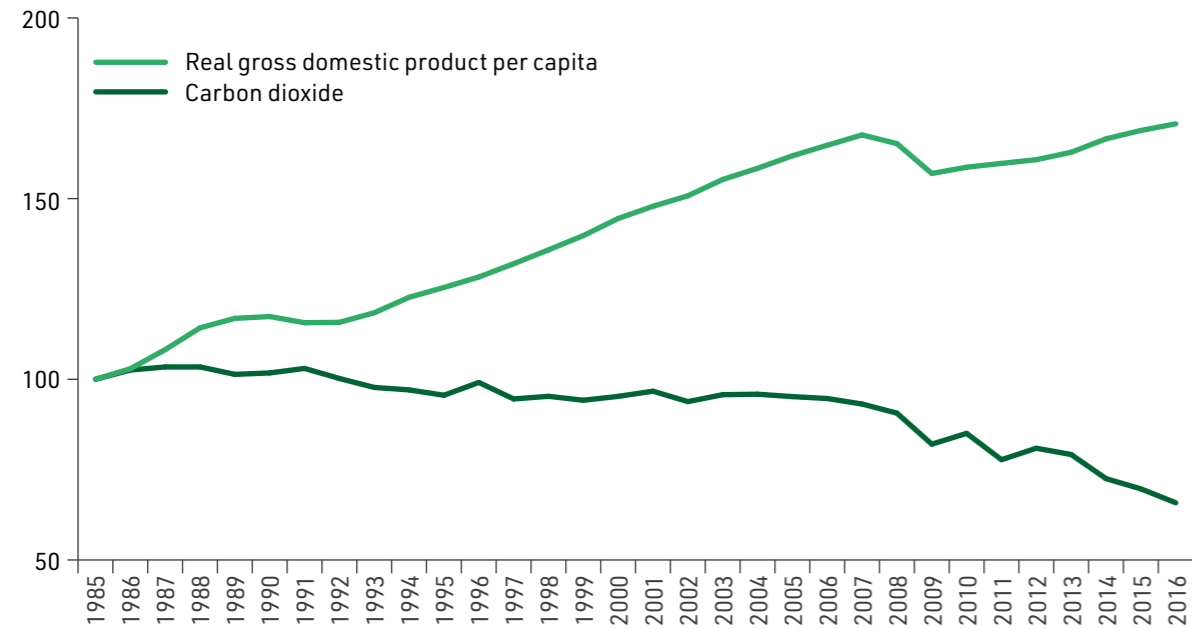
9 International Energy Agency (2020). *Renewable Energy Statistics 2020*.

10 YouGov (2019). *Is the future of food flexitarian?*; Leslie Hook (2019). *Year in a word: Flygskam*.

“Behavioural patterns, of course, are starting to change. Consumers are increasingly signalling their appetite for products with green selling points.”



CHART 1. DECOUPLING OF GROWTH AND EMISSIONS (1985-2016)
(1985 = 100)



Source: Author's analysis of Office for National Statistics (2019). *The decoupling of economic growth from carbon emissions: UK evidence.*¹¹

weekly shop are still safely packaged up, but now perhaps in recyclable or biodegradable materials, instead of plastic; the lights in your house still shine as brightly, but the electricity they use is steadily getting cleaner as renewables generate ever more of our power. Gradually, the market is shifting towards cleaner alternatives and this represents a significant opportunity. According to Beauhurst, the UK's high growth cleantech industry is in good health, raising over £2.28 billion over the last ten years, and £210 million in 2020.¹²

The combined ingenuity of countless different entrepreneurs, guided by a supportive policy framework, lies behind this largely unnoticed transformation. For every additional unit of prosperity eked out, less of a toll is taken on our natural surroundings. Chart 1 illustrates this decoupling, with regards to carbon dioxide (CO₂) emissions and economic growth in the UK between 1985 and 2016.

The response to COVID-19 is a reminder of the creativity and adaptability of entrepreneurs. In the early weeks of the pandemic, we saw gin distilleries producing hand sanitiser,¹³ excavator manufacturers fabricating housing for ventilators,¹⁴ and high-end fashion labels making personal protective equipment.¹⁵ Other entrepreneurs designed technologies to help businesses continue in as normal a way as possible, such as shifting to online commerce. All the while, the pharmaceuticals industry has developed new treatments, diagnostics, and vaccines.¹⁶ If we can utilise the private sector's capacity for innovation to tackle a pandemic, we can use it to address our most pressing environmental challenges, too.

This report focuses on just that – how entrepreneurs can be called upon to help to keep our planet as green and pleasant as possible. This is not to say that all environmental challenges can be overcome by innovation alone, but rather that entrepreneurs have a critical role to play. As such, governments should be doing all they can to create frameworks to best facilitate their endeavours to deliver a more sustainable future, and a bigger and better economy.

¹¹ Admittedly the data in this chart is for domestic emissions only, and thus ignores the deindustrialisation of the UK which had a large effect in lowering domestic emissions.

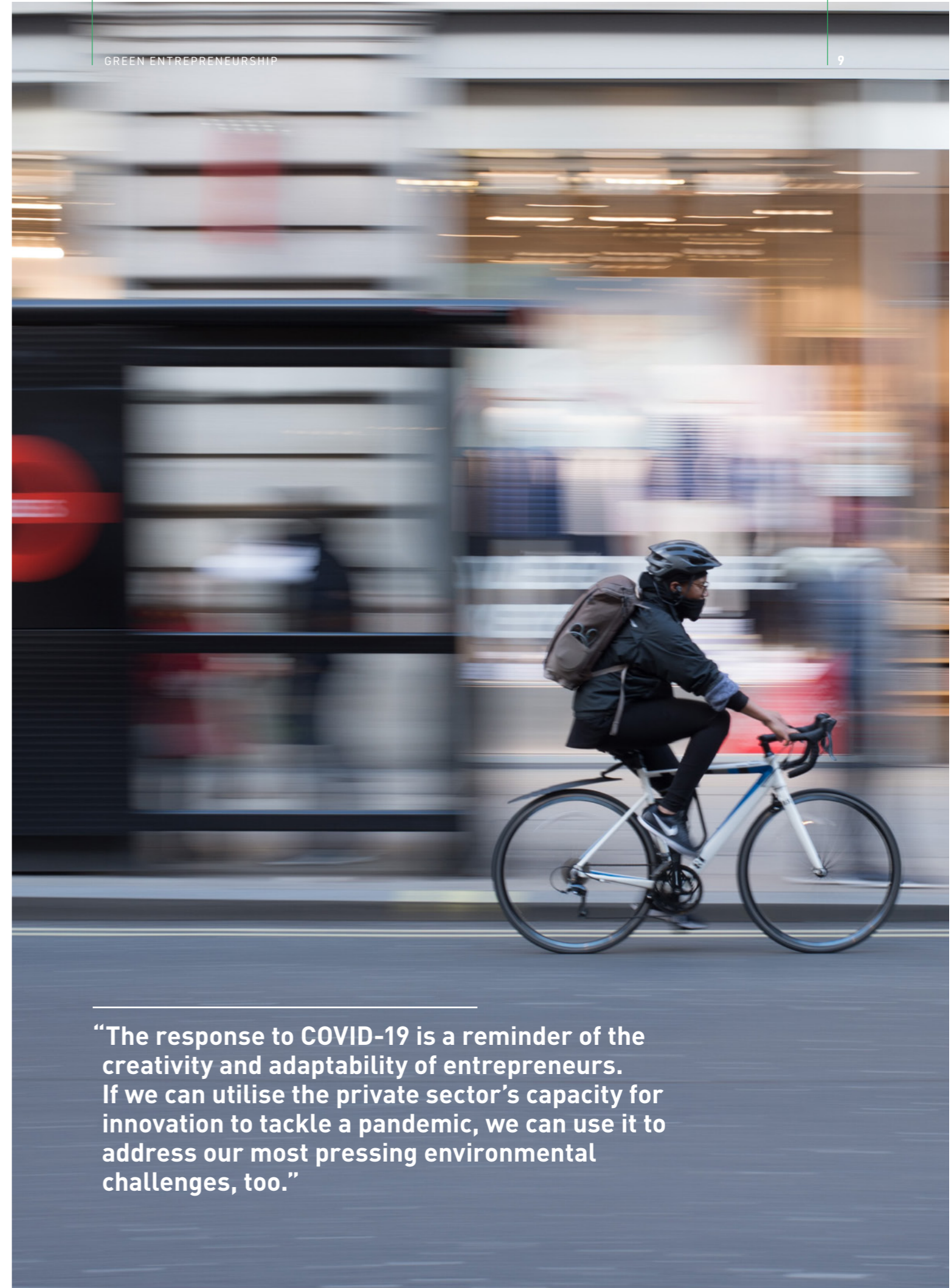
¹² Annabel Beales (2020). *What is CleanTech and who are the Top Companies?*

¹³ Jack Rear (2020). *Meet the gin distiller who switched from spirits to sanitiser.*

¹⁴ JCB (2020). *JCB joins national call to action over ventilator shortage.*

¹⁵ BBC News (2020). *Coronavirus: Burberry donates PPE to NHS.*

¹⁶ Naor Bar-Zeev and Tom Inglesby (2020). *COVID-19 vaccines: early success and remaining challenges.*



“The response to COVID-19 is a reminder of the creativity and adaptability of entrepreneurs. If we can utilise the private sector’s capacity for innovation to tackle a pandemic, we can use it to address our most pressing environmental challenges, too.”

THE CHALLENGES

This report will focus on three key environmental challenges: climate change, air pollution, and resource misuse. They represent not only some of the most pressing environmental issues, but are also where entrepreneurial innovation guided by the right incentives and regulations can make a real difference.

Climate change

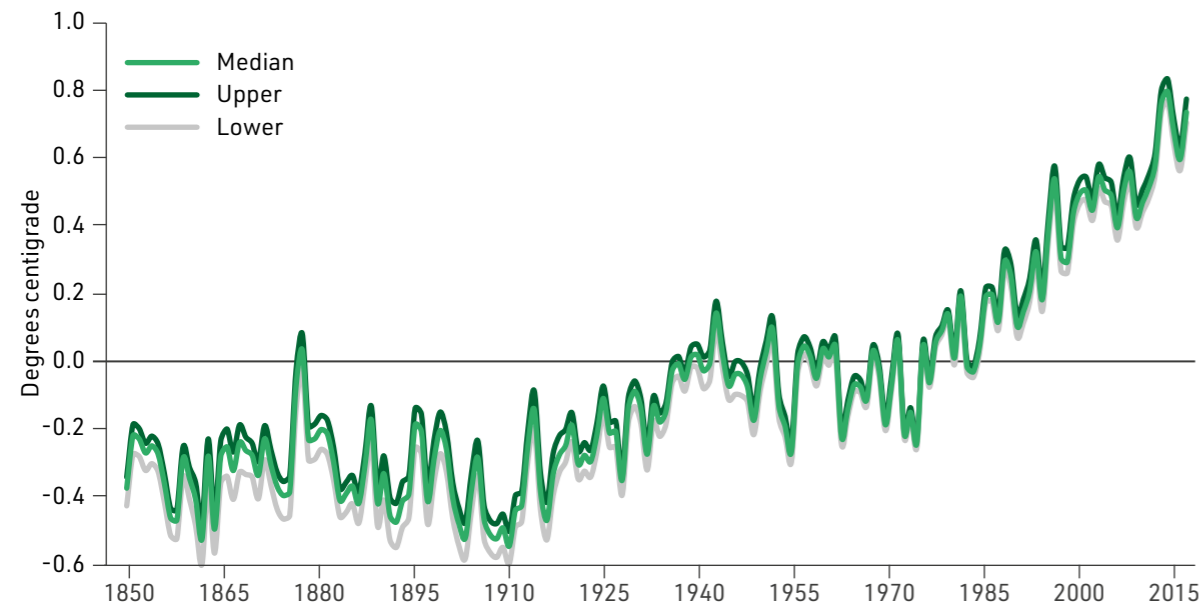
According to the Intergovernmental Panel on Climate Change (IPCC), human activities have already led to a warming of around 1°C above pre-industrial levels – and the rate at which this is occurring is quickly speeding up.¹⁷ Globally, 19 of the 20 hottest years on record have occurred

since 2001, with 1998 being the lone exception.¹⁸

This rapid heating has clear consequences for the planet – causing more extreme weather,¹⁹ melting ice caps,²⁰ raising sea levels,²¹ acidifying the oceans,²² and accelerating species loss.²³

CHART 2. AVERAGE GLOBAL TEMPERATURE ANOMALY

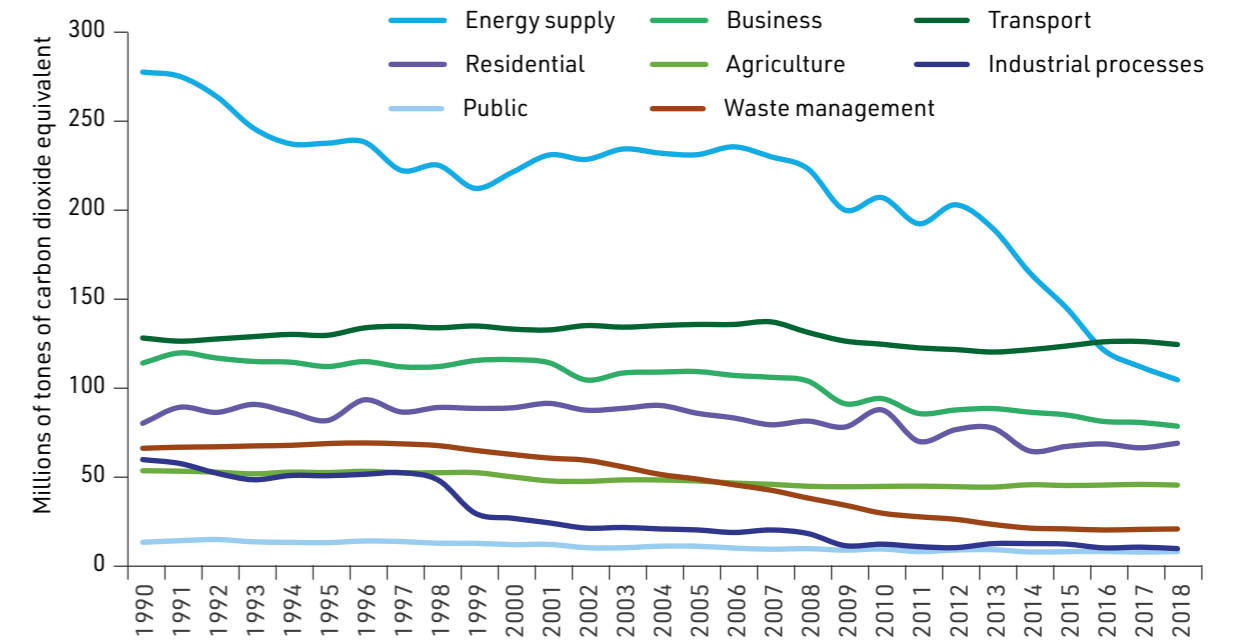
Global average land-sea temperature anomaly relative to the 1961-1990 average temperature



Source: Author's analysis of Hannah Ritchie and Max Roser (2020). CO2 and Greenhouse Gas Emissions.

17 Ibid.
 18 NASA (2020). *Global Temperature*.
 19 NOAA (2019). *Report: Climate change is making specific weather events more extreme*.
 20 Intergovernmental Panel on Climate Change (2013). *Climate Change 2013: The Physical Science Basis*; Boris K. Biskaborn et al. (2019) *Permafrost is warming at a global scale*.
 21 NASA (2020). *Sea Level*.
 22 Adrienne Froelich Sponberg (2007). *Ocean Acidification: The Biggest Threat to Our Oceans?*; Janice M. Lough, Kristen D Anderson and Terry P. Hughes (2018). *Increasing thermal stress for tropical coral reefs: 1871-2017*.
 23 Intergovernmental Panel on Climate Change (2018). *Global warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*.

CHART 3. UK GREENHOUSE GAS EMISSIONS BY SECTOR (1990-2018)



Source: Author's analysis of BEIS (2020). *Final UK greenhouse gas emissions national statistics 1990-2018*.

In 2015, the Paris Agreement was brokered, with a central aim of keeping global temperature rise to well below 2°C above pre-industrial levels, and to make efforts to keep it below 1.5°C.²⁴ In 2018, the IPCC produced a report which stated that greenhouse gas emissions need to reach net zero by around mid-century to give a reasonable chance of limiting global warming to 1.5°C.²⁵ In 2019, the UK government signed into law a target for net zero greenhouse gas emissions by 2050, yet is currently on track to fall short of achieving it.²⁶ Meeting the target will require significant changes to the way we move goods and people around, how we power and heat our homes, and how we produce the goods and services we buy.

Causes

Virtually all parts of the economy emit greenhouse gases. In the UK, transport is the single biggest contributing sector – accounting for 28% of total emissions.²⁷ Second is the energy supply (23%), followed by emissions from business (18%), residential emissions (15%), and those originating from agriculture (10%).²⁸

As can be seen from Chart 3, total greenhouse gas emissions have plummeted in the UK over recent years. Between 1990 and 2018, emissions fell from 794 million tonnes of carbon dioxide equivalent (MtCO₂e) to 461.7 MtCO₂e – a reduction of nearly 42%.²⁹

“Meeting net zero will require significant changes to the way we move goods and people around, how we power and heat our homes, and how we produce the goods and services we buy.”

Behind the staggering fall in emissions are countless success stories. Perhaps the most crucial, however, is the near total

24 United Nations Climate Change (2020). *What is the Paris Agreement?*
 25 Intergovernmental Panel on Climate Change (2018). *Global warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*.
 26 BEIS (2019). *UK becomes first major economy to pass net zero emissions law*; CCC (2020). *Reducing UK emissions: 2020 Progress Report to Parliament*.
 27 BEIS (2020). *Final UK greenhouse gas emissions national statistics 1990-2018*.
 28 Ibid.
 29 BEIS (2020). *Final UK greenhouse gas emissions national statistics 1990-2018*.

FOR THE WORLD

“Climate change is a global problem – its causes and consequences do not recognise national borders. But innovations produced in one country can be scaled, exported, and utilised to reduce pollution right across the world.”

abandonment of coal-fired electricity generation,³⁰ coupled with the rise of renewables such as wind and solar power (which produced 47% of the UK's electricity in the first quarter of 2020).³¹

Not only is the energy we use cleaner, but we are using less of it too. Improvements in the energy efficiency of everyday appliances used at home and by business meant electricity consumption peaked in 2005.³² At the same time, emissions from the transport network have fallen due to the uptake of hybrid and electric cars, while vehicles have also become more fuel-efficient in general.³³

As good as the UK has been in terms of decarbonising its economy, it still has further to go. Major question marks remain around how to decarbonise domestic heating,³⁴ certain forms of transport (such as heavier vehicles),³⁵ and whether the electricity grid really can be powered by renewables alone.³⁶

Climate change is a global problem – its causes and consequences do not recognise national borders. But innovations produced in one country can be scaled, exported, and utilised to reduce pollution right across the world. Fostering entrepreneurial ingenuity in the UK, therefore, can pay a double dividend – addressing emissions both at home and abroad.

Air pollution

Each day, a typical adult will inhale and exhale around 25,000 times.³⁷ However, through microscopic particles (such as PM_{2.5} and PM₁₀) or noxious invisible gases, air can become polluted and cause significant harm to our health and wellbeing. Many air pollutants have been linked to causing or exacerbating respiratory and cardiovascular conditions,³⁸ while other evidence has found that poor air quality can lead to mental health conditions such as depression,³⁹ as well as dementia,⁴⁰ stunted growth,⁴¹ reduced cognitive function,⁴² and various different cancers.⁴³ In 2016, a seminal report from the Royal College of Physicians and Royal College of Paediatrics and

Child Health estimated that poor ambient air quality in the UK is responsible for 40,000 premature deaths each year.⁴⁴

“In 2016, a seminal report from the Royal College of Physicians and Royal College of Paediatrics and Child Health estimated that poor ambient air quality in the UK is responsible for 40,000 premature deaths each year.”

Poor air quality has many other negative impacts beyond causing health defects. Some wild animals are no more resilient against the effects of air pollution, and other environmental hazards caused by air pollution are well documented.⁴⁵ Phenomena such as acid rain is typically triggered by a mixing of sulphur dioxide (SO₂) and oxides of nitrogen (NO_x) with water in the atmosphere,⁴⁶ which can cause acidification of soils and watercourses, as well as destroying habitats such as forests.⁴⁷

In 2010, the World Health Organization estimated the cost of deaths from air pollution alone in the UK to be equivalent to 3.7% of GDP – which would place it at around £105 billion today.⁴⁸

Causes

Air pollution comes from a range of different sources. Each specific air pollutant has its own primary drivers, but a handful of common individual sectors are responsible for most of the air pollution in the UK – including energy generation, industrial processes, road transport, and agriculture.⁴⁹

30 BEIS (2020). *Energy trends: UK electricity*; Simon Evans (2016). *Countdown to 2025: Tracking the UK coal phase out*.

31 BEIS (2020). *UK Renewables: April to June 2020*.

32 BEIS (2019). *Energy Consumption in the UK (ECUK); Final Energy Consumption Tables*.

33 DfT (2020). *Vehicle Licensing Statistics: Table VEH0130*; DfT (2019). *Energy and environment (TSGB03)*.

34 BEIS (2018). *Clean Growth – Transforming Heating*.

35 Eamonn Ives (2020). *Driving Change: How Hydrogen Can Fuel A Transport Revolution*.

36 House of Commons Library (2019) *Mind the gap: Challenges for future UK energy policy*.

37 British Lung Foundation (2020). *About your lungs*.

38 DEFRA (2020). *Effects of air pollution*; Committee on the Medical Effects of Air Pollutants (2006). *Cardiovascular Disease and Air Pollution: A report by the Committee on the Medical Effects of Air Pollutants*.

39 Naureen Ali and Adeel Khoja (2019). *Growing Evidence for the Impact of Air Pollution on Depression*.

40 Anne Oudin Bertil Forsberg et al. (2016). *Traffic-Related Air Pollution and Dementia Incidence in Northern Sweden: A Longitudinal Study*.

41 Dimitris Evangelopoulos et al. (2019). *Personalising the Health Impacts of Air Pollution: Interim Statistics Summary for a Selection of Statements*.

42 M.A. Shehab and F.D. Pope (2019). *Effects of short-term exposure to particulate matter air pollution on cognitive performance*; Jianghong Liu and Gary Lewis (2014). *Environmental Toxicity and Poor Cognitive Outcomes in Children and Adults*.

43 Hong-Bae Kim et al. (2018). *Long-Term Exposure to Air Pollutants and Cancer Mortality: A Meta-Analysis of Cohort Studies*.

44 Royal College of Physicians and the Royal College of Paediatrics and Child Health (2016). *Every breath we take: The lifelong impact of air pollution*.

45 Mohammed Abdulrazzaq Assi et al. (2016). *The detrimental effects of lead on human and animal health*; James R. Newman (1979). *Effects of industrial air pollution on wildlife*.

46 Biswojit Debnath Golam and Jalal Ahammed (2020). *Effect of Acid Rain on Plant Growth and Development: Physiological and Molecular Interventions*.

47 Peringe Grennfelt et al. (2020). *Acid rain and air pollution: 50 years of progress in environmental science and policy*.

48 WHO (2010). *Economic cost of deaths from air pollution (outdoor and indoor) per country, as a percentage of GDP*.

49 DEFRA (2019). *Air quality: explaining air pollution – at a glance*.

“If we are to breathe truly clean air, further innovations will be needed to tackle those remaining sectors which pollute the atmosphere.”

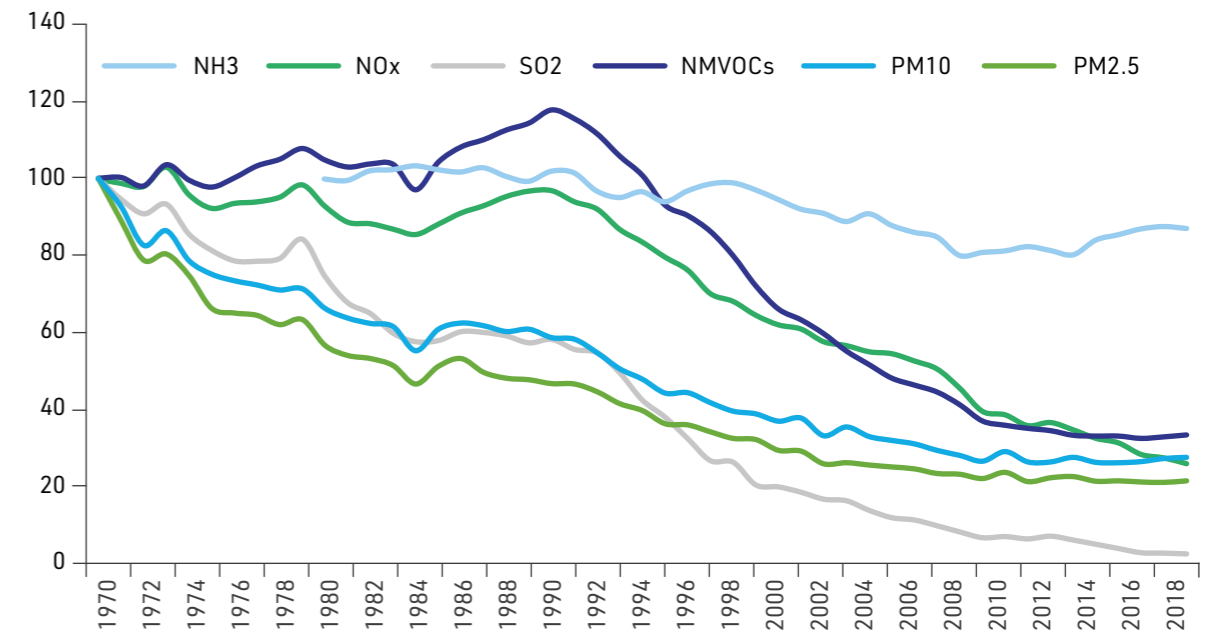
TABLE 1. SECTORS CONTRIBUTING TO SELECTED ATMOSPHERIC POLLUTANTS (2018)

Pollutant	Total (tonnes)	Primary (tonnes; per cent of total)	Secondary (tonnes; per cent of total)	Tertiary (tonnes; per cent of total)
Particulate matter < 10 µm (PM ₁₀)	175,000	Industrial processes and use of solvents (55,600; 32)	Domestic combustion (47,900; 27)	Manufacturing industries and construction (19,500; 11)
Particulate matter < 2.5 µm (PM _{2.5})	107,000	Domestic combustion (46,800; 44)	Manufacturing industries and construction (19,000; 18)	Industrial processes and use of solvents (12,100; 11)
Oxides of nitrogen (NO _x)	823,000	Road transport (258,700; 31)	Energy industries (165,100; 20)	Manufacturing industries and construction (143,800; 17)
Ammonia (NH ₃)	261,000	Direct soil emissions (137,300; 53)	Cattle (71,100; 27)	Waste (21,900; 8)
Carbon monoxide (CO)	1,525,000	Stationary combustion (452,700; 30)	Combustion from residential (446,900; 29)	Road transport (215,700; 14)
Sulphur dioxide (SO ₂)	160,000	Combustion in Energy and Transformation Industry (49,300; 31)	Residential / Commercial / Institutional (44,600; 28)	Combustion in Manufacturing Industry (38,400; 24)
Non-methane volatile organic compounds (NMVOCs)	804,000	Domestic solvent use (150,200; 19)	Fugitive emissions (148,700; 18)	Other (128,100; 16)

Source: Author's analysis of DEFRA (2020). ENV01 – Emissions of air pollutants.

British air quality has improved dramatically in recent decades. Chart 4 shows how emissions of six commonly examined air pollutants have fallen in the UK since the late 20th Century.

CHART 4. LEVELS OF SELECTED UK AIR POLLUTANTS (1970-2018) (1970 = 100)



Source: Author's analysis of DEFRA (2020). Emissions of air pollutants: Trends in UK sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds, ammonia, and particulate matter (PM10, PM2.5) emissions.⁵⁰

Tackling air pollution has often gone hand in hand with tackling climate change. Decarbonising various sectors has also helped clean up the air. As with climate change, however, while progress has been made on getting air pollution down, there is still more to do. For PM_{2.5} and PM₁₀, the rate of reduction has flatlined since the turn of the millennium, while NH₃ emissions are worryingly creeping back up.

If we are to breathe truly clean air, further innovations will be needed to tackle those remaining sectors which pollute the atmosphere, and dirty the air we all breathe.

Resource misuse

The final environmental challenge we shall consider is resource misuse. Compared to climate change and air pollution, this is less of a clear-cut issue in terms of what, exactly, it refers to.

Resource misuse is also an issue exacerbated by countless different factors. For our purposes, we will hold resource misuse to mean a situation whereby scant regard for the environment in the production or disposal of the goods and

services we consume actively threatens the environment.

Drivers of resource misuse in these terms are perhaps best understood by concrete practical examples. Here, we consider a handful of the most commonly cited drivers, and give a brief discussion of the consequences they have for the environment. These are: littering, water pollution, and agriculture.

Littering

Littering is a very tangible example of resource misuse, and something which threatens the environment in many ways.

Litter poses a risk for wild and domesticated animals of all shapes and sizes. Research estimates that perhaps nearly 3 million small mammals die in the UK each year as a result of getting trapped in discarded bottles and cans,⁵¹ while at sea, much recent attention has focused on how plastic items harm aquatic animals – a viral video from 2015 of a turtle having a straw extracted from its nose being a particularly emblematic example.⁵²

50 All pollutants indexed at 100 = 1970, except NH3 which is at 100 = 1980.

51 Graham Moates (2018). *Small mammal mortality in discarded bottles and drinks cans: A Norfolk-based field study in a global context.*

52 Christine Figgenger (2018). *What I learnt pulling a straw out of a turtle's nose.*



In the UK, the charity Keep Britain Tidy surveyed 7,200 sites between April 2017 and March 2018, and found that while 86% of sites achieved an ‘acceptable standard for litter’, this was a decrease on the previous survey, taken in 2014/15.⁵³ The most commonly littered items were smoking-related (such as cigarette butts, lighters, and cartons – which were found on 79% of sites), followed by confectionary packaging (found on 60% of sites), and non-alcoholic drinks cans and bottles (found on 52% of sites).⁵⁴

Water pollution

The average person in the UK uses around 140 litres of water every day – to flush lavatories, wash clothes, rinse dishes, clean cars and so forth.⁵⁵ It is therefore important that water resources – be they our seas, rivers, lakes, or canals – are kept to a decent standard, relatively free from pollution. Water quality is influenced – and diminished – in several different ways. These include:

- **Eutrophication** – where, commonly, fertilisers and animal wastes wash off fields and seep into watercourses;⁵⁶
- **Atmospheric deposition** – where pollutants in the air manage to get into watercourses via acid rain or vapour absorption;⁵⁷
- **Industrial pollution** – where chemicals and other



substances used in industrial processes find a way into watercourses;⁵⁸

- **Sewerage and wastewater pollution** – where wastewater from domestic households, businesses and industry goes untreated into watercourses.⁵⁹
- **Plastic** – where plastic can be found in watercourses, whether in the form of macroplastics (larger items such as bottles and bags) or microplastics (such as microbeads or fragments which have broken off from larger items).⁶⁰

As is the case with many environmental issues, water pollution threatens human health and the health of habitats and the organisms living in them, and poses certain economic costs to individuals and businesses.

In terms of human health, water pollution can cause illnesses such as gastrointestinal disease, various skin conditions,⁶¹ and even neurological conditions.⁶² In terms of animal health and that of the wider ecosystems in which they live, water pollution can be far more dangerous – low oxygen levels caused by eutrophication can be fatal for fish and other aquatic species,⁶³ while excessive concentrations of chemicals such as NH₃ can also be toxic.⁶⁴

In terms of economic damage, cleaning up water to ensure it is fit to drink or be used elsewhere in our daily lives costs

53 Keep Britain Tidy (2018). *Litter in England: The local environmental quality survey of England 2017/18.*

54 Ibid.

55 Environment Agency (2018). *The state of the environment: water quality.*

56 NOAA (2020). *What is eutrophication?*

57 World Meteorological Organization (2020). *Atmospheric Deposition.*

58 Fredric Windsor et al. (2019). *Persistent contaminants as potential constraints on the recovery of urban river food webs from gross pollution.*

59 Lilia Rodríguez-Tapia and Jorge A. Morales-Novelo (2017). *Bacterial Pollution in River Waters and Gastrointestinal Diseases.*

60 Gitte Kragh et al. (2020). *Plastic rivers: reducing the plastic pollution on our doorstep.*

61 UKRI (2014). *Abandoned landfills are polluting UK rivers.*

62 British Rowing (2008). *Water-borne Infectious Diseases.*

63 Michael F. Chislock et al. (2013). *Eutrophication: Causes, Consequences, and Controls in Aquatic Ecosystems.*

64 Stuart M. Levit (2010). *A Literature Review of Effects of Ammonia on Fish.*

more to do if it is heavily contaminated with pollutants. One might also point to the fact that polluted bodies of water mean rural and coastal communities lose out on tourism, or income derived from recreational industries such as boating, fishing, or swimming.

While the UK’s water bodies are in better condition than they once were, recent years have seen the condition the UK’s lakes and rivers deteriorate.⁶⁵ Table 2 shows the condition of

surface water bodies in England in percentage terms for each classification – high, good, moderate, poor and bad.

For 2016, just 16% of water bodies were deemed to be good or above, while fully 20% were regarded as poor or worse. Compared to a few years earlier, the proportion of water bodies rated good has declined by nearly ten percentage points.

TABLE 2. CONDITION OF SURFACE WATER BODIES IN ENGLAND (2009-2018)

Year	High	Good	Moderate	Poor	Bad
2009	0.1	24.7	60.7	12.5	2.1
2010	0.1	23.9	59.3	14.5	2.2
2011	0.1	24.6	55.6	17.5	2.2
2012	0.1	23.8	56.3	18.0	1.9
2013	0.1	23.1	55.6	19.1	2.2
2014	0.1	19.8	56.0	21.6	2.6
2015	0.2	16.5	62.9	17.6	2.9
2016	0.2	15.8	63.4	17.7	3.0

Source: Author’s analysis of DEFRA (2019). *ENV09 – England biodiversity indicators.*⁶⁶

Agriculture and food waste

Without modern agriculture, humanity could scarcely hope to be as prosperous and successful as it currently is.⁶⁷ But while useful and necessary, farming can come at a huge cost to the natural environment.

In the UK, 17.5 million hectares (72% of the total land surface) is dedicated to farming.⁶⁸ Consequently, this means there is less virgin habitat than the case would be otherwise. Take forest cover for example. In pre-Neolithic times much of the country would have been blanketed by trees.⁶⁹ But, as a result of human activities, such as agriculture, forest cover

has steadily decreased – reaching a low of around five per cent after the First World War.⁷⁰ In the intervening century, forest cover has slowly crept upwards, and now stands at around 3.2 million hectares, or 13% of the UK land area – but this is still only about a third of the cover seen in many other European countries.⁷¹

Diminished forest cover is one just example of habitat loss caused in part by the UK’s expanding agricultural footprint. Others include wildflower meadows, for instance, which declined in area by 97% between the 1930s and 1984.⁷²

65 DEFRA (2019). *ENV09 – England biodiversity indicators.*

66 Excludes proportion of unassessed bodies of water.

67 Matt Ridley and David Hill (2018). *The effect of innovation in agriculture on the environment.*

68 DEFRA (2020). *Agriculture in the United Kingdom: 2019.*

69 Woodland Trust (2011). *The state of the UK’s forests, woods and trees.*

70 House of Lords Library (2019). *Forestry Act 1919: 100 Years.*

71 Forest Research (2020). *Woodland Statistics.*

72 State of Nature Partnership (2019). *State of Nature 2019.*

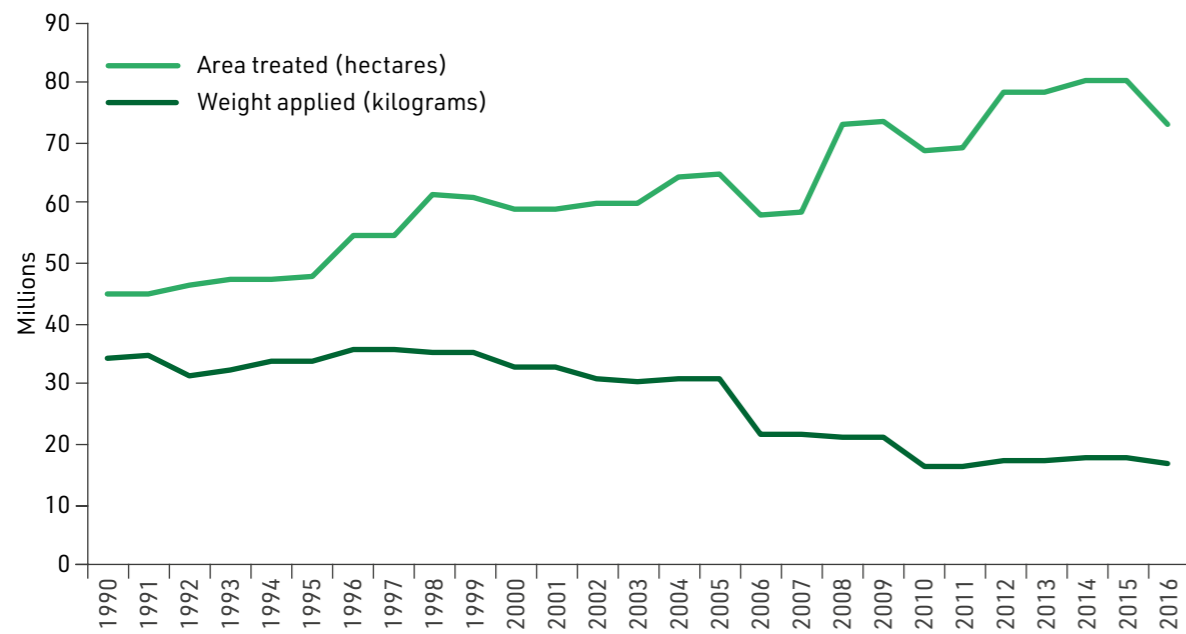
Habitat loss is a primary threat to biodiversity. According to the Joint Nature Conservation Committee's *State of Nature* report for 2019, over two in five species have shown strong or moderate decreases in abundance since 1970, and one-sixth are classified as threatened with extinction from Great Britain.⁷³ Sadly, two per cent have already been made extinct.⁷⁴

Agriculture can also harm the environment in other ways. Fertilisers are a necessary part of growing the crops needed to feed the population. They ensure that yields remain high, which keeps costs low and prevents further habitat loss.⁷⁵ But they do have negative consequences – if applied excessively. When too much fertiliser is used, it can leach into

groundwater, or be washed directly into streams – which, as discussed, can cause eutrophication and damage ecosystems.⁷⁶ Fertiliser use also contributes to air pollution and climate change.⁷⁷

Similarly, while pesticides' primary aim is to kill plants, fungi and insects which damage crops – they can impact the wider environment as well, by reducing the amount of food available for other animals, such as birds, and in some cases, harming pollinator species, which are critical for the healthy functioning of many ecosystems.⁷⁸ Pesticide use in the UK is down in weight terms over the past 30 years, however, the area of land they are applied to has increased.

CHART 5. PESTICIDE USE IN THE UK (1990-2016)



Source: Author's analysis of FERA (2020). *Outdoor and Protected Crops*.⁷⁹

Though not the most well-known problem, soil degradation is another considerable environmental challenge exacerbated by agriculture. Soils are a vital carbon sink, storing by some estimates 10 billion tonnes of carbon in the UK. But degraded soils cannot sequester carbon dioxide as well, and,

when they are excessively degraded, they release carbon back into the atmosphere.⁸⁰ Unhealthy soils are also less able to attenuate water (and thus mitigate flood risk),⁸¹ and can harm water quality by causing sedimentation, among other problems.⁸²

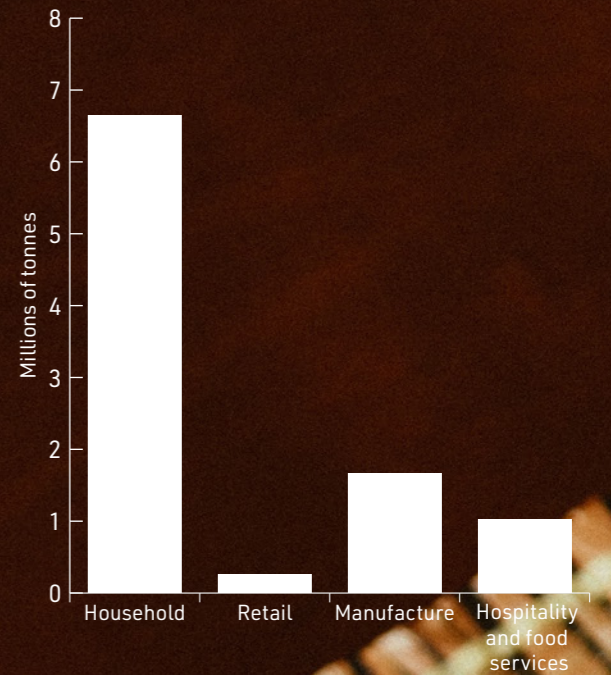
73 Ibid.
 74 Ibid.
 75 Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-being: Synthesis*.
 76 World Resources Institute (2020). *Sources of Eutrophication*.
 77 Air Quality Expert Group (2018). *Air pollution from Agriculture*.
 78 Sam Wong (2017). *Strongest evidence yet that neonicotinoids are killing bees*.
 79 The same area can be treated on multiple occasions each year, hence why values can be returned which exceed the total acreage of the UK.
 80 CCC (2016). *Environmental Audit Committee - Inquiry into Soil Health: Written Submission from the Committee on Climate Change*.
 81 Ibid.
 82 Ibid.

Soil health can deteriorate for lots of reasons, including via compaction by heavy agricultural equipment,⁸³ excessive and deeper ploughing,⁸⁴ and poor management by farmers, such as failing to use cover crops.⁸⁵

While we have above considered various environmental threats created in the production of food, we should not ignore the potential challenges posed by the disposal of food. Food waste is a significant source of greenhouse gas emissions – as it releases methane when it decomposes.⁸⁶ In the UK nearly 10 million tonnes of it is thrown away, associated with an estimated 25 million tonnes of greenhouse gas emissions.⁸⁷

Nearly 70% of food waste by weight occurs in the household, followed by waste during manufacturing, in hospitality and food services (for example, restaurants) and finally retail (for example, supermarkets). The data below, however, does not include wastage which occurs on farms themselves, for instance if crops spoil in the field, which if counted would push the total numbers up even higher.

CHART 6. UK FOOD WASTE BY SECTOR (2018)



Source: Author's analysis of WRAP (2018). *UK progress against Courtauld 2025 targets and UN Sustainable Development Goal 12.3*.

83 Thomas Keller et al. (2019). *Historical increase in agricultural machinery weights enhanced soil stress levels and adversely affected soil functioning*.
 84 David Gregory-Kumar (2017). *Does ploughing actually damage soils and crops?*
 85 ADHB (2015). *Opportunities for cover crops in conventional arable rotations*.
 86 Chad Frischmann (2018). *The climate impact of the food in the back of your fridge*.
 87 WRAP (2020). *Food surplus and waste in the UK - key facts*.



“The better that we perform, the more meals that we save, the better the impact is for the environment and local communities.”

Jamie Crummie, Too Good To Go

CASE STUDY JAMIE CRUMMIE

TOO GOOD TO GO

When Jamie talks about Too Good To Go’s early adopters, he explains that when the company started back in 2015, it was typically the ‘eco warrior’. As the business has grown, so have its customers and the conversation around the redistribution of excess food. Today, Too Good To Go helps 40,000 businesses across Europe to reduce their food wastage at scale. Their leading KPI is meals saved.

In the UK alone, almost £20 billion worth of food is wasted each year. It’s a startling statistic – around eight times the amount of the annual police budget. In the hospitality sector, food waste costs £682m, around 97 pence per plate of food served. A third of all food being produced ends up being wasted. If food waste were a country, it would be the third largest greenhouse gas emitter after the US and China.

“The crux of our business is about creating this movement around food waste”, says Jamie. Too Good To Go’s marketplace app is designed to connect businesses who have surplus food for sale with consumers. “When I’m talking about surplus food, I am talking about food that would otherwise go to waste”. The businesses that they work with are an eclectic mix of high street restaurants, local cafes through to large retailers and further up the supply chain to manufacturers and caterers.

Besides the fact that Too Good To Go’s marketplace is helping the environment, it is also helping businesses to recover sunk costs. As Jamie puts it, “it’s a win-win. It’s a win for our businesses who are able to recover sunk costs on food that would otherwise go to waste. It is a win for our consumers who are able to enjoy and discover amazing food at prices that don’t cost the earth, and, ultimately, it is a win for the environment as amazing food isn’t going to waste.”

In addition to the environmental message, Jamie sees value in Too Good To Go’s consultancy work. “We will always be

speaking with our partners on a one-to-one basis to see how we can do more to reduce food waste.” He also sees this as an important part of placing value back on the people who create food. “I struggle to think of any other sector where the core product of their business is thrown away with such disregard.”

Too Good To Go’s marketplace is important because it funds the work that they do with schools, businesses, households and through public affairs. “We recognise the importance of working with younger generations to make sure they are not making the same mistakes tomorrow.”

Looking to the future, Jamie has no plans to slow down. “We want to be a global solution that is synonymous for food wastage and used globally.” Speaking about some of the challenges that Too Good To Go faces on its journey to global expansion, he explains that it hasn’t necessarily been regulatory hurdles but rather having to change public perceptions about the quality of excess food.

Jamie believes that the government could play an important role in supporting this message. “If we look at France, they introduced legislation in 2015, around retailers over 500 square metres having to redistribute food surplus. That has been a huge enabler because people are actively seeking food waste solutions.” As Jamie puts it “the better that we perform, the more meals that we save, the better the impact is for the environment and local communities.”

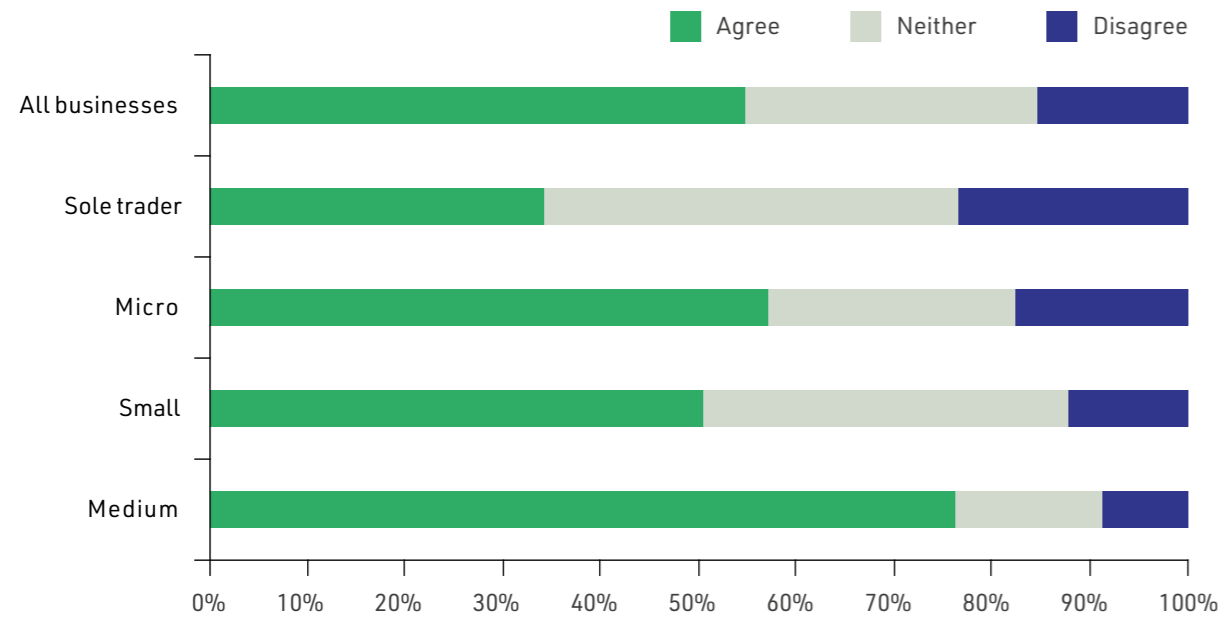


BUSINESSES' ATTITUDES TOWARDS ENVIRONMENTAL ISSUES

The previous chapter examined three threats to the natural environment. In this chapter, we report the findings of a poll which we conducted with Opinium to assess attitudes among British small and medium-sized businesses with regards to various environmental questions.⁸⁸

First, businesses were asked whether they have sought to become more environmentally responsible in the previous 18 months, or since it started trading if younger. Over half (54%) of businesses agreed, while just 15% disagreed.

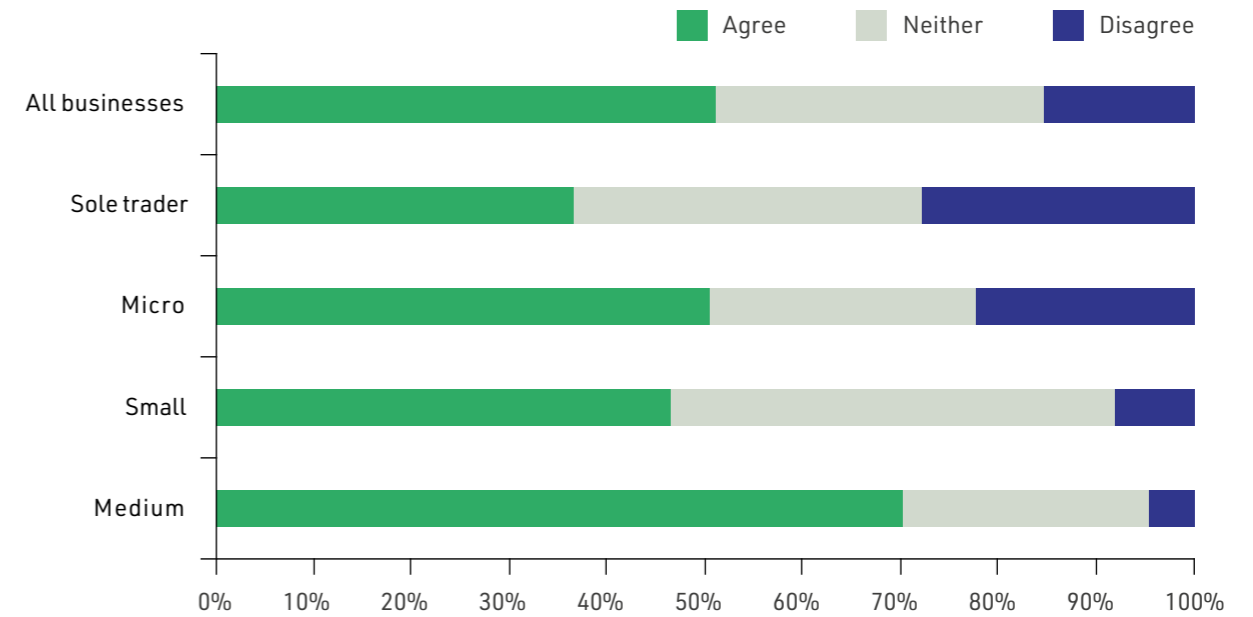
CHART 7. MY BUSINESS HAS ACTIVELY TRIED TO BECOME MORE ENVIRONMENTALLY RESPONSIBLE IN THE LAST 18 MONTHS.



Businesses were then asked if they believed their customers expected them to be taking steps to become more environmentally responsible. Exactly half of the businesses polled agreed they did, and again only 15% disagreed. Interestingly, the sectors in which businesses believed there was the most consumer pressure to be more environmentally responsible were also generally the sectors which tended to agree they had taken steps to do just that.

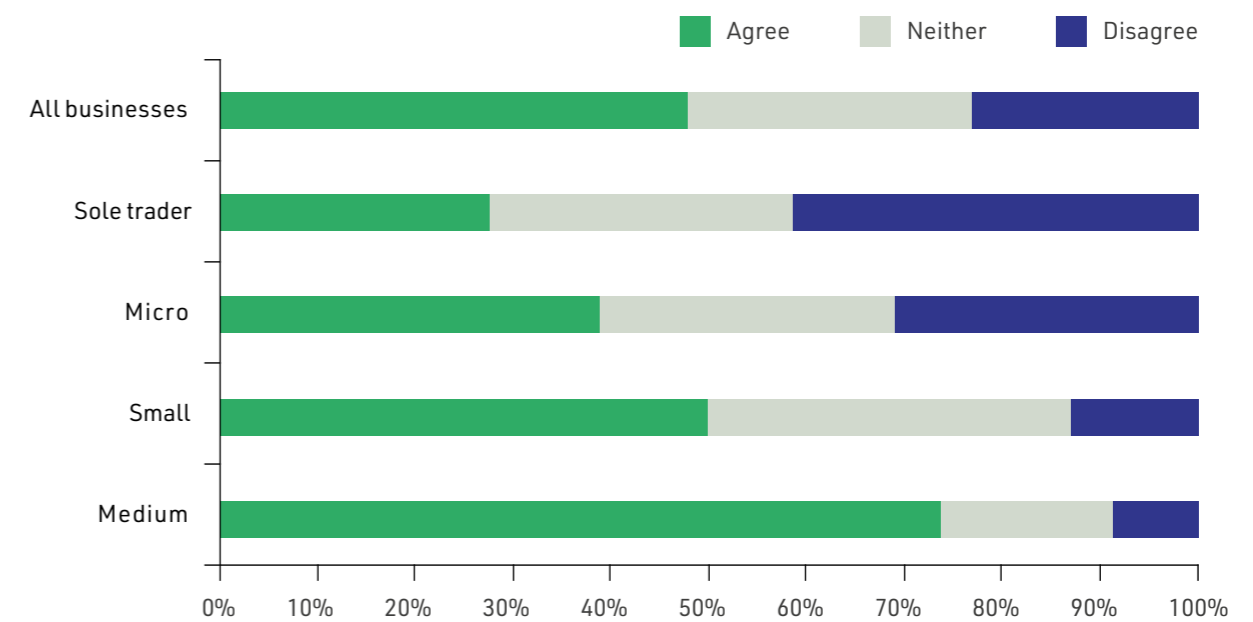
⁸⁸ A statistically representative sample of 502 senior decision makers in small and medium-sized enterprises were polled between 23 and 28 September 2020 by Opinium. All charts exclude 'don't knows'. All base = 502, except Chart 12. Full data tables can be found on The Entrepreneurs Network website.

CHART 8. MY CUSTOMERS EXPECT MY BUSINESS TO BE TAKING STEPS TO BE MORE ENVIRONMENTALLY RESPONSIBLE.



Then, businesses were asked if they thought they could be doing more to reduce their impact on the environment. Here there was more of a spread of answers, but still nearly half (47%) agreed that they could be doing more, while 23% disagreed. One reading of these data is that there is a significant market for solutions to help businesses reduce their environmental footprint – a market which entrepreneurs could be succeeding in.

CHART 9. MY BUSINESS COULD BE DOING MORE TO REDUCE ITS ENVIRONMENTAL IMPACT.

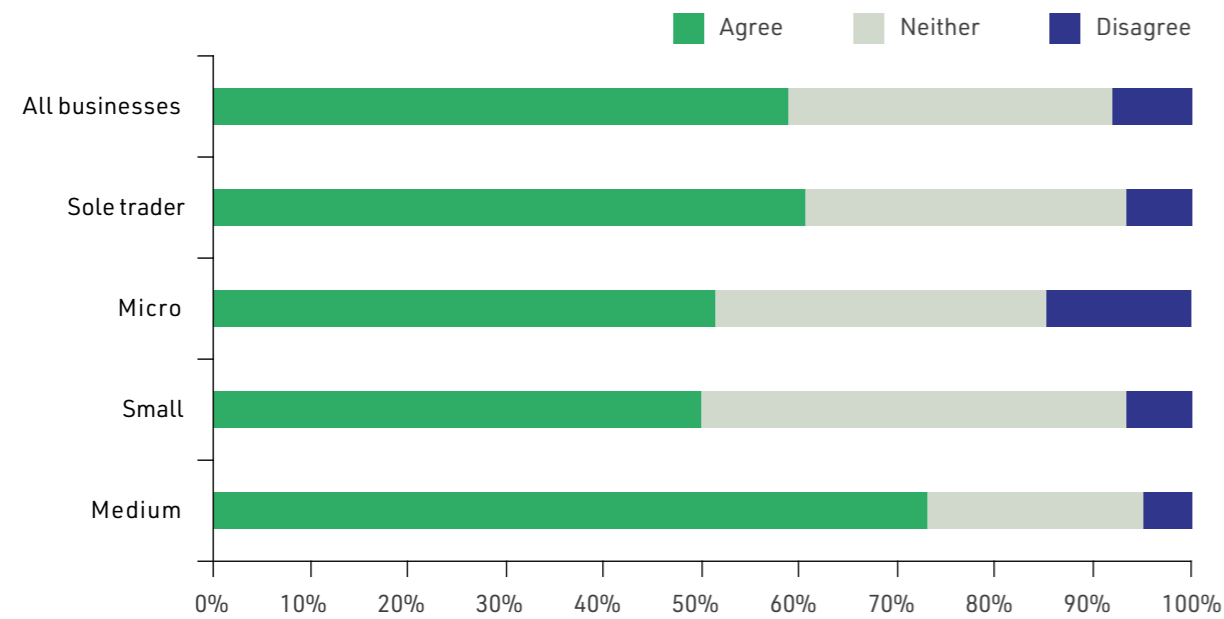




Following this, we were keen to understand how a business' environmental credentials impacts hiring. Nearly three-fifths (56%) of the businesses we polled agreed that employees increasingly wanted to work in businesses which were

environmentally responsible – and this rose to nearly two-thirds (64%) in the youngest businesses we polled (those aged five years or younger).

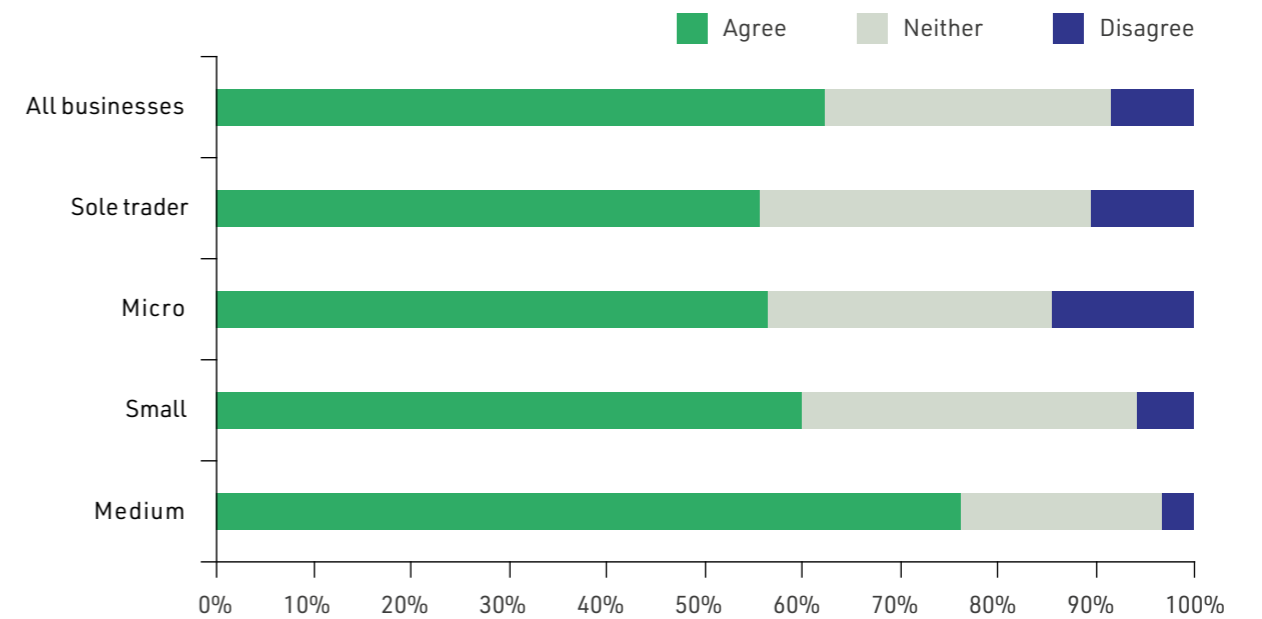
CHART 10. EMPLOYEES INCREASINGLY WANT TO WORK IN BUSINESSES WHICH ARE ENVIRONMENTALLY RESPONSIBLE.



Though less so nowadays, pursuing sustainability is often regarded as a hindrance to businesses and the economy – as if the two are mutually exclusive. We wanted to test whether businesses thought this was true. The results suggested not – over three-fifths (61%) agreed that the move to a greener economy represented positive opportunities for businesses,

while just eight per cent disagreed. Businesses with the largest annual turnovers (in excess of £5 million) were most positive (71% agreeing), while – unsurprisingly – businesses which are planning to address environmental issues were also overwhelmingly positive (77% agreeing) about this happening.

CHART 11. THE MOVE TO A GREENER ECONOMY PRESENTS POSITIVE OPPORTUNITIES FOR BUSINESSES.



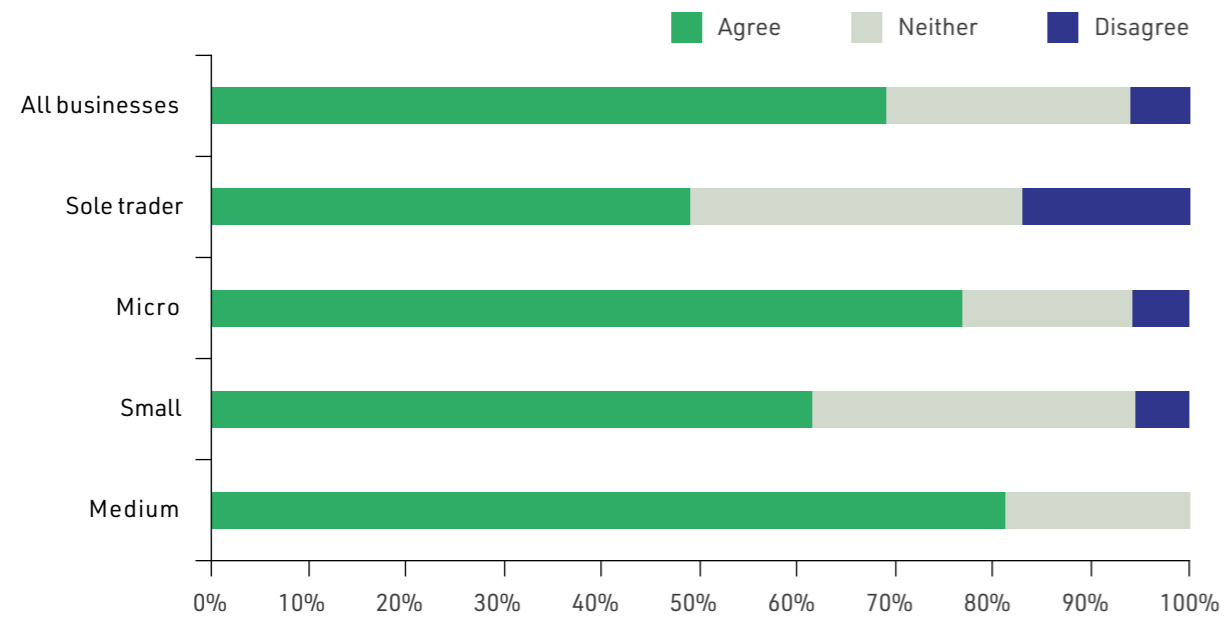
Having worked out how many businesses believed that the shift to a greener economy would present positive business opportunities, we then wanted to see how many of those believed they themselves would benefit financially from this. Over two-thirds (67%) thought they would. Again, this

casts doubt on the idea that embedding sustainability in the economy is necessarily harmful to business – in fact, it suggests that most small and medium-sized businesses think there are financial opportunities in a greener economy, and that they personally can benefit from them.



“There is a huge diversity of issues which the population wants to see addressed – implying a similarly huge diversity of opportunities for environmental entrepreneurs of all kinds.”

CHART 12. I AM CONFIDENT MY BUSINESS WILL BENEFIT FINANCIALLY FROM A NATIONWIDE MOVE TOWARDS A GREENER ECONOMY.

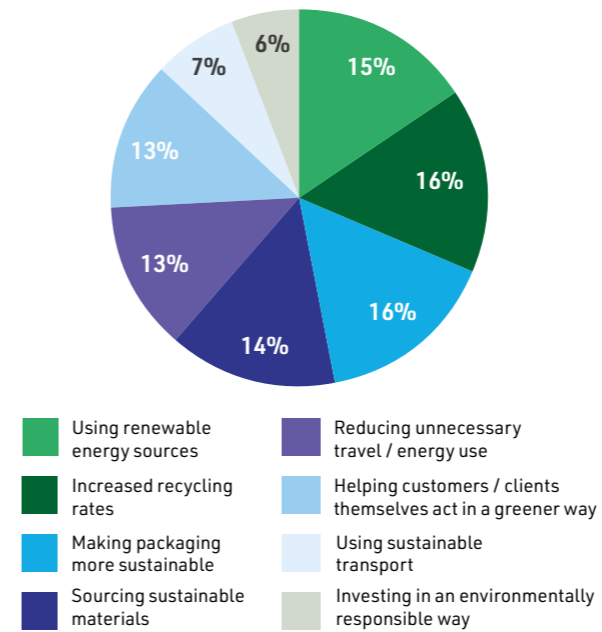


Base: 304 businesses who agreed that the move to a greener economy presents positive opportunities for businesses.

Returning to all of the businesses in our sample, we asked them what the number one environmental issue their customers or clients are most interested in being addressed. No single issue received anything close to a majority of responses. ‘Using renewable energy sources’, ‘increased recycling rates’, ‘making packaging more sustainable’ were all selected by 11% of businesses, while ‘sourcing sustainable materials’ was chosen by ten per cent, ‘reducing unnecessary travel and energy use’ and ‘helping customers and clients themselves act in a greener way’ were chosen by nine per

cent. Five per cent selected ‘using sustainable transport’, and four per cent chose ‘investing in a responsible way’. To our mind, this suggests that there is a huge diversity of issues which the population wants to see addressed – implying a similarly huge diversity of opportunities for environmental entrepreneurs of all kinds.

CHART 13. WHICH ENVIRONMENTAL ISSUE DO YOUR CUSTOMERS OR CLIENTS CARE ABOUT YOUR BUSINESS ADDRESSING MOST?



Having tested what issues customers most wanted to see solved, we then asked businesses what one environmental issue they themselves will next address. Again, a range of answers were returned – but the ones which seemed to crop up again and again included: increasing recycling, reducing waste, reducing travel (or travelling more sustainably), and switching to electric vehicles. These too indicate potentially lucrative markets for entrepreneurs to move into, as they are where businesses are stating they require solutions for.

Our final question to businesses was to gauge how well or badly they believe the government is doing in terms of helping them to tackle environmental problems. The modal response here was distinctly average – 38% of businesses think the government is neither doing well nor badly. Slightly more (30%) think it is doing badly than well (24%). These data could be interpreted in lots of different ways, but one reading would be that despite all of the new policies and attention devoted to the environment by the government – especially in the last few years – businesses still think it has more to do. In future, the government might be minded to think more about how it can actively help businesses to become more sustainable in their every day operations.

CHART 14. HOW DO YOU THINK THE GOVERNMENT IS DOING IN TERMS OF HELPING BUSINESSES TACKLE ENVIRONMENTAL PROBLEMS?

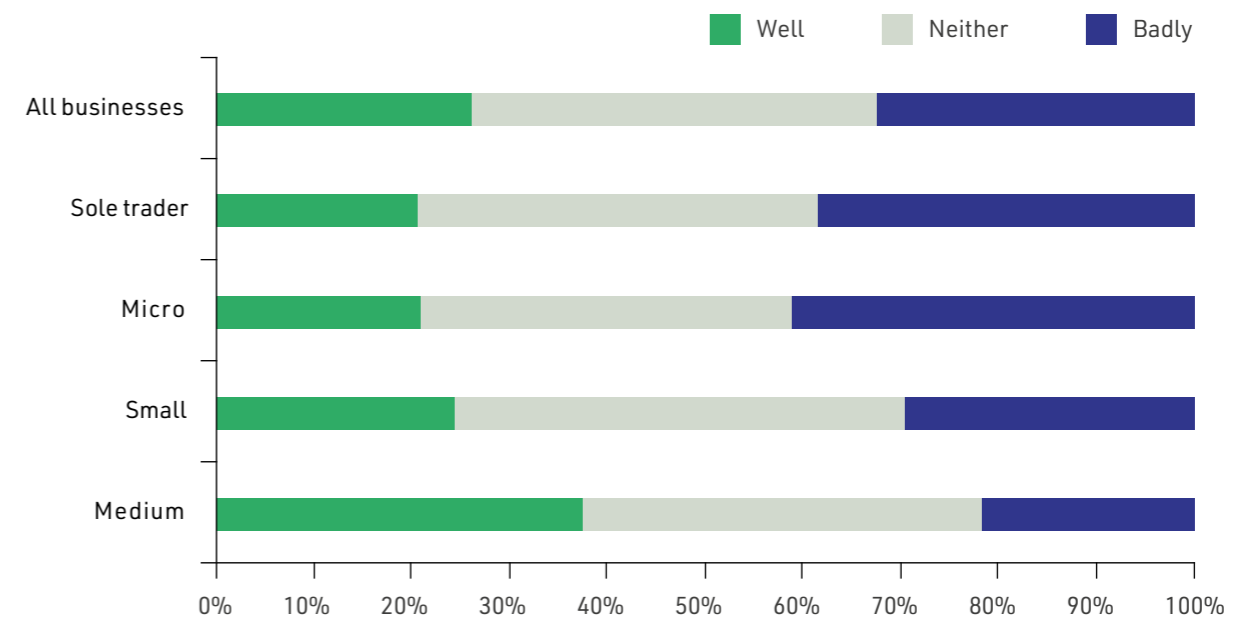


TABLE 3. TRENDS IN SUSTAINABLE MARKETS

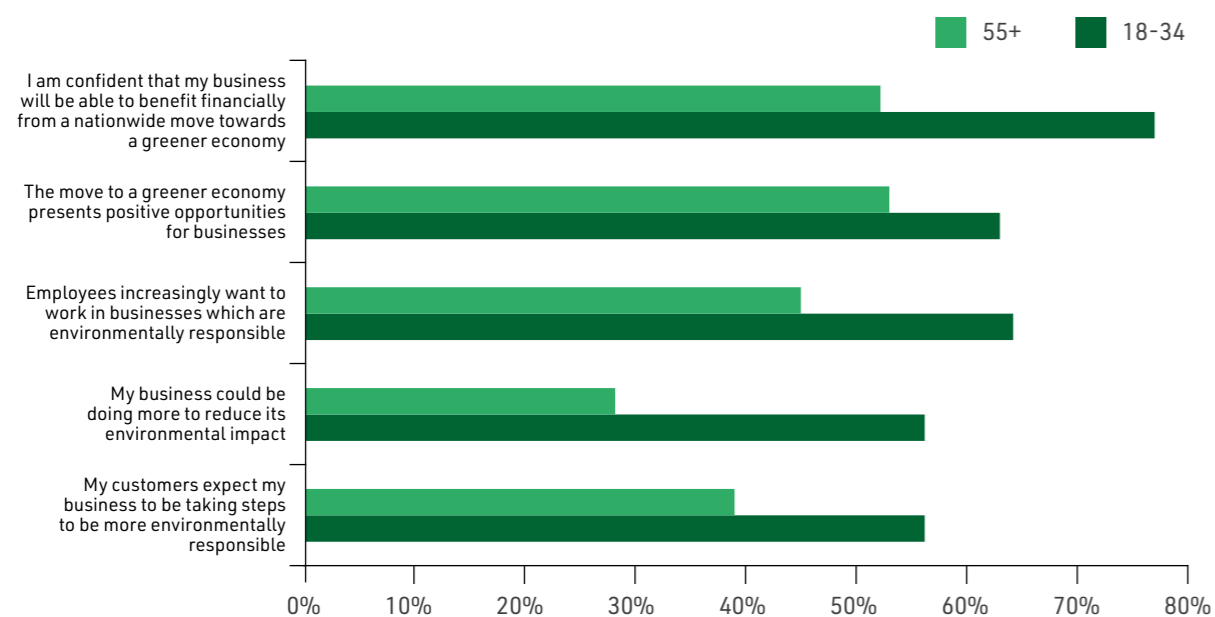
		Funds raised (2019)	Cumulative funds raised (2015-2019)	Fundraising growth (2015-2019)	Number of fundraisings (2019)	Number of fundraisings growth (2015-2019)
Sector	Clean technology	£1.1 billion	£3.34 billion	+ 115%	299	+ 15%
Buzzword	Biomass and biofuels	£118 million	£412 million	- 27%	23	- 49%
	Drones	£100 million	£330 million	+26%	44	+ 100%
	Precision agriculture	£68 million	£295 million	+ 3,650%	20	+ 400%
	Urban farming	£86 million	£121 million	+ 520%	11	+ 450%
Descriptor	Sustainable	£2,2 billion	£5.75 billion	+ 205%	442	+ 69%
	Renewable	£251 million	£1,269 million	- 42%	119	+ 3%
	Environmental	£514 million	£2.29 billion	+ 94%	232	+ 55%
	Eco-friendly	£29 million	£130 million	+ 62%	30	+ 76%

Source: Author's analysis of Beauhurst (2020). Advanced search.

When broken down by age of respondent, our polling revealed some other interesting results. In general, younger respondents tended to be more positive about the environment. Chart 15 contrasts percentages of respondents agreeing with various statements, based on whether they are aged 18-34 years old versus those aged 55+ years old. Younger respondents are more likely to agree that: the move towards a greener economy represents opportunities for businesses (and that they will be able to financially benefit from that); that employees increasingly want to work in businesses which

are environmentally responsible; that their businesses could be doing more to reduce their environmental impact; and that customers expect their businesses to be taking steps to be more environmentally responsible. This suggests that not only is environmental awareness high on the business agenda, but also that it is especially so among businesses run by younger people – and this may well mean that the increasing tendency for businesses to be environmentally conscious will only continue to grow (proportionally) as time goes by.

CHART 15. ATTITUDES BY AGE BRACKET



Launching your own skincare brand is a daunting feat, especially during the COVID-19 lockdown. For Katrina Borissova, founder of Little Danube, it was all about combining her training from one of the top soap schools with her vision to create a natural skincare brand.

CASE STUDY KATRINA BORISSOVA LITTLE DANUBE



The vegan soap bars are Little Danube's first product since launch this August. The soaps are colourful and vibrant and importantly, fragrance and cruelty free. For Katrina, sustainability is an integral part of Little Danube's vision. Katrina considers the high consumption of plastic packaged beauty products to be a major way in which her industry is contributing negatively to the environment.

When it comes to the beauty industry, Katrina is surprised that there has been a lack of investment in sustainability. "No one is thinking, why don't I just use sugarcane instead of plastic." A Swiss study found that the carbon footprint of liquid soap is 25% larger than soap in bar form on a per-wash basis. Liquid soap also takes five times more energy to produce, can use 20% more packaging, despite lasting only half as long as a soap bar. As Katrina puts it, with her soap bars "you save your money and the environment, it's a win-win."

Katrina has also been thoughtful with her packaging. "The paper tissue ink is made from soy, it is toxic free. Every time I make an order, a tree is planted, and I have certification from them on my website. I also went for compostable mailers; the paper surrounding the soap is also made from shredded paper which is biodegradable." She pays more to work with sustainable suppliers but in her opinion, the extra cost is met with consumer demand. Since her launch, Katrina has sold 300 products through wholesalers, artisan and plastic-free shops as well as her own retail channels.

A stepping stone in Katrina's decision to create vegan products was a Forbes article on clean beauty. In this article, Richard Kestenbaum of Triangle Capital said, "there's probably a time

five years from now where, if you're not natural and clean, you're not on the shelf."

One aspect of 'clean' is vegan products. According to a study by Signal Analytics, consumer discussion around vegan beauty has doubled over the past two years. Vegan beauty accounts for around 13% of the conversation but only four per cent of the product range, suggesting there is a big opportunity.

Katrina isn't stopping with soaps. She sees products such as solid shampoo and solid conditioner in her brand's future, and plans on expanding into markets outside of the UK. She agrees that the products we see in our bathrooms today will be more 'clean' in the future. "There is this element of being sustainable. But you can't claim it until basically you do something different, and doing something different is solid shampoo bars."

Now more than ever, people are invested in their personal care and safety. A study recently revealed that during the COVID-19 pandemic the soap and body wash market saw a 194% growth in the market with 102% in luxury hand soaps, and only set to stay high with strong public health and safety procedures in place to keep citizens safe.

One potential solution that Katrina puts forward to deal with the plastic problem post-pandemic is for the government to support programmes that invest in companies that develop sustainable non-plastic products. "You just need some brainstorming. You take a green scientist, a designer, a maker and put them in a room for a few days and they will come up with something. Plastic can definitely be replaced."

“If we are to reduce our impact on nature without seeing living standards decline, then we must find new technologies and improve existing ones. Entrepreneurs will be needed to identify, deploy and scale sustainable alternatives.”

SOLVING ENVIRONMENTAL CHALLENGES

Climate change, air pollution, and resource misuse. Behind each challenge lies multiple causes. Often, the issues overlap.

As we maintained at the start of this report, entrepreneurs can play a pivotal role in solving each problem. If we are to reduce our impact on nature without seeing living standards decline, then we must find new technologies and improve existing ones. Entrepreneurs will be needed to identify, deploy and scale sustainable alternatives.

It is worth noting that, given just how many different factors cause different environmental problems, it would be conceited to assume any single actor can identify what they are, and devise and execute solutions for them accordingly. As Rachel Wolf of the Zero Carbon Commission recently wrote regarding the UK's bid to get to net zero by 2050: “[Current] plans rely on an implausible level of omniscience and competence from governments. We cannot engineer economies. We do not know exactly what innovations to support.”⁸⁹ She is correct on all counts – and the upshot of her logic is that rather than trying to micromanage each part of the economy to get a near infinite number of individual sectors to net zero, the government would do far better to set out a broad framework, and then allow that spontaneous process of entrepreneurial innovation to deliver the desired ends.

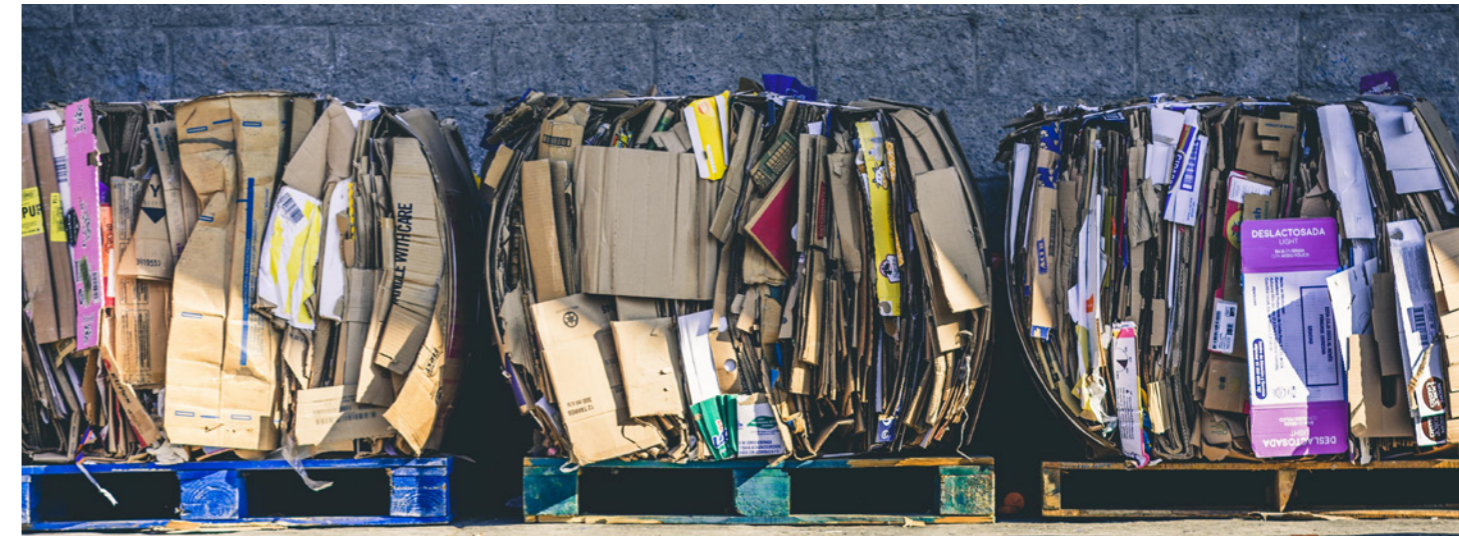
Some green innovations will win out simply by being more cost-efficient than their dirtier counterparts. Consumers will

adopt them without reference to their green credentials. This is what is increasingly happening in new-build electricity generation, with solar photovoltaic panels and onshore wind now being the cheapest way to generate electricity for the majority of the world's population.⁹⁰

Moreover, in some markets, organic consumer demand for environmentally friendly products will stimulate markets and provide a return for entrepreneurs tapping into them. For example, public pressure in the wake of BBC's *Blue Planet II* documentary led to restaurants, bars and cafes replacing plastic cups and straws with sustainable alternatives.⁹¹

Despite this, there are still plenty of sectors where governments will need to step in to create the right incentives to develop and switch to cleaner alternatives if certain environmental objectives are to be delivered on.

This in itself creates a tension. Too much interference from government risks stifling that vital entrepreneurial spirit needed to develop solutions. Moreover, not all regulations are created equal. Some may have unintended consequences, which actively hinder efforts to increase sustainability. Our polling also found that less than a quarter of businesses thought the government was currently doing well in terms of helping businesses to address environmental problems, perhaps suggesting a rethink is required.



A key driver of environmental problems are when individuals do not bear the social costs of their actions, or are not fully rewarded for the social benefits of the services they provide. Economists describe the former problem as negative externalities, and the latter as positive externalities.

Many environmental problems are caused by negative externalities going unchecked. For example, a motorist driving a polluting car – in which they get to their destination, but only after emitting CO₂ and PM_{2.5}. As the motorist does not bear the full cost of their actions, they are less likely to shift to a cleaner alternative.

“A key driver of environmental problems are when individuals do not bear the social costs of their actions, or are not fully rewarded for the social benefits of the services they provide.”

Similarly, entrepreneurs under-invest in the development of green technologies as they are unable to capture the full benefits. This happens in two ways. First, if their cleaner product reduces fertiliser use and prevents soil degradation, they are not rewarded for the carbon sequestration or flood risk mitigation. Second, knowledge tends to spill over. Competitor businesses may be able to replicate the new processes or technologies the entrepreneur has developed.

When externalities are unpriced, markets fail to deliver

optimal outcomes. Opportunities for entrepreneurs to thrive and provide solutions are diminished. But with proportional government intervention – possibly through policies such as regulation and R&D Tax Credits – we can improve the situation.

This section provides a series of recommendations on how to begin squaring the three circles cited above: climate change; air pollution; resource misuse. To do so, we limit our focus to what might be regarded as three correspondingly key ‘sectors’:

- Energy (Generation and Use)
- Transport
- Consumer Goods

We single out these problems for a number of reasons. Transport is the leading contributing sector to greenhouse gas emissions in the UK, and the energy supply is the second.⁹² They also generate significant quantities of air pollution, often in the immediate vicinity of large populations of people.⁹³ Meanwhile, everything we buy, consume, and dispose of inherently has an environmental story to tell, and this is a sector in which each individual has a considerable degree of autonomy in terms of how they make more sustainable decisions – and how they can influence companies and entrepreneurs to develop and retail environmentally friendly alternatives to their favourite products. Moreover, issues such as using more sustainable materials, or reducing levels of packaging, were some of the recurrent answers business owners provided when we polled them about what their customers care most about.

⁸⁹ Rachel Wolf (2020). *Net Zero risks upending our lives and livelihoods. Here's why carbon pricing gives it a better chance of working.*

⁹⁰ BloombergNEF (2020). *Scale-up of Solar and Wind Puts Existing Coal, Gas at Risk.*

⁹¹ Sean Poulter (2019). *Blue Planet effect drives shoppers' war on plastic as consumers ditch single-use bags by switching to retailers who are opting for sustainable packaging.*

⁹² BEIS (2020). *2018, UK Greenhouse Gas Emissions, Final figures.*

⁹³ ONS (2019). *Road transport and air emissions.*

Therefore, while the following might not address all of the different environmental challenges with which the planet is faced, we believe they are good places to start. If meaningful progress could be made in each of them, the pressures on global ecosystems would be markedly relieved.

Some of the recommendations we make will help entrepreneurs in quite obvious ways – perhaps by removing regulations which act as barriers to whole industries. Others might be more subtle – perhaps working to stimulate entrepreneurship by pricing pollution, and thus implicitly creating incentives for solutions to be developed for cleaner versions of hitherto polluting equipment, transport, and so forth.

“When externalities are unpriced, markets fail to deliver optimal outcomes.”

Energy (Generation and Use)

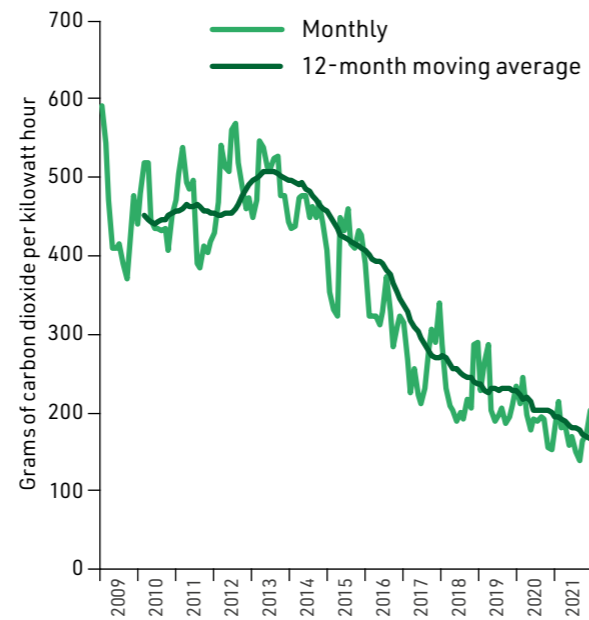
Energy supply contributes almost one quarter (23%) of the UK’s net greenhouse gas emissions.⁹⁴ Until only very recently, it was the primary contributor to emissions in the UK, though has since been surpassed by the transport sector.⁹⁵

Despite still being a leading contributor to net emissions, the energy supply has managed to decarbonise much faster than other sectors of the economy. Since 1990, its emissions have fallen by a staggering 63%. In fact, over half of all of the decarbonisation seen in the UK since 1990 can be explained by falling emissions in the energy sector.

Energy can be produced in countless different ways – ranging from zero-emission methods such as solar photovoltaics and wind turbines, through to carbon-intensive ones such as burning natural gas and coal.

Compared to even just a handful of years ago, much more of the UK’s energy needs are now being supplied by clean alternatives to fossil fuels.⁹⁶ In 2000, wind and solar contributed just 0.25% of total electricity generation in the UK, whereas today they provide almost a quarter.⁹⁷ Add in other low-carbon sources like nuclear, hydro, and biomass,⁹⁸ and actually the majority of electricity (54%) in the UK in 2019 came from non-fossil fuel sources.⁹⁹

CHART 16. CARBON INTENSITY OF ELECTRICITY (2009-2020)



Source: Author’s analysis of Drax (2020). *Drax Electric Insights*.

Chart 16 shows how much cleaner Britain’s electricity now is. In terms of annual averages, the carbon intensity of the grid hit a peak in 2012 at 507 grams of CO₂ per kilowatt hour (gCO₂/kWh). In 2019, however, average emissions were just 189 gCO₂/kWh – a reduction of nearly 63%. At the time of publication, carbon intensity for 2020 thus far was a mere 167 gCO₂/kWh.¹⁰⁰

Behind the staggering ascent of low-carbon electricity generation lie numerous factors. But one which is particularly noteworthy is simply how much better clean energy technologies have become in recent decades. As a consequence of learning by doing, and enormous scaling up, wind turbines have become bigger, and solar panels more efficient. The net result is their ability to capture energy from the environment is vastly improved – allowing them to be far more productive, and able to provide more of our energy.

Impressive as renewables have been in making inroads into energy once provided by coal and natural gas, questions hang over whether they will be able to reliably occupy greater shares of the energy mix, owing to their inherent intermittency. One way to mitigate this is to use batteries – either installed at ‘utility scale’ (in other words, a centralised



series of batteries able to discharge large quantities of stored energy onto the grid), or directly within homes. Another place where batteries can increasingly be found are in vehicles – as battery powered electric cars and alike occupy a larger share of the national fleet.

“Over half of all of the decarbonisation seen in the UK since 1990 can be explained by falling emissions in the energy sector.”

Despite batteries making striking leaps forward in recent years, they still have some way to go if they are to be a serious and significant part of the energy system.¹⁰¹ Further research will be needed to develop more efficient batteries that are lighter and smaller and retail at a lower price. Other innovations, such as ‘vehicle-to-grid’ (or V2G) technology (where vehicles discharge their batteries to the grid in times of peak demand) and other grid balancing systems will most probably be needed to smooth peaks and troughs in electricity generation to better match supply and demand. Without doubt, scientists, engineers and entrepreneurs are all working hard to this end, but the point remains that battery technology of the sorts which renewables will require is still a relatively nascent industry.

POLICY

Recent policy statements and fiscal changes from the current government should help with regards to stimulating research and development (R&D) into better battery technology – and other types of clean energy innovation. At the most recent Budget, the Chancellor, Rishi Sunak, set out plans to increase public R&D investment to £22 billion per annum by 2024/25.¹⁰² He also increased the Research and Development Expenditure Credit from 12% to 13%.¹⁰³ In theory, these changes open up new streams of funding for entrepreneurs to tap into in order to develop green innovations.

The renewed focus on getting the UK investing more in R&D should be welcomed. The government should ensure that clean technologies in each of the energy, transport, and consumer goods sectors are sufficiently recognised in the disbursement of the uplift in public spending on R&D. It should also monitor the increase in Research and Development Expenditure Credit and consult on increasing it further for R&D specifically for environmental goods and services if necessary.

94 BEIS (2020). *2018, UK Greenhouse Gas Emissions, Final figures*.

95 Ibid.

96 BEIS (2020). *Digest of United Kingdom Energy Statistics (DUKES) 2020: main chapters and annexes A to D*.

97 BEIS (2020). *Historical electricity data: 1920 to 2019*.

98 Though debate surrounds biomass’ inclusion as a low-carbon technology, as we shall explore later.

99 Simon Evans (2020). *UK low-carbon electricity generation stalls in 2019*.

100 Drax (2020). *Drax Electric Insights*.

101 BloombergNEF (2019). *Battery Power’s Latest Plunge in Costs Threatens Coal, Gas*.

102 HM Treasury (2020). *Budget 2020: Delivering on our promises to the British people*.

103 Ibid.



CASE STUDY JO-JO HUBBARD ELECTRON

Electricity is critical to modern life as we know it. It is what powers our lights, charges our phones, and keeps us connected online. What many people do not know, however, is that the power they are consuming right now was generated under a second ago somewhere on the system, and this is all stabilised through a remarkable balancing act of matching total supply and demand in layered financial and physical markets. This is all set to get much harder and more complicated as we move to net zero.

Net zero means moving away from predictable generation, from sources such as gas that turns up or down to match demand, and towards majority wind and solar power, which is intermittent, impossible to turn up, and – increasingly frequently – impossible to export due to local energy traffic jams, called ‘grid constraints’.

One company aiming to offer such solutions here is Electron, which was co-founded in 2015 by Jo-Jo Hubbard. Electron – through its platform, ElectronConnect – allows network operators, distributed energy resources, and others to co-create local markets and trade and optimise the combined use of network capacity and renewable generators.

Using ElectronConnect, electricity can be consumed intelligently – with demand much more closely matching supply. Grid constraints can be minimised. This means more renewables can be connected to the grid, while ensuring security of supply is maintained. Furthermore, it maximises the value of renewable assets, by better guaranteeing their energy has somewhere to go, therefore helping investors in zero-emission generators.

Jo-Jo is excited about the future of energy – which she sees as being increasingly about smaller generation, paired with intelligent systems to distribute it as efficiently as possible. “Where once we had big gas plants to manage flexibility”, she explains, “we could instead have tens of thousands, or even millions, of decentralised microgenerators and energy users doing that role instead.”

Since being established, Electron has grown steadily, and has no plans to slow down. It is involved in projects all over the world, helping communities interact with their clean energy more efficiently. Fundamentally, it is facilitating the next stage of the decarbonisation of the energy supply. As Jo-Jo herself puts it: “The conversation around net zero has a tendency to focus on simply building more renewable capacity. That’s certainly welcome, but without flexibility and the services which enable that, there’s a limit to the amount we can add.”

As noted above, Britain’s electricity has been getting cleaner year-on-year, for the last several years. But one might think that counts for little if – as the economy grows ever larger, and the population expands too – we are consuming more of it in gross terms. In actual fact, electricity consumption peaked all the way back in 2005 – at just under 350 terawatt hours (TWh).¹⁰⁴ In 2018, Britain consumed fractionally less than 300 TWh, which is equivalent to levels not seen since the mid-1990s.¹⁰⁵

Behind this immense shrinking of electricity consumption has been – sometimes quite staggering – efficiency gains in everyday appliances and equipment. An average present-day refrigerator, for instance, consumes less than half of the electricity its equivalent did in 1980, while for computers, average electricity consumption is down by around four-fifths over the same time frame.¹⁰⁶

Driving these efficiency gains are a number of explanatory factors. Perhaps the principal reason is that where possible consumers prefer to pay lower energy bills, thus making efficiency a selling point. Regulations about minimum efficiency standards have been applied to a whole range of goods – which have no doubt redoubled manufacturers’ resolve to increase how frugally their products consume power.¹⁰⁷

But fiscal policy, too, has had an impact. For many years, UK businesses could benefit from ‘Enhanced Capital Allowances’ on goods deemed to be either particularly efficient in terms of the energy or water they used – for instance LED light bulbs, or low-flush toilets.¹⁰⁸ Qualifying products had to be listed on the Energy Technology List, which generally included technologies which fell within the upper quartile of efficiency for that technology category in the UK market,¹⁰⁹ or the Water Technology Product List, for which certain requirements per technology class had to be met to show where water was being saved.¹¹⁰

The allowances meant that businesses could deduct the full cost of a qualifying investment from their taxable income for the period in which the investment was made, helping to improve cash flow and generally make the prospect of investing in efficient goods more attractive.¹¹¹ In doing so,

one could reasonably argue that demand was induced for innovation in the development and creation of efficient technologies – a boon for entrepreneurs in the sector.

Yet, Enhanced Capital Allowances were scrapped in April 2020.¹¹² Upon bringing in the changes, HMRC remarked that they were not expected to have any environmental impact – because firms could still use other reliefs, such as the Annual Investment Allowance which is set at £1 million.¹¹³ However, medium-sized manufacturers who exceed the limit will see a reduced incentive to invest in energy efficiency.

POLICY

The government should retain close scrutiny of the decision to scrap the Enhanced Capital Allowances to monitor for any indication that their ending has led to businesses being less willing to invest in energy efficient measures. More broadly, the government could look at expanding the Annual Investment Allowance to an unlimited one – akin to full expensing, as recommended by The Entrepreneurs Network previously – to ensure that as much business investment into environmental goods and equipment is being made as possible.¹¹⁴

Further, thought could be given to broadening out the qualifying lists – which are still issued by the government to help steer businesses’ decision making. The requirement for energy saving technologies to be in the ‘upper quartile’ as aforementioned certainly ensures only the most efficient technologies are listed – but this may be overly prohibitive. An expansion, perhaps to the upper third, for example, might cast the net that bit wider, possibly persuading more businesses to consider investing in what are still broadly energy efficient technologies. Moreover, the government should maintain the list of qualifying technologies, publicise them to businesses, and ensure that it is adequately responsive to any potential changes in the market which occur in the next few years.

Energy efficiency is also promoted through the government’s Energy Performance Certificate (EPC) regulations.¹¹⁵ EPCs are ratings of buildings’ energy efficiency, graded on a scale of A (most efficient) to G (least efficient), and are a legal requirement whenever a property is built, sold or rented.¹¹⁶ No building needs to meet a minimum standard per se, but there are regulations around minimum grades for

¹⁰⁴ BEIS (2020). *Historical electricity data: 1920 to 2019*.

¹⁰⁵ *Ibid.*

¹⁰⁶ BEIS (2019). *Energy Consumption in the UK (ECUK); Final Energy Consumption Tables*.

¹⁰⁷ European Commission (2020). *Energy efficiency directive*.

¹⁰⁸ HMRC (2018). *Capital allowances: Ending enhanced allowances for energy and water efficient plant and machinery*.

¹⁰⁹ BEIS (2020). *The Energy Technology List (ETL): A guide to saving energy and costs through the purchase of high performance energy efficient equipment*.

¹¹⁰ DEFRA (2019). *Water efficient enhanced capital allowances*.

¹¹¹ *Ibid.*

¹¹² *Ibid.*

¹¹³ *Ibid.*

¹¹⁴ The Entrepreneurs Network (2017). *A boost for British businesses: Policies for a new government*.

¹¹⁵ Gov.uk (2020). *Buying or selling your home: Energy Performance Certificates*.

¹¹⁶ House of Commons Library (2018). *Energy efficiency and the Clean Growth Strategy*.

“According to the Committee on Climate Change, electricity demand could well double to 600 TWh by 2050, as individuals swap fossil fuelled cars for electric vehicles and replace gas boilers for electric heat pumps.”

rented properties, as well as renters having certain rights to request landlords make improvements which they cannot unreasonably refuse to carry out.¹¹⁷

In theory, EPCs are a useful piece of information for consumers in the housing market to take into consideration when deciding on where to move. As it is cheaper to heat an energy efficient building, a high EPC grade makes a property more attractive relative to a similar property with a lower EPC, and therefore a market is stimulated for energy efficiency improvements to be undertaken. This in turn represents an opportunity for entrepreneurs designing or fitting energy efficiency upgrades, from insulation to heating technologies.

Yet, EPCs are not without criticism. Research suggests that perhaps up to 62% of EPCs contain errors.¹¹⁸ Beyond this, more fundamental faults can be observed. One is because an EPC is not strictly a measure of energy efficiency, it is a measure of how much it costs to heat a property. Therefore, it can bias towards heating systems which are cheaper to run – but which might also be worse for the planet, such as those which use natural gas. In doing so, relatively more expensive, but environmentally more sustainable, systems are put at a disadvantage – such as electric heat pumps.¹¹⁹ Indeed, stories abound about how homeowners can sink considerable sums of money into climate friendly heating systems, only to find their property’s EPC rating the same as it was before.¹²⁰

POLICY

The government should hold a consultation on how EPC ratings can be reformed to more accurately reflect the true energy performance of a building. Within the scope of the consultation should be a desire to iron out any quirks which currently bias for or against different heating technologies, and how to ensure that EPCs more accurately reflect the true energy performance of a building. It may also want to consider whether it is appropriate to begin including hitherto excluded property types in the EPC regulations – such as holiday homes which are occupied for only part of the year.

More accurate measurements of buildings’ energy efficiency could better inform property owners who might then be incentivised (or in some circumstances obliged) to invest in energy efficiency upgrades – stimulating a market for environmental entrepreneurs to develop more advanced technologies to help them do so.

Despite the sizeable reduction in electricity consumption seen since 2005, in all likelihood this trend will be reversed in the years and decades to come. This is because one of the best ways to decarbonise the economy is to electrify the parts of it which are currently powered by fossil fuels. This includes vehicles, heating, and even certain industrial processes. According to the Committee on Climate Change, electricity demand could well double to 600 TWh by 2050,¹²¹ as individuals swap fossil fuelled cars for electric vehicles and replace gas boilers for electric heat pumps.¹²²

Therefore, while the share of electricity produced by renewables will need to increase, so too will the gross amount. Ensuring this can happen means ensuring that renewables – of all scale, large and small – have a clear route to being installed and connected to the grid.

Unfortunately, current rules do not always permit this. While the National Policy Planning Framework (NPPF) states that: “The planning system should support the transition to a low carbon future”, it also includes language and additional formal barriers which makes it challenging for onshore wind to receive planning permission.¹²³ Campaigners for smaller scale, community energy schemes have noted that the net result of this is to make it either downright impossible to build onshore wind turbines (one of the cheapest ways to produce electricity in the UK), or in the event that permission is granted, it is more expensive and takes longer to receive.¹²⁴

Indeed, a paper published in 2019 showed that between 1991 and 2017, over half of all onshore wind applications were rejected or abandoned – no doubt partly because of the onerous planning rules which stack the deck against onshore wind.¹²⁵

POLICY

The new government has demonstrated a considerably greater appetite for onshore wind than its predecessors – announcing in March that onshore wind would be able to bid for government support schemes for the development of low-carbon power.¹²⁶ Polling shows that a qualified majority (71%) of the public support onshore wind, too, and that this support actually rises to nearly three-quarters of Conservative voters.¹²⁷

117 Ibid.

118 Adam Hardy and David Glew (2019). *An analysis of errors in the Energy Performance Certificate database*.

119 Jan Rosenow (2019). *Energy performance certificates hold back heat decarbonisation*.

120 Ibid.

121 Committee on Climate Change (2019). *Net Zero Technical report*.

122 National Grid ESO (2020). *Future Energy Scenarios: July 2020*.

123 MHCLG (2019). *National Planning Policy Framework*.

124 Possible (2020). *Onshore wind campaign: The Story so Far*.

125 Michael Harper et al. (2019). *Onshore wind and the likelihood of planning acceptance: Learning from a Great Britain context*.

126 Molly Lempriere (2020). *Onshore wind 'brought in from the cold' as government to allow Pot One CfD auction*.

127 Conservative Environment Network (2020). *Our polling*.

As such, the government should take the next logical step to equalising how current policy interacts with different power sources, and reform the NPPF to end the discrimination against onshore wind. Short of this, some environmentalists have called for the government to simply make clearer some of the wording in the NPPF, so as to remove uncertainty on the part of developers when they are considering submitting applications.

In doing so, it would make it easier for those entrepreneurs in the renewables sector to install their equipment – boosting the industry as a whole – but in particular it could help the smaller, start-up providers who specialise in bringing renewable energy to more minor sites across the country.

Thinking ahead, the government should also be cognisant of how future trends in low-carbon energy generation – notably the likely need for greater electricity storage – will interact with current policy. During this research, we heard that, at present, planning policy is reasonably friendly towards new battery storage developments. The government should ensure that this stance continues, as doing so will be critical for the greater penetration of renewables into the energy mix.

Another way the government has sought to increase the amount of electricity which is produced via renewable and low-carbon sources is through regulations such as the Renewables Obligation (RO). This policy was introduced in 2002, and places an obligation on energy suppliers to source a proportion of the electricity they supply from renewable sources.¹²⁸ It works by granting generators of renewable electricity Renewables Obligation Certificates (ROCs) for the electricity they produce, which are then transferred to suppliers when they buy the renewable electricity from them.¹²⁹ Alternatively, energy suppliers can choose to ‘buy out’ a portion or all of their obligation – at predetermined rates per unit of electricity.¹³⁰

Thus, the RO implicitly subsidises renewable generation by mandating suppliers to procure more renewable electricity than they might otherwise have chosen to do so. This creates a market for renewable generators, and helps to bring down carbon intensity of the grid.

Or so one would hope. Certainly, some methods of generation covered by the RO are bona fide renewable technologies – such as wind and solar power.¹³¹ These

technologies produce no air pollutants or greenhouse gases when generating electricity. But the environmental credentials of some other methods which can claim ROCs are more dubious – most notably large scale woody biomass burning.

In recent years, woody biomass burning for energy has come under increasing scrutiny.¹³² Some analysis now indicates that far from being a carbon negative method of electricity generation, it can actually increase greenhouse gas emissions.¹³³ Woody biomass burning can also have devastating consequences for animals living in the habitats from which the wood is sourced – with large swathes of forests in the south east of the US cleared indiscriminately to be made into wood pellets.¹³⁴ Finally, biomass burning – as with many types of combustion – has a deleterious effect on air quality for people in the nearby vicinity.¹³⁵

POLICY

In light of the increasing evidence of the negative impact on the climate from large scale biomass burning, the government should set out a timeline for removing it from the RO. More generally, the government may wish to even conduct a comprehensive review of which technologies should be able to benefit from the RO, and to what extent they can do so.¹³⁶

This could allow the implicit subsidy regime to look more favourably upon later generation renewable energy sources, which one could more reasonably argue have a legitimate case for subsidy, as opposed to more mature technologies which have proven themselves able to compete with established methods of generation.

Limiting the amount of greenhouse gases which are emitted in the UK is one thing, but it will count for little if other nations continue to pump out vast amounts of emissions. Addressing climate change will require action both at home and abroad – and the latter is still something the government can influence in various ways.

UK Export Finance (UKEF) is a government body run out of the Department for International Trade with a mission to “ensure that no viable UK export fails for lack of finance or insurance, while operating at no net cost to the taxpayer”.¹³⁷

UKEF provides financial and technical support – loans and guarantees, plus expertise – across all sorts of business sectors.¹³⁸ In 2019/20, UKEF provided 135 applicants with finance and insurance, with 77% of those being small and medium-sized enterprises.¹³⁹

Some recent attention in the media has focused on UKEF’s funding of projects involving fossil fuels.¹⁴⁰ This follows the publication of a damning report from the Environmental Audit Committee in 2019, which found that £2.6 billion of support was given to fossil fuel projects between 2013/14 and 2017/18.¹⁴¹ According to the investigative outlet Unearthed, UKEF is on record as saying that it is considering funding even more fossil fuel projects which would emit at least 20.6 MtCO₂e.¹⁴²

Similarly, some have pointed out how the Department for International Development (DfID) uses UK aid money to support fossil fuel projects. In 2019, the Guardian reported how between 2010 and 2017, nearly £680 million of Official Development Assistance (ODA) had been spent on such projects.¹⁴³

Clearly, the funding of fossil fuel projects with taxpayer money is inconsistent with the government’s commitment to address climate change at a global scale. But it also represents a huge opportunity cost for investment in the UK’s own cleantech sector, which is developing innovative solutions which will help address global warming and so many other environmental problems. Some ODA and UKEF money already goes towards renewables, although in 2017/18 this amounted to only slightly more than a quarter of all the UKEF support which went towards the energy sector as a whole.¹⁴⁴

POLICY

As more countries begin to adopt stricter climate and air quality regulations, the chances of fossil fuel projects defaulting on their loans and guarantees from UKEF only grows. This is heightened by the fact that renewables are steadily becoming more viable, thus eroding fossil fuels’ historical competitive advantages, and in turn increasing the likelihood that they will eventually end up as stranded assets.

To insulate the government against losing taxpayer money on fossil fuel projects defaulting, it should instruct UKEF to cease funding them. Indeed, the Prime Minister, Boris Johnson, has already indicated his desire for this.¹⁴⁵ Similar instructions should be given to the Foreign, Commonwealth

and Development Office with regards to ODA spending. Cementing the proposal in law would help minimise the UK’s contribution to global warming outside its own shores, while also conceivably expanding the amount of funding open for British entrepreneurs who are developing cleantech for use in overseas projects.

Before COVID-19 struck, the UK was due to co-host the 26th UN Climate Change Conference – COP26 – in Glasgow in November, 2020. Owing to the pandemic, COP26 will now take place in November, 2021.¹⁴⁶ The conference serves as a vital opportunity for nations to come together to discuss action on climate change, and how, ultimately, they can work to deal with the causes and consequences of global warming. COP26 is also due to be a particularly important conference, because it is the first moment where countries have to outline more ambitious goals for mitigating their contribution to climate change, under the Paris Agreement.

Constructively helping to deliver on the hard politics of bolstering climate action should be the government’s first priority with COP26. Ensuring that Paris Agreement signatories are being as aspirational as is practicably possible when it comes to decarbonisation is perhaps the most significant thing that can be accomplished at the conference.

Even so, the government should not limit itself to the purely political side of the equation in terms of hosting the conference. COP26 will command the attention of businesses, civil society organisations, and even interested members of the general public. COP26 represents a chance to showcase the practical side of climate action – in terms of the innovations which will ultimately facilitate decarbonisation, and other environmental objectives which individuals, businesses, and other governments will be pursuing in years and decades to come.

POLICY

The government should also use COP26 as a chance to burnish its own brand of environmentalism – one which recognises the critical importance of entrepreneurs and private sector innovation in delivering on net zero.

Over the course of the next year, Alok Sharma – the COP26 President – should establish a dedicated team within the Department for Business, Energy and Industrial Strategy with a mandate to engage with British entrepreneurs and businesses operating in the sustainability sector, in order to champion them on the global stage.

128 Ofgem (2020). *About the RO*.

129 Ibid.

130 Ibid.

131 BEIS (2019). *The Renewables Obligation for 2020-21: Calculating the level of the Renewables Obligation for 2020/21*.

132 Michael Norton et al. (2019). *Serious mismatches continue between science and policy in forest bioenergy*; EASAC (2020). *Emissions Trading System: Stop Perverse Climate Impact of Biomass by Radically Reforming CO₂ Accounting Rules*.

133 Duncan Brack (2017). *Woody Biomass for Power and Heat: Impacts on the Global Climate*.

134 Cut Carbon Not Forests (2020). *About us*; Southern Environmental Law Center (2020). *Southeast U.S. Wood Pellet Plants Exporting to Europe*.

135 Air Quality Expert Group (2017). *The Potential Air Quality Impacts from Biomass Combustion*.

136 For example, the government may wish to allow promising but more nascent renewable technologies to claim more ROCs per unit of electricity generated.

137 UKEF (2020). *About us*.

138 Ibid.

139 UKEF (2020). *UK Export Finance Annual Report and Accounts 2019-20*.

140 James Clayton (2020). *Carbon emissions: Scale of UK fossil fuel support 'staggering'*.

141 House of Commons Environmental Audit Committee (2019). *UK Export Finance*.

142 Luke Barratt (2020). *Revealed: UK government financing millions of tonnes of emissions overseas*.

143 Jonathan Watts (2019). *£680m of UK foreign aid spent on fossil fuel projects – study*.

144 House of Commons Environmental Audit Committee (2019). *UK Export Finance*.

145 Jillian Ambrose (2020). *Boris Johnson poised to stop UK funding overseas fossil fuel projects*.

146 Gov.uk (2020). *COP26*.

“Transport is the single biggest contributing sector to greenhouse gases in the UK and is a primary source of air pollution.”

Pricing is one of the most widely understood ways to effectively cut greenhouse gas emissions.¹⁴⁷ The UK has a variety of taxes which aim to do this – for instance, the Carbon Price Floor charges £18.08 per tonne of CO₂ emitted by power stations,¹⁴⁸ while Vehicle Excise Duty is also tied to vehicles’ CO₂ emissions.¹⁴⁹

Yet, there are a host of issues with the UK’s system of carbon pricing – if indeed one can call it that. It is highly complex, and, depending on the sector, a tonne of CO₂ is charged at different rates.¹⁵⁰ There are exemptions for emissions from some industries, which distort consumer behaviour at the expense of the climate.

Not only does this incoherent approach limit our ability to tackle global warming, it also disadvantages entrepreneurs in the environmental sector. If polluters had to bear responsibility for their emissions, then a market would be created for firms which offer cleaner solutions, allowing businesses to avoid paying the carbon tax.

POLICY

The government should commit to simplifying and standardising the carbon taxes which exist in the economy today, as well as assessing how to broaden them out to cover other sectors which are not currently subject to them. Doing so would mean that polluters are responsible for the carbon they emit. In certain sectors, uniform carbon prices would level the playing field between different technologies – and make zero-emission choices relatively more attractive, as they would not be liable to pay a carbon tax.

From the perspective of entrepreneurs, they would be sent a huge signal that developing carbon-avoiding technologies promises returns where once there were none – or at least very few. A carbon price would also show exactly where entrepreneurial efforts are most required, as the industries which are most exposed to the price would ipso facto be the ones most willing to purchase such carbon-avoiding technologies.

Transport

Transport is the single biggest contributing sector to greenhouse gases in the UK (28% of the total),¹⁵¹ and is

also a primary source of air pollution.¹⁵² By necessitating the construction of transport infrastructure – such as roads, carparks, and airports – the sector also harms the environment by increasing pressure on habitats which could otherwise be left undisturbed.

Reducing transport’s impact on the environment will require two things to happen: swapping vehicles with fossil fuelled internal combustion engines for those with zero-emission technologies; and promoting modal shift, for instance encouraging walking or cycling instead of driving.

In terms of modal shift, one recent development is that of the part electrification of micro-mobility modes of transport. The humble bicycle is increasingly being equipped with electric motors to assist the rider, while electric scooters, or e-scooters, are also taking off.

In the case of the latter, however, their adoption has historically been suppressed by regulatory barriers. E-scooters are prohibited on public roads and pavements owing to the Highways Act 1835 and the Road Traffic Act 1988.

This is a classic example of out-of-date regulation – nobody in 1835, and few in 1988, could have foreseen the rise of the e-scooter. The continuing prohibition on their use means that the UK is denied the opportunity to call upon a useful tool in the fight against climate change, air pollution, and other nuisances such as congestion and noise.

In its *Future of Transport Regulatory Review*, the Department for Transport (DfT) consulted on whether e-scooters should be permitted to legally use roads and or cycle lanes.¹⁵³ The DfT also set out how it planned to relax regulations to trial their use in four ‘Future Transport Zones’.¹⁵⁴ As it happened, following the outbreak of COVID-19, the DfT decided to offer all local areas the chance to trial rental e-scooters, so people could get around without risking their health on public transport.¹⁵⁵

POLICY

The government should recognise the benefits which e-scooters could have in terms of cleaning up the nation’s air,



particularly in dense cities, where fumes and particulates from fossil fuelled vehicles pose a significant health risk to humans and the natural environment at large. It should learn from the current relaxation of regulations, and liberalise their use and ownership as we emerge from the lockdown and people begin to resume commuting into their workplaces again.

This is not to say e-scooters should have carte blanche – regulations are probably necessary to ensure rentals are not dumped anti-socially, for instance – but rather to say that there should be a presumption in favour of them as an environmentally friendly method of transportation.

A liberalisation of rules would patently help not only entrepreneurs who manufacture and sell e-scooters, but also those involved in developing associated platforms for people to use them on, for example, a rental basis.

Continuing with modal shift, buses are an obvious means to facilitate this. Last year, 4.3 billion journeys were made by bus in England alone.¹⁵⁶ As bus travel splits the carbon emissions associated with each journey over perhaps up to 100 passengers at full capacity, it is a relatively green mode of transport. But buses nonetheless produce a lot of their own pollution, particularly among older models which are yet to be retired from fleets.

While smaller, passenger cars are reasonably transitioning towards pure electric models, powered by batteries, questions remain about whether buses – and indeed other heavy vehicles – will be able to make the same leap over.¹⁵⁷ For one reason, batteries might not necessarily be the best choice for heavy vehicles, because in a vehicle the size of a bus or lorry, the cumulative weight of the batteries necessary to power it would be so vast as to be completely prohibitive.

Some have argued that hydrogen fuel cells offer a solution to this challenge.¹⁵⁸ Hydrogen fuel cells are a tried and tested technology which react hydrogen from a fuel tank with oxygen taken from the air to produce an electric current (with water as its only other by-product). Fuel cells are relatively lighter, and can be refuelled in minutes – as opposed to the hours which it might take to recharge a present-day battery. This allows heavier vehicles to maximise the amount of time they can be on the road for, which is especially important for vehicles such as buses and lorries.

POLICY

The government currently subsidises bus operators to the tune of around £250 million a year through the Bus Service Operators Grant (BSOG).¹⁵⁹ The BSOG pays bus operators a set amount per litre of fuel their buses consume. Strictly speaking, therefore, what the subsidy incentivises is fuel consumption. This model has come in for criticism of late, because it puts newer, more fuel-efficient models at a relative disadvantage.¹⁶⁰ A more appropriate funding approach might be a distance-travelled model, perhaps with a passenger number multiplier, as this is fundamentally what the government is seeking to encourage.

To provide a more equitable funding basis for bus travel, the government should seek to switch the BSOG to a distance-travelled by passengers model. This would provide greater incentives for bus operators to invest in cleaner buses and help decarbonise public transport, while also improving urban air quality.

This greater demand would in turn incentivise entrepreneurial research and development into zero-emission powertrains – such as hydrogen, or even batteries if they can advance enough to cope with the particular demands of heavier vehicles.

147 Joshua Burke, Rebecca Byrnes and Sam Fankhauser (2019). *How to price carbon to reach net-zero emissions in the UK*.

148 House of Commons Library (2018). *Carbon Price Floor (CPF) and the price support mechanism*.

149 House of Commons Library (2017). *Vehicle Excise Duty (VED)*.

150 Energy Systems Catapult (2020). *Innovating to Net Zero*.

151 BEIS (2020). *2018 UK Greenhouse Gas Emissions*.

152 DEFRA (2019). *Clean Air Strategy 2019*.

153 DfT (2020). *Future of Transport Regulatory Review: Call for Evidence*.

154 DfT and BEIS (2020). *New transport tech to be tested in biggest shake-up of laws in a generation*.

155 DfT (2020). *£2 billion package to create new era for cycling and walking*.

156 DfT (2020). *Quarterly Bus Statistics: England, October to December 2019*.

157 Eamonn Ives (2020). *Driving Change How Hydrogen Can Fuel A Transport Revolution*.

158 Ibid.

159 Office for Low Emission Vehicles (2018). *Ultra-Low Emission Bus Scheme*.

160 Eamonn Ives (2020). *Driving Change How Hydrogen Can Fuel A Transport Revolution*.

CASE STUDY JO BAMFORD RYSE HYDROGEN

We all know that cleaning up transport will be critical if we are to meet our climate goals and improve local air quality. In short, this means swapping out petrol- and diesel-powered vehicles for greener alternatives.

Battery technologies seem to be the solution to decarbonising the personal car market – with more and more models released each year. But some have questioned the suitability of batteries for bigger, bulkier vehicles – such as buses, lorries, as well as trains, ships and even aeroplanes.

That's where Ryse Hydrogen comes in. Founded in 2018 by Jo Bamford, Ryse is at the forefront of Britain's green hydrogen industry. Jo explains how the process works: "We take electricity generated by wind turbines throughout the UK and use it to power our electrolyzers, which in turn split water into oxygen and hydrogen molecules. The hydrogen can then be used in all sorts of applications, from transport, to heating, to industry. As it's made from renewable electricity, it is 100% climate friendly, and it improves air quality too."

What makes hydrogen such a good fit for heavier forms of transport? One reason is simple – physics. Despite recent improvements, batteries are still rather bulky things – and while this is fine in a typical family car, in something the size of a bus or articulated lorry, the sheer weight becomes a real obstacle. A hydrogen fuel cell, however, is more manageable in relative terms.

Jo also points out another of hydrogen's key qualities – its

ease of use. "Unlike batteries, which can take hours to fully recharge, vehicles which run on hydrogen can be refuelled just as quickly as you would a normal petrol or diesel model. You pump in the hydrogen, and off you go. This means drivers can be on the road for longer, making deliveries, populating more routes or picking up more passengers."

Ryse will refuel buses based up and down the country, from London, to Birmingham, to Belfast, to Aberdeen. Ryse has also just won planning permission to build an electrolyser in Kent, connected to an offshore wind farm, which could produce enough hydrogen to fuel 800 buses.

Hydrogen is steadily gaining traction in the government, with the Prime Minister, Boris Johnson, one of its most prominent fans. But Jo now wants to see the rhetoric backed up with meaningful action. "At the moment, the way we subsidise buses is rather counterproductive: the funding allocation is biased against cleaner fuels such as hydrogen, and this is slowing the transition from polluting diesel buses to zero-emissions ones which we could provide the fuel for. The government's enthusiasm for green hydrogen is brilliant, and with a couple of small tweaks to the rules, we could speed up our efforts to tackle both urban air pollution and climate change."

Aside from modal shift, the environmental impact of transport can be lessened by running existing vehicles on cleaner fuels, such as biofuels. Simply put, these are fuels which come from biological origins. A classic example would be bioethanol, which comes from crops such as corn and sugar beet, and is blended with regular petrol or diesel.

For decades, the UK has subsidised biofuels in various ways on an understanding that they helped to reduce greenhouse gas emissions. One such policy is the Renewable Transport Fuel Obligation (RTFO), which came into effect in 2008. The RTFO mandates that fuel suppliers which dispense over 450,000 litres (or equivalent) of fuel a year have to ensure a certain proportion comes from renewable sources.¹⁶¹ For 2020, this share was set at 9.75% of total fuel dispensed by volume, rising to 12.4% by 2032.¹⁶²

As of 2019, a sub-target within the RTFO has been in force. This is for a certain portion of fuel supplied to be classified as a 'development fuel' – one which is less well tested or as commercialised as other fuels which would already fall under the RTFO.¹⁶³ An example of a development fuel would be hydrogen produced via electrolysis. For 2020, the share of fuel which needs to be classified as a development fuel is 0.075%, rising to 1.4% by 2032.¹⁶⁴

Biofuels are implicitly subsidised by the government because fuel suppliers which fail to meet the RTFO have to pay the difference between what they have fulfilled and what the annual share is set at. This mechanism thus stimulates demand for certain biofuels, where there might not otherwise be any. For entrepreneurs, therefore, it represents a potentially profitable market to enter.

Biofuels are not without their critics, however. Some debate whether they really do decrease greenhouse gas emissions overall, or state that as they compete with crops for food, they necessitate the expansion of agriculture, impinging on yet more of the natural world.¹⁶⁵

To protect against the latter, the government introduced in 2017 a 'crop cap', which limits how much renewable fuel can originate from crop-based sources. The crop cap began at four percent, and is due to fall to two per cent by 2032.¹⁶⁶

POLICY

Owing to increasing scientific evidence which casts doubt upon the genuine sustainability of some biofuels, the government should consider ruling out any further support under the RTFO for crop-based biofuels after 2032. This would provide players in the sector with long-term policy certainty, and stimulate research and development into cutting edge, later generation renewable fuel sources – such as synthetic or algal biofuels – which can make a better case for the need for subsidies to help their commercial maturation.

Other government policies which relate to fuel could be reformed, too. Red diesel, for instance, refers to diesel fuel which benefits from a tax loophole and sees the Fuel Duty which is levied on it rebated. Instead of the normal rate of 57.95 pence per litre, red diesel pays just 11.14 pence per litre – a saving of over 80%.¹⁶⁷ Over 15% of total diesel consumption is classed as red diesel¹⁶⁸ – though it can only be made use of by a few sectors, such as in agriculture, construction vehicles, small scale machinery (sometimes known as non-road mobile machinery, or NRMM), watercraft and some trains.¹⁶⁹ The cost to the Treasury of the rebate is estimated at around £2.4 billion.¹⁷⁰

Due to red diesel's relative cheapness, fossil fuels are embedded into the economy more so than they would otherwise be – in turn increasing greenhouse gas emissions and air pollution. To be sure, zero-emission alternatives to many of the applications which consume red diesel do exist (JCB are pioneering electric excavators, for example).¹⁷¹ Yet, opportunities for entrepreneurs to develop alternatives is made more difficult by the red diesel subsidy, because farmers, building companies, and so forth will be swayed by artificially cheaper equipment which can benefit from it.

POLICY

At the most recent Budget, the government tightened the red diesel exemption, by limiting which sectors can legally use it to agriculture, fish farming, rail and non-commercial heating.¹⁷² It should now set its sights on abolishing red diesel entirely – allowing the market to adjust to where it should be, and incentivise entrepreneurs to research, develop, and sell zero-emission alternatives to equipment which currently runs on red diesel.

161 House of Commons Library (2019). *Future of the British bioethanol industry*.

162 DfT (2020). *RTFO Guidance Part One Process Guidance*.

163 Ibid.

164 Ibid.

165 DfT (2020). *Renewable Transport Fuel Obligation Guidance Part Two: Carbon Sustainability*.

166 Ibid.

167 Eamonn Ives (2018). *The red diesel loophole is slowing the transition to cleaner alternatives*.

168 HM Treasury (2018). *Red diesel: call for evidence*.

169 HMRC (2019). *Fuels for use in vehicles (Excise Notice 75)*.

170 HM Treasury (2018). *Red diesel: call for evidence*.

171 Jonathan Amos (2020). *JCB electric digger wins top MacRobert engineering prize*.

172 HM Treasury (2020). *Budget 2020*.





The principal way in which personal cars have been decarbonised of late is through switching their petrol- or diesel-powered internal combustion engines for electric batteries. Latest figures show that there were 38,000 cars registered for the first time in 2019 in the UK powered solely by batteries – more than double what they were in 2018 (15,800), and nearly triple what they were in 2017 (13,900).¹⁷³ A further 146,600 hybrids were registered for the first time in the UK in 2019, a tenfold increase compared to a decade earlier.¹⁷⁴

Like all batteries, however, they deteriorate over time. A battery in a typical electric vehicle might lose perhaps around 70-80% of its capacity after ten years' use.¹⁷⁵ But while such batteries will have lost most of their capacity – and become functionally redundant for their intended purpose – they are not entirely useless.

Innovative entrepreneurs and start-ups are now seeking to find ways in which almost spent electric vehicle batteries could be given a second life – such as using them to provide energy storage for both small-scale or utility-scale renewables such as solar panels or wind turbines.¹⁷⁶ Utilising them in ways such as this bolsters the grid, and would help renewables to occupy an ever greater share of Britain's energy supply. It could also make purchasing an electric vehicle more attractive, if an owner believes they can derive some value from the battery even once it has degraded, which would help clean up the transport system as a whole.

During our research, however, we heard how certain regulations are stifling the development of repurposing batteries for secondary uses. Though no doubt designed with

good intentions in mind, rules around handling batteries, and what they can and cannot be used for once removed from a car, make life more challenging than necessary for entrepreneurs in the sector.¹⁷⁷

Indeed, it seems that the rapid rise of batteries being used in cars to provide all or some of their power has taken regulators by surprise, and the rules are in urgent need of reform lest we continue to write off batteries earlier than is strictly necessary.

POLICY

The government should consult on whether regulations pertaining to the end life of batteries are fit for purpose. It should liberalise them if it believes there are ways in which rules can be safely relaxed around handling of batteries and their use.

As electric vehicles become ever more commonplace, the importance of having appropriate regulatory regimes for dealing with aspects such as their batteries will only grow. By amending the regulations now, clarity can be given to entrepreneurs who are seeking to profit from such opportunities, while also increasing circularity within the economy and helping to increase markets for renewables and electric vehicles themselves.

Consumer goods

Everything we consume has a story to tell – where it came from, how it was made, and how it eventually came to end up in our homes, offices or elsewhere. Almost by definition, the production of the things we buy has consequences for the environment. Of course, in order to survive and enjoy a relatively comfortable standard of living, we have to make

some impact on the world around us – taking natural resources and turning them into useful things which others want to buy.

Yet, ever more attention is now being cast onto how we can continue to produce the vast assortment of inexpensive and convenient goods and services we desire in a more sustainable fashion. Moreover, concern for what happens to such goods after they have been made use of has skyrocketed, especially of late (including their associated packaging and so forth).

Few issues in politics – let alone environmental policy in particular – have resonated with the British public more than the problem of plastic waste. From a near standing start, awareness about plastic pollution has climbed steeply in recent years – with opinion polls consistently finding that the overwhelming majority of people are concerned about the impact plastic is having on the wider environment.¹⁷⁸

It is not hard to understand why. Plastic pollution threatens wildlife – through entanglement or ingestion. It despoils habitats. The breakdown of plastics can leach toxic chemicals into watercourses and soils.¹⁷⁹ Plastic pollution has been linked to the spread of diseases as mismanaged waste blocks waterways or provides breeding grounds for certain pathogens.¹⁸⁰

Solving the problem will not be straightforward. The UK already has a suite of policies in place to try to reduce the

amount of plastic waste generated in Britain. Since October 2015 in England, single-use plastic carrier bags have attracted a five pence charge.¹⁸¹ Since June 2018, microbeads have been banned in cosmetic products.¹⁸² At the 2018 Budget, the government announced that any plastic packaging which does not contain at least 30% recycled material by weight will be liable to pay a tax.¹⁸³

What is less well appreciated is what and where the biggest drivers of plastic pollution are. By and large, the UK has a reasonably 'tight' waste stream – meaning that most of what is produced and disposed of will be done so in a reasonably responsible way.¹⁸⁴ This is not to say that plastic waste poses no problems in the UK, but that the levels we experience pale in comparison to other countries.¹⁸⁵

One paper from 2015 found that just four countries – China, Vietnam, Indonesia, and the Philippines – are responsible for half of the world's mismanaged plastic waste.¹⁸⁶ Another paper, from 2017, found that rivers in Asia account for 86% of global riverine input of plastic into the oceans, while those in Europe account for just 0.28%.¹⁸⁷

Other research suggests that the items of plastic which are often most vilified in the media are not the biggest drivers of plastic pollution. While things such as plastic straws have been banned in England, these only make up a tiny fraction of plastic pollution by weight.¹⁸⁸ Bigger items are much more of an issue for wildlife – and one in particular is

173 DfT (2020). *VEH0253: Cars registered for the first time by propulsion and fuel type: Great Britain and United Kingdom*.

174 Ibid.

175 Energy Systems Catapult (2020). *Storage and Flexibility Net Zero Series: Second Life Batteries*.

176 David Chandler (2020). *Grid-scale Solar PV storage can use re-purposed old EV batteries*.

177 Michael Green (2017). *Aspects of Battery Legislation in Recycling and Re-use*.

178 King's College, London Polling Club and Ipsos MORI (2018). *Worried about plastic?*

179 HM Government (2018). *Our Waste, Our Resources: A Strategy for England*.

180 Fiona Harvey (2019). *Mismanaged waste 'kills up to a million people a year globally'*.

181 HMRC (2020). *Plastic packaging tax*.

182 DEFRA (2018). *World leading microbeads ban comes into force*.

183 HM Treasury (2018). *Budget 2018*.

184 Hannah Ritchie and Max Roser (2018). *Plastic Pollution*.

185 Ibid.

186 Jenner Jamback et al. (2015). *Plastic waste inputs from land into the ocean*.

187 Laurent Lebreton et al. (2017). *River plastic emissions to the world's oceans*.

188 DEFRA (2020). *Start of ban on plastic straws, stirrers and cotton buds*; BBC News (2020). *Plastic straw ban in England comes into force*.

discarded fishing nets, which can ensnare all sorts of aquatic creatures.¹⁸⁹

The extent to which entrepreneurs can help mitigate plastic pollution is up for debate. Lots of plastic pollution simply comes down to people thoughtlessly littering – and this is probably an issue best dealt with simply through more stringent enforcement measures.

That said, entrepreneurs can certainly play a role. They can develop plastic alternatives, which directly replace plastics like for like. They can come up with ways to reduce the amount of plastic needed, for instance by packaging goods more intelligently. They can also think about how to engender more circularity in the economy – developing reusable versions of once single-use items, as we have seen with coffee cups.

POLICY

The government has already overseen major interventions in the plastic sector, from applying plastic taxes, to introducing regulations around minimum recycled content, to outright bans on certain uses of plastic. Further innovation could make it even easier for individuals to reduce their plastic consumption. There are government schemes, such as Innovate UK grants, which provide funding for R&D to stimulate this endeavour.¹⁹⁰ This is welcome, and will hopefully result in the creation of new and exciting products which could allow consumers to reduce their plastic consumption.

Next on the government's plastic agenda should be to deepen its understanding of what it can do to tackle plastic pollution where it is at its most significant, such as in the case of fishing industry malpractice or poor waste management systems. Innovate UK, for instance, could fund R&D into new products that enable better monitoring and enforcement.

Establishing grant funding for R&D into tackling plastic pollution should be accompanied by a programme of reform as to how Innovate UK awards grants. We heard during our research how making applications is a bureaucratic and time-consuming process, which not all entrepreneurs can afford to take on. The Entrepreneurs Network and CoadeC have discussed how grant making procedures could be improved in their Startup Manifesto, for instance by introducing a lottery model.¹⁹¹

189 DFID (2019). *Penny Mordaunt doubles support for plastic recycling.*

190 Innovate UK and UKRI (2020). *Developing sustainable plastic packaging: apply for funding.*

191 The Entrepreneurs Network (2019). *The Startup Manifesto.*

“Establishing grant funding for R&D into tackling plastic pollution should be accompanied by a programme of reform as to how Innovate UK awards grants.”



“We need to make the mistakes ourselves because no one has really become a massive, worldwide eco company.”

Pawan Saunya, Zero Waste Club

CASE STUDY PAWAN SAUNYA ZERO WASTE CLUB

Feeling let-down and frustrated by the damage that unsustainable products were causing to our environment, Pawan Saunya and Rishi Gupta went in search of answers. Pawan recounts watching *The Age of Stupid* and nearly crying: “It seemed that unsustainable consumption would eventually lead to mass destruction and suffering for billions of people in 20 or 30 years time.”

On their journey to starting Zero Waste Club, the pair found that while markets were changing, eco-friendly products were perceived as luxury goods. They also found that many products sold under the ‘eco’ label were stretching the definition of sustainability.

This inspired Pawan and Rishi to produce products that were truly sustainable, beautifully designed, ethical, and sold at affordable prices. Zero Waste Club has reinvented everyday essentials to make people’s daily routines more sustainable. “We create zero waste products – this means that the whole product is completely biodegradable or it is infinitely recyclable”.

An integral part of Zero Waste Club’s business model is opening up their supply chain for everyone to see. “We are extreme on transparency. We say how the product was made, by whom, how much these people are paid, and the conditions under which the product was made. We also plant a tree to ensure that the carbon footprint is offset.”

Pawan believes that transparency is key to inspiring other businesses to become more sustainable. As he puts it: “just not having role models was definitely an issue [for Zero Waste Club]. We need to make the mistakes ourselves because no one has really become a massive, worldwide eco company.”

“There is a deep root of great design in everything Zero Waste Club does,” says Pawan. For instance, the Reusable Razor is made of stainless steel, as an alternative and replacement for single-use plastic razors - most of which only last between six to nine shaves, before they are blunt and destined for landfill.

In addition to exporting internationally, Zero Waste Club are planning to expand their operations into the US next year. The company’s barriers to growth have not necessarily been regulatory but rather issues within their supply chain and keeping up with the growing demand from wholesalers for their products.

To help sustainable businesses, Pawan thinks the government could improve how R&D funding works. He notes how Innovate UK grants are often bureaucratic and time-consuming, which makes it unappealing for many entrepreneurs to undertake. He thinks that an effective method to deal with this would be for Innovate UK specialists to visit and talk with innovators within the plastic recycling sector. “This would allow them to get to know their project and act as a capital allocator based on the operations, meeting with the team and not solely basing the application on paper.”



As noted earlier, agricultural expansion threatens the planet in many different ways. Landscapes become denuded of their natural features – woodlands, waterways, or wildflowers – to make way for monoculture crops, or grazing for livestock. Artificial chemicals are dumped often rather indiscriminately onto the land to encourage things to grow, or to inhibit seemingly undesirable pests. As a consequence, the environment as a whole suffers, with populations of native birds, insects, and small mammals put at risk.

While farming has certainly improved in terms of greater yields, the way in which it is fundamentally carried out has not varied all that much over the past centuries. That now could be changing. Developments in agricultural science have led to the rise of concepts such as vertical farming – along with associated ideas, such as hydroponics and so-called precision agriculture. According to Beauhurst, there are 52 UK companies operating under this heading, including Didcot-based Deep Planet which develops software that uses satellite imagery to identify agricultural trends, such as crop stress, in order to reduce negative impact of low crop yield and natural changes.¹⁹²

Vertical farming essentially refers to the process of growing crops – typically vegetables, soft fruits, and salad leaves and herbs – in layers of vertically stacked trays, in controlled conditions indoors. It has a number of advantages over conventional methods, especially for the environment. One of the biggest blessings of vertical farming for nature is the way in which it necessitates far less land to be cultivated – as crops are layered on top of each other, a vertical farmer's acreage is really only limited by how high they can stack them.

Beyond that, vertical farms can tune their conditions for optimal growth – selecting for how much light and nutrition crops receive, while insulating them from any natural threats posed by weather, other plants, and animals. Due to the ability to optimise growing, vertical crops require less time to go from sowing to harvesting, allowing more cycles to be grown throughout the year. All told, one recent paper estimated that a 10-layer indoor vertical farm could boost wheat yields by between 220 and 600 times the global annual average.¹⁹³ Thus, if all of the world's food was grown vertically, it would mean vast tracts of land could be returned to nature. Yet the benefits do not end there.

Owing to the fact that vertical farms are essentially divorced from the world beyond their doors, that means a whole variety of crops can be grown in locations which would otherwise not be able to sustain them. Tropical fruits could be grown in temperate countries, or a whole range of

vegetables might be cultivated deep inside some of the most urbanised and bustling cities. Indeed, if vertical farming did take off, with warehouses of crops being grown close to the people eating them, we might expect food miles (and all the greenhouse gases and air pollution associated with them) to virtually cease to exist as we know it.

Following on from this, because vertical farms are kept in controlled conditions, functionally discrete from the outside environment, there is much less of a need for things such as pesticides – given the absence of any pests to begin with. This in turn ensures that animals – not least insects, such as bees and other pollinator species – are relatively less exposed to harmful chemicals which have caused their numbers to fall in recent decades.¹⁹⁴

In a similar vein, any fertilisers which vertical farms might make use of can also be applied in a much more targeted fashion, with just the right amount to the plants that need it, and ensuring that they do not eventually wash away into the wider environment.

To be sure, vertical farming is not without some flaws. It forgoes one of the most crucial aspects of conventional farming – sunshine – and so energy needs to be produced to provide lighting and heating, and at present that means combusting fossil fuels (although many vertical farming operations source their energy from renewables such as solar panels).¹⁹⁵

Simply put, vertical farming has the potential to radically reshape agriculture – and at a time when demand for food will increase as the global population grows. If humanity is to adequately feed perhaps ten billion people by 2050 without sacrificing ever more of the environment to do so,¹⁹⁶ new approaches such as vertical farming are almost certainly going to need to be developed and commercialised to the point where they are cost competitive with traditional methods.

POLICY

The government should examine how it can help foster the development of vertical farming and associated breakthrough approaches to food production including precision agriculture. It could consider reappropriating part of the money it spends on subsidising farmers, with some of that going towards research and development funding for new technologies. It should also liberalise regulations to the practical development of vertical farming, such as those around planning permissions and where vertical farms can be constructed. Failure to do so risks depriving British entrepreneurs in this space the opportunity to lead in this emergent sector, while also prolonging agriculture's impact on the environment.

¹⁹² Deep Planet (2020). *About us*.

¹⁹³ Senthold Asseng et al. (2020). *Wheat yield potential in controlled-environment vertical farms*; The paper does note that indoor wheat farming will probably remain economically uncompetitive at least in the near future, but nevertheless serves as an illustrative example of the potential for vertical farming to transform agricultural yields.

¹⁹⁴ Douglas Main (2019). *Why insect populations are plummeting – and why it matters*.

¹⁹⁵ The Economist (2019). *New ways to make vertical farming stack up*.

¹⁹⁶ Janet Ranganathan et al. (2018). *How to Sustainably Feed 10 Billion People by 2050, in 21 Charts*.



CASE STUDY ALEX FISHER SATURN BIOPONICS

Feeding our growing global population is a major challenge. It requires the mass scale production of food - but in a way which minimises the issues of soil degradation, habitat destruction, pollution and increased chemicals use if it is to be remotely sustainable. Saturn Bioponics is starting a growing revolution, to change how the world eats. "We offer a solution which delivers sustainable intensification [...] whilst simultaneously increasing productivity by up to four times and reducing production costs," says Alex Fisher, founder of Saturn Bioponics.

Growing fresh produce the traditional way - in the soil of a field, is energy, resource and labour intensive. But agricultural entrepreneurs such as Alex have developed a promising solution - to grow food vertically, in 3D hydroponic towers. The towers increase planting density, meaning that farmers need only one-third of the space they would have required for traditional soil farming for certain crops. The soil quality is also unaffected - Saturn Bioponics do not contaminate or pollute the soil, and use up to 95% less water in crop production, compared to the global average.

Saturn Bioponics were not the first to try hydroponic towers as an alternative to traditional soil farming. However, Alex and his team have created a solution that is commercially viable. This

has led to strong sales in the UK and overseas, with Saturn Bioponics acquiring important partnerships with multinational companies.

Looking to the future, the company is currently developing new technologies for alternative crops and enhanced precision farming. "We are looking to expand and improve our offering across more crop sectors," says Alex. However, the agricultural industry remains largely conservative and is not necessarily ready to embrace innovation. This has been one of the main obstacles that Alex has faced in expanding Saturn Bioponics operations.

Alex thinks that providing funding to support farmers to adopt innovative technology could be a way in which the government could support companies such as Saturn Bioponics that are reducing the environmental impact of food production. "Farmers are often undercapitalised, making high levels of investment very difficult," says Alex. In addition, relaxing the planning regulations (and costs) of constructing greenhouses could encourage more farmers to plant their crops in an environmentally conscious way. "In the UK particularly," Alex notes, "gaining planning permission to build a greenhouse can be tough."

“Entrepreneurs in the sector have developed aerial drones which can scan farmers’ fields to monitor the health of crops from above – far better and more quickly than could be done with the naked eye from the ground.”

Even if in the near future more of our food could come from vertical farms, much of the conventional agriculture which blankets most of the UK will remain. Indeed, it is probably here where most of the low-hanging fruit could be picked in terms of mitigating harmful impacts on the environment caused by farming. Thankfully, entrepreneurs are already devising solutions to do just that.

One particular area of excitement is of the wider application of robotics for farming purposes. So-called agri-tech has the potential to deliver many of the same benefits vertical farming – largely by boosting yields and reducing harmful inputs such as fertilisers and pesticides. Economic benefits abound too, with the industry accounting for an estimated £14.3 billion in value-added in 2016, and supporting 542,000 jobs.¹⁹⁷

Entrepreneurs in the sector have developed aerial drones, for example, which can scan farmers’ fields to monitor the health of crops from above – far better and more quickly than could be done with the naked eye from the ground.¹⁹⁸ Should any threatening diseases be spotted, the farmer can take evasive action before they spread to the rest of the harvest – thus reducing potential wastage.

Other flying robots have been created which can more precisely apply fertilisers and pesticides to crops, instead of drenching entire fields in an indiscriminate fashion.¹⁹⁹ Back on terra firma, robots that can sow crops are being designed to replace heavy tractors and alike, which cause soil compaction – which as we have noted can threaten watercourses and lead to increased greenhouse gas emissions.²⁰⁰

Perhaps unsurprisingly, the drone sector is hugely lucrative. According to Beauhurst, drone companies in the UK raised more funding in 2018 alone than in the previous seven years combined – illustrating the industry’s upward trajectory.²⁰¹ Other research - from PwC - estimated the addressable value of drone powered solutions at over \$127 billion in 2016.²⁰²

POLICY

Agri-tech is going to become a more common fixture in the production of food in the years to come. To ensure that they are adopted as quickly as possible, however, the government must provide the conditions for drones and robots to be developed, tested, and – ultimately – utilised.

At the moment, drones in the UK are regulated in a number of ways. One of the more significant sources of regulation is the Air Navigation Order 2016. Lots of the regulations contained within the Order are perfectly sensible, however one in particular represents a potential obstacle to the proliferation of drones for commercial purposes. Section 94 states that “unaided visual contact” must be maintained between the drone and the operator at all times. This may be appropriate for hobbyists, perhaps using a drone in an urban park, but for a farmer hoping to use a drone to check on their crops it becomes more of an obstacle – despite being less of a necessity, given how fields are almost definitionally going to be in remote open spaces.

The government should seek to reform regulations for drone use – moving away from blanket rules and towards a more flexible framework. Section 94 of the Air Navigation Order 2016 should be closely scrutinised to ensure that the law is able to recognise the rapid developments being made in the drone sector which render the need for direct lines of sight between drone and operator less of a necessity, particularly for agricultural applications. Such a rule change could not only help entrepreneurs in the agri-tech business, but also those who might be pioneering drones for other uses, such as for making deliveries or fulfilling other tasks.



CASE STUDY MAGDA DANILOAIA AND IEVA BALCIUTE AEQUEM

When friends Magda Daniloaia and Ieva Balciute became increasingly frustrated at how difficult it was to conveniently purchase sustainable fashion, they decided to do something about it. Together, the pair established Aequem, the world’s first e-commerce platform to align with the UN Sustainable Development Goals, with an ethos to reduce the impact which the fashion industry is having on the planet. “Our unique proposition is that we aggregate the world’s best (truly) sustainable products,” says Magda, “so everyone can shop for items they need with a significantly reduced impact, if any.”

Recently, a spotlight has been thrown onto the environmental footprint behind the clothes and accessories we all buy. An investigation by the House of Commons Environmental Audit Committee in 2019 found that the appetite for ‘fast fashion’ was accelerating climate change, threatening biodiversity, and serving as a driver of excessive water consumption. It also heard of how synthetic garments contribute towards microplastics pollution – with as many as 700,000 fibres being shed in a single six kilogram domestic wash.

Magda and Ieva’s platform aims to address these concerns. It promotes sustainability in fashion in four different ways. First, they ensure that garments come from organic sources – thus avoiding pesticides, and promoting soil health in the growing of fibres for clothing. Second, they upcycle stock – with many products made from discarded materials or ‘dead stock’, which would otherwise have gone straight to landfill. Third,

they seek out recycled materials – which promotes circularity in the economy and prevents the need for as many ‘new’ products to be made as possible. Fourth, they focus on new environmentally friendly tech in the industry – such as Tencel, a material made from responsibly sourced wood fibres. Aequem also offset the impact of each purchase by planting ten trees.

Aequem officially launched in May 2018 and has already enjoyed its fair share of success – recently winning a ‘Ones to Watch’ award at the Drapers Sustainable Fashion Awards. In the future, Magda and Ieva hope to raise funds to develop new technologies which will help Aequem to improve their brand vetting process and improve the shopping experience for their customers. Aequem is also considering developing its own line of sustainable materials and products.

In terms of the barriers that the pair have faced growing their business, these have included accessing finance, the uncertainty around Brexit and the evolving COVID-19 pandemic situation. Magda believes that levying environmental taxes on fast fashion retailers could be the answer to reducing the environmental footprint of the fashion industry. “They are currently destroying our planet,” says Magda, “we should invest in more conscious consumerism, invest in more sustainable sectors worldwide and have a Brexit deal that does not affect trade with the EU.”

197 Department for Business, Innovation and Skills (2016). *Agri-Tech Industrial Strategy: Evaluation Scoping Study and Baseline*.

198 Eamonn Ives (2017). *How agricultural drones are rising above environmental problems*.

199 PwC (2016). *Clarity from above: PwC global report on the commercial applications of drone technology*.

200 Small Robot Company (2020). *Small is smart*.

201 Beauhurst (2019). *UK’s Top Drone Companies Performance*.

202 PwC (2016). *Clarity from above: PwC global report on the commercial applications of drone technology*.

Vertical farming and drones can boost the productivity of the food system without exacerbating damage to the environment, by adapting how farmers grow certain things. But other technological developments promise to achieve the same ends by changing the very nature of the things which are being grown, or produced.

Genetically modified organisms (GMOs) have been effectively banned from Britain for as long as it was a member of the European Union.²⁰³ The regulations which do so also capture newer developments such as genetic editing, which while delivering similar results as genetic modification, is functionally different.²⁰⁴ Whereas genetic modification generally refers to foreign genetic material being inserted into another genome, genetic editing refers to precise changes – maybe removal, or alteration – of genetic material already within a genome.²⁰⁵ Genetic editing, therefore, is arguably just the natural evolutionary process of selecting for positive genetic traits, sped up for our benefit – and hence why the regulation binding it has come in for so much criticism from the scientific community.²⁰⁶

The main purpose of genetic modification and editing is, fundamentally, to increase yields. In doing so, less land needs to be cultivated in order to grow the same amount of food. This, as we have discussed already with vertical farming and agri-tech, protects the environment by allowing habitats to remain untouched, or by allowing previously cultivated land to be rewilded.

But genetic modification and editing can boast other environmental benefits, as well. For instance, genetically altered crops which require less fertiliser in order to grow without compromising on yields have been developed.²⁰⁷ As fertilisers are associated with the emission of greenhouse gases, air pollution, and other environmental threats such as eutrophication of watercourses, one might conclude that if more crops could be genetically altered to require less fertiliser, the environment would improve accordingly.

Alternatively, others have posited how genetic editing could help fight climate change by increasing the ability of, for instance, trees to absorb carbon from the atmosphere and lock it into their roots, trunks, and branches.²⁰⁸

POLICY

Following the Brexit transition period, the government should liberalise rules which stifle research and development into genetic engineering. The UK boasts some of the world's best universities and research institutes which, coupled with the country's network of life sciences entrepreneurs, could capitalise on the opportunity to experiment with genetically altered plants – all to the benefit of the environment at home and abroad. Liberalising regulations on genetic engineering would also mean that the sector is open for all sorts of players – from big multinationals to innovative start-ups, who might otherwise not be able to negotiate complex regulatory landscapes as adeptly as more established outfits.

Over the past few years, a significant amount of media attention has focused on the role of diet in terms of addressing environmental issues. Campaigns against unsustainably sourced palm oil have been thrust into the spotlight,²⁰⁹ while vegan, vegetarian, or 'flexitarian' diets have risen to prominence.²¹⁰ There is good reason for this. Though precise comparisons are always going to be difficult, meat and dairy have considerable environmental footprints relative to plant-based foodstuffs, and are associated with things such as habitat destruction, species loss, air pollution, and the over-extraction and degradation of freshwater resources.²¹¹

In light of this, one might expect a government wanting to protect the environment to embrace developments such as the rise of meat and dairy substitutes – such as vegan sausages made from Quorn, or plant-based milks made from oats, soya, almonds and so forth. However, the UK is bound by certain regulations which often prevent this.

Following a ruling from the Court of Justice of the European Union in 2017, products can only refer to themselves as 'milk', for example, if they derive from "normal mammary secretion".²¹² The formal justification for the ruling was that customers could be misled, thinking that they are actually buying dairy products. Yet some have noted that a more accurate explanation might be that this decision was the result of lobbying from traditional agriculture groups – seeking to smother the dairy alternatives industry.²¹³ The clamour over how various foodstuffs can be retailed became particularly noisy again in 2019, after the European

203 European Commission (2020). *Genetically Modified Organisms*.

204 Ewen Callaway (2018). *CRISPR plants now subject to tough GM laws in European Union*; Andrew J. Wight (2018). *Strict EU ruling on gene-edited crops squeezes science*.

205 Eric Niiler (2018). *Why Gene Editing Is the Next Food Revolution*.

206 Erik Stokstad (2018). *European court ruling raises hurdles for CRISPR crops*.

207 Ashok Shrawat et al. (2008). *Genetic engineering of improved nitrogen use efficiency in rice by the tissue-specific expression of alanine aminotransferase*.

208 Salk (2020). *What if we could use plants to fight climate change?*

209 Laura Paddison et al. (2014). *From rainforest to your cupboard: the real story of palm oil*.

210 The Guardian (2020). *Almost one in four food products launched in UK in 2019 labelled vegan*.

211 Hannah Ritchie and Max Roser (2020). *Environmental impacts of food production*.

212 Paul McClean (2017). *Sellers of soya milk and tofu butter in EU told to rebrand*.

213 Eamonn Ives (2019). *Free market veganism – or why government shouldn't interfere with our food*.

Parliament's agriculture committee approved a ban on meat alternatives using nomenclature typically used to describe meat products, such as burgers or sausages.²¹⁴

POLICY

By mandating that plant-based alternatives cannot be branded in ways most people are familiar with, authorities implicitly make life more difficult for companies which produce them. People might be forgiven for not finding a 'veggie tube' or 'soya drink' as appealing as sausages or milk, and this could dampen demand for such products. Consequently, the environment misses out on a potential reprieve – as land remains devoted to animal agriculture.

The government should consider dropping the rules against naming words for meat and dairy alternatives – to encourage more people to try vegetarian and vegan versions of products, which have smaller environmental footprints. Such a move would be a blessing for entrepreneurs in the sector who are seeking to tap into the rise of, for instance, plant-based and flexitarian diets.

Useful as it would be for the environment if more of society adopted more plant-based diets, it would be naïvely optimistic to assume a wholesale change in opinion is about to be forthcoming. Many people will still want to eat animal meat, and this represents an environmental challenge which entrepreneurs could play a role in solving.

Helpfully, work is already underway. In recent years, various start-ups have been developing clean meat – sometimes referred to as lab grown meat, or cultured meat, or synthetic meat – and have raised significant amounts of venture capital in the process.²¹⁵ There are lots of different ways of producing clean meat, but each process results in the creation of genuine animal tissue – no different to that of tissue found on once alive creatures that one might buy from a supermarket.

The environmental savings of clean meat are quite staggering. A 2011 study found that in comparison to conventionally produced European meat, clean meat had the potential to reduce energy use by between 7-45%, greenhouse gas emissions by between 78-96%, land use by 99%, and water use by between 82-96%.²¹⁶ Clean meat would obviate all of the air pollution associated with animal agriculture, too.

Therefore, like with vegetarian and vegan alternatives, one might hope for the sake of the environment that clean meat could benefit from a liberalised regulatory regime, which best

allows entrepreneurs and companies to develop and sell clean meat. Unfortunately, that is not necessarily the case.

When the UK was in the EU, it was bound by the Novel Food Regulation (NFR) – which applies certain rules to foodstuffs which did not have a history of consumption in the EU before 1997.²¹⁷ The NFR also asserts that novel foods must be: "[N]o less nutritious than the foodstuffs they seek to replace". Furthermore, since 2018, the approval period stands at up to two years for a novel foodstuff to be authorised for legal sale within the EU. Examples of foodstuffs which have had to comply with the NFR include chai seeds, certain mineral salts, and turmeric extracts.²¹⁸

POLICY

The government should amend the NFR once the Brexit transition period has ended so as to allow maximum freedom to entrepreneurs and companies working to develop alternative foodstuffs such as clean meat – as well as clean dairy and other animal product substitutes. Doing so could allow for significant environmental damage to be forgone, without relying on consumers to consciously and deliberately adopt plant-based diets commonly understood.

Moreover, the government should examine how it can use its own power to stimulate demand for more environmentally sustainable foodstuffs. A sizeable amount of taxpayer money is spent on food and drink each year – in schools, hospitals, prisons and other public sector institutions – and so greening this part of the public budget could be a powerful way to reward innovators who are developing environmentally friendly alternatives. Already, the UK has Government Buying Standards, which place certain requirements on central government procurers – such as not serving fish listed as endangered, or buying non-sustainable palm oil.²¹⁹ These standards could be reviewed and strengthened after consultation, but potential ideas might include having a set portion of budgets devoted to clean meat and dairy and other animal produce substitutes, or instigating initiatives such as 'meat free Mondays', as other governments around the world already have.²²⁰

214 Daniel Boffey (2019). *'Veggie discs' to replace veggie burgers in EU crackdown on food labels*.

215 Antony Froggatt and Laura Wellesley (2019). *Meat Analogues: Considerations for the EU*; Freya Pratty (2020) *Cell-based meat startup secures \$55m*.

216 Hanna L. Tuomisto and M. Joost Teixeira de Mattos (2011). *Environmental Impacts of Cultured Meat Production*.

217 European Commission (2020). *Novel food*.

218 European Commission (2020). *Summary of applications submitted within the meaning of Article 10(1) of Regulation (EU) 2015/2283*.

219 DEFRA (2015). *GBS for food and catering services*.

220 Meat Free Monday (2019). *New York schools join Meatless Monday*.

“We believe the recommendations will point the country in a better direction – and which would help entrepreneurs in particular to do their bit in greening the economy.”

CONCLUSION

Despite COVID-19 understandably occupying the headlines this year, the environment has remained a salient issue among the general public and business community.²²¹

Efforts to cut greenhouse gas emissions, improve air quality, or reduce the impact that our personal consumption has on the planet have not been knocked back. In fact, as governments around the world seek to emerge from the economic impact of the pandemic, acceptance of the need to rebuild the economy on a more sustainable footing has only crystallised further.²²²

These sentiments have been backed up by our polling. We found that many businesses believe the shift to a more sustainable economy presents opportunities for them to take. It also showed how there is increasing pressure from consumers and employees for businesses to go greener – and that there is concern for a diverse range of issues to be addressed.

In this report, we cast a light on how entrepreneurs can help alleviate some of those issues. We know just how innovative individuals can be when incentives align, and the government should be unrelenting in trying to harness that ingenuity. Indeed, it is only through the development of newer and better technologies that society will genuinely be able to overcome such problems.

This is not to say that the government should play no role at all. It needs to provide the necessary conditions to help innovation come to the fore – whether by setting new regulations, reforming others, investing in nascent technologies or by creating a climate which is conducive to entrepreneurialism and investment.

Concluding the report, we identify a handful of areas where such policy reform could be most helpful. We have by no means provided an exhaustive list which will remedy each and every current threat to the environment. But we believe the recommendations will point the country in a better direction – and which would help entrepreneurs in particular to do their bit in greening the economy. Taken together, their adoption should continue the decades’ long endeavour to incrementally reduce humanity’s impact on the world around us.

The prizes which are on offer of getting policy right are twofold. First, opportunities are created for entrepreneurs to thrive – to get a headstart in pioneering products and services in the markets of tomorrow. With this should come jobs, exports, and growth – appreciated outcomes at any time, but especially now given the precarious economic situation.

Second, the environment is granted a vital reprieve. Cleaner air, a more stable climate, and less despoiled natural ecosystems. More than anything else, perhaps these are the most valuable outcomes which a shift in policy could deliver. It is now up to the government to put those frameworks in place – and allow entrepreneurs to get on with doing what they do best.

221 Ipsos MORI (2020). *Two thirds of Britons believe Climate Change as serious as Coronavirus and majority want Climate prioritised in economic recovery.*

222 Alok Sharma (2020). *Let's build back better.*

ADVISORY BOARD

To help steer the research for this project we convened an advisory board of individuals involved in the sustainability sector. Any errors, recommendations, and matters of opinion in the report are the author’s alone and do not necessarily reflect the views of the advisers.



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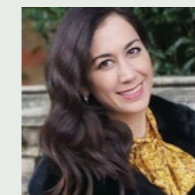
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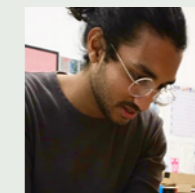
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@TENTHINKTANK

The Entrepreneurs Network is a think tank for Britain's most ambitious entrepreneurs. We support entrepreneurs by:

- Producing cutting-edge research into the best policies to support entrepreneurship;
- Campaigning for policy changes that will help entrepreneurship flourish;
- Hosting regular events and webinars to bridge the gap between entrepreneurs and policymakers;
- Updating entrepreneurs on how policy changes will impact their business;
- Making the case in the media for entrepreneurs' contributions to society.

We are the Secretariat of the APPG for Entrepreneurship, which was set up to encourage, support and promote entrepreneurship and to engage with entrepreneurs; and to ensure that Parliament is kept up to date on what is needed to create and sustain the most favourable conditions for entrepreneurship.

EnterpriseTrust

@E_TRUSTCHARITY

Enterprise Trust was launched in 2011 by Richard Harpin, the entrepreneur behind the UK's leading home repairs and improvements business HomeServe, now a FTSE 250 company valued at more than £4bn. The charity aims to create an impact and leave a legacy by helping individuals from all backgrounds to realise their potential as independent wealth generators. In 2020 the charity launched a research arm to extend its reach and provide important insight, new thinking and evidence-based problem-solving around the key issues affecting the UK's small business community.

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Beauhurst provides research and insight on the UK's high-growth companies. Our data platform allows professionals to discover and track Britain's most ambitious businesses in unrivalled detail. For more information, visit beauhurst.com.

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