
UK CASH DISTRIBUTION AND THE CARBON FOOTPRINT

Public Version

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Commissioned by LINK



This study has been commissioned by LINK, recognising the importance of the UK cash distribution industry contributing to the country's work to achieve an overall reduction in the UK's carbon footprint.

All of the views expressed in this work are those of the authors and are not necessarily those of LINK.

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“We breached the global threshold of 400 parts per million in 2015. And just four years later, we crossed 410 ppm. Such a rate of increase has never been seen in the history of our records. The lockdown-related fall in emissions is just a tiny blip on the long-term graph. We need a sustained flattening of the curve”,

Petteri Taalas
Secretary-General of the World Meteorological Organization (WMO)
upon issue of the WMO’s 2020 Greenhouse Gas Emission report⁰

⁰ WMO Greenhouse Gas Bulletin (GHG Bulletin) - No. 16: *The State of Greenhouse Gases in the Atmosphere Based on Global Observations through 2019*. November 2020, available at:
https://library.wmo.int/index.php?lvl=notice_display&id=21795#X7u58c22InJ%C2%A0

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1. EXECUTIVE SUMMARY

Climate change is, quite literally, a hot topic.

There is general agreement that reducing the carbon footprint is required to keep the overall temperature of the planet at acceptable levels.

The UK government has set a target that by 2050, at the latest, the country achieves a net Zero Carbon footprint.

Climate change is frequently called a “collective action problem,” meaning that victory requires participation from everyone. Every industry must play its part in reaching the net zero target.

The UK cash distribution industry can be no exception.

LINK has commissioned Cash and Card Consultants to review the current status of the UK cash distribution industry’s carbon footprint and make recommendations on the steps required to reach Zero Carbon.

It is worth pointing out from the outset that common payment methods, including cash and card, have very low carbon footprints. However, that is no reason for these industries not to do their bit and this report sets out the priorities for cash. It is also worth emphasizing that both cash and digital payment methods have the potential to promote high levels of general sustainability and there is an important role for both. For example, cash spent and recycled in local communities has virtually no carbon footprint once withdrawn from an ATM. It can be one of the greenest of all payment methods. Digital, with the exception of highly environmentally destructive mechanisms such as Bitcoin, support many of the ways of living and working needed for a sustainable economy including much of the online world. It is worth emphasizing this role of payment choice in sustainability.

The central issues for UK cash distribution are zeroing the carbon footprint of the ATMs themselves and the transport of cash. The use of renewable electricity is key to achieving those reductions alongside the localisation of cash distribution, including local recycling and cashback which would help to neutralise the carbon footprint of cash, reduce the costs of operating the distribution network and add to resiliency.

Zeroing the carbon footprint associated with cash centres, branches, offices and ATM premises are other important, and less challenging, issues that need to be addressed.

The UK power industry is moving towards achieving Zero Carbon emissions for electricity generation and distribution. The government has underlined the need for further progress by targeting that 100% of the UK’s electricity requirements are met by wind power by 2030. This is a tough challenge, though, and companies are encouraged to create some or all of their own renewable energy. A number of companies are earnestly engaged in this activity.

Another key to Zero Carbon footprint for power, is reducing consumption. The cash distribution industry must continue with efforts already started to reduce the electricity used by ATMs and the mileage driven to fill and service the ATMs. These moves have both positive environmental and reduced cost potential. This study contains recommendations as to how reduced consumption can be achieved.

One obvious and speedy way of reducing power consumption is by avoiding unnecessary duplication of ATM services. By establishing a standard for average queuing times, 5 minutes, for example. ATM operators could then be asked to survey every site where they have more than one.

Where removal of one or more ATMs would leave average queuing times at 5 minutes or less, the operator could be encouraged to remove machines which were surplus to meeting the required standard. Every thousand ATMs removed in this way should reduce the power consumption of the ATM estate by around 2% from 2020 levels.

Progress to introduce electric-only vehicles in the cash distribution industry has been slow. Suitable vehicles are now being manufactured to allow the industry to go all-electric and are beginning to be seen in parcel delivery. A target of reaching this position by 2026 would be challenging but achievable.

Localisation measures could also make a significant impact and these include:

- Ensuring every community has local facilities for withdrawal and deposit of cash, both notes and coins;
- Supporting and widening cashback and similar cash-in-shop initiatives;
- The promotion of cash deposits in shops, both over the counter, and for larger volumes through cash deposit ATMs and terminals;
- Machines used for depositing cash should be recycling-enabled wherever possible;
- Implementing measures to reduce the use of coins; and
- Increase local and online maintenance of equipment, including ATMs.

Where a suitable local post office is present in a community, it provides an important option for both personal and business customers for community cash services and 50% of small businesses used them in 2020. The cash distribution industry, through the use of Zero Carbon electricity and implementation of measures to reduce overall power usage, can demonstrate to other industries what can be achieved when a coordinated effort is made by all industry stakeholders. The cash distribution industry can be Zero Carbon footprint by 2030.

Carbon footprint reduction measures have already been taken by some participants in the UK cash distribution industry. However, it is not a consistent picture, which it needs to be if the full potential to reduce the carbon footprint of cash distribution is to be realised.

The strong recommendation is for a united approach by ATM operators with targets set and agreed for all participants. This will provide extra impetus and will particularly aid the monitoring and improvement of supplier footprint.

The COVID-19 pandemic has caused some reduction of carbon footprint around the world. As in other industries, it is believed that the pandemic reduced the carbon footprint of the UK ATM industry, due to temporary closure of some ATMs and fewer transactions performed at others. It is vital that any carbon savings made in 2020 do not lead to relaxation in efforts to reduce carbon footprint permanently.

2. INTRODUCTION

2.1 WHY DOES THE CARBON FOOTPRINT OF THE CASH DISTRIBUTION INDUSTRY MATTER?

Climate change creates financial risks as well as physical threats. These risks are generated through two primary channels: the physical effects of climate change itself, plus the impact of the changes required to achieve the transition to net Zero Carbon.

The cash industry as a whole makes widespread use of carbon emitting resources and other materials that have an impact on the environment. From paper and polymer, through metallic materials, to electricity and gas, plus transportation fuel, and plastic and water.

UK general targets have been set that should limit the increase in climate temperature to agreed levels, but only if all parties join in, and only if the easier things are done quickly, to allow time for more challenging elements to make their changes. Every moment that somebody or something causes Greenhouse Gas (GHG) emissions, adds to climate change. It has been calculated that we must limit the global temperature rise to 1.5 degrees Centigrade and reach net Zero Carbon by 2050. To have a chance of meeting those targets, we must reduce global emissions by just under 8% per year from now until 2030.

Positive action is required now, not as a last-minute action before a deadline.

2.2 WHAT WE KNOW SO FAR

There has been little previous investigation into the cash distribution industry and its role in climate change.

The two studies noted below looked at certain aspects of cash distribution, notably cash payments and banknote carbon footprint. Their findings raised significant concerns about the damage the industry is causing.

2.2.1 DE NEDERLANDSCHE BANK (DNB) REPORT

An October 2018 report by DNB¹ looked at the environmental impact of the cash payment chain (notes and coins) in the Netherlands.

¹ Life cycle assessment of cash payments, De Nederlandsche Bank, October 2018, available at: https://www.dnb.nl/binaries/Working%20paper%20No.%20610_tcm46-379441.pdf

The DNB report analysed data relating to the 2015 cash cycle, and identified three key elements:

- Fossil fuel consumption in distributing cash between ATMs, retailers and cash distribution centres
- Copper ore extraction for coin production
- Power consumption of ATMs

Their calculations for Netherlands outputs in 2015 showed that the operation phase (principally energy use of ATMs, and transport of banknotes and coins) (64%) and coin production phase (32%) had the largest impact on the environment. The operation phase also had the largest, by far, impact on climate change (88%).

2.2.2 THE BANK OF ENGLAND'S BANKNOTE CARBON FOOTPRINT ASSESSMENT REPORT

Following the introduction of polymer notes in 2016, the Bank of England (the Bank) commissioned a report² looking at the carbon footprint of paper and polymer notes. The report was published in July 2017. The study was certified by the Carbon Trust to ensure conformity to the requirements of PAS 2050:2011 (BSI, 2011) and the Carbon Trust Standard for Carbon.

The report analysed the life from “cradle-to-grave” of £5 and £10 paper and polymer notes, from raw material production (i.e. cotton, polypropylene), through manufacturing of paper and polymer substrates; printing, distribution of bank notes into circulation, use of ATMs, note sorting at regional cash centres, to the final disposal of unfit bank notes. The study concentrates on the banknotes’ GHG emissions, but also includes some useful references to GHG emissions by other key elements of the cash distribution cycle.

The study concluded that over the full life cycle, polymer £5 and £10 bank notes had smaller carbon footprints (fewer GHG emissions) than paper bank notes of the same denomination. That said, the analysis showed that in terms of manufacturing and disposal, a polymer bank note results in more GHG emissions than manufacturing a paper bank note. However, when assessing the different notes on the basis of equivalent functionality i.e. length of life, polymer bank notes outperform paper bank notes. Sensitivity analysis showed that polymer £10 notes need last only 6% longer than paper notes to have lower overall GHG emissions. For £5 bank notes no additional lifetime is required.

Significant for analysis of the cash cycle as a whole, it was noted that the carbon footprints of both paper and polymer bank notes were dominated by impacts associated with circulation of the notes.

² Carbon footprint assessment: paper vs polymer £5 and £10 bank notes, Thinkstep on behalf of Bank of England, July 2017, available at: <https://www.bankofengland.co.uk/-/media/boe/files/banknotes/polymer/carbon-footprint-assessment.pdf?la=en&hash=A2077D4BEF302DF8F8488503DEA041876627ECBD>

Transportation of cash throughout its life emits significant amounts of GHG, but it was the electricity generation required to operate ATMs that emitted the most GHG, with the report's analysis pointing at over 60% of a banknote's carbon footprint coming from the power used in ATM operation alone. This huge impact, which is the same for all substrates, had the effect of reducing the relative differences that arise from the other life cycle stages due to variations in impacts among the substrates. ATM power usage is discussed in greater detail in section 10 of this study.

The findings of the Bank's report demonstrate that as the general carbon footprint of electricity in the UK reduces levels, thus reducing the carbon footprint of ATMs, the GHG emissions of banknote production and disposal will become more significant in overall footprint.

With ATMs before the current pandemic being the channel for the distribution of around 90% of the cash used by the UK public, the challenge for the cash distribution industry is to reduce the carbon footprint of the machines as a matter of urgency.

2.3 THE LINK BETWEEN CLIMATE AND CARBON

Carbon emissions are in most experts' views, the primary cause of the accelerated climate change that is now impacting the world.

The climate on Earth has been changing since it formed 4.5 billion years ago. Until recent decades, natural factors, such as volcano eruptions, have been the prime cause of these changes. Since the Industrial Revolution in the 1800s, however, the global temperature has increased at a much faster rate, aided and abetted by human activity.

Climate change, otherwise known as global warming, is generally acknowledged as the most pressing environmental challenge of our time. The cross-country, indeed cross-world, nature of the threat, and of the required response, is undeniable.

2.4 CLIMATE CHANGE AND CARBON FOOTPRINT

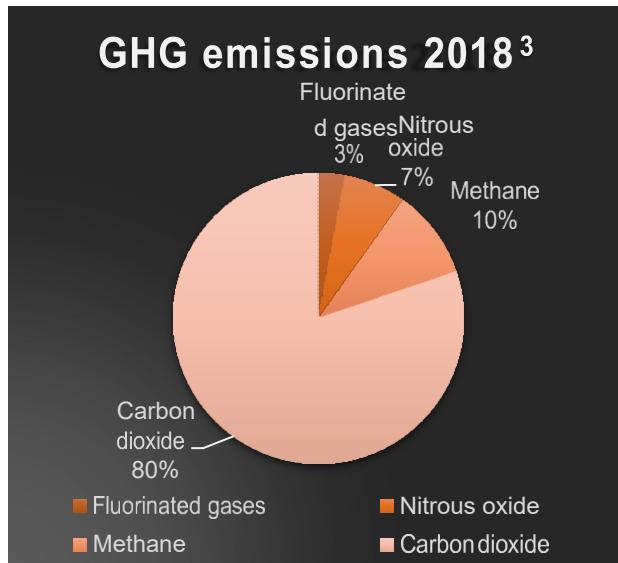
The gases we now term 'greenhouse gases' (GHG) act as a warming blanket around the Earth, trapping heat, known as the 'greenhouse effect'. This greenhouse effect is critical to our survival. However, since the Industrial Revolution, the human population has been adding more and more greenhouse gases into the air causing the 'enhanced greenhouse effect', the main cause of climate change.

During the 20th and 21st century, the level of carbon dioxide rose by 40%. Today, there is more carbon dioxide in the atmosphere than there ever has been in at least the past 800,000 years.

The predominance of carbon dioxide amongst these problematic GHGs has led to the term 'carbon footprint'.

The gases normally measured are the seven defined by the Kyoto Protocol: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulphur hexafluoride (SF₆) and nitrogen trifluoride (NF₃). The footprint is measured in the number of CO₂ equivalents, CO₂e.³

Standard ratios are used to convert the various gases into equivalent amounts of CO₂, based on their global warming potential (GWP).



2.5 IMPACT OF COVID-19 PANDEMIC

The full economic implications of COVID-19 remain uncertain in the extreme, but the pandemic has certainly revealed the world economy's vulnerability to unexpected incidents and the importance of localisation and resilience.

The pandemic has also highlighted strategic questions over climate critical sectors of the economy, including aviation, energy and road transport. It is now apparent that the deployment of clean technologies can be a cost-effective, resilient and more local strategy for generating significant economic multipliers in the recovery.

More on the pandemic impact can be found in Annex 5

³Overview of greenhouse gases, EPA, available at <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

3. PURPOSE AND SCOPE OF STUDY

3.1 PURPOSE

This study has been commissioned by the LINK ATM Scheme, recognising the importance of the UK cash distribution industry contributing to the effort to achieve an overall reduction in the UK's carbon footprint.

In June 2019, UK parliament passed legislation requiring the government to reduce the UK's net emissions of greenhouse gases by 100% relative to 1990 levels by 2050⁴. See Annex 4 for further information on climate targets and legislation.

Cash is a vital utility and must play its part in halting climate change.

This first review of UK cash distribution carbon footprint will enable the industry to confirm progress to date and to agree next steps to bring about further reductions, with a preliminary target of achieving a Zero Carbon footprint for cash distribution by 2030.

The authors would like to thank the LINK members and industry suppliers who gave support and provided information for this study.

Names are not attributed to information gathered during these interviews and surveys. Where company names are given these relate to information that is publicly available.

This Study has been conducted on the basis that there will be a need to distribute cash around the UK for the foreseeable future. No detailed assumptions are made on continued volumes.

All of the views expressed in this work are those of the authors and are not necessarily those of LINK.

3.2 TIMING OF STUDY

The study was commissioned in early 2020, ie before the start of the Coronavirus crisis, in a year that was expected to be one of urgent action to respond to recent UK target changes and leading to the 26th session of the Conference of the Parties (COP26) in Glasgow in November, now rescheduled for 2021.

As work on this study started, the COVID-19 pandemic struck, and the focus and priorities of those in the cash industry moved to urgent operational matters. However, despite the delays it imposed on the gathering information, it has been timely to carry out this work in 2020, with the COVID-19 pandemic having its own impact on both carbon footprint itself and on attitudes to the steps required to deal with climate change.

⁴The Climate Change Act 2008 (2050 Target Amendment) Order 2019, available at www.legislation.gov.uk/uksi/2019/1056/contents/made

3.3 SCOPE OF STUDY

The scope of the current study focuses on a subset of components of the cash cycle (For a full list of components that may be included in future studies, see Annex 13).

The subset considered in this study is:

- Operation of Note Circulation Scheme (NCS) cash centres and Cash Management Organisation (CMO) cash and logistic hubs
- Transportation of cash
- Operation and maintenance of ATMs, coin processing and similar equipment
- Cash processing by retailers.

This subset of components of the life cycle of cash is very much focused on post manufacturing cash distribution within the UK.

The use of plastic in cash distribution is not considered in this study. Although plastic is a serious environmental concern, it is not strictly related to the carbon footprint. Indeed, some research has concluded that measures taken to reduce plastic actually increase the level of carbon in the atmosphere. It is also worth noting that many interviewed as part of this study have already made substantial progress in reducing use of plastic.

There is no specific investigation in this study of the carbon footprint of banknotes produced in Scotland and Northern Ireland, but the issues of ATM power consumption and transportation fuel bear the same import there as in the rest of the UK.

4. COP26

4.1 SETTING THE SCENE

COP26 will be the largest summit the UK has ever hosted. Indeed, it is being described as the most significant climate event since the 2015 Paris Agreement, with presidents and prime ministers from around the world reporting back on the progress they have achieved since the Paris Agreement.

The summit in the UK comes as the country aims to establish itself as an international climate leader, following an ambitious new “68% by 2030” commitment under the Paris Agreement and prime minister Boris Johnson’s new “10-point plan” for achieving net-zero. The sixth carbon budget has now been defined and legislation is expected by June 2021, well in advance of COP26. See Annex 4 for more information on the UK’s legislation and carbon budgets.

However, figures now show that the UK set to miss its upcoming fourth and fifth carbon budgets (currently in the third carbon budget period). The Climate Change Committee (CCC) has noted that the government’s own figures show current plans still fall “a long way short” of what is required⁵.

4.2 COP25

COP25, held in Madrid in 2019, finished with many significant issues still unresolved, but an agreement was reached about cutting carbon dioxide, whereby each nation agreed to devise a plan to cut their carbon emissions by the time of COP26 (then expected to be November 2020).

COP25 overran by 2 days, with intense negotiations still achieving little in terms of actions. The UN Secretary General, Antonio Guterres, said he felt "disappointed" by how little was actually achieved at COP25, and others called the conference a failure. Much is now expected of COP26.

⁵ Advice on reducing the UK’s emissions, CCC, updated December 2020, available at: <https://www.theccc.org.uk/about/our-expertise/advice-on-reducing-the-uks-emissions/#:~:text=The%20Climate%20Change%20Act%20requires,over%20a%20five%2Dyear%20period.&text=The%20Committee%20will%20advise%20on%20the%20Sixth%20Carbon%20Budget%20in%20December%202020.>

4.3 COP26 PLANS SO FAR

The COP26 summit will focus on five core areas: Clean transport; Finance; Nature Solutions; Adaptation and Resilience; Energy Transition. The clear message is that the time for negotiation is long gone, now is the time to review progress and plan further action.

Sponsors confirmed so far (as of end November 2020) are SSE, Scottish Power, National Grid and NatWest Group.

NatWest Group will be the leading banking sponsor. They have declared their commitment to reducing the bank's impact on the climate. Alison Rose, CEO NatWest Group, commented:

“.. we want to do more than play our part – we want to lead on the collaboration and cooperation that is so critical to influencing the transition to a low carbon economy⁶”

It is very clear that now is the time for the cash industry as a whole to make their united carbon reduction targets clear and transparent, with active participation in the summit.

⁶First sponsors for COP26 announced with one year to go until the climate summit, Department for Business, Energy & Industrial Strategy, 16 November 2020, available at: <https://www.gov.uk/government/news/first-sponsors-for-cop26-announced-with-one-year-to-go-until-the-climate-summit>

5. CASH AND ITS POSITION IN THE WORLD'S CARBON FOOTPRINT

5.1 SETTING THE SCENE

To set the scene, let us look at the usage of key items in working life in most industries⁷.

Activity	CO2e	Notes
An email	17g	10 minutes to write, 3 minutes to read, laptop to laptop
A unit of electricity from the UK grid	340g	
Driving a mile in a mid-size electric car	180g	
Driving a mile in an average UK car at 36 miles per gallon	530g	
Using average efficiency laptop per hour	10g	
PC connected to servers and networks per hour	22g	In excess of laptop usage
Use of smartphone per year *	69kg	Typical usage of 195 minutes per day, including electricity,
Bitcoin in 2019	46 million tonnes	
All cryptocurrencies in 2019 **	68 million tonnes	
Cloud and data centres in 2020 ***	160 million tonnes	
UK, emissions within borders	352 million tonnes	
UK, overall emissions	435 million tonnes	
UK, total footprint	840 million tonnes	including imports, flights and shipping
The world's ICT ****	1.4 billion tonnes	including all user devices, data centres, networks and TV
The world's total GHG emissions	56 billion tonnes	AND GROWING

Notes:

* Use of mobile phones is responsible for approximately 1% of global emissions. It is interesting to note that the vast majority of a smartphone's emissions come from its

⁷ How bad are bananas: the carbon footprint of everything, Mike Berners-Lee, Profile Books, revised edition 2020

manufacture and transport to the user. It would take 34 years of average use for the footprint of the electricity used to equal the footprint of the phone itself. This is a very clear argument for reducing the high level of new phone purchases and increase in re-use: keeping a phone longer than normal, drastically reduces the total annual footprint. The embodied footprint of the iPhone 11 stands at 105kg CO₂e, which is 35kg per year if you keep it for three years, or 52.5g if you discard it after two years as most people do. Keeping it for ten years would bring the embodied footprint down to 10.5kg per year.

** In just a decade, cryptocurrencies have eaten up 0.12 per cent of the world's carbon footprint. Currently 0.3 % of global electricity is used for Bitcoin alone and 0.5 % for all cryptocurrencies. Use of blockchain further adds to the energy use and carbon footprint. Some are worried that, if the growth trend continues, Bitcoin alone could push the world over 2oC warming within the next twenty years.

*** Data centres use about 1 per cent of global electricity and 0.25 per cent of its footprint¹.

**** ICT now accounts for 2.5 per cent of global emissions. The horrendous footprint figure is split more or less equally into three parts: 1) phones, computers, consoles and tablets; 2) TV; 3) data centres, networks and, shockingly, 5 per cent accounted for by cryptocurrencies.

These figures give an excellent overview of the toll that all activities involving data, ICT and transport take on the climate. It must be noted, however, that calculations of Global Warming Potential (GWP) make many assumptions, and figures produced by different bodies vary, due to both their assumptions and their methodologies.

5.2. DATA CENTRES AND CARBON FOOTPRINT

In 2016, it was reported⁸ that the world's data centres used three percent of the global electricity supply. Accounting for about two percent of total greenhouse gas emissions, data centres have the same carbon footprint as the aviation industry.

Further predictions⁹ stated that the energy consumption of data centres is set to account for 3.2 percent of the total worldwide carbon emissions by 2025 and they could consume no less than a fifth of global electricity. By 2040, storing digital data was predicted to create 14 percent of the world's emissions.

⁸ Global warming: Data centres to consume three times as much energy in next decade, experts warn, Tom Bawden, The Independent, January 2016. Available at: <https://www.independent.co.uk/environment/global-warming-data-centres-consume-three-times-much-energy-next-decade-experts-warn-a6830086.html>

⁹ 'Tsunami of data' could consume one fifth of global electricity by 2025, The Guardian, December 2017. Available at: <https://www.theguardian.com/environment/2017/dec/11/tsunami-of-data-could-consume-fifth-global-electricity-by-2025>

In 2012, there were only 500,000 data centres worldwide to handle global traffic, but in 2019 there were more than 8 million according to IDC¹⁰. The rapid rise in smartphone usage and big data analytics have led to a massive growth in data centres, and this comes with a heavy climate cost.

This is clearly a vital area for all industries to focus on in their moves to achieving Zero Carbon.

It is worth noting that Google and others with massive data centres have made solid improvements by both reducing energy usage and using renewable power. Google is reported to be the world's largest corporate purchaser of renewable energy, and it has been found that efficiency improvements have kept energy usage almost flat across the globe's data centres as demand for cloud computing has skyrocketed.

5.3 PAYMENTS AND CARBON FOOTPRINT

Cash and electronic payments share several carbon footprint generators, principally:

- power used to operate the payment / dispense transaction,
- power used to store data at data centres and to perform the transaction, and
- creation and destruction / recycling of transaction equipment.

As far as data centres go, it can be seen that the likes of Visa and Mastercard have made significant improvements in power usage. Mastercard report that they source renewable energy for 100% of their global operations

It is also worth noting that Mastercard is working with Aland Index to allow customers to track carbon footprint of each transaction and then offset it. This is based on what they are buying not how they pay for it. There has also been introduction of an environmental form of "cashback" on card transactions, with the issuer offsetting a weight of CO2 for every pound spent using the card. As an example, Canadian Fintech Mogo offsets one pound of CO2 for every dollar spent using the MogoSpend Visa card.

Both POS terminals and ATMs are generally switched on 24 hours / day. Manufacturers of both are improving power efficiency, by introducing passive cooling, heat "sink" attachments and sometimes the ability to sleep when not in use.

¹⁰ *The Data Center Dilemma: Is Our Data Destroying the Environment?*, Michael McNeerney, April 2019. Available at: <https://www.datacenterknowledge.com/industry-perspectives/data-center-dilemma-our-data-destroying-environment>

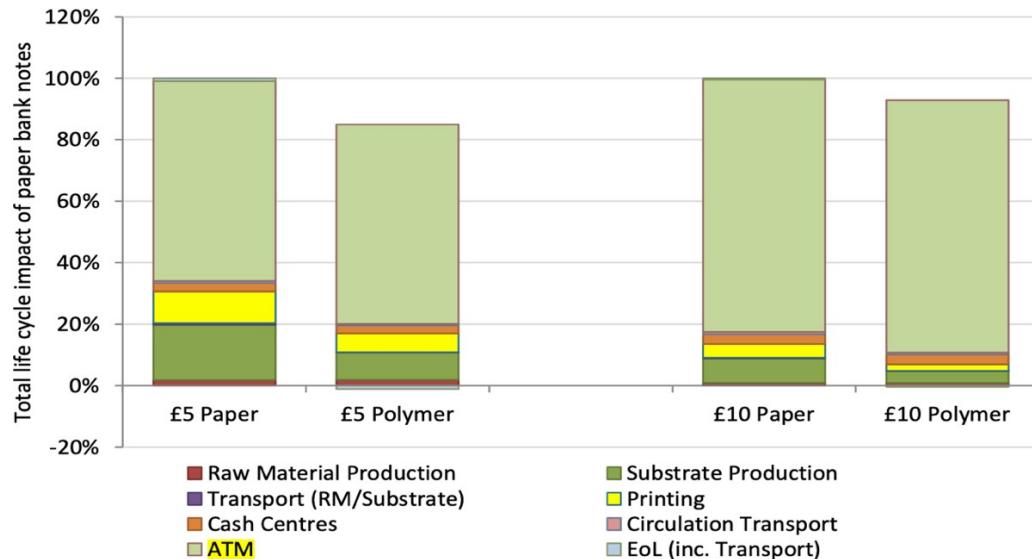
POS terminals have far shorter length of life than ATMs and are more frequently replaced due to rapid changes in software and functionality, relatively low capital costs, and faults. The lower value of the equipment means there is less tendency to recycle the units, than with a far more costly ATM.

Because of the nature of cash usage (typically smaller payments) and the use of cash to control budgets, one cash withdrawal is typically used to make around 5 payments, and more than that during the COVID pandemic as people take out larger amounts per withdrawal.

De Nederlandsche Bank (DNB) reported¹¹ that an average cash withdrawal in 2015 had a GWP of 4.6 g CO₂e, whereas an average debit card transaction had a GWP of 3.8 g CO₂e. If we factor in the average of 5 payments per withdrawal, cash is already less climate damaging than card payments.

It should also be noted that with the increased use of contactless payments in 2020, the payment carbon footprint is increasing. Increased use of the smartphone for payments is adding to that tally.

The position of cash versus electronic payments does not, however, leave the industry in a position of laissez-faire. A look at the diagram below¹², shows that ATMs and cash centres contribute significantly to the carbon footprint of our banknotes. Whilst introduction of polymer has had a beneficial impact, the footprint of ATMs and its associated services is blunting that impact.



This impact will be analysed in greater detail in this report.

¹¹ Life cycle assessment of cash payments, De Nederlandsche Bank, October 2018, available at: https://www.dnb.nl/binaries/Working%20paper%20No.%20610_tcm46-379441.pdf

¹² Carbon footprint assessment: paper vs polymer £5 and £10 bank notes, Thinkstep on behalf of Bank of England, July 2017, available at: <https://www.bankofengland.co.uk-/media/boe/files/banknotes/polymer/carbon-footprint-assessment.pdf?la=en&hash=A2077D4BEF302DF8F8488503DEA041876627ECBD>

6. THE IMPORTANCE OF POWER IN THE CARBON FOOTPRINT OF CASH DISTRIBUTION

“The uncomfortable fact is that while the UK's greenhouse gas emissions have reduced by 43% compared to 1990 levels, three-quarters of that has come from the energy-generation sector (wind and solar power generation especially). All other sectors ... have lagged badly in comparison.

Now is the time for real change.”

- RIBA, July 2019¹⁴

6.1 CASH AND POWER

As seen from the limited previous analysis of cash and ATMs, the principle GHG emitters in the cash cycle are electricity and transport fuel. The DNB report¹⁵ attributed 64% of the environmental impact to machine and transport power, while, as we have already seen, a recent Bank of England report¹⁶ demonstrated that the electricity used to operate ATMs themselves produces over 60% of the carbon footprint in the life of a banknote.

Whilst the RIBA quote above generally has negative connotations, for the cash distribution industry this can be taken as a strong positive message, in two ways.

Firstly, ongoing reductions in the carbon footprint of electricity provision will automatically reduce the carbon footprint of cash distribution through ATMs.

Secondly, substituting the use of electricity for fossil fuels in any part of the cash cycle, including transportation, will, over time, reduce the overall carbon footprint of cash distribution.

¹⁴ RIBA Council meeting of 27 June 2019, available here: <https://www.ribaj.com/intelligence/riba-climate-change-action-plan>

¹⁵ Life cycle assessment of cash payments, De Nederlandsche Bank, October 2018, available at: https://www.dnb.nl/binaries/Working%20paper%20No.%20610_tcm46-379441.pdf

¹⁶ Carbon footprint assessment: paper vs polymer £5 and £10 bank notes, Thinkstep on behalf of Bank of England, July 2017, available at: <https://www.bankofengland.co.uk/-/media/boe/files/banknotes/polymer/carbon-footprint-assessment.pdf?la=en&hash=A2077D4BEF302DF8F8488503DEA041876627ECBD>

6.2 UK POWER SUPPLY

The National Grid is the system operator of Great Britain's electricity and gas supply, managing the network and distribution of electricity and gas via high-voltage power lines, gas pipelines, interconnectors and storage facilities. The National Grid is tasked with ensuring that all areas of Great Britain always have enough power.

The National Grid ESO is a legally separate business within the National Grid PLC family and is the electricity system operator segment of the business. They do not generate or sell, they distribute.

Electricity generating companies supply electricity to the National Grid. Historically, half a dozen major providers dominate this market, but competition is growing, notably from generators focused on renewable sources of power.

The National Grid has set itself a target of net zero by 2050. They are still working on the full details of their corresponding plan, but have made several vital steps, including the creation of the first ever hydrogen fuel-cell powered construction site, in Lincolnshire.

The National Grid ESO has set itself a target of being able to operate a zero-carbon electricity system by 2025. This means that if the electricity generation market provides the National Grid purely with electricity generated from Zero Carbon sources, the system could run without needing to use any extra services that emit carbon. In other words, if 100% of the electricity provided to the National Grid in 2025 has Zero Carbon footprint, Britain's electricity distributed on by the National Grid would be carbon free.

Northern Ireland Electricity Networks Limited (NIE Networks) is the electricity asset owner of the transmission and distribution infrastructure in Northern Ireland, NIE Networks does not generate or supply electricity. NIE Networks has three transmission interconnectors with the transmission grid in the Republic of Ireland.

6.3 UK RENEWABLE ENERGY

The National Grid constantly monitors and discloses its carbon intensity.

2019 was the cleanest year on record for Britain as, for the first time, the amount of Zero Carbon power outstripped that from fossil fuels for a full twelve months. The year saw highest levels to date of wind and solar generation ever recorded, with May having the longest ever period of no coal being burned to generate electricity of 437 hours.¹⁷

2020 looks set to break those records, encouraged by COVID-19 lockdown.

¹⁷ ESO data shows record breaking year for Britain's electricity, December 2019, available at: <https://www.nationalgrideso.com/news/eso-data-shows-record-breaking-year-britains-electricity>

Britain is seeing the growth of companies who purchase and/or generate renewable power and feed it into the National Grid. Good Energy (who provides excess renewable energy in case a generator has a problem) and Ecotricity are the two reported as 100% renewable in the Which September 2019 analysis¹⁸.

In Northern Ireland, GHG per unit of electricity generated decreased 36% from 631gCO2/kWh in 2004 to 406gCO2/kWh in 2017. This has been driven by the growth of renewable generation in Northern Ireland, a shift away from coal use towards gas for electricity generation, and improvements in energy efficiency¹⁹.

Electricity generated by wind turbines has been singled out by the UK government as being the most likely route to reducing the carbon footprint of the power industry.

At the October 2020 Conservative Party Conference, the Prime Minister announced that he was targeting that wind power would meet 100% of the UK's electricity needs by 2030. His strengthened commitments are the first stage of a 10-point plan for a "green industrial revolution" from the government, with No 10 promising the rest of the details later this year to "accelerate our progress towards net zero emissions by 2050"²⁰

This is a challenging target and will require commitment from many, including Parliament. As of 2020, there are around 9,000 wind turbines in the UK. Based on their current average level of electricity generation, this would need to increase to at least 50,000 turbines by 2030, if 100% of the UK's electricity needs are to be satisfied from this source. Given the need for complete resilience in terms of the ability of the National Grid being able to react to the peaks and troughs of demand for power, it is likely that up to 60,000 wind turbines will be required by 2030.

Duncan Clark, Head of UK Region for Ørsted said: "Offshore wind is the most cost-effective way to achieve the UK's net zero ambitions and delivering 40 GW of offshore wind by 2030 is an essential part of this roadmap. This is a challenging target but achievable if Government and the industry continue to work together to accelerate deployment and build out the UK project pipeline as quickly as possible."²¹

The Carbon Footprint of UK electricity is crucial to the quest to reduce the carbon footprint of UK cash distribution.

¹⁸ How green is your energy tariff, Sarah Ingrams, Which?, September 2019 available at: <https://www.which.co.uk/news/2019/09/how-green-is-your-energy-tariff/>

¹⁹ Carbon intensity indicators published, DAERA, OCTOBER 2019, available at: <https://www.daera-ni.gov.uk/news/carbon-intensity-indicators-published>

²⁰ Wind farms could power every home by 2030, BBC, October 2020, available at: <https://www.bbc.co.uk/news/uk-politics-54421489>

²¹ Prime Minister's landmark offshore wind speech will unlock huge opportunity for UK, Ørsted, October 2020, available at: <https://orsted.co.uk/media/newsroom/news/2020/10/dc-pm-announcement>

Counting and packing machines in cash centres use electricity; ATMs use electricity; POS retail tills use electricity; self-checkouts use electricity; some vehicles used for cash transportation already use electricity.

The challenges for the cash distribution industry are threefold:

- 1 Substitute renewable fuel, most likely electricity, to replace fossil transportation fuel.
- 2 Source renewable electricity as a matter of urgency
 - o from companies such as Good Energy, who generate power themselves from wind turbines and contract with other smaller electricity generators who provide Zero Carbon footprint electricity, or
 - o generate their own renewable power, by fitting solar panels, air source heat pumps, biomass boilers and similar
- 3 Reduce power usage where possible, to aid the achievement of Zero Carbon footprint power.

7. THE SCALE OF CASH DISTRIBUTION IN THE UK



There is around \$37 trillion worth of physical money around the world



ATMs are the main distributor of cash to the public



1.9 million consumers mainly use cash¹³

There are currently over 3.9 billion Bank of England notes in circulation. Together, these are worth around £71 billion.²²

The total number of coins in circulation as of October 2019 was approximately 29 billion, with a face value of around £4.6 billion^{23 and 24}

In December 2019, there was a total of just over 60,000 ATMs connected to the LINK network in the UK and Channel Islands.

During 2019, UK ATMs dispensed in excess of £150 billion – or approximately £3000 per UK adult

Temporary ATM closures due to the COVID-19 pandemic have meant that up-to-date ATM numbers have not been published during 2020, though industry estimates indicate that as of September 2020 there are now only around 55,000 ATMs in the UK²⁵. Figures show that the amount of cash delivered by those ATMs is running at around 80% of pre pandemic levels, against a reported backlog of many payment methods suffering a downturn during 2020.

Even at 80% of 2019 levels, the value of cash dispensed by UK ATMs would be £120 billion. The obvious conclusion is that the cash distribution industry is going to have a significant workloads for the foreseeable future.

As of 2019, there were around 3000 vehicles employed in the distribution of cash around the United Kingdom, in addition to those used in cash centres and by ATM maintenance staff.

Further information on cash and cash access in the UK is provided in Annexes 8 and 9.

¹³ UK payment market summary 2019, UK Finance, June 2019, available at: <https://www.ukfinance.org.uk/sites/default/files/uploads/pdf/UK-Finance-UK-Payment-Markets-Report-2019-SUMMARY.pdf>

²² Banknote statistics, Bank of England, updated March 2020, available at: <https://www.bankofengland.co.uk/statistics/banknote>

²³ Royal Mint annual report 2018-2019, available at: https://www.royalmint.com/globalassets/the-royal-mint/pdf/annual-reports/201819_royal_mint_limited_annual_report.pdf

²⁴ UK's circulating coin mintage figures, Royal Mint, October 2019, available at: <https://www.royalmint.com/corporate/circulating-coin/uk-currency/mintages/>

²⁵ LINK statistics, available at: <https://www.link.co.uk/about/statistics-and-trends/>

8. OPERATION OF CASH CENTRES

8.1 CASH CENTRE PURPOSE AND POWER USAGE

Cash Centres are secure locations where cash can be processed and stored.

Cash Centres are where bulk cash is counted, sorted, verified, packed and distributed. Much of the work of cash centres is highly automated, involving the use of sophisticated equipment for the counting and sorting of cash.

Cash centres are heavy users of power, including for cash processing equipment, lighting, heating and air conditioning.

As an example of power use in cash centres, the DNB study revealed that typical energy consumption of cash processing machines is 207.6 kWh per million counted and checked banknotes. Each kWh of fossil fuel generated electricity produces approximately 0.26 kg of CO₂e, based on UK government GHG conversion factors.²⁶

Power used in cash centres is almost exclusively electric, with the exception of the fuel used to operate vehicles, which is primarily fossil diesel.

To reach a position where cash centres are operating on a Zero Carbon basis involves, initially, reducing use of power and, ultimately, moving to a renewable-electric-only operation, including all vehicles.

8.2 NOTE CIRCULATION SCHEME (NCS)

The Note Circulation Scheme (NCS) governs the distribution, processing and storage of Bank of England banknotes, providing a framework for the wholesale commercial cash industry. Legal agreements and rules underpin the operation of the NCS.

There are currently around 30 cash centres which are part of the NCS.

In addition, CMOs operate logistic hubs which act as staging posts between the NCS cash centres and the end users of cash, when such end user deliveries are not made direct from the NCS cash centres.

The Bank of England also has responsibility for regulating the treatment, holding and issuance of commercial banknotes in Scotland and Northern Ireland (S&NI)²⁷.

²⁶Greenhouse gas reporting: conversion factors 2019, available at:

<https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019>

²⁷ S&NI banknote rules 2017, BEIS, available at <https://www.bankofengland.co.uk/-/media/boe/files/banknotes/scottish-northern-ireland/scottish-and-northern-ireland-banknote-rules-2017.pdf>

8.3 COINS

Coins are manufactured by the Royal Mint, acting on instructions from HM Treasury, and then transported to cash centres and CMO logistic hubs for distribution. There are small number of cash centres and logistic hubs that only process coins. However, the majority of coin processing is done at dual banknote and coin facilities.

8.4 REVIEW OF WHOLESALE CASH DISTRIBUTION

The Bank of England has convened relevant industry participants to consider a new model for wholesale cash distribution that will support the UK in an environment of declining cash volumes. The intended outcome of this work is for the Wholesale Distribution Steering Group (WDSG) participants to agree on a new model 28 for the wholesale distribution of cash in the UK that is efficient, resilient and sustainable and meets the needs of the UK public, supporting continued access to cash

8.5 DESTROYING AND RECYCLING BANKNOTES

500-600 million banknotes are returned each year because they are old, worn or dirty. This is typically 15% of notes in circulation 29.

NCS members are responsible for sorting banknotes and returning any that are unsuitable for circulation to the Bank. The Bank destroys all such returned banknotes.

²⁸Consultation on the Future of the UK's Wholesale Cash Distribution Model, WDSG, June 2020, available at: <https://www.bankofengland.co.uk/-/media/boe/files/paper/2020/consultation-on-the-future-of-the-uks-wholesale-cash-distribution-model.pdf?la=en&hash=D9B4FB7B6CA6FD3F846E5C277AE3BB8D20F2B928>

²⁹Banknote statistics, Bank of England, <https://www.bankofengland.co.uk/statistics/banknote>

9. TRANSPORTATION OF CASH

9.1 EXTENT AND PURPOSE

The printer of banknotes delivers cash to two Bank of England cash centres, one of which is on the same site as the print works at Debden in Essex and another in Leeds.

Cash in bulk is transported from the two Bank of England Cash Centres to around 30 Note Circulation Scheme (NCS) centres around the UK by Cash Management Organisations (CMOs), acting on orders placed by UK banks.

The NCS centres are operated by four member organisations: G4S, Nat West, Post Office, and Vaultex.

It is at NCS centres that cash is packed into cassettes, for use in ATMs and other self-service devices, or bagged to be delivered to bank branches, building societies, post offices, other businesses requiring cash, and CMOs not directly related to an NCS member.

It is worth noting that around half of the ATMs in the UK are operated by two operators, Cardtronics and Note Machine. Both of these organisations run their own CMOs, delivering cash to the ATMs they operate that are not merchant replenished.

The CMOs then deliver cash either direct to customers or to their logistic hubs around the UK, to meet the cash needs of customers in each region in which the CMOs operate.

Banknotes at the NCS centres are regarded as being under the ownership of the Bank of England and are therefore held at no cost to the centre operators. However, this also means that the cash has to be returned to one of the NCS sites from regional CMO logistic hubs, to put it back under the ownership of the Bank of England, and remove interest and other costs.

The number of cash centres has been consolidated in recent years due to a combination of economy, branch closures and ATM removals. This has led to increased transportation distances. In S&NI, the existence of different notes produced by some of the banks, adds to the logistics complications, and also has some impact on distances travelled.

The consequence is that a massive amount of cash is moved significant distances around the UK for a reason unconnected with operational efficiency. An indication of distances involved can be seen in Table 3-2 of the Bank of England banknote document³⁰.

³⁰ Carbon footprint assessment: paper vs polymer £5 and £10 banknotes, Thinkstep on behalf of Bank of England, July 2017, available at: <https://www.bankofengland.co.uk/-/media/boe/files/banknotes/polymer/carbon-footprint-assessment.pdf?la=en&hash=A2077D4BEF302DF8F8488503DEA041876627ECBD>

There is also clearly an element of duplication in this modus operandi, notably because competing CMOs can be operating NCS centres in geographic proximity or transport and logistic hubs in the same region. Equally, this can lead to there being no NCS centres in certain parts of the UK - the North of Scotland is an example of this – and several in other regions, such as the Midlands and the North-West of England.

The competition between geographically close NCS centres or logistic hubs located in the same region can lead to cash delivery vehicles from different organisations being in the same post codes at the same time. This does not favour the most efficient transportation of cash as a whole. The same comment would apply to cash collections.

Shared NCS centres and logistic hubs may be one answer. This is among the subjects being considered by the Bank of England Wholesale Distribution Steering Group. The same group may be considering a UK Cash Utility, which could be another path to removing pointless and costly duplication of cash movement services by the around 3000 vehicles used by UK CMOs in 2019.

Another obvious means of reducing cash transportation is encouraging ATM merchant replenishment.

9.2 POWER USAGE IN CASH TRANSPORTATION

Some UK CMOs responsible for the transportation of cash were relatively quick to understand the significance of the 2008 Climate Change Act³¹.

As early as 2010, there were reports of all-electric vehicles being used for cash transportation, with G4S announcing use of a lithium-ion battery-powered vehicle, with photovoltaic top-up, and a range of £100 miles between charges, and a forecast saving of 4,974kg of carbon emissions per year³².

However, for whatever reason, such trials did not lead to an introduction of electric vehicles in significant numbers by any CMO.

³¹ The Climate Change Act 2008 (2050 Target Amendment) Order 2019, available at: <https://www.legislation.gov.uk/ukdsi/2019/9780111187654>

³²G4S Cash Solutions launches world's first fully electric cash in transit vehicle, *Fleetworld*, 2010, available at: <https://fleetworld.co.uk/g4s-cash-solutions-launches-world39s-first-fully-electric-cash-in-transit-vehicle/>

Instead, CMO work has focused on operational factors such as

- reducing the size of their fleets;
- using lighter vehicles, often including lighter anti-cut armour ;
- using more fuel-efficient vehicles;
- using renewable diesel, where available.
- improving route planning;
- educating drivers in environmentally friendly driving techniques;
- curtailing running engines in idle (subject to meeting security standards);
- fitting vehicles with photovoltaic panels;
- improved fuel efficiency through the widespread introduction of telematics technology allowing the tracking, mapping and feedback of driver behaviour;
- sharing the carbon footprints achieved at a vehicle-level, through physical badging or other reporting methods, aimed at encouraging further improvement.

Such changes and innovations have allowed some CMOs to report a significant reduction in CO₂ emissions in the last decade.

However, the picture is not consistent across all CMOs

In any event, the fact remains that today, in October 2020, the vast majority of the vehicles used for cash distribution currently, whether it be the up to 50 tonne Trunkers used to move cash from /and to Bank of England and NCS centres or the lighter vehicles utilised for delivery of cash to local ATMs and bank branches, continue to use fossil diesel. Transport fuel is still the second biggest “bad boy” in the carbon footprint of cash distribution.

Whilst CMO vehicles have typically been assigned an 8-year lifespan, it seems that some companies have extended that lifespan, possibly partly to reduce investment required and partly to allow more time to consider options.

9.3 STEPS TOWARD CARBON NEUTRALITY OF CASH TRANSPORTATION

In some areas of the UK, local restrictions on vehicle emissions have forced some CMOs to favour hybrid solutions for their lighter vehicles. Specifically, this allows switching from diesel to electric power to facilitate entrance into zones with air pollution rules.

With specific regards to Trunkers, the recent announcements by Tesla of the availability by 2021 of an all-electric truck with a 500 mile one-charge range, raises hopes that all-electric Trunkers for cash transportation will appear in the next few years. Currently, such HGVs are not included in any government targets for reducing the number of diesel-powered vehicles, mainly due to concerns that the torque required to pull heavy loads can only be produced by diesel engines. If Tesla have resolved that issue, the authorities may reconsider their position on HGVs, though there may well be concerns from CMOs as to the cost of the solution.

Apart from the work being done by Tesla, a US based start-up has already created the first electric vehicle specifically for CMOs. It weighs more than 12 tons empty, rising to more than 15 tons when fully loaded. There are seemingly some issues with range, but at least one CMO is hopeful of placing an order in 2021.³³

This news from another market indicates that there could well be developments in the UK in the near future in relation to CMOs introducing a significant number of all-electric vehicles for cash distribution.

The significance of the switch to electric vehicles by CMOs cannot be overstated. As highlighted earlier in this study, the National Grid reported that in 2019 more than 50% of all UK electricity was for the first time generated from renewable resources. With this % likely to increase each year, the average carbon footprint associated with using electric vehicles for cash distribution will also reduce each year.

CMOs are already able to contract with suppliers of Zero Carbon footprint electricity. Any CMO solely operating electric-only vehicles and contracting to receive power from such a supplier could realistically claim to be running a Zero Carbon footprint cash transportation service.

Away from electricity, at least one CMO has been using Hydrotreated Vegetable Oil (HVO) diesel for several years. HVO yields a significant carbon emissions reduction, reducing the fuels carbon footprint by up to 90% and making it an excellent way to significantly reduce vehicle GHG emissions. Availability of HVO is good in the Nordic market, but in other markets remains a challenge. The issues of HVO supply levels have been raised with governments in Europe, but the general view is that it is unlikely to improve in the next three years. There are some suppliers in the UK but not offering significant volumes. Should supply issues be resolved, this could be a very useful short-term solution, allowing carbon emission reduction in older vehicles awaiting electric replacements.

Another developing option is the use of hydrogen cells to power vehicles, but this has had a more mixed path of successes and failures than electricity. From what is known at the moment, hydrogen seems unlikely to become more popular than electricity, though it does have a clear advantage on distance per fill, and could be an option for Trunkers. That said, the cash distribution industry no longer has time to wait and see, conversion to renewable power needs to start now.

Whilst is good to see innovation on various fronts in relation to fuel, today it seems clear that in the UK moving all CMO vehicles to electric-only as a matter of urgency is the surest route to reducing further and ultimately eliminating the carbon footprint of cash distribution.

³³ XOS Rolling out at ACT Expo 2019, Announces Exclusive Loomis Agreement, Xos, April 2019, available at: <https://www.globenewswire.com/news-release/2019/04/23/1808410/0/en/XOS-Rolling-out-at-ACT-Expo-2019-Announces-Exclusive-Loomis-Agreement.html>

9.4 AIDS AND INCENTIVES TO ACHIEVE CARBON NEUTRALITY OF CASH TRANSPORTATION

How the move to electric-only vehicles is funded is another, separate, issue that needs to be addressed, with government grant assistance one possible solution.

Ultra-Low Emission Vehicle (ULEV) areas are being established in several UK cities, meaning that there are substantial fines for non-light emission vehicles entering. The rules apply 24 hours and provide a strong incentive to go electric.

9.5 KEY ELEMENTS FOR CARBON REDUCTION OF TRANSPORTATION OF CASH

- Reduce distance travelled by cash
- Replacement of fossil transport fuel with renewable electricity
- All CMOs to implement already available operational efficiencies
- Deploy ATMs with greater cash capacity
- Encourage Merchant Replenishment of ATMs
- Transparent annual progress reporting

10 OPERATION AND MAINTENANCE OF ATMS, COIN PROCESSING AND OTHER EQUIPMENT

10. 1 AREAS OF DIRECT POWER CONSUMPTION BY ATMS

ATMs consume power in a number of areas:

- Power to core
- Operation of dispenser
- Lighting of ATM and surrounds
- Heating / cooling

Through the Wall ATMs (TTW) consume more power than internal machines, largely due to the need to negate more excess heat and cold from its external location.

ATM manufacturers have been working hard in recent years to reduce their machines' carbon footprint. Models released in the past few years have had the following power-related improvements applied to them:

- Moving to DC (direct current) based PC core
- Reduced wiring
- Mobile chipsets, with lower power requirements
- Improved efficiency within the power supply units
- Low-energy LED lighting
- Use of alternative power sources e.g. solar *
- Weather proofing to reduce power consumption

*it should be noted that alternative power ATMs have not been adopted in the UK. There are many examples of successful use of such machines in Africa and India, but the incentive for such changes has not been carbon footprint, it has been general unreliability of the local power supply.

Some of the changes listed above, but not all, principally lighting and nature of power, can be applied to older ATM models, but for full carbon saving value, new models are required.

Many ATM operators spoken to as part of this current study have already replaced legacy ATM lighting with LED.

10.2 ATM POWER CONSUMPTION FIGURES

Based on 2015 statistics of the number of ATMs and Cash Recycling Machines (CRMs) in the Netherlands, typical fill amounts and number of transactions, the DNB report³⁴ concluded an average power consumption figure per ATM of 4.1 kWh per day, and per CRM of 5.5 kWh per day*.

The Bank of England analysis³⁵ based on UK 2016 data of a similar structure, found that for standby mode a lobby ATM uses 4.03 kWh per day, and a TTW uses 5.3 kWh per day*. At these rates of consumption, the report calculated that the ATM power (allowing for a mix of transaction and idle consumption) was responsible for over 60% of the carbon footprint of a banknote's life.

Figures obtained as part of this current study, found improved figures for the latest models of ATMs, with a TTW multi-function ATM idling at 3.43 kWh, compared with a similar older version at 5.14kWh*. It is clear that manufacturers have made significant changes to reduce ATM power consumption, but this requires deployment of new machines to achieve carbon savings.

10.3 STEPS TO REDUCE OVERALL ATM POWER CARBON FOOTPRINT

Most UK banks appear to be on track to achieve Zero Carbon footprint for branch electricity by 2030. As a result, ATMs located in branches will no longer have an impact on carbon emissions after 2030.

ATMs located off-branch are harder to deal with, and their individual carbon footprints often miss appropriate focus as they feature in the scope 3 category (indirect emissions that occur within a company's value chain, both upstream and downstream) in the carbon footprint declarations of most operators.

Clearly, there is work still to be done in this most critical area of cash distribution's carbon footprint.

*Each kWh of fossil fuel generate electricity produces approximately 0.26 kg of CO₂, in accordance with Greenhouse gas reporting: conversion factors 2019, BEIS, updated July 2020, available at:

<https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019>

³⁴ Life cycle assessment of cash payments, De Nederlandsche Bank, October 2018, available at:
https://www.dnb.nl/binaries/Working%20paper%20No.%20610_tcm46-379441.pdf

³⁵ Carbon footprint assessment: paper vs polymer £5 and £10 bank notes, Thinkstep on behalf of Bank of England, July 2017, available at: <https://www.bankofengland.co.uk/-/media/boe/files/banknotes/polymer/carbon-footprint-assessment.pdf?la=en&hash=A2077D4BEF302DF8F8488503DEA041876627ECBD>

One important issue is locations with multiple ATMs.

Indeed, the multiplicity of ATMs in close quarters in urban areas was a major stated reason behind the cutting of LINK interchange rates on 1st July 2018 and 1st January 2019. Those cuts had an impact on both the numbers of ATMs and the conversion of previously free-to-use to pay-to-use ATMs. However, the generally lower profitability of non-urban ATMs has meant that those changes have not had the hoped-for impact on urban ATM duplication, where at bank branches, supermarkets and transport interchanges can be often be found two, three or even more ATMs although one impact of the COVID crisis has been the closure of ATMs which are next to others for social distancing and it appears some of these may be removed altogether, however in other cases the possibility of removing them does not seem to have become a reality – many are opening again with plastic barriers etc erected between them.

It may be that some ATM operators are too conservative in their estimates of the ability of an individual ATM to meet the local demand for cash. It is perhaps relevant to consider that in 2019 there was a single ATM situated in Liverpool that reportedly averaged close to 40,000 cash withdrawals per month, compared to an average figure for a UK ATM of under 5,000 cash withdrawals per month. While most people would consider excessive customer queuing times to be undesirable, field testing of allowing for an average queuing time of, say, 5 minutes might well reveal that many ATMs could be removed – and the overall carbon footprint of cash distribution reduced – within acceptable customer service standards.

Removal of some ATMs from locations where duplication exists may also enable newer, more power-efficient ATMs to be relocated to replace older, less fuel-efficient machines at remote locations.

ATM operators' commitment to net Zero Carbon must include a full survey of their ATM estate: to establish each ATM's power usage and, where there is more than one ATM, need should be measured based on the queuing time for users of the machines. There are a number of reports on queue times at retail, banks and ATMs, and the acceptable limit has generally been considered to be between 5 and 10 minutes. With our current fast-paced lives and the immediacy expected from our smart technologies, it would seem sensible to take 5 minutes as the acceptable queuing time for 90% of the day. Analysis of ATM estates on this basis should result in removal of the surplus ATMs which are not required to keep the queuing time below 5 minutes.

There is also the issue of the power used by ATMs which are left switched on 24/7, even in locations where there is no public access because, for example, a branch or retail premises is closed and the ATM is inside.

Significant GHG emissions could well be saved by switching off ATMs out-of-hours, either where there is no access or where usage is simply going to be very low. There is always the potential to switch off during low usage periods one or more ATM in every location which currently enjoys a multi-ATM service.

10. 4 WIDER AREAS OF ATM POWER CONSUMPTION

Operating ATMs consumes power in a number of other ways:

- Visits to cash replenish (see section 9)
- Visits to service faults
- Visits to clean
- Visits to replenish consumables
- Security meets to provide secure access e.g. CMO and engineer

10. 5 SERVICING OF ATMS AND OTHER CASH PROCESSING EQUIPMENT

It is vital that ATMs and other equipment have as little downtime as possible. By maximising uptime, it is possible to minimise the amount of equipment deployed.

Clearly, the inherent reliability of equipment will be an important factor in maximising uptime and reducing the number of required service visits. Each service visit creates additional carbon footprint.

Inevitably, however, there will be occasional equipment failures. There will also be a continuing need to replenish ATM consumables.

Here are some steps that can be taken to both maintain ATMs more efficiently and reduce the carbon footprint of machine maintenance:

- Preventative maintenance at every visit can reduce equipment failures and repeat visits.
- Automatic consumable replenishment at the time of a cash delivery or other maintenance visit will reduce the need for special travel to replenish.
- Reduce the use of consumables. In particular, electronic receipts should be used where possible (SMS or email, or use of QR code on screen), to reduce footprint of paper, ink, printing power and visits.
- Spare parts for equipment should be carried by the engineer in his boot-kit, with back up supplies/ less frequently used parts stored locally. Equally, parts to be refurbished should travel as little as possible in the process.
- Consideration should be given to training site staff to carry out simple/routine/ preventative/ maintenance, including consumable replenishment.

- Where a Merchant Replenishment of cash model is being used, site staff should carry out as much maintenance and consumable replenishment as possible. One external engineer visit a year (and that engineer should be based to minimise travel) would be a feasible target.
- For more remote areas, service providers could be encouraged to share engineers and storage/use of parts/transportation of parts.
- There may be potential to have “reserve” engineers in more remote areas, possibly a resource shared between service providers.

There are shared liability issues in relation to security/ insurance issues with some of these potential actions. However, such issues can be solved, with goodwill and flexibility from every party.

Some of the steps noted above have already been taken by some organisations responsible for maintenance. However, it is not a consistent picture and it needs to be if the maximum possible reductions in the carbon footprint are to be achieved.

10. 6 KEY ELEMENTS FOR CARBON REDUCTION OF OPERATION OF ATMS AND ASSOCIATED EQUIPMENT

- Reduce overall ATM numbers by eliminating duplication not justified by usage
- Simple changes such as LED lighting and reduced receipt printing
- Power usage by ATMs should be kept to a minimum, including full utilisation of stand-by potential, including powering off at night or when the site is closed (subject to security running on separate power supply)
- Deploying newer more power-efficient ATMs
- Smarter maintenance, with more preventive and remote engineering taking place
- Power sources should be as environmentally-friendly as practicable e g what is the potential to use sources such as solar and wind for branches and other premises and equipment
- Weather proofing issues should be considered for every piece of equipment to reduce both power consumption and maintenance
- Use of shared engineering resources

11 CASH PROCESSING BY RETAILERS

11. 1 USE OF CMOS FOR CASH PROVISION

Some retailers, particularly multiple retailers, have contracts in place with CMOs covering the delivery and collection of both banknotes and coins. This service is clearly a contributor to the transportation element of cash distribution's carbon footprint. Whilst amounts are smaller than for ATM fills, the distances are the same, or potentially worse, with some stores in remoter positions than ATMs.

In addition, transportation of coins is more demanding in terms of weight and has its own practical difficulties. Point of Sale equipment, be it human-operated tills or self-checkout, requires specific mixes of denominations, with coins more challenging than notes. Deliveries are required on a timely basis to coincide with retail opening times, and convenient packaging is vital to smooth operations for the retailer.

A lower carbon footprint option is local availability of both notes and coins suitable for tills, and local deposit facilities with same day credit to account. As with deliveries, these facilities must be available at retail opening and closing times.

11. 2 USING CASH MANAGEMENT TO REDUCE CARBON FOOTPRINT

In recent years, the cash management services available to retailers have improved. Many of the cash management providers have included retail in their service offerings. What is more, at larger stores, particularly the supermarkets, cash deliveries for ATMs and POS share the same transport, making an important saving on carbon footprint.

Some retailers now use smart safes at POS that can be monitored by the CMO, or third party cash management provider, allowing better management of cash transport.

11. 3 CASH RECYCLING

The main reduction of carbon footprint for cash distribution to and from retailers can be achieved through cash recycling, be that in machine, in store, or in the local community.

This is covered fully in section 12.

11. 4 COINS

As mentioned above, coins present a number of challenges to retailers, and all of this impacts the cash distribution carbon footprint.

There are a number of steps that can be taken to reduce impact on carbon footprint, including local availability of till-ready coins and pricing methods that reduce change, such as price rounding and transfer of change to card / app rather than coins to pocket.

This is covered fully in section 12.

11. 5 KEY ELEMENTS FOR CARBON REDUCTION OF CASH PROCESSING BY RETAILERS

- **Reduce volume of coins required**
 - Reducing change through eliminating price pointing – no more 99p
 - Reducing change through rounding of total cash spend amount
 - Removal from circulation of small denomination coins
 - Transfer of change to card or app
- **Merchant filling of ATMs**
- **Coordination of merchant cash delivery with ATM replenishment**
- **Local availability of notes and coins for tills at start of day**
- **Local smart deposit for takings**

12 THE LOCALISATION OPPORTUNITY

12. 1 THE CURRENT SITUATION

As noted previously, some businesses, particularly multiple retailers, have contracts in place with CMOs covering the delivery and collection of both banknotes and coins. Smaller businesses are more likely to pick up cash they need from bank or post office branches, whilst depositing cash in the same locations, as long as such facilities are available.

The public mainly get the banknotes they need at ATMs, though some is accessed through bank and post office branches. In addition, a small amount of the public's need for cash, under 5% in 2019, is met through "cashback", mainly at retailers.

Most banks operate ATMs which accept the deposit of banknotes, by either business or personal customers of the bank providing the service. Most bank branches accept deposits at the counter, again for own customers only.

As regards coins, the public mainly receive coins in change when making purchases. Some of those coins are reused in payment transactions, including in vending, self-checkout and ticket machines. Some are returned to bank or post offices.

At a limited number of bank branches there are coin deposit machines, typically allowing customers to deposit coins free of charge in exchange for a receipt which the depositor then takes to the counter to have credited to their bank account. Most branches accept coins at the counter, usually limited quantities and from own customers only.

The rest of the coins nominally in circulation remain in the 23 million UK dwellings, occasionally lost down the back of chairs, but more often kept in the kitchen or bedroom in some form of receptacle.

Coins can remain "stored" by the public forever but, increasingly, they are taken to kiosks in supermarkets or transport hubs, where they can be deposited in machines which count the coins and issue the depositor with a receipt that can be used for payment or converted into banknotes at the check outs. There is usually a charge made for this service of up to 10% of the value of the coins deposited.

The big issue with the majority of cash deposit methods detailed above is that they do not incorporate on-site recycling. What this means is that the cash deposited, whether banknotes or coins, is currently invariably picked up by a CMO and transported in a diesel-fueled vehicle for reprocessing at a cash centre some – or many – miles away. Each such journey clearly adds to the carbon footprint of UK cash distribution.

Today, cash distribution is highly reliant on long distance transportation.

As noted in section 9, at a national level, a massive amount of cash is moved significant distances around the UK for reasons unconnected with operational efficiency: largely to return cash to interest-free storage at NCS cash centres.

12. 2 A NEW MODEL FOR LOCALISATION OF CASH TRANSPORTATION

Cutting down transportation of cash is a key factor in reducing the carbon footprint of cash distribution. Since ATMs are the conduit for almost 90% of the cash distributed in the UK, reducing the carbon footprint of their operation is a crucial issue.

Reducing the number of ATM cash fills is a key facet for reducing the carbon footprint. This can be done in a number of different ways, namely:

- Reduce fills by closer analysis of trends and increased use of Just in Time filling
- Maximising the amount of cash delivered per visit.
- Installing ATMs which accept deposits of banknotes and recycle them so that the notes are available for withdrawal.
- Using merchant takings to replenish ATMs, effectively performing recycling within store.
- Recycle residual cash removed from ATMs or branches on site or in the CMO vehicles, reducing the need to transport the cash to cash centres.

12.3 LOCALISATION OF OTHER ELEMENTS OF THE CASH DISTRIBUTION CYCLE

Other steps can be taken to reduce visits to ATMs and reduce carbon footprint:

- Carrying out more remote maintenance, rather than site visits. This is something increasingly possible on newer models of ATMs.
- First Line Maintenance being carried out by the site.
- Carrying out remedial maintenance at each visit
- Ensuring a high % of first-time fixes to obviate the need for follow-up maintenance visits.
- Expand use of contactless ATM transactions to reduce maintenance of ATM card readers.
- Reducing visits for security meets, by contractual agreements and/or automated access systems

12.4 THE LOCALISATION MODEL BEYOND ATMS – BANK AND POST OFFICE BRANCHES

The number of visits to ATMs is certainly capable of being managed down, bringing corresponding reductions in the overall carbon footprint associated with ATM operations.

There are also carbon footprint reduction opportunities in relation to increasing the use of post office and remaining bank branches.

The post office has contracts in place with every significant UK financial institution. Those contracts cover cash deposit and withdrawal for both personal and business customers. The potential for 11,000 post offices to provide community cash services is clear, though currently only a small percentage of cash deposits and withdrawals are channeled through those offices.

One factor potentially holding back growth in the use of cash services at post offices is the lack of automation. Not all post offices have ATMs or coin deposit machines. Automated recycling functionality is currently entirely absent.

Another limiting factor is that only around 3000 post offices currently accept deposits over £2000.

Post offices have the potential to become the first choice of both personal and business customers for community cash services. They also have the potential to become local recycling hubs, with all cash deposited, whether banknotes or coins, being recycled automatically so it can be offered for withdrawal.

The remaining bank branches currently do not provide the same level of opportunity to become community cash services hubs, for the simple reason that each bank branch only provides comprehensive services for the customers of the specific bank operating the branch. Only ATM cash withdrawals are more or less universally available, to any member of the public holding a card routing the transaction to the LINK ATM Network

In relation to providing cash services for their own customers, ideally machines at bank branches accepting banknote and coin deposit should have recycling capability and offer smart deposit functionality, allowing deposits direct to accounts. If the public facing machines are not capable of recycling, it remains possible to process deposited banknotes and coins in the bank branch back- office.

12.5 THE LOCALISATION MODEL BEYOND ATMS – RETAIL

Though there is a continuing role for both ATMs and branches, whether bank or post office, there is an undeniable trend of reductions in both spheres.

It is clear that new solutions for local cash distribution have to be found beyond the realms of ATMs and branches.

Much of the currently excess cash in any community is in the hands of businesses accepting cash as a payment method. Currently, much of that cash ends up being returned to cash centres, either via branches or directly by CMO collections. Neither method is carbon-efficient.

Ideally, cash in the tills of businesses needs to be delivered to the public or to other businesses which require cash for till floats and similar uses.

12.5.1 CASHBACK AND CASH-IN-SHOP

As noted previously, cashback, which has been available in the UK since 1987, still only meets a relatively small – under 5% – portion of the cash needs of the UK public.

One issue with traditional cashback has been the rule that it can only be offered with purchase. Although on the face of it this would not appear to be a significant deterrent, it may have made retailers cautious of overtly offering the service and the public reluctant to ask for it. These two factors plus the fact that many small traders traditionally used to charge for the service before that practice was prohibited by law, may well be amongst the main reasons for the low take-up cashback in the UK.

More effective promotion of cashback, to include removing the need for purchase, may be a route to improve community cash recycling.

Another factor which may have counted against a stronger take up of traditional cashback has been the inability of the service to provide certainty and therefore peace of mind.

A member of the public at home intending to go shopping and wanting to obtain cash in a community where there is poor branch/ATM cash access, cannot currently know before leaving home whether cashback will definitely be available at any local business. Even if the service is offered, there is no guarantee that any specific amount of cash will be available. Indeed, this lack of guarantee as to cash availability also applies to communities with only one ATM, as there can be no certainty that cash will be available via that channel either. ATMs are sometimes out of service, for a variety of reasons, including having insufficient cash to dispense.

One solution to this lack of certainty for the public is an innovation that the European Payments Council has named “Cash-in-Shop”. This service, which is App based, allows the user to reserve their cash for collection at a nominated local business within a specified period of time. The service provider provides a direct connection between the public and the cash in the tills of the businesses in the community. This effectively turns every till into a virtual ATM.

As well as certainty and peace of mind, the use of the Cash-in-Shop service removes both the need for purchase and the requirement that the customer asks for cash at the till. The App has the transaction confirmation code. The user simply shows this at the till, the code is scanned by the business's reader and then the transaction is executed. The customer gets the cash they wanted and settlement to the business is put in process.

As a cash withdrawal service Cash-in-Shop may be viewed as an enhancement of the traditional cashback service. This enhancement can also be extended to include cash deposit, with the public and local businesses able to deposit either at the till itself or into a deposit taking device on the premises. The device is likely to be required for security reasons when larger amounts of cash are being deposited. Ideally, the device would incorporate recycling and withdrawal functionality, to reduce the number of cash pickups required. In the absence of this functionality, recycling the cash for local reuse in the CMO vehicle could be considered.

In relation to coins, even in the absence of automated processing, community businesses could encourage the public to bring in their coins. There are simple machines costing less than £200 which can be used for coin sorting in the SME environment. Businesses can then use the coins for till floats. In July 2020, triggered by a lack of coins more than carbon footprint concerns, Wawa and other convenience stores in the US, rewarded their customers for bringing in their hoarded coins to overcome a chronic shortage caused by COVID-19³⁶. This enabled cash payments to continue despite problems in relation to the availability of coins from the US Mint.

12.5.2 REDUCING COIN VOLUMES

The carbon footprints and costs of 1p and 2p coins are substantial; removal, or substantial reduction, of the need for these coins at POS would significantly reduce the carbon footprint of cash.

There have been discussions in recent years in relation to removing 1p and 2p coins from circulation. If the removal of both is not possible for "political" reasons, experts believe the best option would be to discontinue use of 2p coins. It seems 1p coins, once issued, relatively rarely reappear in the UK cash distribution network, whereas billions of 2p coins do so.

Leaving aside the potential to remove one or more denominations of coins from circulation, there are a number of measures which can be implemented to reduce the need for coins to give as change.

One potential step is for businesses to reduce or eliminate "price pointing" i.e. pricing at £3.95 or

£3.99 rather than £4. This would have obvious benefits in reducing the need for low denomination coins. Some commentators have expressed concerns regarding the inflationary impact of such a step but, in practice, it is likely to lead to an overall price increase of less than 1%.

Another option, and one that has been considered previously is price rounding of cash payments to the nearest 5 pence.

³⁶ Wawa asks customers to use exact change citing coin shortage, CBS News, July 2020, available at <https://www.cbsnews.com/news/coin-shortage-businesses-exact-change-credit-debit/>

This has already been implemented in some countries, and the European Commission is currently reviewing uniform introduction of rounding (open for public feedback to 26 October 2020).

Introduction of rounding in the UK would be a good step towards carbon neutrality of cash distribution.

More innovative ways of reducing the use of coins are also being developed. One example is an App and card-based solution, where change that would previously have been offered in coins is instead credited to the customer's App or card. The deposited amount can then either be used for future purchases or credited to a bank account. This has been used for some time in South Korea, with change returned to the shopper's travel card. An alternative option is to transfer the change to a charity – an automated version of the charity jar on the shop counter.

All the measures and innovations detailed above bring about more efficient community use and reuse of cash, with a resultant reduction in the need for carbon emitting transportation.

It is clear that the number of replenishment visits to ATMs and retail is certainly capable of being managed down, bringing corresponding reductions in the overall Carbon Footprint associated with ATM operations, and cash distribution.

12. 6 KEY ELEMENTS FOR CARBON REDUCTION AND LOCALISATION

- Every community needs local facilities for withdrawal and deposit of cash, both notes and coins
- Cashback and Cash-in-Shop should be promoted
- Cash deposit in shops should be promoted, both over-the-counter and, for larger deposits, in machines
- Machines used for deposit of cash should be recycling enabled
- Where machines cannot recycle, local alternative means of recycling should be introduced
- Implement measures to reduce the use of coins
- Increase local and online maintenance of machines

13 SUPPLIER AND THIRD-PARTY ENGAGEMENT

13.1 SUPPLIER ENGAGEMENT

Supplier engagement acts as a key incentive for suppliers within the cash industry to set and act upon its own targets. It also encourages the companies who are purchasing services to take responsibility for scope 3 emissions.

Where senior staff take personal responsibility, including impact on their earnings, for reaching targets those targets should include scope 3.

Barclays has set a strong example in vendor engagement, being recognised for leadership in supply chain engagement and listed in CDP's Supplier Engagement Leader board in 2019.

13.2 THIRD PARTY ENGAGEMENT

There are other important third parties whose involvement in zeroing carbon footprint are required.

The most notable of these in the cash distribution cycle is the host of off-branch ATM locations – the corner shop, leisure mall, transport hub, etc. It is too easy for companies involved in cash distribution to ignore the scope 3 elements of GHG emissions. With ATM power consumption being a key element in cash distribution's carbon footprint, the source of power for remote ATMs must be measured and fully declared. All operators of ATMs must include the assessment of ATM power source as part of their site selection criteria, and must take responsibility for zeroing the emissions.

13.3 EXAMPLES OF SUPPLIER ENGAGEMENT

In 2019, Barclays reached out to 120 suppliers to complete CDP's Climate Change questionnaire to understand their suppliers' approach to climate change and emissions reductions.

They achieved a 56% response rate from suppliers in 2019. They have now set a target to achieve a 90% response rate from suppliers in responding to CDP's Climate Change questionnaire.

Barclays also aim for 80% of their suppliers to report carbon emissions to create a robust Scope 3 supply chain emissions baseline and track any emissions reduction initiatives across their supply base³⁷.

13.3.1. BANK OF ENGLAND

The Bank is embedding carbon and environmental criteria in the tenders for the provision of new polymer. They are also encouraging their suppliers to invest in carbon offsets to achieve carbon neutrality for polymer production. Both chosen suppliers for the £50 polymer banknotes have committed to carbon neutrality on the polymer substrate by 2021.

13.3.2. ROYAL MINT

The Royal Mint has introduced an ethical and sustainable purchasing policy with key suppliers.³⁸ The policy encourages key suppliers to have an ethical sourcing policy or be members of a recognised responsible sourcing organisation or equivalent body.

This encourages suppliers to obtain materials from sustainable sources, minimise their impact on the environment and encourage the achievement of standards such as ISO 14001 the Environmental Management Standard, ISO 50001 the Energy Management Standard and SA 8000 Ethical Standard. The policy also promotes waste reduction and the use of recycled materials to minimise the use of secondary materials and landfill for waste disposal. Suppliers are urged to assess their carbon footprint and have in place action plans to reduce and monitor emissions. The Royal Mint encourages suppliers to attend Royal Mint supplier workshops, where the above ethos is promoted.

13.4 KEY ELEMENTS FOR CARBON REDUCTION VIA SUPPLIER AND THIRD PARTY ENGAGEMENT

- All ATM operators should include carbon footprint as a key criterion in supplier selection
- Carbon footprint targets should include targets for suppliers
- Operators with ATMs sited in off-branch locations should ensure renewable power source for the ATM

³⁷ 2018-2030 targets (progress to date and accelerated targets), Barclays, available at: <https://home.barclays/citizenship/the-way-we-do-business/direct-environmental-impacts/>

³⁸ The Royal Mint Limited consolidated annual report 2019, available at: https://www.royalmint.com/globalassets/the-royal-mint/pdf/annual-reports/201819_royal_mint_limited_annual_report.pdf

14 CONCLUSIONS AND RECOMMENDED NEXT STEPS

“Two dates should now be seared in everyone's mind: 2030 and 2050. By 2050 at the latest, and ideally by 2040, we must have stopped emitting more greenhouses gases into the atmosphere than Earth can naturally absorb through its ecosystems (a balance known as net-zero emissions or carbon neutrality). In order to get to this scientifically established goal, our global greenhouse gas emissions must be clearly on the decline by the early 2020s and reduced at least 50 per cent by 2030.”

Christiana Figueres and Tom Rivett-Carnac, *The future we choose*³²

Climate change is frequently called a “collective action problem,” meaning that victory requires participation from everyone: all countries, all industries, all individuals. This message is key to the way forward of LINK and the cash distribution industry.

In several areas of the cash industry, environment benefits can comfortably sit side by side with cost reductions. However, it is clear that pursuit of improved profitability will not always sit happily with reducing climate change. Pursuit of increased value will, though, and that value needs to include social care.

The key causes of cash distribution’s carbon footprint are ATM fossil power consumption, and transport fossil fuel consumption. Progress in resolving these issues has been inconsistent, with some parties far more active than others. Urgent action is required, because failure to beat or meet the target dates will turn the task into an even bigger one, that of restoration and reparation as opposed to prevention.

ATM operators can drive the zeroing of the cash distribution carbon footprint with the footprint of the ATM network being included in the overall measurement of the company’s carbon footprint.

ATM operators should therefore set their targets for reducing the carbon footprint of cash distribution, with these being reviewed and published regularly.

³⁹ *The future we choose: surviving the climate crisis*, Christiana Figueres & Tom Rivett-Carnac, Manilla Press, 2020

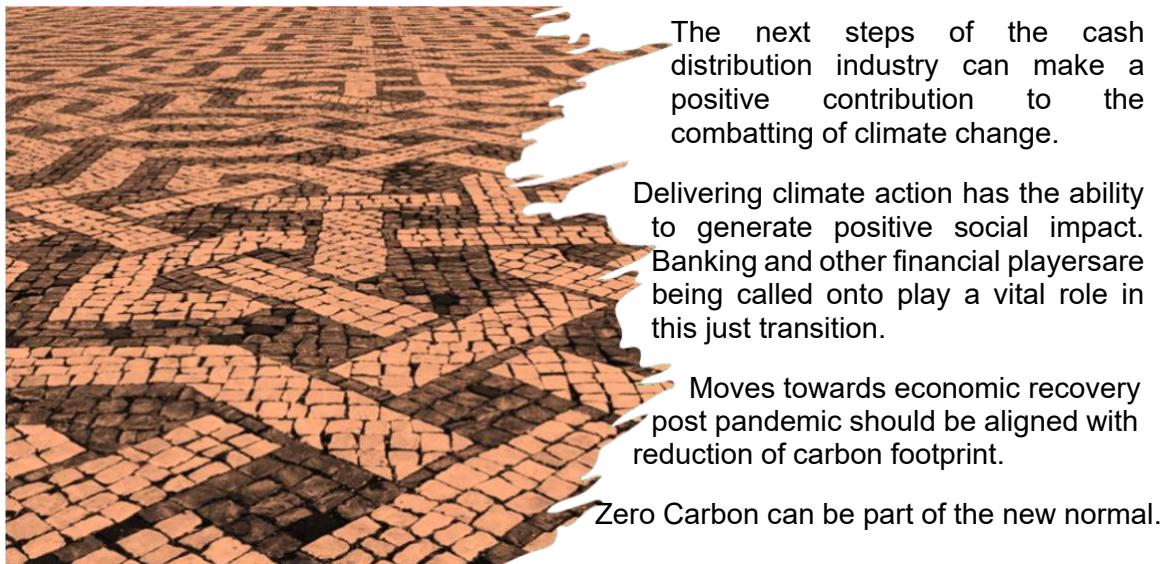
These targets should include:

- **Zero Carbon for each operator's usage of power (including powering of ATMs on own premises) by 2022.**
- **All vehicles, for cash distribution and equipment servicing, to be migrated to renewable power by 2026.**
- **Full Zero Carbon by 2030.**
- **Clear targets for, and measurement of, suppliers' carbon footprint**
- **Renewable power source for all ATMs, including those at remote locations. We suggest that operators be allowed to offset carbon emissions at remote locations until 2026, after which the sites must be Zero Carbon in their own right.**
- **Any use of offsets must be declared in detail.**
- **Review ATM locations to understand the issue of duplicate machines.**
- **Steps to localise and recycle, with wider availability of both deposit and recycling.**
- **Coordination between operators to review sharing of provisions and services, such as cash centres and engineer.**

ATM operators should also include carbon footprint as a key criterion in supplier selection and it is also recommended that achievement of carbon footprint targets should be criterion in senior staff remuneration.

Targets will be met by employing a mix of sticks and carrots. These can be built into supplier contracts as well as staff remuneration.

There may well be external incentives too, and If carbon tax is introduced in 2021, we may see improved focus in many areas next year.



15 ABOUT THE AUTHORS

Ron Delnevo - Ron Delnevo joined Euronet UK in 1998, led an MBO in 2003 and a trade sale to Cardtronics in 2005. He ran the company – “Bank Machine” - until 2012. During that time, Ron was an elected director of the UK Payments Council, served on the governance committee of the LINK ATM Network and Chaired the European Board of the ATM Industry Association

Ron now works as a consultant for a number of organisations, whilst also leading Cash & Card Consultants, a company he established a decade ago. He is a widely-recognised thought leader on many aspects of financial services, including payment choice, and is invited to speak at conferences around the World.

Ron recently completed a five-year term as Trustee of Citizens Advice and is currently the elected Chairman of CaLP, the Cash Learning Partnership, an organisation established by a number of the world's leading charities.

Debbie Smyth - Previously a researcher and translator at British Library and technical libraries, Debbie moved to the design and development of public library automated systems around Europe.

Debbie has worked in the ATM industry for over 30 years. She worked at FTS, a founder member of the LINK network, managing the required changes as other UK ATM networks merged with LINK. She joined Euronet UK in 2000, participating in the MBO and creation of Bank Machine. She continued there until 2013 in the role of Operations Director, bringing key operations services in-house, including the set-up of the Green Team cash-in-transit company, plus internal engineering and installations.

Debbie now works as a consultant for Logical Intent and Cash and Card World, providing consultancy services to the ATM Industry Association and a number of other cash, ATM and banking organisations.

ANNEXES

ANNEX 1 – ABBREVIATIONS

BBA	British Bankers' Association
BEAPFF	Bank of England Asset Purchase Facility Fund
BEIS	Department for Business, Energy & Industrial Strategy
BES	Biennial Exploratory Scenario
BoE	Bank of England
CCC	Committee on Climate Change
CDP	formerly Carbon Disclosure Project
CfD	Contracts for Difference scheme
CFRF	Climate Financial Risk Forum
CIT	Cash in Transit
CMO	Cash Management Organisation
CO2	Carbon dioxide
COP26	the twenty-sixth session of the Conference of the Parties
Covid-19	Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)
CRM	Cash Recycling Machine
CSA	climate scenario analysis (CSA)
DEFRA	Department for Environment, Food and Rural Affairs
DNB	De Nederlandsche Bank
DNO	Distribution Network Operators
FCA	Financial Conduct Authority
EpE	Enterprises pour l'Environnement
FES	Future Energy Scenarios
FPC	Financial Policy Committee

FSB	Financial Stability Board
FTE	Full-time Equivalent
FTF	First Time Fix
G20	Group of Twenty – Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom and the United States.
G7	Group of Seven – Canada, France, Germany, Italy, Japan, the United Kingdom and the United States
GCV	Gross Calorific Value (related to combustion of gas)
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWP	Global Warming Potential
HVAC	Heating, ventilation, and air conditioning
HVO	Hydrotreated Vegetable Oil
IDC	International Data Corporation
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilowatt hour
LCA	Life Cycle Assessment
LCCC	Low Carbon Contracts Company
LCIA	Life Cycle Impact Assessment
MPC	Monetary Policy Committee
NCS	Note Circulation Scheme
NDC	Nationally Determined Contributions
NGFS	Network for Greening the Financial System
NIC	Notes in circulation
NLF	National Loans Fund

NRMM	Non-Road Mobile Machinery
OLEV	Office for Low Emission Vehicles
ONS	Office for National Statistics
PACE	Platform for Accelerating the Circular Economy
PCAN	Place-based Climate Action Network
POS	Point of Sale
PRA	Prudential Regulation Authority
PRC	Prudential Regulation Committee
RTFO	Renewable Transport Fuel Obligation
S&NI	Scotland and Northern Ireland
SBT	Science-Based Targets
SBT-FI	Science-Based Targets for Financial Institutions
SIF	Sustainable Insurance Forum
SM&CR	Senior Managers and Certification Regime
SRN	Strategic Road Network
TCFD	Task Force on Climate-related Financial Disclosures
TTW	Through the Wall ATM
ULEV	Ultra-Low Emissions Vehicle
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WACI	Weighted Average Carbon Intensity
WDSG	Wholesale Distribution Steering Group
WHO	World Health Organisation
WHPa	Working Hours per annum

ANNEX 2 – TERMINOLOGY

Carbon budget	Legally binding long-term emissions reduction targets
Carbon footprint	“A carbon footprint is the total greenhouse gas (GHG) emissions caused directly and indirectly by an individual, organization, event or product” – Carbon Trust
Carbon neutrality	Improvements in carbon footprint are often referred to as a move to carbon neutrality or net-zero, not to Zero Carbon. This involves the use of the removal of carbon from the atmosphere post-emission, and/or the offsetting of carbon footprint, by generating sufficient renewable energy to compensate for the gases emitted.
Carbon offsetting	<p>Carbon offsetting is the creation of sufficient renewable energy to compensate for an adverse carbon footprint.</p> <p>To have any value, offsetting requires acceptance of climate change as a worldwide problem, not a local issue. It allows carbon emission at a factory in Manchester to be compensated for by, say, new trees growing in Manchuria. It is not easy to ensure it takes place, or that it remains in place. Nor are the required volumes easy to achieve.</p> <p>The four key elements to be considered in offsetting are:</p> <ul style="list-style-type: none"> 1) purpose – are the trees planted specifically for the offset payment or would they have happened anyway? 2) permanence – will these trees continue to grow and compensate for the carbon that they are offsetting? Increasing occurrences of wild-fires is just one reason to call that into question. 3) single use - once an offset is purchased, the underlying emissions reduction must not be sold again. 4) leakage - leakage can occur when an offsetting area of forest is designated for protection but leads to increased deforestation in unprotected areas. <p>It should be noted that the GHG protocol does not allow offsets to be counted when calculating organisational carbon footprint and reduction</p>
Carbon removal	Carbon-removal strategies remove carbon dioxide from the atmosphere and store it through various means, such as in soils, trees, underground reservoirs, rocks, the ocean and even products like concrete and carbon fibre. Each approach has its own risks and benefits.

Just transition	A unifying set of principles, processes, and practices to be used by industry, society and regulators to shift from an extractive economy to a regenerative economy. This requires approaching production, delivery and consumption cycles holistically and waste-free. The term 'just transition' was first coined by North American unions in the 1990s to describe a support system for workers unemployed due to environmental protection policies. It has become a framework developed by the trade union movement to encompass a range of social interventions needed to secure workers' rights and livelihoods when economies are shifting to sustainable production, primarily combating climate change and protecting biodiversity.
Life cycle assessment	"Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle" (ISO 14040:2006, section 3.2)
Life cycle impact assessment	"Phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product" (ISO 14040:2006, section 3.4)
Net negative carbon	The point at which we are removing more carbon from the air than we emit.
Net Zero Carbon	Improvements in carbon footprint are often referred to as a move to carbon neutrality or net-zero, not to 'Zero Carbon'. This involves the use of the removal of carbon from the atmosphere post-emission, and the offsetting of carbon footprint, by generating sufficient renewable energy to compensate for the gases emitted.
Scope 1 emissions	Direct company emissions from owned or controlled sources
Scope 2 emissions	Indirect emissions from purchased energy.
Scope 3 emissions	Indirect emissions that occur within a company's value chain, both upstream and downstream. E.g. home working, outsourced services, off-site ATM
Ultra Low Emissions Vehicle	Any electric or hybrid vehicle that emits less than 75g of carbon dioxide (CO ₂) per kilometre travelled, with a capability of travelling a minimum range of 10 miles with zero CO ₂ emissions.

Zero Carbon	<p>The carbon footprint of various companies, industries and personal impact are being measured and published. Though there are more who appear to be waiting for a “miracle” rather than measuring and taking action.</p> <p>The desired carbon neutrality is achieved through reducing the output of carbon dioxide and other greenhouse gases. To limit emissions we must ramp up renewable energy, boost energy efficiency, halt deforestation and curb super pollutants, such as hydrofluorocarbons. The limiting GHG emissions must be not simply rapid, but also permanent.</p> <p>The cost, speed and availability of options to reduce emissions look unlikely to achieve the targets we have set around the world. Some industries in particular, including air transport and heavy industries such as steel and chemicals will find it hard to achieve zero emissions.</p>
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ANNEX 3 - CLIMATE-RELATED COMPANIES, BODIES AND SCHEMES

Banking on a Just Transition Project

Grantham Research Institute at LSE and the Sustainability Research Institute at the University of Leeds, working in partnership with UK Finance, to research the just transition of the banking industry.

www.lse.ac.uk/GranthamInstitute/financing-a-just-transition/

Carbon Trust

The Carbon Trust is a partner for businesses, governments and organisations around the world – supporting them in realising ambitious plans for a sustainable, low carbon future. They believe that environmental sustainability and economic prosperity can go hand-in-hand. Their mission, stated by Tom Delay, Chief Executive, is “to accelerate the move to a sustainable, low carbon future - today, that means leaders setting netzero pathways and everyone taking steps to reduce their environmental impact”.

<https://www.carbontrust.com>

CDP

CDP is a not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts. CDP Global is an international non-profit organization comprising of CDP Worldwide Group, CDP North America, Inc. and CDP Europe AISBL. It is directed by a board of trustees and board of directors respectively. As an international organization, CDP receives funding support from a wide range of sources.

CfD

The Contracts for Difference scheme is the UK government’s main mechanism for supporting low-carbon electricity generation. It incentivises investment in renewable energy by providing funding for high up-front costs and giving ongoing direct protection from volatile wholesale prices.

Chapter Zero

This is a special network for non-executive directors committed to developing their knowledge of the implications of climate change for UK business, enabling them to better understand how it is likely to affect their companies and sectors, and to encourage their boards to hold informed and strategic discussions and respond effectively to the climate change challenge.

<https://www.chapterzero.org.uk>

EcoAct
An international consultancy and project developer, helping businesses and organisations succeed in their climate ambitions, and publishers of white papers and statistics. They joined Atos on 1 October 2020. https://eco-act.com
EV 100
EV100 is a global initiative bringing together forward looking companies committed to accelerating the transition to electric vehicles (EVs) and making electric transport the new normal by 2030. https://www.theclimategroup.org/project/ev100
E-waste coalition
A group of seven UN entities that have come together to increase cooperation and more efficiently provide support to Member States and Parties to address the e-waste challenge. The coalition brings together: The International Labour Organization (ILO); the International Telecommunication Union (ITU); the United Nations Environment Programme (UNEP); the United Nations Industrial Development Organization (UNIDO); the United Nations Institute for Training and Research (UNITAR); the United Nations University (UNU), and the Secretariat of the Basel and Stockholm Conventions. It is supported by the World Business Council for Sustainable Development (WBCSD), the World Health Organization (WHO) and the World Economic Forum and coordinated by the Secretariat of the Environment Management Group (EMG)
Global Footprint Network
Founded in 2003, aiming to make ecological limits central to decision-making. GPN's worldwide achievements have been recognised in a number of awards, including the 2018 World Sustainability Award.
Grantham Research Institute on Climate Change and the Environment
Established in 2008 at the London School of Economics and Political Science, bringing together international expertise on economics, as well as finance, geography, the environment, international development and political economy to establish a world-leading centre for policy-relevant research, teaching and training in climate change and the environment. www.lse.ac.uk/grantham/

Intergovernmental Panel on Climate Change

The IPCC was created to provide policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options. IPCC reports are neutral, policy-relevant but not policy-prescriptive. The assessment reports are a key input into the international negotiations to tackle climate change. The IPCC is now in its sixth assessment cycle, in which the IPCC is producing the Sixth Assessment Report (AR6), due for release in 2022.

National Grid ESO

A legally separate business within the National Grid PLC family since 2019, this is the electricity system operator part of the business

PACE

Platform for Accelerating the Circular Economy (PACE)

RE100

RE100 is a global initiative bringing together the world's most influential businesses committed to 100% renewable electricity. Led by the Climate Group and in partnership with CDP, their stated mission is to accelerate change towards Zero Carbon grids at scale.

Sustainability Research Institute at the University of Leeds

Researches climate change, energy, transport, water, resource use, land use, conservation, cities, communities, business and lifestyles, specialising in participatory, action-oriented research that brings together government, business, NGOs and local communities.

<https://environment.leeds.ac.uk/sustainability-research-institute>

Task Force on Climate-related Financial Disclosures (TCFD)

In 2015, the Financial Stability Board (FSB) established the industry-led Task Force on Climate-related Financial Disclosures (TCFD). The TCFD was asked to develop voluntary, consistent climate-related financial disclosures for use by companies in providing information to lenders, insurers, investors and other stakeholders, which were published in the TCFD Recommendations Report in 2017.

www.fsb-tcfd.org

United Nations Framework Convention on Climate Change

The UNFCCC secretariat (UN Climate Change) is the United Nations entity tasked with supporting the global response to the threat of climate change. The Convention has near universal membership (197 Parties) and is the parent of the 2015 Paris Agreement. The secretariat provides technical expertise and assists in the analysis and review of climate change information reported by Parties and in the implementation of the Kyoto mechanisms. It maintains the registry for Nationally Determined Contributions (NDC) established under the Paris Agreement, a key aspect of implementation of the Paris Agreement.

<https://unfccc.int>

WMO Global Atmosphere Watch (GAW)

The Global Atmosphere Watch is a worldwide system established by the World Meteorological Organization – a United Nations agency – to monitor trends in the Earth's atmosphere. Global Atmosphere Watch studies the variability and trends in atmospheric composition and related physical parameters, and assesses the consequences, issuing regular greenhouse gas bulletins.

ANNEX 4 – CLIMATE CHANGE TARGETS AND LEGISLATION

1992	The Kyoto protocol ⁴⁰ was the first agreement between nations to mandate country-by- country reductions in greenhouse-gas emissions. It arose from the UN Framework Convention on Climate Change (UNFCCC) at the 1992 Earth Summit and was finalised in Kyoto in December 1997.
2005	Years of negotiation followed the Kyoto meeting the protocol entered into force in February 2005
	The UK responded quickly and has paved a strong path for others to follow, in both evaluation and in legislation dealing with the issue.
2006	In 2006, two major UK government-sponsored reports were published.
	The first was the Stern Review on the Economics of Climate Change ⁴¹ . This seminal 700- page report was published on 30 October 2006.
	Less than two months later, on 1 December 2006, the Eddington Transport Study ⁴² was published. This work detailed the impact of transport decisions on the economy and environment of the United Kingdom.
2007	In 2007, the UK Department of Transport produced a report entitled “Towards a Sustainable Transport System” ⁴³
2008	These and other studies culminated in Royal Assent for the Climate Change Act 2008 ⁴⁴ . This Act set a target of reducing greenhouse gases by 80% as compared to 1990 levels, by the year 2050. It also established the Committee on Climate Change (CCC) to oversee achievement of that target.

⁴⁰ Kyoto protocol to the United Nations Framework Convention of Climate Change, available at:
<https://unfccc.int/resource/docs/convkp/kpeng.pdf>

⁴¹ Stern Review Report on the Economics of Climate Change, 2006, available at:
https://webarchive.nationalarchives.gov.uk/20100407172811/http://www.hm-treasury.gov.uk/stern_review_report.htm

⁴² The Eddington Transport Study, available at:
<https://webarchive.nationalarchives.gov.uk/20081230093524/http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/>

⁴³ Towards a Sustainable Transport System – Supporting Economic Growth in a Low Carbon World available at:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228953/7226.pdf

⁴⁴ Climate Change Act 2008, available at: <https://services.parliament.uk/Bills/2007-08/climatechangehl.html>

2016	The Paris Agreement ⁴⁵ entered into force on 4 November 2016 and was the first-ever universal, legally binding global climate change agreement. Its central aim was to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels, and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.
2018	The Katowice package ⁴⁶ adopted at the UN climate conference (COP24) in December 2018 contains common and detailed rules, procedures and guidelines that operationalise the Paris Agreement. It covers all key areas including transparency, finance, mitigation and adaptation, and provides flexibility to Parties that need it in light of their capacities, whilst enabling them to implement and report on their commitments in a transparent, complete, comparable and consistent manner. It will also enable the Parties to progressively enhance their contributions to tackling climate change, in order to meet the agreement's long-term goals.
2018	The importance of the UK Climate Change Act of 2008 was recognised in a review of it in 2018. Commenting on a decade of the CCC and the Act, Chris Stark, Chief Executive of the CCC, remarked: "The Act provided the impetus for the story of the last decade: decarbonising electricity. That was the right strategy, but it's not sufficient now...I'm pleased we've received the instruction to look again at the UK's long-term (2050) climate change target. Our advice is due to be published in Spring 2019, then all eyes will be on Parliament again." ⁴⁷
2019	The Climate Change Act, originally established in 2008, requires the UK government to set carbon budgets to act as "stepping-stones" towards the 2050 emissions target. These budgets are caps on the amount of greenhouse gases that can be emitted in the UK across a five-year period. In May 2019, as promised, the CCC issued the recommendation that the UK reduce GHG emissions by 100% from 1990 levels by 2050. The CCC also advised Scotland's targets to meet net-zero by 2045, and for Wales to reduce GHG emissions by 95% by 2050. These recommendations would deliver the commitment the UK made in the 2015 Paris Agreement ¹⁰ to keep global warming within 2 degrees. The UK was the first major economy to pass a net zero law. ⁴⁸

⁴⁵ The Paris Agreement, United Nations, 2015 available at

https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf

⁴⁶ The Katowice Package 2018, available at <https://unfccc.int/process-and-meetings/the-paris-agreement/paris-agreement-work-programme/katowice-climate-package>

⁴⁷ Marking 10 years of the climate change act, November 2019, available at:

<https://www.theccc.org.uk/2018/11/26/marketing-ten-years-of-the-climate-change-act/>

⁴⁸ In-depth Q&A: The UK becomes first major economy to set net-zero climate goal, CarbonBrief, June 2019, available at: [https://www.carbonbrief.org/in-depth-q-a-the-uk-becomes-first-major-economy-to-set-netzero-climate-goal](https://www.carbonbrief.org/in-depth-q-a-the-uk-becomes-first-major-economy-to-set-net-zero-climate-goal)

	<p>In June 2019, secondary UK legislation actioned the advice of the CCC and amended the target for reduction in GHG established in the Climate Change Act 2008 from 80% to “at least 100%” by 2050 ⁴⁹</p>
	<p>The European Commission (EC) published its European Green Deal⁵⁰ in December 2019, establishing a plan for the bloc to achieve carbon neutrality by 2050. Its main ambition is for Europe to become the first climate-neutral, industrialised continent. It aims to do so by reviewing each existing European law on its climate merits. The deal calls on the EU bloc to restore biodiversity, cut pollution levels and boost the efficient use of resources by moving to a clean, circular economy. Overall, it has targeted to cut greenhouse gas emissions to at least 55% below 1990 levels. This is a substantial increase compared to the existing target upwards from the previous target of at least 40%.</p>
2020	<p>A strong Environment Bill ⁵¹ was introduced into Parliament in January 2020. This, in turn, acted as a key vehicle for delivering the bold vision set out in the 25 Year Environment Plan ⁵²</p>
2020	<p>In December 2020, the CCC recommended that the sixth carbon budget ⁵³, to run from 2033 to 2037, should be set at 965m tonnes of CO2 equivalent (MtCO2e), equating to, on average, 193MtCO2e annually. Expected to be legislated by June 2021.</p> <p>(The fifth carbon budget was set in November 2015, establishing a limit of 1,765 MtCO2e, including emissions from international shipping, effectively limiting annual emissions to an average 57% below 1990 levels. ⁵⁴</p> <p>In 2019, annual emissions stood at 522 MtCO2e.</p> <p>As the first carbon budget advice to emerge since the UK set a net-zero goal last year, it marks a critical point for the country’s trajectory towards addressing climate change.</p>

To achieve the UK targets set in 2019 and 2020 clearly requires rapid and unprecedented action across the UK economy and wider society, supported by both innovation and policy. Every industry has an obligation to work how their impact on the climate can be reduced, create targets and action those plans.

The cash distribution industry can be no exception.

⁴⁹ Climate Change Act 2008 Order 2019, available at: <https://www.legislation.gov.uk/uksi/2019/1056/contents/made>

⁵⁰ European Green Deal, European Commission, December 2019, available at: https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf

⁵¹ Environment Bill 2020, available at: <https://www.gov.uk/government/publications/environment-bill-2020>

⁵² 25 Year Environment Plan, DEFRA, available at: <https://www.gov.uk/government/publications/25-year-environment-plan>

⁵³ Sixth carbon budget, CCC, December 2020, available at: <https://www.theccc.org.uk/publication/sixth-carbon-budget/>

⁵⁴ Fifth carbon budget, CCC, November 2015, available at: <https://www.theccc.org.uk/publication/the-fifth-carbon-budget-the-next-step-towards-a-low-carbon-economy/>

ANNEX 5 – IMPACT OF COVID-19 PANDEMIC

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Fueling a sustainable economic recovery by reigniting business investment and creating green jobs is the right response to the challenges unleashed by COVID-19.

- Dame Carolyn Fairbairn, CBI Director-General, October 2020

5-1 IMPACT ON ECONOMY

The full economic implications of COVID-19 remain unknown, but the pandemic has certainly revealed the world economy's vulnerability to unexpected incidents and the importance of localisation and resilience.

It has highlighted strategic questions over climate critical sectors of the economy, including aviation, energy and road transport. It is now apparent that the deployment of clean technologies can be a cost-effective, resilient and more local strategy for generating significant economic multipliers in the recovery.

5-2 IMPACT ON ENVIRONMENT AND CARBON FOOTPRINT

COVID-19 is impacting many aspects of carbon footprint.

The latest IEA data, released in April 2020, show that the drastic curtailment of global economic activity and mobility during the first quarter of 2020 pushed down global energy demand by 3.8% relative to the first quarter of 2019. Coal (8%) and oil (5%) demand was impacted more than gas (2%), but electricity (20%) was impacted most. If lockdowns last for many months and recoveries are slow across much of the world, as is increasingly likely, annual energy demand is predicted to drop by 6% in 2020⁵⁵.

The National Grid's FES 2020 noted the certain impact of COVID-19 on the future of energy, but decided that uncertainty and lack of evidence of this impact at the time of producing the 2020 report meant it had to be excluded. The impact of COVID-19 will be discussed with stakeholders in the second half of 2020 and will form part of FES 2021.

⁵⁵ Global energy and CO₂ emissions, IEA, April 2020, available at: <https://www.iea.org/reports/global-energy-review-2020/global-energy-and-co2-emissions-in-2020>

5-3 IMPACT ON INTENT

The pandemic has changed the working and home life of many and has raised awareness of vulnerability at all levels.

Despite the delay of COP26, research and measuring has continued, and several new and updated analysis reports have been released. There is now much new information available to aid industries' decisions on how to become carbon zero.

5-4 CHANGES IN EMISSION TYPE AND SCOPE

As a result of closures and reduced operations during lockdown and recovery, many companies will be demonstrating a reduction in emissions. This will largely fall in line with the reduction of office building energy consumption. However, despite these calculated reductions, the emissions have not actually been eliminated, rather they have been relocated to employee homes beyond the company's direct control. The emissions have effectively been moved from scope 1 (Direct company emissions from owned or controlled sources) and scope 2 (Indirect emissions from purchased energy) to scope 3 emissions, which are not necessarily reported in company disclosures. It is worth noting that under the GHG protocol, homeworking is currently an optional disclosure covered in the Employee Commuting (Category 7) section⁵⁶.

In October 2020, EcoAct, in conjunction with Lloyds, NatWest and Bulb, issued a white paper on the impact of home working, with useful methods of calculating the emission impact⁵⁷. These recent changes stress the importance of the declaration of emissions in all three scopes.

5-5 IMPACT ON CASH INDUSTRY

The COVID-19 pandemic has meant that in-person payments of all types have reduced in 2020. Cash potentially suffered more than other types of payments due to misunderstanding of comments on the hygiene of banknotes by organisations such as WHO, along with a desire for social distancing at the time of payment.

In addition, access to cash was problematic for many. ATMs in locations such as shopping malls and leisure complexes were inaccessible during lockdown, and others were closed to ensure social distancing, notable if several ATMs were sited together or where an ATM was very close to a heavy footfall location, such as a supermarket queue. Long queues at bank branches were partly due to people wanting to access more cash than they could get from an ATM.

⁵⁶GHG protocol technical guidance for calculating scope 3 emissions, available at:
https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf

⁵⁷Homeworking emissions, available at: https://info.eco-act.com/hubfs/0%20-%20Downloads/Homeworking%20emissions%20whitepaper/Homeworking%20Emissions%20Whitepaper%202020.pdf?hs_CtaTracking=3eff6f0c-0b64-4bd8-bcb4-306fd8f37883%7C7d4209ab-91ae-48dc-8961-ccda2beb511a

At the height of UK national lockdown in Spring 2020, cash withdrawal numbers at LINK ATMs dropped by 60% compared with the same period in 2019. In September 2020, a traditionally stable month unaffected by public holidays, ATM usage looked more settled with only a 30-35% drop in withdrawal numbers, and a 20% drop in amount of cash. These can be viewed as positive figures as far as cash demand is concerned, given the ongoing restrictions and localised lockdowns in various parts of the UK.

Despite the drop in ATM withdrawal numbers, the value of Notes in Circulation (NIC) did not see a decline over this period. In fact, NIC saw a slight increase following the government's first social distancing announcements, suggesting an increase in the hoarding of cash by both businesses and individuals. NIC held steady at this slightly elevated level, until another increase in early May.

5-6 UK ECONOMY MOVING FORWARD FROM COVID-19

The COVID-19 pandemic resulted in the postponement of COP26 in Glasgow, now scheduled for November 2021. Christiana Figueres, former UN climate chief heavily involved in the Paris Agreement of 2015, was not in agreement with that decision. She had viewed the Paris agreement to have set the COP26 summit as the moment when all countries would ramp up their targets and that urgent action was required to limit warming to 1.5C. However, in October 2020, she commented that she is now glad the postponement took place and that she is happy to have been wrong. She feels that many attitudes have changed for the better as a result of the pandemic, and the meeting in 2021 will be far more successful as a result.⁵⁸

Further positive actions in 2020 were noted by Tom Rivett-Carnac, political lobbyist for the United Nations Framework Convention on Climate Change, reporting in October 2020 that in recent months the number of businesses around the world, with commitment to net zero, had increased from 50 to 1500, and city commitments to targets had increased from 100 to 823.⁵⁸

It certainly appears that the sudden and fast-growing impact of the pandemic, has raised people's awareness and acceptance of the dangers of human encroachment into nature, the importance of believing science, and the fact that the world economy can so easily be brought to a halt.

As the UK emerges from the COVID-19 pandemic and focuses on economic recovery, there is an important opportunity to ensure the growth measures be aligned with net-zero, and also that they are applied in a fair, just and inclusive manner across the UK.

⁵⁸ Covid-19 and Climate Change – Time for a reset?, chaired by Rosie Boycott, available at: <https://www.youtube.com/watch?v=nhtTwCXkQxc>

In 2020, climate change and COVID-19 each pose massive threats to both health and economy. Whilst it can be hard to be positive about such a situation, this coincidence of danger could give much needed impetus to those who are seeking to combine recovery with the changes needed to positively impact climate change and address other environmental concerns.

In September 2020, talking via video link to a roundtable discussion at the UN in New York, Boris Johnson reiterated his government's pledge to "build back greener" after the Covid-19 pandemic⁵⁹.

5-7 CASH INDUSTRY MOVING FORWARD FROM COVID-19

It is not yet clear as to how far the recovery will go, though many industry commentators believe cash usage will not reach previous peaks.

Even when the impact of the pandemic has fully unwound, the number of cash withdrawals from ATMs is unlikely to stabilise for long. The forecast continuing decline in the use of cash for payments is likely to see further falls in both the number of ATM cash withdrawals and the volume of cash withdrawn.

However, no one is currently forecasting the complete elimination of cash use as a payment method and, in any event, given the increasing volume of cash in circulation, seemingly largely used as a store of value, the need for convenient access channels, through ATMs or otherwise, seems set to continue.

As bank branch numbers are set to decline further, the remote ATM estate will increasingly become the dominant access point for cash in the UK, augmented by innovations that will be considered later in this study.

⁵⁹ Prime Minister's speech to UN General Assembly September 2020, available at: <https://www.gov.uk/government/speeches/prime-ministers-speech-to-un-general-assembly-26-september-2020>

ANNEX 6 – CARBON REDUCTION

Science has shown that human activity has released more than 2 trillion metric tons of greenhouse gases into the Earth's atmosphere since the start of industrial growth in the mid-1700s, with most of the emissions taking place since the 1950s.

6-1 CARBON STATUS IN THE UK

The UK has made strong progress in cutting GHG emissions whilst growing the economy. It was the first country to introduce legally binding long-term emission reduction targets, known as carbon budgets, through the Climate Change Act in 2008.

Under this legal framework, the UK has led the world in delivering clean growth. Between 1990 and 2018, it reduced its emissions by 43% ⁶⁰ whilst growing the economy by 75%
⁶¹

DEFRA national statistics ⁶² show that in 2018, UK emissions of the seven greenhouse gases covered by the Kyoto Protocol were estimated to be 451.5 million tonnes carbon dioxide equivalent (MtCO2e), a decrease of 2.1% compared to the 2017 figure of 461.0 million tonnes. CO2 itself accounted for 81% of total UK greenhouse gas emissions in 2018

Emissions from transport fell by 1.4% (1.8 MtCO2e) in 2018, their first fall since 2013. Despite this transport remains the largest emitting sector, responsible for 28% of all greenhouse gas emissions in the UK.

Despite these strong improvements, the UK was still ranked 36th in the world for its CO2 emissions from consumption spread across its population, totaling at 8.34 tonnes per person in 2017 (latest data available).

⁶⁰ 2018 final figures, DEFRA, available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/862887/2018_Final_greenhouse_gas_emissions_statistical_release.pdf

⁶¹GDP chained volume measures, available at:

<https://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/abmi/qna>

⁶² 2018 UK Greenhouse Gas emissions, DEFRA, Feb 2020

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/863325/2018-final-emissions-statistics-summary.pdf

6-2 UK COMMITMENT

There are varying levels of visible commitment to carbon footprint targets by businesses in the UK. There are a number of guiding and supporting bodies with whom to align, and a number of valuable methods of measurement, but these variations make comparison of achievements and attitudes more challenging.

According to the UN Environment Programme (UNEP) inquiry, “Greening the Banking System”⁶³, banks are generally taking two approaches to sustainability.

Firstly, they are enhancing their environmental risk assessment by stress testing their portfolios against climate change risks under several scenarios.

Secondly, they are mobilising capital for green assets through the provision of loans, credit and savings products.

Compared to other sectors in our research, banks have better developed strategy and governance mechanisms than many other types of business, much due to their involvement in the Task Force on Climate-related Financial Disclosures (TCFD). In addition, EcoAct, an international consultancy helping businesses and organisations succeed in their climate ambitions, have commented that “after electricity, gas and oil supply and mining, the banking sector is the third most likely to be using CSA[climate scenario analysis]”⁶⁴.

6-3 CARBON FOOTPRINT FIGURES

Calculation of the many elements that make up the carbon footprint is complex. Many of the figures quoted in research, documentation and policies are based, from necessity, upon partially estimated figures. Many assumptions are made to generate intelligent estimates. As an example, figures used in the Department of Transport’s Decarbonising Transport paper⁶⁵ on air transport emissions uses assumptions and exclusions; they themselves admit that including land journeys to and from the airport would have significant impact on their figures.

This complex concept of carbon footprint is measured in a number of ways, with a variety of free tools available online, supplemented by services provided by various bodies. A list is provided in Annex 13 of this study.

⁶³ Greening the banking system: taking stock of G20 green banking market practice, Nick Robins and Jeremy Mc Daniels, September 2016, available at: http://unepinquiry.org/wp-content/uploads/2016/09/9_Greening_the_Banking_System.pdf

⁶⁴ The Sustainability Reporting Performance of the FTSE 100, EcoAct, September 2019, available at: <https://info.ecoact.com/sustainability-reporting-performance-ftse-100-2019>

⁶⁵ Decarbonising transport, Department of Transport, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878642/decarbonising-transport-setting-the-challenge.pdf

6-4 AID, INCENTIVES AND DETERRENTS

Many views are that additional aid, incentives and deterrents are required to achieve the current UK targets. Views are that more funding for carbon zero projects will be forthcoming before the end of 2020. It is not clear what help that may give to cash distribution industry.

Incentives may be more likely to take the form of stick than carrot. Carbon tax is applied in a number of countries, as a strong incentive to reduce carbon footprint.

In 1990, Finland was the first country to introduce a carbon tax. Since then, 15 European countries have followed, implementing carbon taxes that range considerable in value. Sweden levies the

highest carbon tax rate at €112.08 (US\$ 132.17) per ton of carbon emissions, followed by Switzerland (€83.17, \$98.08) and Finland (€62.00, \$73.11). You'll find the lowest carbon tax rates in Poland (€0.07, \$0.08), Ukraine (€0.33, \$0.39), and Estonia (€2.00, \$2.36).⁶⁶

The UK is considering implementation of such a tax in January 2021. A consultation setting out how the Carbon Emissions Tax would operate and how that tax might be developed, was held in 2020 and closed on 29 September 2020. Decisions are awaited.⁶⁷

⁶⁶ Carbon taxes in Europe, available at <https://taxfoundation.org/carbon-taxes-in-europe-2019/>

⁶⁷ Carbon emissions tax consultation, HMT, July 2020, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/902737/Carbon_Emissions_Tax_-_consultation.pdf

ANNEX 7 – COUNTRIES COMMITTED TO NET ZERO CARBON

Data correct as of 22 September 2020⁶⁸

Country / area	Target date	Status
Austria	2040	Policy position
Bhutan	Currently carbon negative and aiming for carbon neutrality as it develops	Pledged towards the Paris Agreement
California	2045	Executive order
Canada	2050	Policy position
Chile	2050	Policy position
China	2060	Statement of intent
Costa Rica	2050	Submission to UN
Denmark	2050	In law
EU	2050	Submission to UN
Fiji	2050	Submission to UN
Finland	2035	Coalition agreement
France	2050	In law
Germany	2050	In law
Hungary	2050	In law

⁶⁸ Which countries have a net Zero Carbon goal?, September 2020, available at:
[https://www.climatechangenews.com/2020/09/17/countries-netzero-climate-goal/](https://www.climatechangenews.com/2020/09/17/countries-net-zero-climate-goal/)

Country / area	Target date	Status
Iceland	2040	Policy position
Ireland	2050	Coalition agreement
Japan	ASAP after 2050	Policy position
Marshall Islands	2050	Pledged towards the Paris Agreement
New Zealand	2050	In law
Norway	2030 / 2050	Policy position
Portugal	2050	Policy position
Singapore	ASAP after 2050	Submission to UN
Slovakia	2050	Policy position
South Africa	2050	Policy position
South Korea	2050	Policy position
Spain	2050	Draft law
Sweden	2045	In law
Switzerland	2050	Policy position
UK	2050	In law
Uruguay	2030	Pledged towards the Paris Agreement

⁶⁸ Which countries have a net Zero Carbon goal?, September 2020, available at:

[https://www.climatechangenews.com/2020/09/17/countries-netzero-climate-goal/](https://www.climatechangenews.com/2020/09/17/countries-net-zero-climate-goal/)

ANNEX 8 – CASH ACCESS IN THE UK

Before looking more closely at cash distribution in the UK, since the distribution system is closely linked to provision of cash access, it is helpful to look at how the means of access to cash has changed in the last few decades.

Cash has long been a readily available means of payment for public and businesses. For the end user – the public or businesses – cash access was for many years scarcely an issue.

1960s-1970s

Before 1967, the only way of getting access to cash that was in a bank account was at a branch, using a cheque or by a business allowing cheque cashing. The Cheque Guarantee Scheme, facilitated by use of a signed plastic card, meant that any branch or business cashing a cheque had repayment guaranteed up to a limit of £50. This Scheme started in 1965 and ended in 2011.

However, neither branch access nor cheque use was the primary route for obtaining cash in the 1960s. The vast majority of adults obtained their cash from their employers, because at that stage almost everyone was paid weekly in cash, collecting their traditionally brown envelopes on either a Thursday or Friday when leaving work.

Even today – in 2020 – a number of people are paid in cash. However, the practice started to wane in the 1970s and, by the late 1980s, the vast majority of employees were being paid monthly, with the monies going directly into their bank accounts.

1980s

The density of bank branches, building society offices and post offices reached its peak in the late 1980s, when there was a total of 40,000 such premises in the UK, with an approximate 50/50 split between Banks & building societies, and post offices. Each of them gave a measure of both access to cash and the ability to deposit cash.

In 1986 there were 21,643 bank or building society branches in the UK⁶⁹, after which branch numbers declined. By 2014, when BBA stopped gathering the data, the numbers had reduced by 11,078 or 51%. After this time the data capture was taken on by ONS, and they show a further 22% decline from 2014 to 2019, to 10,405 branches. Post offices have dropped at an almost identical rate, to 11,600 in March 2019.

⁶⁹ Bank branch and ATM statistics, May 2019, available at:

[https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiSxauXvcTsAhWSqHEKHRoHB9MQFjAAegQIBBAC&url=http%3A%2F%2Fresearchbriefings.files.parliament.uk%2Fdocuments%2FCDP-2019-0140%2FCBP-8570-\(1\).pdf&usg=AOvVaw34co67CJ5_P0V5weXdRzG](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiSxauXvcTsAhWSqHEKHRoHB9MQFjAAegQIBBAC&url=http%3A%2F%2Fresearchbriefings.files.parliament.uk%2Fdocuments%2FCDP-2019-0140%2FCBP-8570-(1).pdf&usg=AOvVaw34co67CJ5_P0V5weXdRzG)

As the number of branches began to decline, access to cash was still not an issue for the vast majority of the UK public due to the increasing ubiquity of ATMs.

By the 1980s, bank ATMs were networked to at least allow their own customers to use any ATM in the bank's own estate. However, the advent of networking of ATMs by individual banks quickly provided the impetus towards the creation of a national network of ATMs, with 1985 seeing the first manifestation of LINK, followed by a number of other sharing agreements between banks and building societies. By the late 1990s Link had become UK National ATM Network.

The switch of the majority of the UK working population to monthly pay credited to bank accounts coincided with the issue of the first bank-issued debit cards in 1987, around 20 years after the first credit card was issued in the UK.

With salaries now being deposited in bank accounts, debit cards were very useful since they could be used at either ATMs or branches to obtain cash. Indeed, there was soon another use for debit cards, when Tesco became the first retailer to introduce debit card cashback, allowing their customers to obtain cash up to the limit of the card when buying merchandise from their stores.

1990s

So by 1990 there were a number of well-established conduits for cash. In no particular order these were:

- Wages paid in cash, the most traditional source for working adults
- Branch access, using cheque or card
- Cheque cashing, using guaranteed at non-bank businesses
- Debit Card Cashback, with purchase, at non-bank businesses
- ATMs

Branches remained the dominant source of cash until early in the new millennium, for the very good reason that ATMs were usually situated at branches. By 1998, thirty years after the launch of ATMs, there were 25,000 machines in the UK, with around 19,000 of those at branches.

1998 was perhaps the zenith for branch services in the UK. Although there had been some branch consolidation in the 1990s, mainly due to Building Societies becoming PLCs and subsequently being acquired by banks but, in essence, 1998 was the year when there were more branches than there would ever be again, and the same for branch ATMs.

1997 had been the year the UK saw nascent online banking services, a mere six years after the World Wide Web first allowed commercial services but, by 1998 there were only a handful of online banking users in the UK. However, the growth was to be phenomenal.

2000s and 2010s

Within ten years, 30% of bank customers were using online banking and by 2019, this figure had grown to 73%.

The growth of internet banking has, of course, been aided by the use of mobile phones for banking transactions, with the world's first fully functional banking App launched in the UK in 2011.

The growth of online banks, mobile payment apps, pay later services at POS, and other payment choices means that use of cash for payments has decreased as a proportion of payments. Health fears and desire for social separation have increased that decline during the COVID-19 pandemic.

In 1966, when the first credit card was launched in the UK, cash would have accounted for 96% plus of payments. By 2006, 62% of all payments in the UK were still made using cash. In 2016, that figure had fallen to 40% and by 2019 an estimated 30%.

Notwithstanding the fall in cash use for payments, the number of ATMs and the amount of cash accessed at them continued to increase until 2015, by which stage there were over 70,000 ATMs around the country, dispensing £180 billion. Cash withdrawals from ATMs actually peaked in 2012, when there were 2.915 billion. By 2015, withdrawals had decreased to 2.797 billion, though more cash was actually withdrawn in 2015 due to an increase in the average value of withdrawals.

ANNEX 9 – VOLUME AND FOOTPRINT OF NOTES AND COINS

9-1 VOLUMES

As of 2020, the Bank of England reports that are 3.9 Million banknotes in circulation in the UK, with an approximate value £71 Billion. In addition, there are around 29 billion coins in circulation.

The value of banknotes in circulation in the UK has increased virtually every year since the millennium. The value reached close to £70 Billion, made up of 3.9 Billion banknotes⁷⁰.

There are also Scottish and Northern Irish commercial bank issued banknotes in circulation to the total value of approximately £7.5 Billion.

The Bank of England estimates that only around £16 Billion of the £70 Billion of notes nominally in circulation actually circulate through ATMs, branches and retailers in the UK. The vast majority of remaining £54 Billion of UK banknotes are held as a store of value either in the UK or overseas.

UK Finance estimate that around £175 Billion of the £193 Billion of cash used for purchases in the UK was dispensed by ATMs. Given the fact that only £16 Billion of banknotes are actually circulating and allowing for the fact that £5 and £50 banknotes are rarely used in ATMS, it seems those £10 and £20 banknotes which dominate ATM usage must on average pass through ATMs more than 20 times each year.

There are also coins to the face value of around £4.5 Billion circulating in the UK, made up of approximately 29 Billion coins.

9-2 BANKNOTES

The 3.9 Billion banknotes in circulation by denomination are:

£5 – 415 million

£10 - 1.3 billion

£20 – 1.8 billion

£50 – 350 million

Banknotes are printed on behalf of the Bank of England and delivered by the printers to Note Circulation Scheme cash centres by Trunker.

⁷⁰Total value of all denomination banknotes in circulation in the United Kingdom (UK) from 2014 to 2020, Statista, 2020, available at: <https://www.statista.com/statistics/398992/banknotes-value-circulation-british-pounds-united-kingdom-uk/>

The Bank of England believe that a minimum of four denominations are required to ensure cash circulates efficiently. This is partly because when the Bank recalls a denomination because, for example, conversion to polymer, the remaining denominations are vital in smoothing the transition. Equally, the four notes work well for in-person transactions, allowing change to be offered in convenient denominations, without significant recourse to the use of coins. In addition, the four different denominations provide more of a challenge to counterfeit producers.

9-3 COINS

As regards coins, there are around 29 billion coins in circulation in the UK, estimated for 2016⁷⁰. By denomination these are:

1p – 11 billion

2p – 7 billion

5p – 4 billion

10p – 2 billion

20p – 3 billion

50p – 1 billion

£1 – 1.7 billion

£2 – 0.5 billion

Coins are produced by the Royal Mint and delivered on order to the cash centres of the commercial organisations which require them.

9-4 CASH IN CIRCULATION

For both banknotes and coins, there is a significant difference between the nominal value in circulation and the value of the banknotes and coins which are actually circulating.

The Bank of England estimates that only £13 Billion by value of banknotes are circulating. The remaining £58 billion are held as a store of value, both in the UK and in other markets.

UK Finance reports that approaching 90% of cash actually circulating goes through via ATMs. Since most ATMs only issue £10 and £20 banknotes, it can safely be assumed that almost all of the banknotes actually circulating are in those denominations.

As regards coins, the UK Finance Cash Services Division report that 1p coins barely circulate after reaching the hands of the public. Whilst some are returned to bank or post office branches by businesses accepting them for payment, the majority simply disappear, presumably mostly stored informally by the public.

⁷⁰ Wikipedia, available at: https://en.wikipedia.org/wiki/Coins_of_the_pound_sterling

The 2p coin does however circulate and this creates a significant transportation burden. Whilst Cash Services would like there to be no more than 50 miles between commercial Cash Centres, in practice the number of such centres has decreased significantly and is forecast to continue to do so. This means that coins sometimes have to travel over one hundred miles from a bank branch to a cash centre where they are sorted.

Coins are a different matter. Nearly half the coins nominally in circulation are 1p and 2p denominations. With, as previously noted, 1p coins barely circulating, the 2p coin represents the single biggest issue in relation to coin distribution.

Some coins are in over-supply, most notably the £2 and 2p coins. Production of both of these denominations has been halted due to oversupply⁷¹, with suggestions that no more will be needed to be manufactured for a decade. From a carbon footprint point of view, the costly issue transportation of those still in storage needs to be tackled.

There may well be a case to eliminate the 2p coin denomination. The £2 should also be reviewed.

9-5 CARBON FOOTPRINT OF BANKNOTES

The carbon footprint of coins has been fully assessed in a Bank of England commissioned report.⁷²

The Bank is focused on lowering the footprint of notes with carbon reduction plans in place for the polymer procurement process. Both chosen suppliers for the £50 have committed to carbon neutrality on the polymer substrate by 2021.

9-6 CARBON FOOTPRINT OF COINS

The use of energy continues to be a significant aspect of the organisation's environmental impact. The Royal Mint continually explores opportunities to improve energy efficiency throughout its activities and supply chain. This includes process improvements, investment in more energy efficient equipment and the development of new technologies.

During 2018–19, the Royal Mint has made a move to achieving a more sustainable energy future, whilst cutting emissions, through the use of renewable energy generated by a wind turbine.⁷³

⁷¹ Royal Mint to stop production of £2 and 2p coins due to excess stock, *Guardian*, September 2020, <https://www.theguardian.com/money/2020/sep/18/royal-mint-to-stop-production-of-2-and-2p-coins-due-to-excess-stock>

⁷² Carbon footprint assessment: paper vs polymer £5 and £10 banknotes, Thinkstep on behalf of Bank of England, July 2017, available at: <https://www.bankofengland.co.uk/-/media/boe/files/banknotes/polymer/carbon-footprint-assessment.pdf?la=en&hash=A2077D4BEF302DF8F8488503DEA041876627ECBD>

⁷³ Royal Mint Limited consolidated annual report 2018–2019, available here: https://www.royalmint.com/global/assets/the-royal-mint/pdf/annual-reports/201819_royal_mint_limited_annual_report.pdf

The Royal Mint commissioned an 'on-site' turbine, Delilah, late in 2018–19 which feeds directly to the site. This turbine generated 370,000 kWh for the year. Additionally, the previously installed photovoltaic (solar panel) systems generated 33,000 kWh.

The energy consumption figures include both consumed grid energy and 'on-site' generated energy. The significant change in energy consumption per tonne is a result of the removal of on-site casting of non-ferrous metals.

Total emissions for 2018–19 were 14,100 tonnes of CO₂ equivalent. The reduction in total emissions are in part due to the increased use of renewable energy during 2018–19 but also mainly due to the removal of on-site casting of non-ferrous metals.

The Royal Mint recognises in moving the production of non- ferrous metal to purchased goods/services that its greenhouse gas emissions move from scope 1 and 2 (direct emissions) to scope 3 emissions (indirect emissions due to the activities of The Royal Mint).

APPENDIX 10 - CARBON FOOTPRINT OF TRANSPORT

10-1 CARBON FOOTPRINT OF TRANSPORT IN THE UK

Transport is the largest contributor to UK domestic GHG emissions since 2016, contributing 28% of UK domestic emissions in 2018. Transport emissions are 4% higher than in 2013 and are only 3% lower than in 1990⁷⁴.

It should be noted that the position of transport as the largest contributor is due largely to the significant improvements made in other areas, particularly energy generation, with UK total emissions dropping by 43% 1990-2018⁷⁵.

Of all UK transport GHG emissions, road transport is the largest contributor, responsible for 91% of domestic transport emissions in 2018. The 2018 figures show cars responsible for 55% of the emissions, vans for 16% and HGVs for 17%.

10-2 UK CURRENT TARGETS

The Government's stated aim is to put the UK at the forefront of the design and manufacturing of zero emission vehicles, and for all new cars and vans to be effectively zero emission and are looking to bring forward the end to the sale of new petrol and diesel vehicles to 2035, from 2040.

Grants to the value of around £2.5 billion have been made available for plug in vans and lorries, with some additional funding to support improvements to the charge point infrastructure. The Plug- in Van Grant (PIVG) provides 20% of the price of a qualifying vehicle to a maximum grant amount of

£8,000, or £20,000 for the first 200 large vans (3.5 tonne +) or trucks.

Legislation has been amended to allow category B (car) licence holders to drive certain alternatively fuelled vans up to a maximum weight of 4.25 tonnes, rather than 3.5 tonnes. This is to compensate for lost payload capacity due to the added weight and size of some current alternative fuel technologies and help grow the market for ULEV vans.

Regulation to reduce tailpipe emissions for new cars and vans remains a crucial lever. The Government committed in the Road to Zero strategy that as the UK leaves the EU it will pursue a future approach that is at least as ambitious as the current arrangements for vehicle emissions regulation.

⁷⁴ Final UK greenhouse gas emissions national statistics 1990-2018, available here:
<https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2018>

⁷⁵ Gross Domestic Product chained volume measures, updated September 2020 available here:
<https://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/abmi/qna>

New EU van CO2 emission reductions regulations came into effect on 1 January 2020 setting targets out to 2030 which apply in the UK. The regulation sets binding CO2 emission reduction targets for new vans of 15% by 2025 and 31% by 2030 (based on a 2021 baseline). Manufacturers face fines for non-compliance ⁷⁶.

10-3 ELECTRIC VEHICLES

UK Government is providing £500 million 2020-2025 to support the rollout of a fast-charging network for electric vehicles, ensuring that drivers will never be further than 30 miles from a rapid charging station. This includes a Rapid Charging Fund to help businesses with the cost of connecting fast charge points to the electricity grid.

As of 1 January 2020, a driver is never more than 25 miles away from a rapid (50 kilowatt) charge point anywhere along England's motorways and major A roads, with a total of 809 open-access rapid charge points. This includes an average of 2 rapid charge points at motorway service areas with more being rolled out over the next year.

Budget 2020 included the announcement that the Office for Low Emission Vehicles will complete a comprehensive electric vehicle infrastructure review. The £400m public-private Charging Infrastructure Investment Fund, alongside government grant schemes, will see thousands more electric vehicle charge points installed across the UK.

⁷⁶ Regulation (EU) 2019/631, available here: <https://eur-lex.europa.eu/eli/reg/2019/631/oj>

ANNEX 11 – CARBON FOOTPRINT CALCULATORS

This complex concept of carbon footprint is measured in a number of ways, with a variety of free tools available online, supplemented by services provided by various bodies.

BSI Carbon Footprint Verification – pay-for offline service

<https://www.bsigroup.com/en-GB/cfv-carbon-footprint-verification/>

Bulb calculator – an online easy to use approximate calculator of personal footprint, with options to offset

<https://calculator.bulb.co.uk/footprint>

Cambridge Carbon Footprint online calculator

<https://cambridgcarbonfootprint.org>

Carbon Footprint calculators – online personal and small business

<https://www.carbonfootprint.com/calculator1.html>

Energy HQ – online cost predictor

<https://www.energy-hq.co.uk/energy-management-toolkit/cost-predictor/>

Global Footprint Network online calculator

<http://www.footprintcalculator.org>

Mossy Earth online calculator

<https://mossy.earth/methodologies/carbon-footprint-calculator>

Website footprints

<https://www.websitcarbon.com>

ANNEX 12 - FURTHER READING (AND VIEWING)

Banking the just transition in the UK

Nick Robins, Sophia Tickell, William Irwin, October 2019

<https://www.lse.ac.uk/granthaminstiute/publication/banking-the-just-transition-in-the-uk/>

Bloomberg Green – sign up for latest information

<https://www.bloomberg.com/green>

Carbon footprint; exploring the UK's contribution to climate change

WWF, March 2020

<https://www.wwf.org.uk/sites/default/files/2020-04/FINAL-WWF-UK-Carbon-Footprint-Analysis-Report-March-2020%20%28003%29.pdf>

Carbon footprint of the card industry

Uwe Trüggelmann, 2012

http://www.icma.com/ArticleArchives/CarbonFootprint_SE2-12.pdf

Climate Change Is a Bigger Disaster Than Coronavirus:

Bill Gates Emily Chang, Bloomberg, 6 August 2020

<https://www.bloomberg.com/news/videos/2020-08-06/climate-change-is-a-bigger-disaster-than-coronavirus-bill-gates-video>

COP26,

latest news available at <https://ukcop26.org/news/>

Covid-19 and Climate Change – Time for a reset?

Speakers: Christiana Figueres, Tom Rivett-Carnac, James Thornton, Juliet Davenport, chaired by Rosie Boycott

<https://www.youtube.com/watch?v=nhtTwCXkQxc>

Electric commercial vehicles: a market overview

EV100 webinar

<https://register.gotowebinar.com/recording/5227343659602224134>

The Earth Convention

Speakers: Jonathon Porritt, Farhana Yamin, Mike Berners-Lee, Matt Crossman, chaired by Rosie Boycott

<https://www.youtube.com/watch?v=e8itP5-5uD8>

EU Climate Target Plan 2030; Building a modern, sustainable and resilient Europe
European Commission Factsheet, 17 September 2020

Available to download at: https://ec.europa.eu/commission/presscorner/detail/en/fs_20_1609

An EU fund for a just transition - what it should be and why it matters

WWF Briefing Paper, June 2019

https://wwfeu.awsassets.panda.org/downloads/wwf_an_eu_just_energy_transition_fund_briefing_a4_final.pdf

Financial sector science-based targets guidance

SBT, October 2020

<https://sciencebasedtargets.org/wp-content/uploads/2020/10/Financial-Sector-Science-Based-Targets-Guidance-Pilot-Version.pdf>

Financing climate action with positive social impact: How banking can support a just transition in the UK.

Robins N, Tickell S, Irwin W, Sudmant A, June 2020

<https://www.lse.ac.uk/grantham-institute/publication/financing-climate-action-with-positive-social-impact-how-banking-can-support-a-just-transition-in-the-uk/>

The future we choose: surviving the climate crisis

Christiana Figueres & Tom Rivett-Carnac

Manilla Press, 2020, 978-1838770822

How bad are bananas: the carbon footprint of everything

Mike Berners-Lee

Profile Books, revised edition 2020, 978-1788163811

How Scotland can mobilise finance for a just transition

William Irwin, Nick Robins, Jamie Brogan, October 2019

<https://www.lse.ac.uk/grantham-institute/news/how-scotland-can-mobilise-finance-for-a-just-transition/>

Our Contribution: National Grid's Environmental Sustainability Strategy

National Grid

https://www.nationalgrid.com/sites/default/files/documents/OurContribution_PDF_Brochure.pdf

Our forward plan 2019-2021

National Grid ESO

<https://www.nationalgrideso.com/document/140736/download>

The Sustainability Reporting Performance of the FTSE 100

EcoAct, September 2019

<https://info.eco-act.com/sustainability-reporting-performance-ftse-100-2019>

Ten years of the Climate Change Act

CCC, 26 November 2018

https://www.youtube.com/watch?time_continue=53&v=Exq7Rppq90I&feature=emb_logo

ANNEX 13 – DETAILED SCOPE

To evaluate the carbon footprint of the complete life cycle of cash from raw materials to destruction would require a significant piece of research. Such research would include covering, at a minimum, the following components of the cycle:

- Raw material production/mining.
 - Production/mining residues.
 - Transportation of raw materials.
 - Pre-manufacture refining of raw materials.
 - Construction, maintenance and operation of specialist manufacturing premises.
 - Manufacture, recycling and disposal of banknotes and coins.
 - Transportation of banknotes and coin to storage/processing centres.
 - Construction, maintenance and operation of specialist banknote and coin storage/processing centres
 - Manufacture of equipment to verify, count and otherwise process banknotes and coins.
 - Transportation of equipment to banknote and coin storage/processing centres.
 - Construction, maintenance and operation of specialist banknote & coin storage/processing centres.
 - Construction, maintenance and operation of bank/building society/post office branches.
 - Manufacture, recycling and disposal of note and coin processing equipment.
 - Transportation and installation of note and coin processing equipment.
 - Transportation off/from banknotes and coins to branches and processing equipment.
 - Operation and maintenance of ATMs and coin processing equipment.
 - Recycling/disposal of equipment.
 - Recycling/disposal of banknotes and coins.
 - Visits of cash users to/from branches and cash processing equipment.
 - Cash processing by retailers.
 - Plastic card manufacture and distribution.
 - Mobile phone manufacture and distribution.
 - Set-up, operation & maintenance of network, financial institution and ATM operator processing and data centres
 - Set-up, operation & maintenance of cloud systems.
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