UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP

Business Briefing

Payments for net zero

How the payments industry can contribute to the transition to a net zero economy

ACHIEVING ZERO

VISA

The University of Cambridge Institute for Sustainability Leadership

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Executive summary

Countries and regions around the world (including the UK and the EU) have adopted legislation committing to 'net zero' carbon emissions by 2050 amid a growing body of evidence indicating that failure to decarbonise will lock the world into the accelerating and irreversible impacts of climate change. The transition to net zero will require far-reaching social, economic, regulatory and technological system changes. The payments industry has invested and innovated to enable large-scale socio-economic changes. But what is its potential role in this significant transition?

This report – underpinned by stakeholder interviews and existing research – explores this question and highlights opportunities for the payments industry in the net zero transition.

The opportunity: 'payments for decarbonisation'

Fifteen stakeholder interviews from across the payments ecosystem (including issuing banks, financial technology businesses ('fintechs') and regulators) highlighted enthusiasm for payments networks playing a leading role in the transition. This included leveraging core products and services, as well as alternative assets such as brand trust and data. However, interviews also revealed a telling gap between payments networks seeking to develop new solutions on the one hand, and sustainability stakeholders (often outside of the traditional payments industry 'four-party' model) seeking to drive the net zero transition on the other. Research on consumer attitudes also highlighted the willingness of citizens to play a key role, while also indicating that this is dependent on their being empowered by solutions which are both affordable and convenient.

The role of payments

To help bridge this 'opportunity gap', we outline four potential roles that payments networks can play to enable the net zero transition. These can be used to co-create net zero solutions with a broad range of public and private sector stakeholders.

1. Empower citizens – through product and service innovation, as well as the provision of information and choice architecture.

2. Provision of data-driven insights – investment in products and services powered by payments data.

3. Collaboration and partnerships – shaping and creating new services and solutions with others.

4. Narrative and advocacy – using corporate influence to shape the broader landscape for the net zero transition.

Opportunities for payments in the decarbonisation of key systems

The report also explores four of many potential areas of focus for net zero enablement via payments capabilities, as well as several near to mid, and longer-term opportunities for each. These demonstrate the potential overlap and synergies between payments capabilities and the decarbonisation of the economy. Notably, our research revealed the potential for significant new payment flows in this process:

- **Payments to enable low carbon urban mobility** – The global market for transit and ground passenger transport could grow from $412.97 billion in 2020 to c.$630 billion in 2025; 60 per cent of urban greenhouse gas emissions come from motorised road vehicles.
- **Payments to enable the sharing economy** – The 'take, make, waste economy' is estimated to contribute 50 per cent of global emissions. Moving to a sharing economy (in which goods are re-used, recycled and rented) could generate c.US$335 billion by 2025.
- **Payments to enable sustainable retail banking** – Regulatory, shareholder and customer demand are propelling banks towards greater focus on sustainability. Studies have found that up to a third of consumers in some EU countries would switch to a bank with a stronger product and service offering in sustainability.
- **Payments data-powered sustainability services** – Data-driven insights, products and services can be used by businesses, governments and third-sector organisations as important inputs towards developing strategies for achieving climate and other sustainability goals. The global 'Green Technology and Sustainability market' (including data and artificial intelligence (AI)) is predicted to grow from $11.2 billion in 2020 to $36.6 billion by 2025.

Enabling the net zero transition has several potentially major benefits for payments networks:

- maintain and grow existing client relationships and revenues through value-added services
- attract new clients by offering innovative sustainability-focused product and service suites
- open up new payment flows and markets
- drive brand trust and preference with key stakeholders (clients, investors, regulators, consumers, employees).

Recommendations

The report highlights the following steps that payments networks can take to begin to capture the value and positive impact from enabling the net zero transition:

1. Identify net zero as a strategic opportunity for the core business.
2. Identify and test potential net zero solutions, and the role of payments, with a broad range of stakeholders both including and beyond the four-party model.
3. Use influence and assets to create the external enabling conditions for the net zero solutions.

1. Introduction

Over the last 20 years, there have been significant changes in the payments industry, notably the rise of e-commerce, mobile usage, contactless payments and the impact of Open Banking. Over the same period, evidence has grown around the need to transform and transition to a sustainable net zero economy. There is also increasing alignment among stakeholders, from regulators and investors to civil society, on the need to do so. Given the fundamental role played by digital payments in the modern economy, the sector undoubtedly has a role to play in the transition to a sustainable low carbon economy.

However, some key questions exist around when, how and where this role will manifest. In particular, is the sector sufficiently prepared for the scale of potential change on the horizon? And do consumers, businesses and sustainability professionals fully recognise the potential of digital payments to enable the transition to a sustainable net zero economy?

Scope of this report

This report sets out to explore the role of payments in enabling the transition to a net zero economy (plus any additional benefits to nature and resource use), as a result of enabling decarbonisation solutions across Europe. This will be referred to as 'payments for decarbonisation' and includes the current digital payments services which enable the flow of commerce between consumers, merchants and banks today. The large inter-bank gross payments systems such as SWIFT and TARGET2 are out of scope, as are the direct and indirect (scopes 1 and 2[1]) impacts of payments networks themselves (such as office waste and data centre energy). 'net zero solutions' will be used to refer to solutions or services that materially contribute to the decarbonisation of the economy that are likely to require current or future payments capabilities. An example would be fully integrated multi-modal zero carbon public transport.

In order to transition to a sustainable net zero economy, it is recognised that climate change needs to be addressed in conjunction with a series of inter-connected issues and outcomes such as protecting and restoring nature, and ending poverty and hunger (captured in the UN Sustainable Development Goals (SDGs)[2]). While some of the principles explored in this paper may be applicable to these other sustainability issues, the scope of the report will focus on the transition to net zero.

Objectives

Our intention is to summarise current research on the topic and present insights from stakeholders we have engaged with to develop a common frame of reference for how digital payments might enable the transition to a net zero economy, while also capturing some of the significant value offered by that process. We hope this will help stakeholders and payments networks to work together to unlock opportunities to support and drive this transition. The audience for this report is payments professionals or non-payments stakeholders interested in the role of payments in the decarbonisation of the economy. This could include the broader retail financial services sector, regulatory or sustainability professionals.

Methodology

The research methodology included a literature review of robust research (including from academic, peer-reviewed and data-driven sources) into how digital payments are, or could, enable the transition to a net zero economy. This was supported by 15 interviews with stakeholders from across the payments landscape including: payments networks themselves, as well as issuing banks, merchants, regulators, academics, data companies and financial technology businesses ('fintechs'). We also conducted a workshop with a cross-functional group of over 25 participants from one global payments network.

Structure

The report begins by setting out recent developments in payments. It then lays out the transition to a net zero economy and the opportunity gap we have identified regarding the role of payments within that transition. It goes on to explore the potential role of payments in this transition, using the concept of value networks. It then highlights the important role of consumers in this transition, illustrated by current research insights into consumer behaviour and sustainability. The report then focuses in on a selection of current and possible opportunities for payments in several key systems, including the sharing economy, low carbon urban mobility, financial services and data. We conclude with some recommendations for how stakeholders and payments providers might work together to unlock these opportunities to transition to net zero.

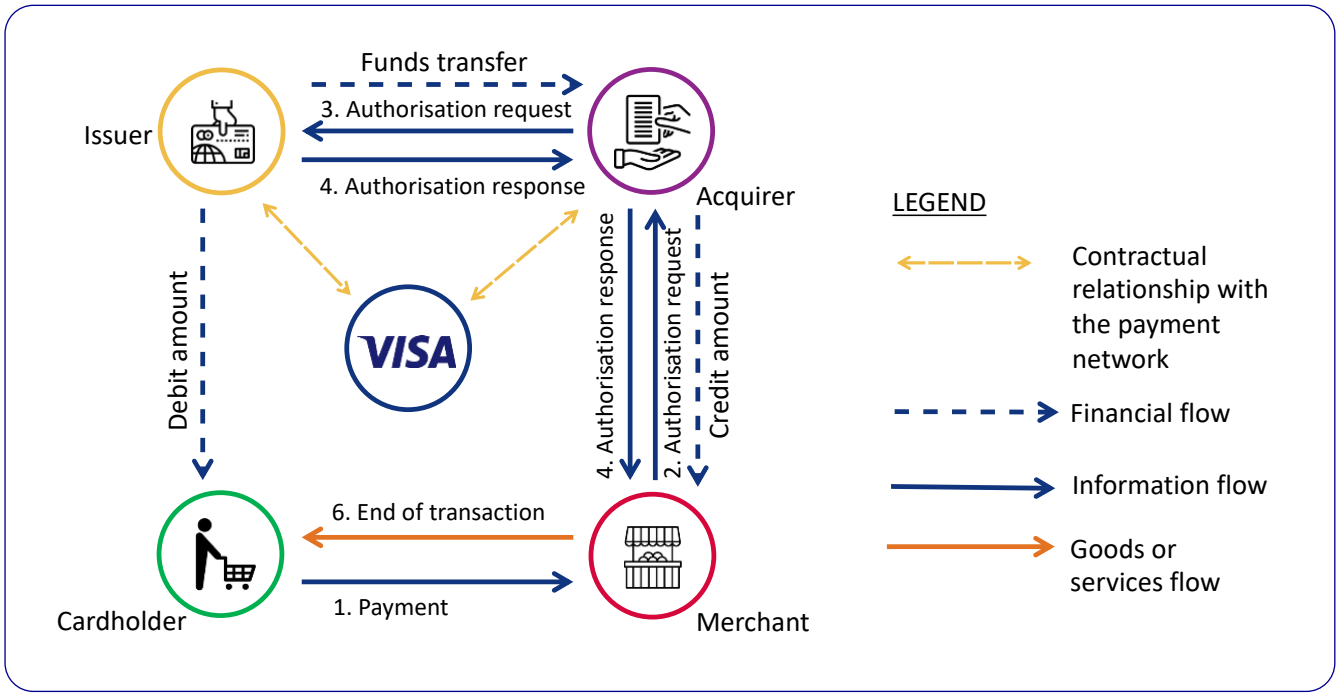
2. The current context

This section sets out the findings from our interviews with stakeholders and desk-based research into robust research on the role of payments for decarbonisation. It begins with an explanation of the current payments industry 'four-party' model and recent developments in payments technology and the sector more broadly. It then summarises the size and scale of the transition to a net zero economy, before setting out stakeholder insights into their understanding and expectations of the role of payments in that transition. It concludes with the implications and opportunity for payments.

The four-party payments model

The major payments networks, such as Visa and Mastercard, have a unique role in society facilitating critical financial services for consumers and businesses around the world. However, they traditionally do this within a 'four-party model', wherein their own contractual relationships exist not with consumers or merchants, but with issuing and acquiring banks. This is illustrated by the illustration below which clarifies the flows of information, money and contractual relationships between the payments networks and the four parties: issuing banks (who service cardholders, i.e. consumers); acquiring banks (who service merchants); merchants; and consumers.

Figure 1. Illustration of the four-party model



Although payments networks are increasingly offering some separate commercial services to merchants, such as data analytics or 'point-of-sale solutions' (designed to help merchants increase sales and attract new customers), these relationships sit outside the traditional four-party model. Within that framework, which forms the core of the payments business model, 'clients' are issuing and acquiring banks, and 'cardholders' are customers (ie consumers). To provide some context for the size of the industry, the total number of non-cash payments in the euro area increased by 8.1 per cent to 98.0 billion in 2019 compared with the previous year, with a total value of €162.1 trillion. Card payments accounted for 48 per cent of the total number of non-cash payments in the euro area.[3] Covid-19 has accelerated the growth of digital payments significantly, including the use of contactless technologies (see below).

Developments in payments

The 50-year history of the modern payments industry holds several significant innovations that played an important role in enabling large-scale societal changes. This section summarises four of the most recent payments innovations with the widest societal impact.

Innovation 1: Payments tokenisation provides the security for global e-commerce to blossom

Payments tokenisation protects a cardholder's account number in a transaction to prevent fraud or theft. The technique was first presented in 2005[4] and has since seen wide uptake. For example, as of 2020 Visa had issued one billion tokens worldwide through its Visa Token Service. Tokenisation replaces the account number (or credit card number) with a unique set of surrogate symbols (a 'token') allowing for identification without divulging sensitive data. Tokens are used once in a specifically defined merchant's environment. The account number and unique string of token symbols are linked in a secured 'token vault' database managed by a payment network. Sensitive information is protected from ill-intended actors, and customers experience simple, secure, frictionless payments. In addition to e-commerce, tokenisation is central to mobile phone-based payment systems. If a cardholder's mobile phone or other device is lost or stolen, their card details are still protected, and the consumer can cancel the token without cancelling their card.

Together with increasingly sophisticated payments fraud protection techniques powered by artificial intelligence (AI), tokenisation has enabled the rise of secure and widespread e-commerce, leading to inherent structural changes in the global economy. E-commerce, in its turn, has had a profound impetus from the Covid-19 pandemic. For example, Visa data shows that more than 20 European countries had a 40 per cent or higher increase in e-commerce transactions during the height of the pandemic from March 2020 to March 2021.[5]

Innovation 2: Contactless payments[6] ('tap and pay')

Contactless payments use radio frequency identification or near field communication technologies to enable payment through sheer proximity to a reader, touch-free, without use of cash or swiping a card. The use of contactless payments was on the rise before Covid-19. With the onset of the pandemic, however, uptake has grown significantly, with one payments network reporting that more than 80 per cent of its in-store payments in Europe are now contactless. Year-on-year growth of contactless has been more than 30 per cent in some European countries[7] and nearly eight in ten transactions globally are now contactless.[8]

Innovation 3: APIs, Open Banking and the data economy

An Application Programming Interface (API) is effectively software that provides services to other pieces of software. Such a connection might include, for example, providing access to a database or software library. APIs can help drive collaboration, enabling two-way data sharing between parties in a secure, scalable and accelerated manner.

A specific driver for API adoption is the rise of Open Banking, underpinned in Europe by the European Commission's Payment Services Directive 2. This regulation obliges banks to share data with third parties at the request of an account holder. In practice, this gives consumers a legal right to instruct their banks to provide licensed third parties access to their customer account payments data. Banks provide this purchase data via APIs in a secure and standardised form. An ecosystem of fintech innovation has sprung up around Open Banking, with consumers being offered new products and services, for example savings advice and insight into their spending habits (including sustainability footprints). It is hoped that increased insight and consumer engagement can drive positive behavioural change, such as better money management and more conscientious spending.

Because of both consumer expectations and regulation, open APIs are transforming the business models of banks and payment networks alike, particularly by promoting a 'platform-as-a-service' model. Such models allow fintech start-ups to scale rapidly, with lower customer acquisition costs, while allowing incumbents to bring together best-in-class customer-centric solutions in a single payments ecosystem. Some payments networks now also offer hundreds of their own open APIs for use by developers and fintechs. For example, Visa opened all of their APIs in 2016.[9]

Payments networks themselves are stewards of broad data stores and (while privacy and security remain paramount) have been increasingly innovative in using that data to generate insights for the benefit of the payments ecosystem. For example, networks are able to help issuer clients analyse portfolio performance at the cardholder, merchant and transaction levels; to better understand, predict and meet consumer needs; and to analyse and solve pain points for their businesses.

Through APIs, Open Banking and growing levels of investment in data-related capabilities, the payments sector is increasingly empowering consumers and businesses, and delivering innovation in the global data-based economy.

Innovation 4: Direct payments: direct transfer from checking account removes need for credit score

With direct payments, funds can be transferred securely, in near real-time, into a customer's bank account linked to a debit card. Real-time authentication enables sender and receiver to validate the status of the payment instantly. Direct payments reverse the traditional payment flow by allowing the paying party to use their debit card to 'push' money directly to the receiving party's checking or savings account. Direct payments can facilitate e-commerce purchases, person-to-person payments, government disbursements, expense disbursements and insurance claims. One application of direct payments with a particular social impact is remittances where, for example, Visa in 2021 saw a 500 per cent year-on-year increase in real-time transfers via the top five global money operators in P2P payments (TransferWise, Western Union, Remitly and MoneyGram).[7]

As this summary of technological innovations demonstrates, one of the features – and requirements – of payments networks' ongoing success is their ability to innovate technology to adapt to changes in regulation and societal expectations. We now turn to explore one of the biggest socio-economic changes of all: climate change.

The transition to net zero

In 2015 the UN signed the Paris Agreement[10] to keep global warming to "well below" a two degrees average temperature rise. This included the required trajectory to reduce global emissions by 45 per cent by 2030 and to achieve 'net zero' global emissions by 2050. net zero is commonly defined as the balance between the amounts of greenhouse gas (GHG) produced and the amount removed from the atmosphere. This is an essential requirement for a stable climate according to the Intergovernmental Panel on Climate Change, the world's authority on climate science.

First the UK government, then the EU, adopted legislation that commits them to become net zero by 2050, in line with the Paris Agreement. For companies operating in these regions, net zero is not just an aspirational goal, but also a legal necessity. The 2020s have been called the 'decisive decade'[11] as the evidence builds[12] that failure to decarbonise will lock the world into accelerated and irreversible impacts of climate change.

Whatever the outcome, society and the global economy face dramatic transformation. On the one hand, failing to significantly reduce emissions will result in increasingly severe disruption caused by the growing impacts of climate change. For example at 2.0°C, the population exposed to water scarcity would increase by an estimated 388 million and annual flood damage losses from sea level rise could be as much as US$11.7 trillion.[13] On the other hand, the transformation to net zero by 2050 will require far-reaching social, economic, regulatory and technological systemic changes.

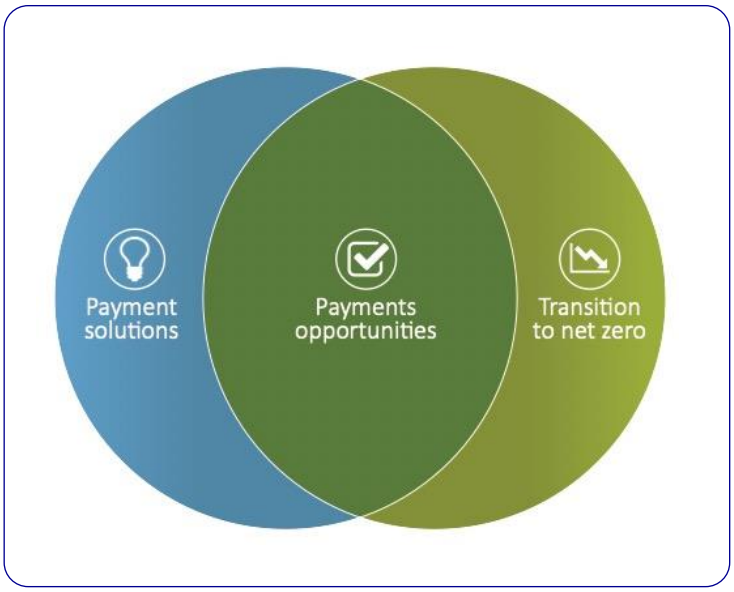
While climate change is a profound threat to humanity and the economy, the transition to net zero also presents a huge opportunity for businesses. For example, there are estimates that climate action could deliver $26 trillion in economic benefits and 65 million new jobs by 2030.[14] As CISL's founder Dame Polly Courtice said in March 2020, "the decade that we earmarked for getting our climate on track for net zero by 2050 and making progress on the UN SDGs will now play out in a new paradigm, where transformational change takes on wholly new possibilities."

Payments and net zero

Enabling the transition to net zero is a sensible strategy for all businesses, in the sense of helping to avert the destabilising impacts of climate change on the economies and societies on which they depend. It is also likely to reduce revenue and reputational risks associated with high carbon payment flows, thus meeting the expectations of investors, employees and regulators. Enabling the transition would also allow payments networks to continue to evolve their services to meet the rapidly changing needs of their clients and consumers.

The ubiquitous socio-economic nature of payments means the sector is particularly well positioned to benefit from playing an active role in this transition. However, the very same ubiquitous nature of payments, combined with the breadth of the transition to net zero, provides a myriad of opportunities that need to be filtered and prioritised in order to explore them. The possibilities range from capturing opportunities for significant new payments flows created as major systems (such as retail, finance and transport) evolve and providing greater transparency of information flows of non-financial value (such as carbon emissions), to facilitating new forms of frictionless financial transactions and data flows between stakeholders to enable low carbon business models, such as hiring an electric vehicle (EV).

The 'payments for decarbonisation' scope of this report will focus on the sweet spot between an existing or potential commercial payments solution that can also enable a material contribution in the shift to a net zero economy. This can be illustrated as a Venn diagram (below).



Focusing on areas of most material impact should optimise potential new revenues and unlock new value, on the basis that the greater the nature and scope of the foreseeable transition, the greater the potential new market for the payments solution. Optimising a payments network's contribution to the net zero transition should also build its trust and attractiveness with stakeholders and minimise the potential accusations of 'greenwash'. Greenwashing refers to insignificant or unsubstantiated environmental marketing claims for a product or service.[15]

However, while the desired outcome and timeframe required for the net zero transition are clear, the pathway to that transition remains uncertain. The pathway itself, and potential new solutions underpinning it, depend on many variables such as regulation (including the price of carbon), investment, societal expectations, adoption speed of new technologies (such as AI) and the enabling infrastructure (such as 5G).

This raises the questions of where payments networks should focus their efforts in this transition, as well as how well equipped stakeholders in the payments value chain are today to capture these opportunities.

We now turn to the research insights into payments for decarbonisation, where we explore these, and other, avenues of inquiry.

Research literature review

Despite significant developments in the fields of sustainable development and payments, the literature review revealed a gap in robust, peer-reviewed research on the role of payments in the transition to a net zero economy. The literature review revealed that the main research domains mentioning payments and sustainability are in cryptocurrency carbon footprints, payments for ecosystem services, EU agricultural policy payments and sustainability, and the sustainability of various national balance of payments deficits. All of these are out of scope for this project.[16] The report does include relevant initiatives published by payments networks themselves.

Consequently, there is no robust, evidence-based research analysis of where a ubiquitous sector such as payments should focus its core capabilities amid the vast potential range of applications presented by multiple global systems transformation. The challenge, as above, is identifying which applications would have the greatest impact and yield the greatest benefits – and how to unlock them.

Potential implications of 'payments for decarbonisation'

To explore potential synergies between systems transformation and payments sector innovation, we consulted stakeholders from across the payments ecosystem. Fifteen stakeholder interviews (including 21 participants overall) provided insights into the current and potential role of payments in enabling a sustainable, decarbonised future. Interviewees ranged from the payments networks themselves, to issuing banks, merchants, regulators, academics, data companies and fintechs.

Broadly, the interviews revealed the following insights:

Leadership: Firstly, more than two-thirds of the interviewees clearly saw the payment networks as the most influential players in the payments landscape, and thus expected them to play a leading role in enabling the transition to a decarbonised future. This expectation went beyond the networks 'greening' their own operations.

> "Each payment network has a choice today: to be a leader right now, or to become a late follower. If you are going to be a leader in payments for sustainability, and therefore a leader in the financial sector, you are going to have to use the great influence and assets you already have."
> **A bank**

> "It would be good to use the significant influence of the payment schemes to develop incentives for sustainability standardization and data sharing by merchants."
> **A bank**

> "Payment networks: use your influence to provide easy access to sustainability data."
> **A bank**

> "Research that our bank has done indicates that consumers are looking to companies and banks to start to take climate action, as they are frustrated with government inaction."
> **A bank**

Role: Interviewees gave examples in which playing such an enabling role would be likely to require payments networks to both adapt and innovate new services and work within and beyond the conventional four-party model. For example, enabling multi-modal public transport may require collaboration with city authorities, transportation manufacturers, and providers and regulators. Notably, it was anticipated and expected that the big networks will need to collaborate with their peers to achieve market change, as has occurred before with innovations such as tokenisation.[17]

> "Visa needs to team up with others (merchants, payment systems, banks, and consumers)."
> **A bank**

> "A composite strategy is the way forward for payments networks: this means a combination of collaboration and competition with other payments networks."
> **A bank**

> To increase sustainability impact, payments networks need to leave their traditional competitive thinking behind and take a collaboration and competition approach with peers.
>
> **A fintech company**

> The only way forward is really collaborating on the same goal with all your stakeholders, including competitors. And even if you don't want to sit on the same table, you at least need to have the same understanding that you both are working towards the same goal.
>
> **A fintech company**

> Schemes such as Visa are the most influential players in the payments landscape, especially if they form a united front.
>
> **A merchant**

Potential opportunities and interventions: These stakeholders identified a number of interventions payments networks could potentially make, both directly through their services and indirectly by influencing other stakeholders. These roles included setting industry standards, educating stakeholders, incentivising consumers and 'nudging' them to make sustainable choices. Stakeholders recognise a significant opportunity for sustainability-related data provision and associated services, such as providing transparency on the carbon, or wider sustainability impacts, of a product or service. This was considered by some interviewees to be potentially transformative. Some interviewees saw a potential role for payments networks to advocate for policy interventions to address some of the challenges facing the transition to net zero today. There was strong support among some interviewees for empowering consumers to control and share their data.

> The payments networks such as Visa and Mastercard may be in a position of trust where they could ask consumers if they want to partner in sharing payment data to help with sustainability goals.
>
> **– A bank**

> Payments networks should create market standards for measuring carbon impact in payments (scope 1, 2, 3). Use that to make consumers explicitly aware of their index.
>
> **A bank**

> We are looking to inform and educate our customers more about sustainability.
>
> **A bank**

> The four pillars of our cards business' sustainability strategy are: educating customers, reward schemes and offers, materials/plastics, and internal processes.
>
> **A bank**

> Payments companies: help partners get there and educate them on sustainability issues, the risks, and the benefits.
>
> **A fintech company**

> The biggest potential lies in educating customers, we need to educate people. We need to get them [to] know what the environment is, what the carbon footprint is. Why we need to take care of it. Because this is his normal now. This is no longer a Greenpeace issue, it is no longer an NGOs [non-governmental organisation] issue, it is no longer a Kyoto Protocol or Paris Agreement issue. It's everyone's issue now.
>
> **A bank**

> Trust in sustainability data and ratings will need to come from outside issuing banks, and possibly from payments networks.
>
> **A bank**

> With respect to nudging, and given the large amount of data and analytics about consumers' behaviour available to large financial companies (such as banks and payment networks), there is a moral obligation for these companies to at least consider whether they want to turn their knowledge into wisdom for the end consumers they serve.
>
> **A data science academic**

Upstream versus downstream: A few interviewees highlighted a potentially important issue for the payments networks, and for issuing and acquiring banks, namely that of 'scope 3' sustainability exposures. Scope 3 means the sustainability impacts across the value chains that those payments facilitate. Stakeholders, from citizens to governments and investors, are increasingly aligning around the need for businesses to be more transparent about their impacts, such as their contribution to a low carbon economy. While a growing number of businesses are adopting net zero goals, most remain at the start of their journey.[18] The financial services sector is responding to these changing expectations,[19] and one interviewee indicated that it is important to accept that the business of money is not a 'neutral' business, implying that facilitating financial services entails moral and political choices, no matter how neutral the appearance of financial processes and technology might seem.

This rise in stakeholder expectations is combined with the growth in the availability of data across the value chain. Interviewees speculated how this increased transparency might lead to shifts in market expectations and behaviour. As the focus on corporate impact has moved from real economy businesses to banks, it is conceivable that in turn it will shift to the role of payments. Sections 4 and 5 ('The evolving role of citizens in sustainability' and 'Exploring possible opportunities for payments in the decarbonisation of key systems') explore the growing regulation and expectations of consumers to understand these impacts. This shift in expectations creates both a greater responsibility and a shared incentive for both issuing banks and payments networks to play their part in the transition to a net zero economy.

> "Money is not neutral; there is a qualitative difference depending on the object of spend."
> **A bank**

> "Help [banking] clients move beyond ex-post [after the fact] compensation, and towards ex-ante [future-orientated] prevention of sustainability harm."
> **A merchant**

> "We're increasingly seeing customers demanding that their banks do something on sustainability, including via their products."
> **A bank**

> "In order to be effective from a sustainability perspective, consider presenting choices in terms of avoiding harm, instead of increasing good."
> **A leading academic specialising in consumer choice**

Challenges: Interviewees identified the following challenges for the payments ecosystem (including payments networks, banks, merchants and consumers) seeking to solve sustainability issues:

- *Prioritising investment in innovation.* Some interviewees flagged that in their firm the initial required investments to implement and maintain sustainable payments products are not prioritised.
- *Prioritising sustainability.* One interviewee indicated that the main barrier for companies to effectively work on sustainability issues is that sustainability is usually an afterthought. This suggests an opportunity to design-in sustainability solutions up front; payments networks could enable their customers to do so.
- *Sensitivity* around unsustainable choices in non-consumer parts of their company. Some interviewees indicated that they are reluctant to push sustainability-focused consumer products (including related to payments) because they feel that they are being publicly scrutinised around unsustainable business choices being made in other parts of their firm.
- *How to enable consumers.* Almost half the interviewees indicated that payments networks should be educating and nudging consumers towards more sustainable purchasing choices. It was harder for interviewees to articulate exactly *how* payments networks should do this given that they are predominantly B2B businesses.
- *Granularity and accuracy* of consumer data services. Several interviewees indicated that for consumer-facing sustainability data services to truly add value for consumers, the granularity and accuracy of these services would need to increase.
- *Access to product data.* Stakeholders recognised various challenges with the use of payments data for sustainability, including the fact that much of the data at the product level resides with merchants, not with payments networks themselves.

- *Consumer data consent management*. One interviewee observed that there could be a challenge in obtaining data-sharing consent from the retail client and ensuring that consent stays up to date.
- *How to establish new forms of innovation and collaboration.* Several interviewees flagged the need for payments networks to collaborate. It was also widely recognised that new payments networks business models and incentives might be required beyond the traditional four-party model. However, interviewees did not articulate in detail how such collaboration should take place.

Outlook: Finally, while stakeholders largely agreed that payments networks had an important role to play in the transition to a sustainable, decarbonised future, their thinking was nascent on what exactly this should entail. This confirmed our impression from the research literature review that payments for decarbonisation is an exciting, but still emerging, area of exploration today.

> “It is an important new idea to link payments and sustainability, and so far it is not something which we have really been active in.”
> **A financial sector regulator**

The researchers infer that this was due to a combination of: 1) the decarbonisation transition being nascent, complex and uncertain; 2) many of the stakeholders interviewed (including at payments networks) lacking domain expertise in the changes in sustainability-related systems; and 3) those involved in transforming sustainability-systems lacking domain expertise in payments. Our conclusion is that an opportunity clearly exists to close the gaps in expertise and thinking between some of these key stakeholders, in order to unlock net zero solutions.

An implication of this opportunity gap, combined with the uncertainty of the net zero transition, is that no one stakeholder will know or determine the path ahead. The transition is therefore likely to be co-created by a range of stakeholders through: identifying material carbon impacts; innovating decarbonised solutions and services to address them; creating the requirements of those solutions, including the role of payments, and then testing and scaling these solutions.

Becoming active participants in this process allows payments networks to optimise their role by shaping these decarbonised solutions and innovating new capabilities. Failure to do so could result in losing ground to competitors or being forced to retro-fit existing payments capabilities to solutions and services that have already been designed and tested by others. Many net zero solutions have yet to be invented or scaled and their development relies on multiple stakeholder groups and significant variables described above, such as regulation and infrastructure.

Conclusions

We have seen that payments networks have evolved their technologies and services to adapt to the changing expectations of regulators, consumers, issuer and acquirer clients and merchants. The transition to net zero presents a huge opportunity to further accelerate the innovation the sector has shown itself capable of over the last six decades. However, as discussed above, there is uncertainty over how the transition will happen and there is little evidence for where payments networks should focus. There are some examples of payments networks participating in the net zero transition today, which will be explored further in section 5 (Exploring possible opportunities for payments in the decarbonisation of key systems). However, they are often experimental, early stage and reactive to progressive stakeholders and sustainability domain experts, such as increasing EV charging points.

The stakeholder interviews highlighted broad enthusiasm, support, and even expectation that payments networks play a leading role in decarbonisation through their services. Despite this, they also revealed a telling gap between payments networks that are developing new solutions on the one hand and stakeholders that are seeking to drive the net zero transition (often outside of the four-party model) on the other. This currently amounts to a barrier to achieving the full potential of payments networks to enable the transition.

Closing this gap presents significant opportunities for new and existing digital payments services. With a more proactive, holistic approach across and beyond the payments ecosystem (including greater focus outside the four-party model on merchants, fintechs and consumers), payments could become crucial enablers of the transition to a net zero economy. This strategic shift could pay dividends in terms of business growth, client engagement and brand trust.

However, there are barriers that will need to be overcome for digital payments to play such an enabling role and to realise the benefits:

- *The solutions or 'asks' from clients are relatively undefined today and still evolving*: Banks are under pressure to respond to consumer demand for 'green banking' solutions and expect partnership and leadership from payments networks, but are not yet necessarily clear what this would involve.
- *The role of payments in the transition is unclear*: While the outcome, size and timeframe of the transition to net zero is clear, the pathway to that transition – and the role of payments within it – is not. The transition will require net zero solutions to be created by multiple stakeholders that depend on several uncertain variables.
- *The traditional payments sector business model does not naturally lead to a focus on commercial opportunities from sustainability*: Payments is still primarily focused on its clients within the four-party model. However, many stakeholders driving the net zero transformation, typically in the real economy (such as city transit providers) are not always part of the conventional four-party payments model. Even within the four-party model, payments networks have not traditionally held direct relationships with merchants and consumers, both key stakeholders in the transition.
- *There is a gap of expertise and understanding:* Payments networks have not yet embedded the specialist domain expertise required to identify and leverage strategic opportunities for the net zero transition, while sustainability experts tend to have no frame of reference for understanding the potential of payments for enabling net zero solutions.

Payments networks seeking to deliver, and derive value from, decarbonisation will need to focus strategic thinking and investment on exploring the potential role of their current and future core businesses, in that transition. This will take them outside their 'business as usual' activities and potentially involve adapting their

prioritisation and investment criteria based on an appreciation of the uncertainty of how these systems will transition and be informed by deeper relationships with the stakeholders that are shaping these systems. To be successful, payments networks will need to consider developing new capabilities and strategies including:

- adjusting to a mind-set of viewing the net zero transition not merely as part of Corporate Social Responsibility, but as an opportunity for the sector, with value to be identified and captured by enabling net zero solutions
- looking beyond managing the direct carbon impacts of their own estate and investing in sustainability expertise that enables them to identify strategic commercial opportunities for payments to enable the transition to a net ero economy
- embedding that domain expertise across their core businesses (such as in strategy, commercial and technology teams) to develop new net zero solutions, services and value flows
- identifying and exploring potential opportunities by proactively engaging with a range of external stakeholders seeking to create net zero solutions, within and beyond the current four-party model.

The next section explores two powerful concepts that can enable payments networks, in conjunction with other stakeholders, to bridge the opportunity gap and develop new net zero solutions together, despite significant uncertainty.

3. The potential role of payments in the transition to net zero

We have identified an opportunity gap between evolving payments solutions and the transition to a net zero economy. While it is clear what outcomes we need (net zero) and by when (2050), it is unclear how this transition will happen and what the role of payments could be in enabling these transitions. This section explores two tools that can help to bridge this gap. They can be used by payments networks and wider stakeholders, to innovate and co-create payments solutions that enable the transition.

The challenge

Conventional corporate reporting measures the financial value created within the legal boundary of the business. This is often reflected in return-on-investment calculations, over a certain period. This approach focuses decision-making on the financial value created within a relatively narrow scope and time-frame.

This conventional approach to decision-making has two limitations in the context of tackling decarbonisation. Firstly, it does not disclose the forms of non-financial value that are required to deliver the financial value (such as consumer trust) nor the wider impacts created as a result of the service, such as carbon emissions. Secondly, it does not capture the relationship between other actors in the wider system (such as regulators or infrastructure operators) that is needed to sustain the product or service.

The four-party model of digital payments, for example, reflects the transactional and contractual relationships between the four parties, but does not reflect other important forms of value, such as the social value created through providing trust and security between the parties. Another form of value flow missing is the carbon emitted or saved because of the service enabled by payments, such as filling a car's petrol tank. These omissions inherent in conventional decision-making can create significant 'blind spots' to appreciating opportunities and risks inherent in the net zero transition. This is the case for several reasons.

Firstly, the larger the carbon emissions, the more stakeholders are likely to see them as a liability and risk for business. However, the wider carbon impacts of a product or service are currently external to economic evaluations, and thus described by economists as 'externalities'. Growing understanding of the importance of 'pricing in' these externalities is driving calls for greater transparency for carbon emissions.20 However, visibility for businesses remains limited today, for both carbon emissions, and the impacts of climate change on a particular product or service, for example the carbon saved by taking public transport, rather than a car journey.

Secondly, the traditional commercial focus on short-term financial gain can overlook wider, more macro and long-term opportunities to serve emerging needs in society, such as delivering low carbon solutions. Finally, conventional decision-making can overlook the importance of non-financial stakeholders within current business models. This can inhibit the innovation of new business models resulting from different configurations of both stakeholders and flows of financial and non-financial value.

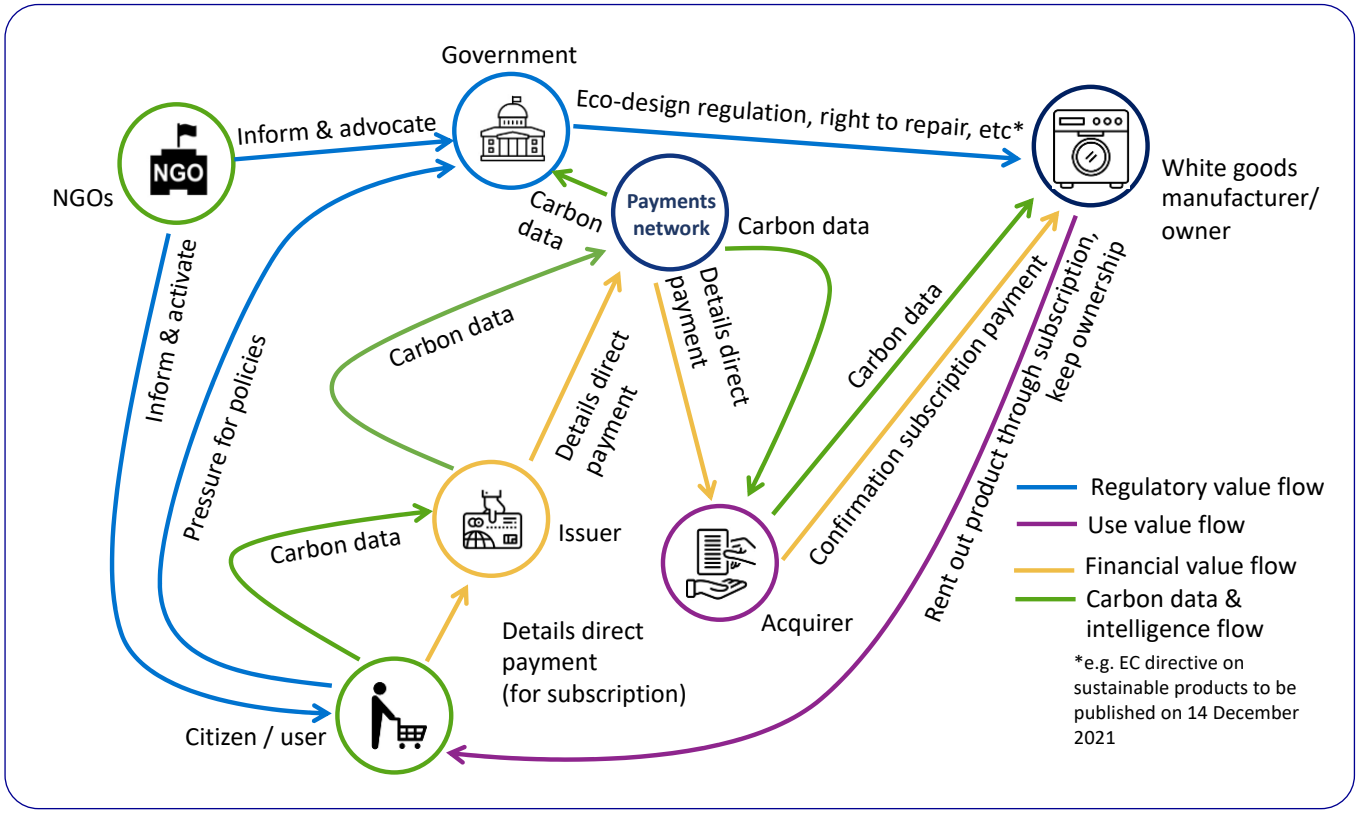
These reasons can combine to create a continuity bias: the propensity to assume the future will be like the past, despite evidence to the contrary. This can result in overlooking both liabilities and strategic opportunities. The transition to a zero carbon economy will require new solutions that deliver financial and non-financial value (for example low carbon convenient, safe and affordable transport) for varied stakeholders (such as city authorities, passengers and transit operators). A value network is a powerful tool to help shape these new solutions and shift traditional corporate decision-making.

Value networks

While a value chain represents the linear flow of goods and financial value across a product or service system, a value network21 also identifies the wider actors and influencers across the system plus the non-financial types of value that flow between them. They are used to create a more holistic map to understand existing business models and create new ones, to surface hidden externalities and risks, to highlight opportunities to meet emerging needs, and to clarify the external conditions and capabilities (such as regulation, infrastructure, partnerships or advocacy) required for success. The network is then calibrated and tested to ensure that it does not create significant unintended externalities and that there is enough value passing between the stakeholders to incentivise their involvement. This is a powerful tool for payments networks to both explore new payment flows and services that might enable the net zero transition and identify potential stakeholders they can partner with to co-create them. This holistic view enables the alignment of stakeholder interests and objectives across the network and can provide a common toolkit for both payments experts and non-payments stakeholders to explore and co-create the future role of payments in the transition.

This can be illustrated with a value network from the sharing economy, where consumers pay for access rather than ownership of a product. This model is designed to be more cost effective for consumers and more resource efficient for society by greater utilisation of fewer products for longer. The illustration below maps how a consumer in the circular economy will pay to use a washing machine, from its lessor (that may be the manufacturer or intermediary retailer). The illustration shows: financial flows between the user (or lessee), issuing bank, payments network, acquiring bank and owner; the potential tracking of carbon incurred (assuming energy use is captured and converted into carbon); and the value to the user derived from the service. It also maps how regulators are informed by these carbon impacts and how they, and NGOs, can influence the value network through regulation and the shaping of public opinion.

Figure 2. Illustration of a circular economy value network



As opposed to a traditional model showing only the flow of financial value and goods, this value network can be used by both payments networks and other stakeholders in the system (such as the banks and white goods owners) to develop, test and refine a business model that supports this potentially lower carbon service, including:

- Identifying the full range of stakeholders and potential partnerships with which to engage, and the roles they each play. This enables stakeholders to align on the purpose of the new value network and clarify their role in it.
- Ensure that each stakeholder is creating and retaining enough value to incentivise their ongoing role in the value network. This ensures that the payments networks' goals are aligned with the other stakeholders and that the other stakeholders are sufficiently incentivised to sustain the value network.
- Identifying the capabilities and investments required to make this business model work, thus helping to highlight potential opportunities for payments networks to participate, such as through facilitation of new payments flows between different actors in the system.
- Surfacing and measuring externalities, in this case the carbon used and saved compared to conventional ownership models. This anticipates and avoids unintended negative impacts and may surface other potential payment services, such as tracking carbon flows through the system to ensure true carbon reductions are being delivered.

Payments networks as enablers of systems transition

Payments networks seeking to capture the opportunity to enable the net zero transition will need to work with new stakeholders, as well as adapting existing capabilities and developing new ones. This might include deploying existing product offerings or technology into new contexts, such as working with banks to develop sustainable retail banking propositions; or leveraging digital payments to increase uptake of EVs. Or it could mean developing innovative net zero solutions as new value networks emerge during systems transition, for example facilitating new payment flows to enable the sharing economy. Payment networks may also need to use their industry and policy influence to shape the enabling context for systems transition, such as the required standardisation of sustainability data across a product's life cycle, or infrastructure such as 5G to enable driverless EVs. To identify potential enabling actions payments networks can take, and to help bridge the opportunity gap identified in section 2 (The current context), we have outlined a potential common framework for payments networks and relevant stakeholders to co-create the role of payments.

The table below captures four categories of enabling roles, each including the payments assets that can be leveraged, what actions (including net zero services) could look like, and how these actions would enable the wider transition. Many new services are likely to require modified infrastructure and regulation, so payments networks may choose to advocate for those changes, depending on the nature and context of the transition. The key assets of payments networks can be summarised as:

Ubiquitous societal touchpoint for consumers and businesses

Infrastructure: the payments network itself

Brand trust: highly regulated, secure and reliable service

Innovation capability: *expertise and investment in new products and services*

Ecosystem relationships: payments sit at the heart of the financial ecosystem, meaning a broad range of business-to-business relationships within and beyond the four-party model and the ability to convene varied stakeholders

Breadth of data, which can be leveraged to provide valuable insights and other data-driven products and services for the benefit of the payments ecosystem

Influence: through communications, advocacy and industry networks.

Payments networks' enabling roles in the transition to a net zero economy

Enabling roles	Relevant payments assets to be leveraged	What actions can payments networks take to enable the transition?	How do these actions enable the transition?
 **1. Empower citizens** through product and service innovation as well as provision of information and choice architecture Eg streamlined payments services for EV charging networks	• Brand trust • Infrastructure • Innovation capability • Ecosystem relationships • Data	• Enable net zero services by providing frictionless transactions, incentives, or data-driven insights (for example carbon) [22] • Provide consumers with information about their purchasing options and consequent sustainability impacts • Incentivise, motivate and reward consumers to make sustainable choices	• Inform and educate citizens • Incentivise citizens' decisions and behaviours through improved service experience • Stimulate end-user demand • Create transparency and accountability for services
 **2. Provision of data-driven insights** Payments data-driven products and services Eg insights that optimise sustainable city planning and management	• Infrastructure • Data • Ecosystem relationships • Innovation capability	• Data-driven innovation in sustainability-focused products and services, including for clients outside the four-party model, such as governments • Provision of insights to inform client and partner strategies (such as identify and predict trends, opportunities and efficiency improvements) • Combine payments data with broader data sets to facilitate monitoring and tracking of systems change impacts	• Create extensive transparency and accountability for carbon impacts • Analyse and optimise energy use across systems, leading to better design and management • Identify and amplify positive impacts/reduce negative impacts of systems interventions
 **3. Collaboration and partnerships** Shaping and creating new services and solutions with others Eg Building and leading coalitions on sustainability in target systems, such as finance, mobility or the circular economy	• Brand trust • Ecosystem relationships • Data • Influence	• Bring together a broad range of stakeholders to develop new value networks through experimentation, co-creation and open innovation • Create enabling platforms (such as infrastructure or digital) and intermediary organisations or groups to deliver net zero solutions • Join or initiate pre-competitive collaborations to tackle complex shared challenges	• Promote shared understanding of transition to net zero, including risks and opportunities • Align stakeholder ambitions, roles and actions • Drive information exchange, innovation and growth • Identify required regulation, infrastructure and other enabling conditions
 **4. Narrative and advocacy** Corporate influence to shape the broader landscape for the net zero transition Eg advocate for consistent carbon transparency for products and services	• Brand trust • Ecosystem relationships • Data • Influence	• Promote bold, persuasive corporate narrative on systems transition, for example around consumer empowerment or the benefits of data for decarbonisation • Positive advocacy for enabling conditions, such as new regulation, infrastructure, standardisation and interoperability	• Reshape the narrative, expectations and 'rules of the game' for the role of business and payments in a net zero economy • Highlight systemic barriers and opportunities • Creates trust and confidence in net zero pathways • Drives real change in the system's rules, power distribution and incentives

These enabling roles and actions draw on insights from research into: systems thinking (from Donella Meadows' leverage points in a system[23]); the four roles of digital in enabling the delivery of the SDGs (from GeSI's *Digital with Purpose* report[24]); plus the role of business in scaling sustainable solutions (from Forum for the Future's Scaling-Up Impact framework[25]).

Conclusions

Payments networks and stakeholders involved in transitioning the economy to net zero need to find ways to work together to unlock the potential of payments. Conventional decision-making tools that focus on financial value over the short term are unlikely to be fit for purpose. To unlock these opportunities, new conversations and tools will be needed to understand how both financial and non-financial value is created and shared across a network of stakeholders.

Value networks and frameworks to analyse the potential enabling roles of payments provide some of the tools that payments networks can use to engage with stakeholders to understand, explore and develop low carbon solutions.

Given the scale and degree of uncertainty around the pace and shape of the transition journey, this may require payments networks to develop new models for assessing and prioritising investments. This could involve modelling the size and payback periods of opportunities that may not fit easily into conventional business decision-making tools.

These new solutions and value networks are likely to involve and engage a range of stakeholders that payments networks do not typically engage with directly as part of the four-party model. An increasingly central stakeholder group will be consumers, who will need to feel that these new services and solutions are safe, trustworthy, affordable and improve their lives. We now turn to explore recent insights into consumer behaviour and sustainability.

4. The evolving role of citizens in sustainability

The transition to a net zero economy will not only require significant changes for businesses, supply chains and infrastructure, but also for the citizens using the new low carbon products and services. The engagement and consent of citizens will be essential to the transition. This section explores the evidence and potential implications of the role of citizens in the transition, including evidence of their attitudes to climate change and their willingness to be involved in tackling it. Consumer research is drawn on to gain insights into the attitudes of citizens.

Do citizens care about climate change?

There are many sources of data that demonstrate a growing citizen interest in climate change and wider sustainability topics. Indications are that this interest has increased during the pandemic.

According to an IPSOS survey of 28,000 citizens from 14 countries in April 2020, 71 per cent of adults agree that 'in the long term, climate change is as serious a crisis as Covid-19'.[26] The same survey revealed that 'a majority of the public globally (68 per cent) agree that if their governments do not act now to combat climate change, they will be failing their citizens.' These findings are supported by Google insights into UK searches from August 2019 to July 2020 that found that there was a 92 per cent increase in searches for 'carbon neutrality', an 89 per cent increase in 'food waste' and a 60 per cent increase in 'recycling and plastics'.[27] Trends such as a 101 per cent increase in searches for 'ways to reduce carbon footprint' also suggest citizens themselves want to take action.

In terms of willingness to act, another survey of 1,000 adults in the UK and US respectively surfaced similar results.[28] 80 per cent of UK and 77 per cent of US respondents said that we should make as many big lifestyle changes to stop climate change as we are making to stop coronavirus. The lifestyle changes that people prioritised were wasting less, avoiding plastics and switching to green energy providers. These findings would suggest not only widespread awareness of climate change, but also a willingness to take action. Only 5 per cent (combined) of the US and UK respondents were not willing to make any change. Tellingly, when asked if these changes would improve or reduce their quality of life, half of the respondents said it would improve their quality of life, 37 per cent said it would make no difference and only 13 per cent said it would worsen their quality of life. This finding would seem to challenge the assumption that lower carbon, more sustainable lifestyle choices are an undesirable burden.

A global survey of 1,000 respondents across 27 countries in 2020 found that environmental issues like climate change and the depletion of natural resources scored highly and rated more highly than the previous year. Environmental issues were just behind health issues (including Covid-19) with the youngest generation of adults being most engaged.[29] Citizens also express a significant interest in behavioural change, and thus changing their lifestyles, in ways that align with health and sustainability.[29]

There is an important caveat to the above positive findings, however. While citizens state that making sustainable choices easy, cheap and accessible will enable their behavioural change, they also identify barriers to adopting sustainable lifestyles which make the changes they might be willing to make difficult to achieve.[29] A Deloitte survey found that the main reasons they had not adopted a more sustainable lifestyle were because: they were not interested (16 per cent); it is too expensive (13 per cent); or it is too inconvenient (11 per cent).[30] This may account for the identified gap[29] between what citizens say they will do on climate change, and what they do in reality (see below).

What does evidence of citizens' interest and willingness to act on climate change mean for businesses?

The above findings strongly suggest latent demand for public and private sector products and services that facilitate the changes consumers say they would be willing to make, including helping to remove the perceived barriers around cost and convenience. This presents a clear role and opportunity for business.

According to the 2021 Edelman Trust Barometer,31 despite widespread mistrust of societal institutions and leaders across the world, business marginally took the lead as the most trusted sector, ahead of NGOs, governments and media. The same survey found that 68 per cent of respondents thought that CEOs should step in when governments do not fix societal problems. GlobalWebIndex research from July 2020 also found that 55 per cent of people in the UK say that it has become more important for companies to behave more sustainably because of the impact of Covid-19.32

This would suggest a widespread public expectation that businesses will take a proactive role in tackling societal problems such as climate change.

Given the apparent mandate for businesses to act, is there evidence that consumers actually respond to more sustainable products and services?

Consumer goods giant Unilever, a widely recognised world leader on sustainability, tracks the growth of their 'Sustainable Living' brands, which integrate demonstrable sustainability benefits. In 2018, these brands accounted for three-quarters of the company's turnover and grew 69 per cent faster than the rest of the business, up from 46 per cent in 2017.[33] CEO Alan Jope said, "purpose creates relevance for a brand, it drives talkability, builds penetration and reduces price elasticity. But talking is not enough. It is critical that brands take action and demonstrate their commitment to making a difference." [34] This insight is consistent with the 2019 Edelman Trust Barometer that found that 72 per cent of consumers say that having a brand's values reflect their own beliefs is a deciding factor in what they buy. The commercial success of Unilever's sustainability approach would suggest that embedding sustainability into credible and affordable product offerings does influence mainstream consumer buying choices.[35]

There is complexity here, however. As referenced above, consumer research consistently suggests people do care about climate change and are willing to make changes. However, academic literature points at a gap between expressed intentions and actual consumer behaviour with respect to sustainability. Surveys and focus groups often suggest that addressing the perceived barriers to action (such as cost or convenience) would make a difference. Broad psychometrics research adds another layer to understanding consumer behaviour. Research findings indicate that behavioural interventions for sustainability, such as information provision, and making sustainable choices, have limited effect on their own. In 2019, a meta-analysis of randomised controlled trials tested behavioural interventions to promote household action on climate change.[36] The study, comprised of 3,092,678 observations, showed that "behavioural interventions (interventions that do not involve economic (dis)incentives and regulations) promote climate change mitigation to a very small degree while the intervention lasts." It also showed "no evidence of sustained positive effects once the intervention ends. The intervention with the highest average effect size is choice architecture (nudges)." This evidence challenges one of the tenants of neo-classical economic theory that has become so influential in especially Western corporate thinking. This tenant is the theory of rational behaviour whereby individuals are viewed as rational in that they act in accordance with their preferences. This emphasises information as being sufficient to influence behaviour.

These findings suggest that providing information to citizens is not enough on its own. Rather, the design of *how* the choice is presented to citizens is important, as well as the balance of incentives and disincentives. In other words, it is about making it easy and worthwhile for citizens to make choices that align with their values and aspirations. These findings challenge the assumption in rational behaviour theory that assumes information and means were necessary and sufficient to influence citizens' choices.

Conclusions

There is evidence that citizens are both aware of climate change and want to take action to reduce their carbon impact, and that these trends have increased during the pandemic. There is also evidence of an expectation that businesses will provide solutions, and that doing so credibly and affordably can increase growth.

In terms of action business can take, research suggests that providing information is not enough. Businesses need to provide clear choice architecture, as well as products and services that make it convenient and affordable for citizens to take positive action. These actions also need to make a material reduction to carbon emissions, to avoid the risk of 'greenwash'[37] that leads to a loss of consumer loyalty, trust and satisfaction in products.[38]

These findings from the citizen perspective are consistent with the insights from stakeholders in the wider payments system. Namely, that there is an opportunity gap between the potential of payments and those stakeholders seeking to transition to net zero. To unlock this opportunity, payments networks will need to work with these stakeholders to create strategies for engaging citizens, creating the right incentives, and providing credible, affordable, convenient products and net zero services.

We now turn to explore the evidence for where payments can enable this transition.

5. Exploring possible opportunities for payments in the decarbonisation of key systems

As discussed in section 3 (The potential role of payments in the transition to net zero) in reference to value networks, there must be appropriate incentives for all parties to engage in the net zero transition. This includes commercial opportunities. This section explores some of those potential commercial prospects for payments networks, assessing where and how they might leverage their core capabilities to enable the transition to net zero.

In the absence of academic research into where payments can play the biggest role in the transition (as discussed in section 2, The current context), including which parts of which sectors, this section provides a high-level survey of some salient opportunities, based on available research. These opportunity areas are therefore indicative and illustrative, not comprehensive.

Firstly, we look at the evidence for which systems will be central to the transition to a net zero economy. Secondly, we explore four sub-systems that can materially contribute to the transition with the opportunity for further enablement via payments capabilities. For each sub-system we set out the potential size and nature of the opportunity to create net zero solutions. We then set out the current role of payments before exploring two types of opportunities in the form of net zero solutions for that sub-system.

The first are 'inside-out', 'market-taking' opportunities, based on a payments network looking at already existent or relatively near-term opportunities, and prioritising based on its current capabilities, assets and relationships. These are usually characterised by requiring lower levels of wider system change or payments innovation to realise the value. Examples might include payments solutions to support sustainable retail banking, or facilitation of payments for EVs.

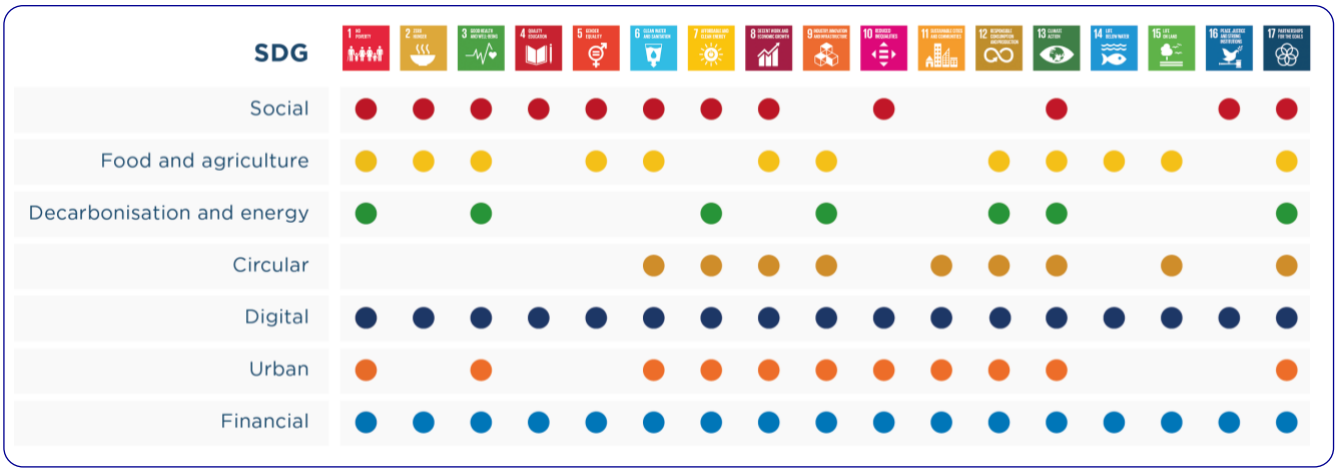
The second are 'outside-in', 'market-making' opportunities, identified through a payments network assessing where the big carbon impacts in the economy exist and then working with other stakeholders to identify and create new net zero solutions and services that address these impacts. These are typically medium to long-term opportunities, requiring evolution or development of payment solutions which may not exist today. These opportunities are more uncertain and reliant on shifting variables such as regulation, data-sharing ecosystems, or infrastructure investment. They are likely to require the involvement of various stakeholders to identify, fund, test and scale net zero solutions. Examples might include smart cities and enabling the renting of driverless EVs.

The relevant enabling roles of payments networks (from section 3, The potential role of payments in the transition to net zero) are used to broadly survey how the companies might unlock these opportunities, however they are necessarily described at a high level due to the uncertainty of these as yet undeveloped net zero services.

Finally, the benefits to payments networks of unlocking these opportunities are summarised. All the opportunities have the benefit of reducing the risk associated with high carbon payment flows, and increase reputation and trust with stakeholders by enabling the shift to a net zero economy.

Key systems in the transition to net zero

Given the ubiquity of potential applications of payments and the absence of research literature into where payments can have the biggest impact, we have used as a starting point existing knowledge of which key systems need to change. These are summarised by the World Benchmarking Alliance's seven systems[39] and their contribution to the UN SDGs,[2] illustrated below.



These interlinked systems need to be transformed together, as there are many interdependencies between them. For example, decarbonising grid electricity in order to enable low carbon EVs. These transitions, and the sustainable future they seek to deliver, have been associated with sizeable economic opportunities as new markets develop. It has been estimated that delivering the goals in just four sectors could create at least $12 trillion in opportunities.[40] There is also potential convergence between the way systems need to transition and new business models and enabling technologies. These include the shift to a circular economy, peer-to-peer decentralised networks, access over ownership, interoperable open systems and smart technologies such as the Internet of Things.

Given this report's focus on the transition to net zero, this section explores the potential opportunities within these key systems that could contribute most to decarbonisation and fall within the current scope of payments services. These are: low carbon urban mobility (part of the transition to sustainable cities); the sharing economy (part of the transition to a circular economy); retail banking (part of transition to sustainable finance); and data (part of the digital contribution to a net zero economy).

5.1 Low carbon urban mobility

Size and nature of the opportunity

Since 2007, more people live in cities than rural areas, globally. By 2030, this figure is anticipated to be 66 per cent of the population.[41] While cities account for 60 per cent of global gross domestic product (GDP), they also contribute 70 per cent of global GHG emissions and 60 per cent of resource use.[42] Sustainable cities (as identified in SDG11) are therefore critical to tackling decarbonisation including sustainable transportation and mobility systems.

Low carbon urban mobility aims to tackle multiple inter-related problems. An estimated 60 per cent of urban GHG emissions come from motorised road vehicles,[43,44] with the growth in traffic from increased urbanisation resulting in dangerous upward trends in urban air pollution in major cities.[45] These emissions also contribute to urban ambient air pollution that the World Health Organization (WHO) estimates leads to 4.2 million premature deaths annually.[46] Globally, many urban areas regularly have over 10 times higher concentrations of particles than these guidelines recommend.[47] Congestion is also a major economic, social and ecological issue in urban areas, which the International Monetary Fund (IMF) estimates costs $350 billion per year globally.[48]

Moving to safe and affordable, low carbon mobility solutions, such as public transit and wider multi-modal mobility, can address many of these challenges, including contributing to decarbonisation, improving air quality, productivity and improved road safety. It also represents a potentially sizeable market opportunity. Commercial market research estimates that the global market for transit and ground passenger transport could grow from $412.97 billion in 2020 to about $630 billion in 2025, with Western Europe accounting for about 29 per cent of that market.[49]

Underpinning how this growth is likely to manifest in Europe is the European Commission's strategy for Sustainable and Smart Mobility, which forms part of the EU's Green Deal.[50] The strategy aims to make the European transport system sustainable, smart and resilient, including specific actions to make "inter-urban and urban mobility more sustainable and healthier". To achieve that, the European Commission will engage with cities and EU member states to ensure that all large and medium-sized cities that are urban nodes on the Trans-European Transport Network put in place their own sustainable urban mobility plans by 2030. [51,52] The EU also set a 90 per cent reduction target for transport-related GHG emissions by 2050 with a central role for digitisation of transport systems.

At the same time, the EV market in Europe is surging, with one in nine cars sold in Europe in 2020 being EVs, and the European Commission proposing to ban the sale of new cars and vans with internal combustion by 2035.[53] The Commission has also set a target to have one million charging stations in Europe by 2025, up from about 285,000 in 2020. Comparing this number to the current 92,000 petrol stations across Europe indicates a considerable shift in the markets supporting personal transport, including the payment systems and flows that come with it. [54]

The current role of payments

Payments networks are already playing a role in sustainable mobility, as digital payments are increasingly widely used in public transit and micro-mobility services, such as scooters, where they perform several functions.

Contactless convenience

Payments, and particularly contactless payments, are a proven enabler of mass transit systems, with one of the most important benefits to commuters being the decrease of friction in their commutes due to contactless ('tap to enter') payments.[55]

In 2014, Transport for London (TfL) became the first public transport provider anywhere to accept contactless payments. Within two and half years, half of all TFL journeys were contactless (via cards or mobile devices). As of 2019, more than 21.6 million journeys per week were made using contactless payments, with more than 53,000 new contactless cards or new mobile contactless payments entering the TfL system every day.[56] **Today, nearly 485 cities and locations around the world have followed London's lead.**

Streamlining the journey

A safe, smooth, convenient and interoperable payments system, wherein consumers can use one card for all means of transport along their journey, is quoted by the World Resources Institute (WRI) as one of several enablers that can unlock an increased use of public transit and multi-modal mobility.[57] This is particularly the case when open-loop systems are used instead of closed-loop systems. Open-loop payment systems (such as contactless card payments) use international standards and universal technology to enable payments at most transit providers. Closed-loop systems (such as the Oyster card in London and the Clipper card in San Francisco) are limited to particular providers and usually apply specific standards and proprietary technology.[58] For cities with many international visitors, making public transit systems interoperable with international payment systems can also facilitate these visitors' use of public transport, driving down motorised vehicle and passenger kilometres still further. This has been observed in New York and Milan.[59]

This is also true for the payments experience across new forms of transport, such as EVs, where digital payments can facilitate charging by streamlining the payments options available to consumers across various EV charging networks.[60]

Decrease transaction costs for transportation companies

An overarching benefit of existing digital payments technologies is that they can help bring down the costs and friction of urban transit by reducing payment costs across transit companies' networks. Transit companies can then use these savings to decrease fare cost or improve service, leading to a virtuous circle with more commuters substituting to public transit. For example, TfL reduced its cost of fare collection from 14 per cent to around 9 per cent following the introduction of contactless.[61]

Accessibility for rich and poor

Payments help transportation operators to provide fare types and payment functions that are accessible to both rich and poor, for example through card-based fixed fares, distance- and time-based fares, multi-modal fares, fare capping, concessions and delay refunds. Distributing these options through digital payments solutions allows people with fewer resources to benefit from fare-capping options that have, until now, mainly benefitted those with the ability to pre-pay for weekly, monthly or annual passes.[55] For example, TfL's contactless ticketing system automatically calculates the optimal value fare based on journey history. Customers are then charged at the end of the day, ensuring they always pay the cheapest fare.[62] Digital payments also enable governments to subsidise fares, thereby stimulating the use of public transit and/or micro-mobility with the ecological and social benefits that come with that.[62]

In Bogotá, Colombia, the poorest residents were spending as much as 17 per cent of their income on transportation. The introduction of an electronic transportation card, called Tu Llave, enabled the city to subsidise their fares, resulting in these passengers increasing their monthly journeys by 56 per cent compared to normal fare card users. Source – ***Global Urban Mobility and Financial Inclusion: A Virtuous Circle***

Inside-out opportunities

As described above, the digital payments sector is well placed to continue to support localised initiatives that improve frictionless, streamlined transport experiences across existing systems, including mass transit, which is critical to reducing emissions-heavy travel. By helping mobility partners in cities to develop and improve the cost and convenience of their mobility systems, payments networks can also grow their revenues from new forms of paid-for transportation. Current and near-term opportunities can also be found in integrated transport and EVs.

Integrated transport means aligning different forms of transport in terms of logistics and modes of payment. A commute that uses metro, bus, public bikes, and/or scooters is seamlessly enabled, with commuters having access to bus and public bike stands at metro stations, and all modes being paid for by the same card. Lift-sharing entails schemes in which commuters can use a means of transportation without owning it. Examples include schemes for cars (such as Share Now), scooters (such as Bolt) and bikes (such as Swapfiets). Research by LEK Consulting suggests that about 30 per cent of consumers in countries outside of China have a 'propensity to access, rather than own' a car, pointing at a potentially sizeable lift-sharing market for

Europe.[63] While the pandemic may decrease the willingness of passengers to share a car in the short term (and is likely to change commuting patterns), it remains to be seen whether these impacts will be sustained in the long term, and other forms of open-air transport, such as scooters, may be less affected.

EVs: By proactively working with developers of EV charging infrastructure to implement interoperable payments systems (instead of a separate token for each charging network), digital payments can help decrease 'range anxiety' for consumers and contribute to faster growth in the uptake of EVs. This could feasibly open up payments opportunities for open-loop charging systems through an open interoperable infrastructure, peer-to-peer charging using micro energy generators, or in-car payments for on-the-go charging.

Outside-in opportunities

While inside-out opportunities grow emerging, localised, net zero mobility solutions, the outside-in opportunities scale these up and add new mobility solutions to them, ultimately leading to net zero mobility becoming the normal modes of transport in cities across the world. The opportunity for payments networks is to work with city authorities, transit providers and other stakeholders that are seeking to scale and mainstream net zero mobility solutions. This transition includes both building the capacity of existing low carbon modes like trains, trams and electric buses, and broadening the range of net zero modes of transport (such as scooter and bike hire or driverless EVs).

Payments networks can enable the integration, scaling and adoption of these multi-modal modes of transportation, especially across cities. These could combine to transition mainstream mobility to net zero modes and optimise new technologies to do so. There are a number of enabling roles that payments networks could play to unlock this opportunity.

Payments networks could empower citizens by making net zero mobility accessible, convenient, safe and affordable by enabling multi-modal services. This could allow passengers to plan their journeys, pay for them and even track their carbon impacts from the journey. This would optimise the brand trust and payments network infrastructure. This could be augmented by measuring, tracking and sharing other data flows, such as the carbon impacts (or savings) from a journey.

Payments networks could also aggregate this data to advise city authorities and transit companies on where the peak times are and how to optimise the system, through interventions such as planning or incentives for passengers to use off-peak times or modes of transport.

Unlocking these opportunities, especially in the medium term, can be enabled through partnerships and collaborations with other stakeholders that are seeking to decarbonise mobility. For example, Milan has an initiative to increase public transport and reduce cars in the city as it emerges from the pandemic.[64]

These initiatives will surface regulation that is a barrier to the transition. Payments networks can use their influence to join other stakeholders in advocating for an updating of these regulatory and infrastructure barriers, to scale up the wider adoption of net zero mobility.

Benefits to payments networks from capturing opportunities in sustainable urban mobility

By further leaning in on current opportunities in sustainable urban mobility, and advocating for and co-creating mid-term opportunities, payments networks can generate the following benefits:

- continue to expand organic payment flow growth in public transport
- create new payment flows and markets, including through the wider transformation to multi-modal integrated public transportation
- broaden the client base by partnering with and supplying new B2B customers, including transit operators, city authorities and other innovators in low carbon transport with data insight services
- help to drive appropriate enabling regulation required to transition to low carbon mobility services.

5.2 The sharing economy

Size and nature of the opportunity

Population growth, technological advances and increased affluence drive a demand for ever more goods and services, and in turn the materials and energy required to make them. The global material footprint rose from 73.2 billion tonnes in 2010 to 85.9 billion tonnes in 2017.[65] To date, consumption has been the main driver of growing global materials use,[66] with 'linear product systems' (sometimes described as the 'take, make, waste economy') now estimated to contribute 50 per cent of global emissions.[67]

In contrast, product sharing or 'the sharing economy' is one of several strategies towards achieving a 'circular economy', which is designed to minimise the amount of new raw resources needed by increasing the life span of a product, then reusing or recycling it to be used again. The sharing economy can also entail a shift from selling-and-purchasing durable goods, to selling-and-purchasing services. A consequence is that the ownership patterns of the goods changes: fewer lessors (who own the product and manage the service) provide access to a wider circle of users of the service.

Economic incentives and incentives to extend the life cycle of goods also shift. Lessors can earn more when they rent out their asset for a longer period, to more users, without it having to be repaired or replaced. Lessors are incentivised to choose more durable goods and manufacturers to design them that way. This 'decoupling' of material extraction, use and embedded energy of the product from its economic performance is a major objective of the circular economy. In some instances, manufacturers may retain ownership of the product and manufacturer/product owners/lessors will become the same entity. In such a case, the manufacturer will have an evolved business model, lengthened balance sheet, different financing structure and changed flow of payments. In that scenario, from a payments perspective, lessors become 'merchants' and the number of transactions related to the use of one product could significantly increase due to multiple use.

Examples of durable goods where the sharing economy could be applied include: *appliances* such as cookers, magnetrons, refrigerators, dryers, air conditioners, and washers; *tools* such as power drills, electrical saws and other DIY equipment; *electronics* such as computers, televisions, phones and tablets; *home and office furnishings* such as tables, chairs, sofas and cabinets; *vehicles* such as cars, trucks and bicycles; *jewellery;* and *apparel*. Several major retailers are already experimenting with leasing business models. In apparel, a sector worth €520 billion in the EU, this could entail a shift to rental models (such as the current scheme by H&M[68]) or investment in fibre recycling technologies. In the home and furnishings sector, IKEA has been trialling furniture rentals and repairs across 20 stores over the last year.[69]

There is already a significant regulatory drive to encourage a circular economy. For example, in March 2020 the European Commission adopted the new Circular Economy Action Plan. It is one of the main building blocks of the European Green Deal and includes a requirement to deliver the goal to be net zero by 2050.[70] China and the EU have also signed a joint Memorandum of Understanding to align on policies that support the transition to a circular economy.[67]

The opportunity and economics of the sharing economy are likely to increase as cities become denser and externalities such as carbon emissions and waste are priced in through regulation. The potential size of the opportunity is significant, with PwC placing the value of the global sharing economy at c.US$335 billion by 2025.71Analysis of the global markets for durable consumer goods for this report (including cars, home appliances, power tools, etc), found that just a 5 per cent shift of the overall global consumer durables markets (including cars, apparel, furniture, white goods, all combined) to sharing economy models could represent US$630 billion of annual revenues.72 As the largest category of durable consumer goods, cars would represent two-thirds of that amount. This 5 per cent shift would entail US$71 billion for the apparel industry, US$51 billion for the electronics industry, and US$28 billion for the home and furnishings industry. The scale of change forecast here points to the potentially significant impact of a move to sharing economy models on payments flows.

The current role of payments

Although there has been some exploration of the sharing economy within the payments sector (which has stressed the importance of trust, transparency and enhanced consumer experiences in the uptake of sharing economy models),73 it appears that no significant moves have been made by the payments industry in this area as yet. Notwithstanding that much of the sharing economy involves pay-per-use models, no publications could be found quantifying the current contribution of payments to a sharing economy, or the impacts of a sharing economy on the payments sector itself (for example in terms of investment or innovation). Opinion pieces in industry publications do, however, highlight the facilitating role of payments, for example in conveniently splitting the costs of rideshares among passengers.[74] Another role mentioned is accelerating the receipt of funds by people working in the gig economy, such as ridesharing chauffeurs and people who deliver takeout food.[75]

Inside-out opportunities

Payment networks already sit within the operating model of retailers that are trialling rental and re-use models of access instead of ownership. Given the potential size of the sharing economy, it would seem likely that the payments industry will strategically position itself to capture the broader predicted economic shifts described earlier across multiple other categories of goods.

In the short term, this would require payments networks to work closely with existing retailers and new entrants that are pioneering sharing economy services, for example in the apparel and home furnishing sectors. This would allow them to understand the barriers and opportunities for payments to enable and scale these services. This would result in developing and deploying timely adaptations to payments capabilities, such as new fee structures, infrastructure and tracking new data flows including the use, repair and optimisation of products.

Payments networks could also conduct research around the sharing economy to stay abreast of the ongoing and predicted shifts, understand categories of goods with the biggest carbon impact, and which categories lend themselves to sharing economy services and when. This would enable payments networks to develop new partnerships with the lessors of the goods and develop or adapt the payments capabilities required to enable the new sharing economy services. Value networks can be used as a tool to design and test these new services, by identifying the stakeholders and flows of financial and non-financial value between them that would make the services viable and avoid unintended consequences.

The analysis in Appendix 3 shows that the parties likely to have the most influence on the emergence of circular economic models are manufacturers of some of the largest categories of durable goods such as cars, smartphones, televisions and refrigerators. These stakeholders typically fall outside of the current four-party model. To leverage sharing economy-induced shifts in payment flows, payments networks should, in particular, develop and deepen their engagement not only with pioneering retailers, but also manufacturers and lessors (if they are not also the manufacturers). This could be achieved through new sharing economy pilots or participation in current retailer and/or manufacturer sharing economy initiatives.

Outside-in opportunities

The primary role of payments networks will be, as above, to scale up and enable the mainstreaming of the sharing economy by allowing consumers, as users of that service, to participate through the safe, convenient and affordable leasing of products. This will draw on payments networks' trusted brand reputation, and secure and ubiquitous transaction flows, combined with physical payments network infrastructure. This opportunity will require payments networks to track and accelerate the adoption and scaling up of sharing services from emerging product categories into other high carbon categories.

In the mid to longer term, this role could be extended to include tracking and revealing the energy and materials used (and saved) through a product's life cycle. There is already significant regulatory, policy and industry momentum around this trend, for example through the EU's circular economy action plan.[67] Achieving this would require a mechanism for measuring the energy used during the product life cycle and the materials incurred during manufacture, repair and end-of-life, which in turn would require a standard method for measuring and recording these impacts. These are complex challenges, however success would represent not only a significant win for net zero, but a new payment data flow that could be of use to both the lessor (to track and validate carbon and material impacts over the life of the product) and to the user. This would allow them to measure the true carbon savings of using the service, in addition to its convenience.

It could also present new opportunities for broader data services including valuable insights for businesses and governments, for example to monitor, analyse, identify and predict peaks in demand and to drive energy-efficient consumer behaviour. These insights could enable lessors to adapt tariffs on electrical goods to incentivise the use of products such as washing machines during off-peak periods, helping to provide more affordable options for users.

As well as regulation driving the shift to a circular economy, there is also regulation to reduce waste for other high carbon categories, such as the EU's Waste from Electrical and Electronic Equipment Directive.[76] This directive is designed to reduce e-waste by preventing it in the first place and contributing to the efficient use of resources and the retrieval of secondary raw materials. These trends combine to create greater transparency and value on the materials used in product categories such as electrical goods. This could incentivise not only circular economy services, but also services that include repairs, disassembly and recycling of used products. Such services could be enabled by payments, not just through transactions, but by tracking other data flows such as the use and value of raw materials and components within the product. Such services could increase the breadth and volume of transactions as well as the range of data flows. With less than 40 per cent of e-waste being recycled in the EU,[77] this presents lots of headroom for services that enable and increase product re-use and recycling.

Payments networks could also use their corporate narrative and advocacy to accelerate the adoption of sharing economy services. As above, many regulators and policymakers are already committed to driving the transition to a circular economy, particularly at EU level through macro policy frameworks. Payments networks could add their weight to the coalition of stakeholders helping to develop and shape enabling policy frameworks, such as more specific regulation, standards, or infrastructure. As part of their contribution to this process, payments networks could leverage the insights and evidence gained through the pioneering pilots and collaborations described in the 'Inside-out opportunities' section, which would help to surface specific regulatory and infrastructure barriers.

Given the brand trust and ubiquity of payments networks, a drumbeat of public support from the industry for the transition to a circular economy through strategic communications activities would help to inspire confidence among stakeholders, including regulators, consumers, investors and other commercial parties.

Benefits to payments networks for capturing sharing economy opportunities

By pursuing current opportunities in the sharing economy, as well as advocating for and co-creating mid- to longer-term opportunities, payments networks can realise the following benefits:

- create and capture potentially sizeable new payment flows (such as carbon impacts and new product utilisation models) and open up new sharing economy markets, by working with manufacturers, lessors and other stakeholders to develop and scale these new services
- grow their client base by enabling current retailers to diversify into becoming lessors by developing new value propositions and services, in doing so deepening and diversifying the relationship, such as through data services
- by communicating their support for sharing economy services, payments companies can attract potential new clients and business partners that share their ambitions and goals.

5.3 Sustainable retail banking

Size and nature of the opportunity

The EU retail banking sector is undergoing significant change due to a series of drivers ranging from regulation and emerging technologies to shifting consumer and investor expectations.[78] Regulation is a particularly strong driver, with banks under increasing pressure to manage sustainability risks and contribute to sustainability policy objectives.[79] Multiple drivers now exist, including through the EU's Sustainable Finance Strategy,[80] the regulation of sustainable finance products and disclosures, and via the banking supervisors themselves (such as the European Central Bank, Banque de France, Bank of England, De Nederlandsche Bank and many others[81]) moving towards climate stress-testing and other forms of macro- and micro-prudential supervision.

CISL sees a significant opportunity for banks to shift from a short-term, risk-based approach to climate change to an active mind-set that is forward-looking and proactively works with their customers to help them transition to a low carbon economy.[82] There is benefit in terms of competitive and commercial advantage, as well as risk management including mitigating unmeasured and unmanaged physical and transition risk in the portfolio, managing pressure from investors, employees and civil society, and reducing legal liability.

Banks are responding to these opportunities, for example by making net zero commitments, like the UN-led Net-Zero Banking Alliance.[83] However, in addition to increasing their focus on managing sustainability risks, they are also increasingly developing tailored sustainability product offerings. For example, the European Banking Association found that almost 11 per cent of the 6,000 European banks and credit institutions are now looking into green credit or debit cards.[84] As discussed in section 4 (The evolving role of citizens in sustainability), consumers are increasingly concerned about climate change and related sustainability issues, and are looking for sustainable products and services which are convenient, credible and affordable. Consumer attitudes research across 2,000 consumers conducted in Germany[85] in 2019 found that 68 per cent agreed that environmental and climate protection was one of the most important challenges to address and had grown year-on-year over the last three years. This was up from 53 per cent in 2016.[86] Another study found that 33 per cent of Swiss and Austrian and 23 per cent of German consumers would switch to a bank with a stronger product and service offering in sustainability, however it also found that the vast majority of the 4,000 consumers surveyed were not aware of ecologically sustainable products offered by their bank.[87] This suggests a competitive opportunity for retail banks to both invest in providing broader financial services that enable consumers to make low carbon, sustainable choices, and to ensure they are actively promoting these services where they already exist today.

Payments transactions are the most frequent touch points that consumers have with financial services. Given the increase in both regulation and consumer expectations of their banks to support sustainable choices, it would seem to be in both the issuing banks' and payments networks' interests to take up this opportunity of enabling more sustainable choices through financial services.

The current role of payments

Issuing and acquiring banks form the core client base for the payments sector. This relationship goes far beyond the facilitation of transactions across network infrastructure, encompassing a broad and continually expanding range of payments products and services, as well as collaboration in areas like brand campaigns and research. Examples span new card capabilities (such as customer payment controls, mobile and direct payments), API tools, performance solutions for customer retention and growth, consultancy services (including around data) and the provision of sophisticated AI-driven services in areas like fraud mitigation and smarter payments. The evolving needs of clients (driven in turn by ever-higher expectations and needs of their customers) has led to enormous investment and innovation across the payments sector.

In the sphere of sustainability products and services, this innovation is relatively nascent. Payments networks and banks have collaborated on initiatives such as brand campaigns, issuing credit cards made from more sustainable materials[88] and planting trees.[89] More recently, payments networks have been exploring suites of sustainable banking products and services, including carbon offsetting services and 'green loyalty schemes'.[90] A further advance has been the development of CO_2 scoring algorithms providing carbon footprint information to consumers, allowing them to understand the carbon impact of their purchases.[91] For example, the Mastercard Carbon Calculator,[92] ecolytiq[93] and Doconomy[94] help consumers understand how the way they spend their money affects their carbon footprint. ecolytiq's technology, for example, analyses individual banking transactions and translates these into a score through environmental impact calculations. This provides consumers with content and context around the sustainability of their transactions, allowing for behavioural change as well as footprint compensation. Some payments networks have built their own carbon scoring algorithms, which use a combination of transaction data and data from public sources (such as the Organisation for Economic Co-operation and Development (OECD)), and which can be used to provide macro-level insights on sustainable behaviour and trends.

On a consumer consent basis, payments networks have partnered with fintechs (such as those referenced above) to provide 'carbon footprinting' insights to individual consumers, via their banking services. These tools enable 'carbon footprinting', or the tracking of the amount of carbon dioxide released into the atmosphere because of the products and services bought. Not only do these tools quantify the entailed carbon footprint and communicate this footprint to the consumer, but they can also be connected to a range of other sustainable retail banking propositions, such as carbon offsets and loyalty schemes which make taking tangible actions to reduce carbon simple and convenient.

We will discuss broader data-related products and services in the next section (5.4 Data-driven sustainability services).

Inside-out opportunities

Payments networks can continue to develop and scale carbon calculators to become more robust and broader in scope. Greater investment in domain expertise within data science teams, as well as active, ongoing efforts to refine models for accuracy (including incorporating new data sources) will lead to more valuable products for clients and consumers. Other known limitations exist for these carbon scoring models today, which will be discussed further in the next section.

Continuing to broaden the range of associated services around these carbon scores is also a logical step. For example, ecolytiq provides financial institutions with a Sustainability-as-a-Service® solution so they can offer their customers not just environmental footprinting, but personalised impact offsetting and environmental, social and governance (ESG) investments. Deepening the partnership between payments networks and sustainability fintechs would be highly beneficial in terms of offering consumers greater choice and convenience for managing and mitigating the impacts of their purchases. Fintechs can leverage the expertise, product capabilities and significant client bases of payments networks to further develop and expand these options for customers, for example:

- personalised recommendations for healthier, low carbon lifestyle products and services
- options for charitable giving
- providing incentives such as loyalty and rewards for making low carbon choices
- gamification to understand and navigate their impact on the world
- providing investment opportunities for sustainable projects.

This would create benefits for payments networks and fintechs (in terms of innovative products and services for clients), while banks will be able to meet consumer demand for sustainable banking with products and services which could be powerful drivers of consumer engagement and behavioural change.

Outside-in opportunities

The medium- to longer-term opportunities lie in payments networks working with banks to identify net zero retail banking solutions that will make a material contribution to the low carbon transition. The scope of these solutions could span any context in which retail banking solutions could interact with the seven key systems identified at the beginning of section 5 (Exploring possible opportunities for payments in the decarbonisation of key systems), which include mobility and the sharing economy (explored above).

Outside of those areas, the following opportunities are examples of cross-cutting ways in which payments might enable retail banks in the transition to net zero.

Payments networks can further help citizens to both understand and contextualise their impact on the world by extending carbon footprinting tools to provide consumers with transparency beyond carbon impacts into other areas, such as impact on society, water intensity, or the use of nature in their products and services. Some of the challenges related to this are explored in section 5.4 (Data-driven sustainability services). As with existing offerings, this awareness could, in turn, provide the basis for new products and services (including incentives and rewards) that allow them to make more sustainable choices and investments.

Payments networks could also join forces with one another, or form broader coalitions, to promote shared public campaigns or collaborations that promote net zero solutions or advocate for the conditions they rely upon, such as regulation, infrastructure or consumer demand.

Another opportunity is for payments networks to use aggregated data on sustainability spend at a corporate or category level to inform the link between sustainability performance and credit risk. Various studies over the last decade have linked environmental performance of businesses and their credit-worthiness.[95] This is a potentially interesting area for payments networks, some of which already use transaction data and machine learning to power models designed to increase financial inclusion through more accurate assessment of credit risk for consumers[96] and merchants. If low carbon choices could be demonstrated to be a proxy for better credit risk, payments networks could explore enhancing credit-scoring models with scores from CO_2 models to build an evidence base for which low carbon choices provide better credit risk. This could drive greater financial inclusion for consumers and businesses. It could also directly influence the regulatory capital of banks and a major market for such data could potentially open up with payments networks as providers of these valuable insights.

Benefits to payments networks for capturing sustainable retail banking opportunities

By pursuing further inside-out opportunities in sustainable retail banking and advocating for and co-creating outside-in opportunities, payments networks can realise the following benefits:

- maintain and grow existing client relationships and revenues with issuing banks by helping clients to meet their consumers' evolving needs for net zero solutions
- attract new clients by offering innovative sustainability-focused product and service suites that help banks seeking to make sustainability a competitive differentiator and/or advantage
- drive greater financial inclusion for consumers and businesses
- open up new markets for data-related services.

5.4 Data-driven sustainability services

Size and nature of the opportunity

Sustainability data insights and data-driven sustainability services (such as data analytics and predictive modelling) can be used by businesses, governments and third sector organisations as important inputs towards achieving climate and other sustainability goals.[97] The global 'Green Technology and Sustainability market' (including data and AI) is predicted to grow from USD 11.2 billion in 2020 to USD 36.6 billion by 2025.[98] Multiple opportunities exist for data insights to enable the transition to a net zero economy, some of which have been discussed in the previous section (5.3 Sustainable retail banking) in relation to sustainable retail banking. Three emerging areas include:

Real economy impacts

Data is the key tool for measuring, monitoring and analysing climate impacts in the real economy. This includes both the embedded carbon in products and services, as well as the impact of climate change on products, services and society. For policymakers and other organisations seeking to navigate future scenarios and design transition pathways, data and related data-enabled technologies are powerful assets.[99] Greater transparency of these impacts through data collection and analysis can also be leveraged to inform and affect the choices and behaviours of stakeholders, as described in the sections above on the circular economy and consumer transaction carbon scoring in retail banking. This can also extend beyond consumer behaviour to inform the strategies of businesses, for example through greater visibility and understanding of trends in consumer behaviour related to sustainability.

Non-financial corporate disclosure and ESG

Financial institutions and corporates are also increasingly being asked to report on their incoming and outgoing climate risks.[100] In 2021, the five major global sustainability data providers (Refinitiv, MSCI, Bloomberg, S&P Global and FactSet) aligned on defining a standardised core set of sustainability metrics for all companies regardless of sector, geography, or size.[101] This disclosure allows stakeholders, from employees to investors, to make choices that are more informed, such as which organisation to work for, invest in or buy products or services from.

Regional planning and optimisation, including for sustainable towns and cities

As mentioned above, data-driven insights can underpin intelligent strategies and responses around planning, monitoring and adapting various systems, from industries to regions. As industries and regions seek to decarbonise, they will need to know where current impacts are and how to innovate new net zero solutions. Data can assist this through revealing carbon impacts and providing insights to underpin smart, efficient planning, innovating and adoption of low carbon solutions. For example, as we explored in section 5.1 (Low carbon urban mobility), cities can use data to map demands for transportation, enabling them to plan for and optimise low carbon modes of transport. Understanding more about how consumers behave and respond to local environments (in terms of footfall and spend for example) can also help planners and managers design performance improvement opportunities and interventions to drive greater sustainability.

Barriers and challenges

Unfortunately, while data is an incredibly powerful tool to support the net zero transition, challenges exist which present barriers to the realisation of opportunities today. While there is growing consensus on how to measure carbon,[102] it is not always consistently applied or reported on. Often the largest product or service impacts are in scope 3, requiring a much wider data set from across the value chain. This can be hard to obtain given the fact that different stakeholders hold different data sets. For example, manufacturers hold product-level data (including information on the carbon impacts of production), while retailers hold 'basket-level' data (including what product was purchased and at which retailer) and payments networks hold transaction-level data (including the time, date, amount and merchant category code of a purchase). The result is that the vast majority of products today are not 'carbon scored' and no universal methodology has yet been established to provide consumers with accurate, consistent feedback about the CO_2 impact of their purchasing.

As societal momentum has gathered around the need to reduce emissions, efforts have accelerated to find a solution to the product-level carbon attribution challenge. These include commitments and action on carbon and broader eco-scoring by individual businesses,103 campaign groups,104 industry bodies,105 and governmental106 and research initiatives.107 There appears to be clear momentum behind the overall objective, and comparisons have been made with the EU journey towards food labelling, which was achieved through a combination of NGO pressure, consumer demand and, ultimately, regulatory action.

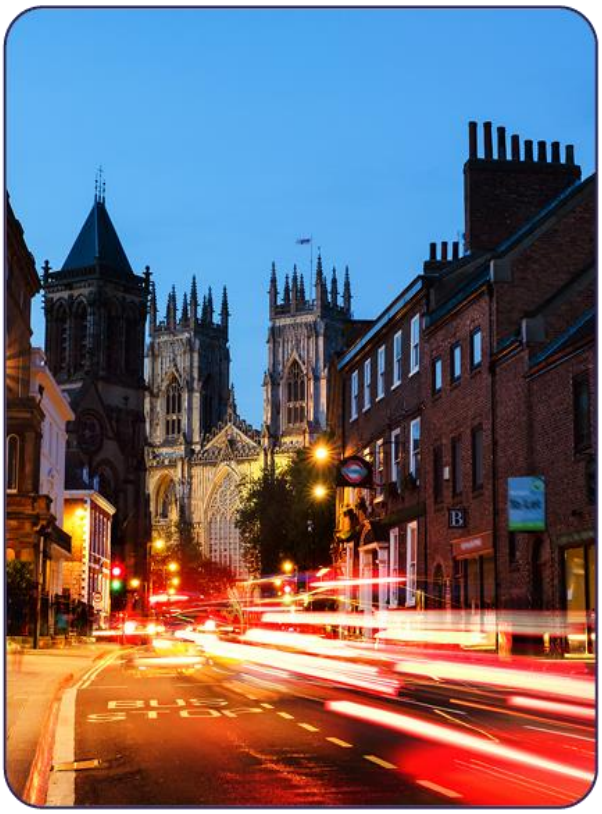
Despite this, carbon scoring of products is likely to remain inconsistent for some time, with numerous schemes co-existing for the foreseeable future. This is combined with more generalised issues related to data quality and collection (including consent and consumer engagement), and barriers to data sharing such as standardisation and interoperability. These combine to provide barriers to the provision of robust, accurate, accessible data on carbon and climate-related impacts. Should these barriers be overcome, the value of data-driven products and services for sustainability could rise exponentially.

What is the current role of payments?

Due to the reach of the services they provide, payments networks are custodians of broad data sets. Upholding privacy and keeping this data safe and secure is directly in the interest of the networks and there have been strong commitments to do so by major providers. Within the scope of responsible data use, there exist potentially transformative opportunities for use of transaction data which the networks have been increasingly exploring in the sphere of sustainability.

In addition to the fintech partnerships around carbon scoring for consumers (described in section 5.3 above, Sustainable retail banking), payments networks are already actively leveraging their data sets to provide sustainability insights and advisory services to their clients. Converting transaction data into insights and trends around consumer buying patterns (for example in categories such as aviation or apparel) can help banks, retailers and other interested parties to plan strategies, initiatives and marketing, and identify productive partnerships. These insights are currently being packaged as consultancy services, or built out into products (such as predictive models which can be licensed or built in-house for clients) or services (such as APIs or dashboards) providing clients with valuable, regular, or in some cases even real-time, sustainability information and predictions.

Payments networks are also sharing data to drive greater understanding and more effective action around sustainability, in order to shape how city centres are used and optimise public transport as people return to city centres in the aftermath of the Covid-19 pandemic.



Cities in the UK including Bath, York and Newcastle are using insights generated from data supplied by providers including O2 and Visa to better understand who is visiting their city, how they are getting there, and what they are doing once they arrive. These insights are used for a variety of purposes, from assessing resilience to disaster events, including the Covid-19 pandemic, to planning for urban regeneration.[108] The provider of the dashboard-based service, Movement Strategies, describes its goals as "creating lasting community benefit and ensuring future communities are made sustainable for generations to come". In terms of sustainability, use cases include assessing the economic impact of clean air zones, pedestrianisation and land repurposing, as well as identifying locations for EV charging and potential sites for sustainable infrastructure investment.

Inside-out opportunities

Data insights for business

As described above, payments networks are well placed to leverage their data to provide insights to organisations engaged in making decisions around sustainability. This might include data-driven insights to help to inform, evidence and support commercial strategies and competitiveness, marketing campaigns and brand reputation opportunities, as well as risk management and evidencing public disclosure and reporting requirements. There is significant opportunity to increase consultancy services in this area, as well as developing dashboard-type solutions. These can provide potentially significant value (to banks and retailers for example) in terms of being able to measure, track, compare and forecast sustainability metrics at a macro level, including identifying trends and benchmarking against the market. This could inform non-financial corporate reporting. Some networks are already piloting these services and there would appear to be notable scope for expansion and refinement.

Data insights for the public sector

Similar to services provided to businesses, payments networks can leverage their expert capabilities and data sets to provide public sector organisations (such as governments, municipalities, transport and health authorities) with insights into domains such as urban mobility, transportation, city planning, population health performance, economic performance and planning, tourism, effectiveness of tax incentives, and the effectiveness of climate strategies. Payments networks are increasingly sharing data 'for good' in this way with public bodies, for example helping governments to understand and track the impact of Covid-19. Targeting these capabilities and efforts towards the sustainability agenda in the public sector, in support of 'green recovery' from the Covid-19 pandemic (behind which there is already significant momentum), could provide significant opportunities for payments networks outside their traditional client base.

Similarly, there are investment and scaling opportunities for data sharing and provision of data-related services in the area of sustainable towns and cities. These insights could benchmark cities, help understand current patterns of behaviour, model future scenarios and underpin strategic decision-making. Activity in this area is currently nascent but has already demonstrated value. Potentially impactful opportunities exist for further development and refining these services, as well as leveraging payment networks' broad ecosystem relationships to expand the client base for these services and building coalitions of the willing. For example, testing and scaling for optimisation of city centres could be expanded from current areas of focus (such as transport) to new areas, such as informing social attractions and activities that promote wellbeing while reducing the carbon footprint, such as theatres and collective exercise.

There is an additional opportunity for regulatory sandboxes focused on sustainable finance and technology (ie 'fintech for sustainability') that are accessible to all market players, large and small, bank and non-bank.

Outside-in opportunities

Leveraging expertise and ecosystem relationships to address barriers to data for sustainability

As discussed above, substantial barriers exist today to fully realising the power of data, including transaction data, for sustainability. Many organisations and initiatives exist with a mission to tackle these barriers, for example Icebreaker One, which helps corporates and financial institutions reach net zero carbon emissions through data sharing, including providing API and data quality standards, as well as licensing and governance structures.[109] There are strong grounds to suggest value for payments networks in driving or supporting efforts such as these to unlock barriers to data use for sustainability, since this would lead to greater availability and quality of data with which to power higher-performing sustainability-related products and services.

One of the most complex challenges is the lack of universal methodology to standardise product-level climate impacts. To achieve this, consistent methods for measuring and reporting carbon impacts across the life cycle of products and services are required. This extends from scope 1 and 2 (direct and indirect) impacts to scope 3 impacts across the whole value chain. Payments networks are well placed to leverage their expertise, brand trust and ecosystem relationships to help drive and co-ordinate existing efforts to create specification standards to provide consistent, interoperable data measurement. Adding their weight behind both sectoral efforts (such as those in apparel and food and drink), as well as cross-industry efforts (such as the World Business Council for Sustainable Development's 'Value Chain Carbon Transparency Pathfinder' that seeks to develop a comprehensive methodology and technical infrastructure for sharing granular, consistent and verified product-level data on primary emissions across value chains) could pay dividends in terms of valuable improvements to existing carbon scoring models.

Increased data sharing must also be facilitated to unblock silos across the value chain today between: product manufacturers (which often 'own' product-level carbon data); suppliers (which can provide 'up-stream' measures such as energy use for raw material extraction or the contribution of certain ingredients); retailers (which own basket-level stock-keeping unit (SKU) data); and payments networks (which have the holistic view of purchasing across the economy. Here again, payments networks can leverage their brands and ecosystem partnerships, working with stakeholders across the economy to tackle barriers to data sharing in this context. This activity would need to form part of wider efforts among policymakers and industry to address barriers to data sharing today, including around security, privacy, governance frameworks, standardisation and interoperability.

A further barrier to the success of data-driven initiatives to drive the net zero transition is the availability and quality of data. This in turn is heavily dependent on consumer trust and buy-in to the benefits of the data-driven economy. Global consumer attitudes research[110] by one major payments provider has shown that consent and control are the key factors influencing consumer confidence and willingness to share data. Payments networks should explore advocating the merits of individual consumers having more control and choice around sharing their own data, grounded in the principle of consent. This would take the form of both advocacy for regulation and potentially the requesting of new standards for consent and new solutions for convenient, secure consent management.

Beyond access to consumer data, industrial data also offers significant potential value for payments networks seeking to enhance existing sustainability-related data products and services, or to build new ones. Europe is taking the lead on building an ambitious data-sharing ecosystem, a 'single market for data', which can be used safely and fairly for the common good.[111] The new ecosystem will include nine identified 'common data spaces' in crucial sectors including health, the environment, energy, agriculture, mobility, finance and manufacturing – all of which could add potential value to sustainability-related models. Enabling legislation is currently under debate, with a new Act expected to be passed in 2022. Payment networks should take a proactive stance on supporting the regulatory development of trusted, secure, governed data-sharing ecosystems such as this, which could be potentially transformative in terms of access to data and insights for sustainability.

Looking ahead, other measures of sustainability beyond carbon could be added to CO_2 scoring models, further increasing their utility, and thus their value as a commercial proposition. Various initiatives are already using or piloting a broader range of factors. For example, the new Foundation Earth pilot (including several major European supermarkets)[112] is trialling an 'Eco Impact Score' label for food and drink products which includes not just carbon but water usage and pollution, as well as biodiversity loss. Similarly, the Sustainable Apparel Coalition developed the now widely used 'Higg Index', including a suite of tools for the standardised measurement of value chain sustainability including water use, carbon emissions and labour conditions. As with product-level carbon attribution, payments networks should consider supporting these efforts, as well as giving strategic consideration to the data systems and architecture which would be required to incorporate broader sustainability features in addition to carbon.

If payments networks are able to capture and process reliable data around life-cycle carbon, and broader environmental impacts, this could provide valuable new data insight services across various products, merchant categories, services, companies, regions and sectors. As regulatory requirements grow on both real economy companies and the banks that fund them, there is likely to be growing demand for more reliable and granular information on the impact of climate change on the products and services provided by businesses. This would extend the potential market for payment data insights from current clients (issuing banks) and consumers to any organisation interested in the climate impact of whole categories. This could include real economy companies, such as brand manufacturers and retailers, to investment banks, regulators and local and central governments. Insights or scores could feed into the regulatory carbon disclosure and ESG requirements of corporates and financial institutions facilitating, for example:

- corporates to substantiate their non-financial reporting and disclosure
- businesses and governments to analyse and develop new markets, strategies and plans
- investors and governments to inform investment decisions and strategies.

Benefits to payments networks from data-driven sustainability intelligence

By further leaning in on current opportunities in data-driven sustainability intelligence, and advocating for and co-creating mid-term opportunities, payments networks can realise the following benefits:

- enhance the value of data-related products and services
- expand the potential suite of data-related products and services
- expand the client base for such products and services.

6. Recommendations

To bridge the huge opportunity gap and play their full role in the transition to a net zero economy, payments networks could take the following four outcomes and options:

6.1 Identify net zero as a strategic opportunity for the core business

This outcome can be achieved by engaging senior leaders in the evidence for both the commercial and societal urgency to decarbonise. This can be enhanced by understanding how stakeholders (from employees, investors and regulators to civil society) are increasingly aligning around the need for business and society to decarbonise. This creates a strong mandate and opportunity for the payment network to understand and explore its distinctive role in the transition to net zero.

6.2 Identify potential opportunity areas for payments networks

Payments networks can use the mandate to commit sufficient resources to explore and clarify the potential opportunity areas where their core capabilities align with the material sectors and systems that need to decarbonise. For example, this could include investing in sustainability and climate change expertise in core teams such as data, product innovation and strategy.

This would also be enhanced by using existing or commissioning new robust research that identifies the trends and carbon impacts in sub-sectors of the economy. This research can be used to overlay payments networks' core capacities to identify potential opportunity areas to create net zero solutions. The enabling roles of payments from section 2 (The current context) can be used to identify these areas. Payments networks can also convene relevant external stakeholders to identify and test potential opportunity areas.

6.3 Diagnose and test potential net zero solutions with stakeholders

Having identified potential opportunity areas (such as expanding the adoption of public transport in urban areas) this outcome takes it further by diagnosing and testing the potential for net zero solutions within that opportunity area (such as a single app that allows passengers to plan and pay for integrated transportation routes). This may include setting system and geographical boundaries and success outcomes, and identifying relevant stakeholders.

This outcome will be enabled through consulting domain experts, and joining or initiating collaborations to address the need, or through strategic partnerships (such as think tanks, municipalities or innovation hubs). Value networks can be used with these stakeholders, which are also driving the net zero transition, to diagnose and identify potential net zero solutions. The payments-enabling roles can be used to identify the potential role of payments within them. Payments networks can also convene stakeholders to share, test and build their diagnosis and potential net zero solutions.

6.4 Co-innovate payments products and services

Having identified potential net zero solutions, payments networks can then adapt or develop new payments products and services that deliver the net zero solution. Value networks and the payments-enabling roles are tools that can be used. This would include the types of data flows (such as energy or materials) and the types of services (such as data insights or secure transactions).

Payments networks can work with stakeholders to co-innovate the role of payments within the net zero solution, rather than developing them in isolation. These payments solutions can be piloted and tested with stakeholders. For example, testing a specific integrated transportation app in a specific city with the municipality and transport operators. Once tested, these net zero solutions could be replicated and scaled up in other markets.

6.5 Influencing the external enabling conditions

Outcomes 6.3 and 6.4 are likely to surface external barriers and enablers, such as regulation, infrastructure or creating end user demand. The payments network can play its role, along with other stakeholders, to influence these external enabling conditions, which will enable the scaling up of the net zero solution.

For example, this may require positive advocacy to create and align the appropriate regulation. It may also involve adapting or creating new standards, such as for the creation, collection and sharing of types of data. These can be advanced through both the payments network's External Affairs teams as well as through collaborations and initiatives that share the same goals and outcomes.

Appendices

Appendix 1

Methodology

Research questions

This project looked into the contribution that payments networks' current and future payments assets, products and services could make towards achieving sustainable economies. It particularly focused on payments' contribution towards decarbonisation and a circular economy.

The research questions are:

1. What are payments for sustainability?
2. What contribution could payments for sustainability make towards achieving sustainable economies, specifically decarbonisation and a circular economy?
3. What are payments networks' roles, if any, in developing and deploying payments for sustainability?
4. What options do payments networks have for meaningful interventions across their business strategy, the public domain and its business operations?

Methodology

Given that payments for sustainability is a new domain, this project is explorative. The research methodology is qualitative. A grounded theory approach was used consisting of iterative qualitative analyses of interviews to form theoretic hypotheses to answer research questions 1 to 3. Further, to answer research question 4, we used a value network analysis approach to identify possible interventions that Visa could undertake.

For this research, 16 in-depth stakeholder interviews were conducted. Stakeholders were selected from the payments sector's current value network, as well as outside experts. The interviews were run using a semi-structured format. The insights from earlier interviews were integrated in the later interviews, thus leading to an evolving body of insight from which plausible answers to the research questions could be drawn.

The interviewees were from the following organisations, in alphabetical order:

Accor

CISL Fellow

Ecolytiq

European Commission

HSBC

Marketpay

PostFinance

The Psychometrics Centre, University of Cambridge

Santander

Triodos Bank

WRI

Appendix 2

Sharing economy – relevant product categories, size of market, order of magnitude of 5 per cent shift, structure of market per category, main players in payments' value network or not

Category	Durable good	Absolute yearly number of items sold	Estimated yearly market revenue (US$)	Decrease in yearly payments sum, away from traditional merchants, if 5% of current market switches to sharing (rounded to bn US$)	Aggregate new payments sums in sharing models	Growth market globally?	Market concentration producers: low–medium–high–extreme	Major players present in current value network of payments?	Some of the most important materials used in the good
Vehicles	Cars	70m[113]	8,921bn[114]	446bn	?	No	Highly concentrated, 80% of production with 15 global groups.[115] High barriers to entry.	Mostly not.	Aluminium Steel Plastics Rubber
Apparel	Apparel	?	1,429bn[116]	71bn	?	?	Low concentration, highly fragmented.	Some producer-merchants.	Plastics Natural fibres (cotton, wool) Leather
Home & office furnishings	Furniture (sofas, beds, chairs, tables, cabinets)	?	559bn[117]	28bn	?	Yes	Low concentration, highly fragmented and has low- to medium-level entry barriers.	Some (eg producer/ retailers like Ikea, Ashley Furniture Industries). But most not (eg pure-play producers like Herman Miller).	Wood Steel Plastics
Electronics	Smartphones	1.4bn[118]	409bn[119]	20bn	?	Yes	Highly concentrated, seven players control the market.[120] High barriers to entry.	No, with the exception of Apple.	Silica sand Plastics Iron, aluminium, copper, lead, zinc, tin, nickel, barium, lithium, tellurium, cobalt, manganese, tungsten, gold
Electronics	PCs & laptops	275m[121]	331bn[122]	17bn	?	Yes	Highly concentrated, five players control the market.[121] High barriers to entry.	No	Aluminium Plastics Copper Silica sand
Jewellery	Non-luxury jewellery	?	212bn[123] to 300bn[124]	11bn to 15bn	?	Yes [119]	?	Some, eg merchants such as Pandora.	Silver Copper Zinc
Electronics	Televisions[125]	214m	243bn	12bn	?	?	Highly concentrated, four players control the market.[126] Medium barriers to entry.	No	Silica sand Plastics Copper, tin, zinc, chromium, gold Neon, xenon, argon, phosphor Cerium

Category	Durable good	Absolute yearly number of items sold	Estimated yearly market revenue (US$)	Decrease in yearly payments sum, away from traditional merchants, if 5% of current market switches to sharing (rounded to bn US$)	Aggregate new payments sums in sharing models	Growth market globally ?	Market concentration producers: low-medium-high-extreme	Major players present in current value network of payments?	Some of the most important materials used in the good
Appliances	Refrigerators [127]	193m	107bn	5bn	?	Yes	Medium market concentration, largest manufacturer has less than 20% market share with many competitors. globally.[128] Medium barriers to entry.	No	Aluminium Steel Plastics Fibreglass Polystyrene Copper Tetrafluoroethane Chlorofluorocarbon Chlorodifluoromethane
Appliances	Air conditioners [129]	141m	103bn	5bn	?	Yes	Low market concentration, largest manufacturer has less than 4% of the global market.[130] Low barriers to entry.	No	Plastics Copper Aluminium Tetrafluoroethane Chlorofluorocarbon Chlorodifluoromethane Water Ammonia
Appliances	Cooking appliances[131]	226m	96bn	5bn	?	Yes	?	No	Aluminium Copper Iron Lead Stainless steel Plastics Silicon Teflon (polytetrafluoroethylene)
Electronics	Tablets	144m[132]	66bn[133]	2bn	?	?	Extremely concentrated, two players control the market. High barriers to entry.	No	Aluminium Carbon Steel Copper Cobalt Chrome Nickel Silica sand Plastics

Category	Durable good	Absolute yearly number of items sold	Estimated yearly market revenue (US$)	Decrease in yearly payments sum, away from traditional merchants, if 5% of current market switches to sharing (rounded to bn US$)	Aggregate new payments sums in sharing models	Growth market globally ?	Market concentration producers: low-medium-high-extreme	Major players present in current value network of payments?	Some of the most important materials used in the good
Jewellery	Luxury jewellery	?	18bn[119] to 45bn[134]	1bn to 2bn	?	?	?	Yes, eg producer-merchants such as Tiffany.	Gold Platinum Diamonds
Vehicles	Bicycles (cargo electric bike, non-cargo electric bike, cargo non-electric bike and non-cargo non-electric bike)	?	29bn[135]	1bn	?	Yes	Low concentration, highly fragmented. Low barriers to entry.	Mostly not	Aluminium Steel Rubber
Tools	Power tools (drills, saws, material removers, compressors, etc)	?	25bn	1bn	?	Yes	Medium concentration, five companies control ¬50% of the market.[136] Low barriers to entry.	No	Plastics Copper Stainless steel
Tools	Hand tools (non-powered)[137]	?	22bn	1 bn	?	Yes	Low concentration, highly fragmented. Low barriers to entry.	No	Plastics Wood Stainless steel
Appliances	Dishwashers [138]	?	2bn	100m	?	Yes	?	No	Steel Plastics
Tools	Foldable ladders[139]	?	1bn	50m	?	Yes	Low concentration, highly fragmented. Low barriers to entry.	No	Aluminium

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