Banking
Environment
Initiative

Catalysing Fintech for Sustainability

Lessons from multi-sector innovation

A report of the BEI's Fintech Taskforce
October 2017

UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP

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Publication details

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Authors and acknowledgements
The authors of this report were Thomas Verhagen and Andrew Voysey (CISL). The report is based on work taken on by the Fintech Taskforce of the BEI.

The production of this report would not have been possible without the generous contributions of the members of the Fintech Taskforce. The following people and organisations were members of the Taskforce; their involvement in the project does not necessarily constitute an individual endorsement of the recommendations, conclusions or statements in this report.

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Reference
Please refer to this report as University of Cambridge Institute for Sustainability Leadership (CISL). (2017, October). *Catalysing Fintech for Sustainability: Lessons from multi-sector innovation*. Cambridge, UK: Cambridge Institute for Sustainability Leadership.

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Foreword

Amine Bel Hadj Soulami
Chair of the Fintech Taskforce, Banking Environment Initiative
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In recent years, considerable progress has been made in the areas of both financial technology ('fintech') and sustainability. However, up to now, these two areas have rarely come together. The Fintech Taskforce of the Banking Environment Initiative worked for six months in 2017 to help bridge this gap. The Taskforce was founded at a meeting of senior executives from multi-national companies, financial institutions and fintech start-ups. The purpose of the Taskforce was to make fundamental design recommendations as to how firms from these sectors could work together to harness fintech to help solve sustainability challenges in the real economy.

Over the past 40 years, information and communication technologies (ICT) have been amongst the most important enablers of the financial sector. These technologies have mostly been developed by major ICT corporations or, in some cases, by financial institutions themselves. Only recently has the development of financial sector-grade ICT become democratised to such an extent that a range of relatively small and innovative firms were able to enter the market. This is the domain of fintech.

During the same period, sustainability has grown from a niche preoccupation for business to a mainstream concern. In the past two years alone, governments and regulators around the world have taken action to bring sustainability issues to the core of companies' management agendas. With the Paris Agreement, governments sent a clear signal, supported by a broad business coalition, about global agreement to deal with greenhouse gas emissions. Through the Task Force on Climate-related Financial Disclosures (TCFD), the Financial Stability Board, which consists of G20 central banks, set out recommendations for how non-financial and financial corporations should report on the climate-change related risks they face as part of their regular disclosure to the markets.

The Fintech Taskforce was premised on the belief that the automation of financial services and their underpinning processes has advanced so far that the application of fintech will stretch beyond the strict provision of financial services. This report by the University of Cambridge Institute for Sustainability Leadership, which convened the Fintech Taskforce, makes eleven recommendations, informed by three use cases. If put into practice, these recommendations would see 'Fintech for Sustainability' catalysts emerge around the world, heralding a major next step in the application of fintech to help solve some of the world's greatest challenges.

Executive summary

This report is the output of the Fintech Taskforce ('the Taskforce'), which was convened by the Banking Environment Initiative (BEI) in March 2017 for a six-month term.

A major turning point may be within reach of leaders trying to evolve, for the better, the relationship between business and society. Specifically, there is a rising awareness about the potential for technology-driven innovation in finance ('fintech') to be harnessed to support sustainable development. If done well, this could be transformative.

The purpose of this report is to share the Taskforce's recommendations on how to design collaboration between multinationals, financial institutions and start-ups such that we better harness fintech to help solve sustainability challenges in the real economy. These recommendations represent insights gathered from an intense period of collaboration between representatives of these different communities. The findings are certainly relevant to these sectors specifically, but also to others such as governments, entrepreneurs and philanthropists who may have an interest in putting them into practice.

The Taskforce was created at a Chief Executive summit convened by HRH The Prince of Wales in early 2017. Its mandate was to address the practical dynamic of how to design better multi-sector collaboration to innovate fintech solutions for sustainability. The Taskforce agreed that its work could be judged a success if its recommendations led to: *"interested parties having a space where together they can create, raise awareness of, and implement industry-level fintech solutions targeted at specific sustainability-related business issues"*.

The secretariat for the Taskforce was provided by the University of Cambridge Institute for Sustainability Leadership (CISL). CISL has 30 years of experience of working from within the University to empower leaders from business, government and finance around the world to tackle critical global challenges.

Lessons derived from practice

To identify recommendations about the design of future collaborative innovation processes, the Taskforce decided to begin by immersing itself in three separate examples. These 'use cases' were situations where collaboration between multinationals, financial institutions and fintech start-ups could deliver value that was previously out of reach. The intent was not to initiate primary research nor develop new solutions in these groups, but to explore what could be achieved through new combinations of existing ideas and actors. Lessons were then extracted and evolved from these working examples.

The use cases, which are detailed in this report, relate to fast-moving consumer goods supply chains, pension value chains and renewable energy markets. Although these use cases were only intended as opportunities to test the Taskforce's thinking against reality, the use-case teams made remarkable progress in their own right. In some instances, solutions were identified quickly and responsibility taken for developing them further. One solution in particular is under further development by the team to deliver a proof of concept.

The Taskforce was set up to explore such issues at a pre-competitive stage of collaboration. This allowed participants to focus on maximising both the societal and commercial impact of their thinking without being constrained by the desire for particular innovations to have commercial relevance at a later stage. The aim was to create every opportunity for ideas to flow more freely.

Recommendations

The Taskforce's recommendations as to how to design collaboration between multinationals, financial institutions and start-ups such that we better harness fintech to help solve sustainability challenges in the real economy are as follows. They are elaborated with thoughts on implementation in the report itself.

0. **Establish 'Fintech for Sustainability' catalysts to trigger targeted, collaborative innovation between multinationals, financial institutions and start-ups.**
Meaningful opportunities are being overlooked because multi-sector innovation does not happen easily on its own. Every catalyst would support a portfolio of innovation projects, each focused on a specific challenge.

1. **Require that each round of innovation is anchored by at least one organisation with the commercial motivation, and the ability, to implement the solution at scale.**
Having a 'problem owner' commission the innovation process provides clarity, focus and discipline. If the organisation's size and networks mean it can deploy what results at scale, greater impact can be achieved by design.

2. **Require that all solutions help more capital to become available to deliver at least one UN Sustainable Development Goal (SDG).**
Existing fintech incubators and accelerators do not typically solve for sustainable development, despite this being a global imperative agreed by the world's governments and targets articulated through the SDGs.

3. **Locate the catalysts to benefit from physical access to as wide as possible a selection of multinationals, financial institutions and start-ups.**
Multi-sector innovation works best when collaboration between sectors is made as easy as possible. Face-to-face interaction is still a key ingredient, so co-location with existing innovation and business clusters matters.

4. **Require that each round of innovation takes the time to design for industry-wide scale.**
The SDGs set out a transformative agenda for business and time is short. Solutions that cannot easily be adopted by others are insufficient; widely used data standards and open source solutions are preferable.

5. **Use well-established innovation practices to deliver professional governance, including of competitive boundaries and IP.**
To allow a multi-sector group of firms to move seamlessly from pre-competitive exploration to commercial development of solutions, clear policies on antitrust compliance, staged decision-making and IP are needed.

6. **Award an independent party, which has sufficient expertise in fintech, finance and sustainable development, the mandate to structure the innovation process.**
The diversity in multi-sector innovation is an asset but without managing roles and pace, it cannot work. A party free of conflicts of interest must play this role but also be fluent across boundaries between sectors.

7. **Commit dedicated, meaningful resources related to firms' innovation strategies to this effort for the next three years.**
Taskforce members have already been persuaded to fund a 'proof of concept' for one of the use cases. For Fintech for Sustainability catalysts to deliver other solutions, they must be properly resourced through a set-up phase.

8. **Measure success by the delivery of commercially viable solutions.**
To add value in a crowded landscape, the catalysts should have a singular focus on taking specific solutions from conception to implementation and on those solutions being self-sustaining business propositions.

9. **Seek the support of key enablers, like governments, regulators and standard-setters.**
While this is envisaged as a business-led endeavour, authorities have a role to play in smoothing and even accelerating the deployment of new solutions at scale.

10. **In all communications, cut through complexity to connect problems and solutions and use language common to all.**
Convening multi-sector groups inevitably introduces different knowledge bases, lexicons and perspectives. Failure to effectively bridge between them certainly wastes time but can ultimately be fatal.

Conclusion

Significant opportunities are on offer if multinationals, financial institutions and start-ups can better harness fintech to help solve sustainability challenges in the real economy. Realising these opportunities will require new effort both from the current Taskforce members and many others around the world. The recommendations of the Taskforce could be delivered within existing collaborative structures, lead to the establishment of new structures, or a combination of both. The promise of both commercial and societal reward should provide the necessary motivation to all involved to put these design principles into practice.

Contents

Introduction

What is the purpose of this report?

This report is the output of the Fintech Taskforce ('the Taskforce'), which was convened by the BEI in March 2017 for a six-month term. The purpose of the report is to share the Taskforce's recommendations on how to design collaboration between multinationals, financial institutions and start-ups such that we better harness fintech to help solve sustainability challenges in the real economy.

These recommendations represent insights gathered from an intense period of collaboration between representatives of these different communities. The findings are certainly relevant to these sectors specifically, but also to others such as governments, entrepreneurs and philanthropists who may have an interest in putting them into practice.

The Taskforce was created at a Chief Executive summit convened by HRH The Prince of Wales in early 2017. The rationale for that meeting was the thought that a major turning point may be within reach of leaders trying to transform, for the better, the relationship between business and society. Specifically, there is a rising awareness about the potential for fintech solutions to be harnessed to support sustainable development. If done well, this could be transformative. The expectation that big business must find commercially viable ways to help solve the world's social and environmental challenges is constantly growing. In parallel, fintech is emerging as a major redefining force for the provision of goods and services.

What is the value of multinational companies, financial institutions and fintech start-ups collaborating on this agenda?

There are already many examples of fintech start-ups working directly with financial institutions or, separately, with multinational companies. Such collaborations often centre on the promise of improving operational efficiency, broadly defined.

The focal point for the Taskforce's work, helping to solve the world's most pressing social and environmental challenges, is a goal of an altogether different order of magnitude. This is true in terms of both scale and complexity. CISL's own work has attempted to capture the transformative nature of doing so through its *Rewiring the Economy* strategic framework.[1] This framework distils ten interconnected tasks for leaders in government, business and finance to guide the structural and cultural changes that will be necessary in the economy to solve the big challenges at hand.

The concept of 'rewiring' is particularly pertinent in the context of harnessing fintech to help solve sustainability challenges. We have to provide for as many as nine billion people by 2050 within a finite envelope of land, water and natural resources. At the same time, we must adapt to a warmer, less predictable climate. This must be done in a way that at least addresses people's basic needs, wellbeing and expectations of decent work. We will therefore need to redesign core concepts of value creation and capture and find ways to execute those concepts at scale.

One manifestation of the opportunity within reach here is the possibility of using fintech to allow the secure availability of information about the social and environmental impact of business activities. Users of such information could range from credit risk analysts to corporate procurement teams and all the way through to consumers at the end of corporate or financial value chains. Fintech innovation is creating opportunities to do this in ways that are fundamentally more secure, efficient and affordable – this has not been achieved so far and has therefore held back the pace of change.

The rationale for multinationals, financial institutions and fintech start-ups to work together on this agenda therefore lies in the fact that their distinct strengths and assets complement one another. Greater value can be unlocked when these strengths are combined. Connecting previously disparate sets of information and making new data layers available within the existing distribution channels of multinational companies and financial institutions holds great promise as a new source of value. Each of the three use cases studied by the Taskforce demonstrates this promise in its own way.

Introduction *continued*

Why was the Taskforce needed?

In the coming few years, it is likely that various of the technologies underpinning fintech solutions that are relevant to addressing sustainability challenges in the real economy will mature, and that standards – for instance around data streams, protocols and security – will therefore be set. An inflection point may arise when such technology-based solutions are linked across multiple sectors, redefining how information is created and value flows.

For leaders of financial institutions, this matters. Uppermost in their minds are the challenges of the regulatory agenda, technology disruption and regaining a sense of their sector's relevance to society. Finding ways to harness fintech to help solve sustainability challenges in the real economy has the potential to touch all three challenges. This concept and the Taskforce's approach to defining fintech are detailed in Appendix 1.

However, some of the initial challenges that need to be overcome before realising these opportunities, are more practical and prosaic. Multinational companies, financial institutions and fintech start-ups typically have minimal experience of working together to innovate shared solutions. A shared language and mutual understanding across these sectors still need to be developed in most of the specific contexts where progress might be expected in the coming years.

The Taskforce was conceived at the Chief Executive summit to address the practical dynamic of how to design better multi-sector collaboration to innovate fintech solutions for sustainability.

The secretariat for the Taskforce was provided by CISL, drawing on its 30 years of experience of working from within the University of Cambridge to empower leaders from business, government and finance around the world to tackle critical global challenges.

What approach did the Taskforce take to come up with its recommendations?

To identify recommendations about the fundamental design of future collaborative innovation processes, the Taskforce decided to begin by immersing itself in three separate examples. These 'use cases' were situations where collaboration between multinationals, financial institutions and fintech start-ups could deliver value that was previously out of reach. To be clear, the intent was not to initiate primary research and develop new solutions in these groups, but to explore what could be achieved by new combinations of existing ideas and actors. Lessons were then extracted and evolved from these working examples during regular Taskforce meetings.

The use cases, which are detailed in this report, relate to fast-moving consumer goods supply chains, pension value chains and renewable energy markets. Although these use cases were only intended as opportunities to test the Taskforce's thinking against reality, the use-case teams made remarkable progress in their own right. In some instances, solutions were identified quickly and responsibility taken for developing them further. One solution in particular is under further development by the team to deliver a proof of concept.

The Taskforce was set up to explore such issues at a pre-competitive stage of collaboration. This allowed participants to focus on maximising both the societal and commercial impact of their thinking without being constrained by the desire for particular innovations to have commercial relevance at a later stage. The aim was to create every opportunity for ideas to flow more freely.

"This is a meaningful and timely study. In China, we are already seeing specific 'fintech for sustainability' solutions gaining traction. For instance, Ant Financial has mobilised some 200 million Chinese consumers through its Ant AliPay Forest app that gamifies cutting greenhouse gas emissions. This report from the BEI's Fintech Taskforce provides valuable recommendations for how to ensure many more such solutions are brought to market, by design, which is of great interest in China."

Professor Wang Yao, Deputy Secretary General of China's Green Finance Committee (GFC) and Director General of the International Institute of Green Finance (IIGF) at Beijing's Central University of Finance and Economics (CUFE)

How does the Taskforce's work differ from that of others?

Individually, the landscapes of fintech, business innovation and aligning finance with sustainable development are crowded. Important initiatives exist around the world at the firm level, driven by partnerships, and by multilateral groupings at the national, regional and international levels.

The grand challenge of harnessing fintech to solve sustainability challenges in the real economy has been attracting attention only relatively recently. Nevertheless, an ecosystem of activities is developing across all levels here, too. Individual start-ups around the world are pioneering solutions focused on particular technologies. They are engaging with companies and governments in their target markets to implement viable propositions. Financial institutions are incubating and investing in a range of fintech start-ups with a view to not just tracking the most promising ideas, but profiting from them, too. Some of these early ventures may offer discrete opportunities for catalysing truly sustainable development. Meanwhile, at a global level, the Green Digital Finance Alliance[2] has been established by the Chinese firm ANT Financial Services Group and UN Environment to raise awareness of the agenda among financial institutions, policymakers and other key stakeholders.

All of these actors, and more, will play a vital role in developing this field. The Fintech Taskforce was established not to ***be*** anything in particular but, first and foremost, to answer the central question, outlined above, of how to design collaboration between multinationals, financial institutions and start-ups such that we better harness fintech to help solve sustainability challenges in the real economy. The sector leaders who aligned on this question felt that it was not being answered elsewhere and that there was a commercial and societal imperative to do so.

The Taskforce's mandate also included several distinguishing features arising from its founder Chief Executives, who agreed that the group's work should be:

- **Action-oriented:** the group may require research to inform its thinking, but ultimately the outcomes should be actionable solutions. Landscape reviews and stakeholder dialogues are not the desired outputs or outcomes.
- **Multi-sectoral:** the composition of the group should include at least multinational companies, financial institutions and fintech start-ups. This combination of actors is rarely found in other settings.
- **Designed for scale:** given the urgency of the societal challenges around which the group has convened, its work should embrace the ambition to achieve industry-wide adoption of solutions, where appropriate, as quickly as possible. This may necessitate taking an open-source approach, in line with existing trends towards so-called open banking.

Answering this central question has defined the scope of the Taskforce throughout its six-month mandate. Early on, Taskforce members agreed that their recommendations could be judged a success if their implementation led to: "interested parties having a space where together they can create, raise awareness of and implement industry-level solutions targeted at specific sustainability-related business issues".

Recommendations

The recommendations below are based on the learnings of the Taskforce during its six-month lifespan. Each recommendation is accompanied by an explanation as to *why* that recommendation has been prioritised and *how* it might be implemented.

0.
Establish Fintech for Sustainability catalysts to trigger targeted, collaborative innovation between multinationals, financial institutions and start-ups.

1.
Require that each round of innovation is anchored by at least one organisation with the commercial motivation, and the ability, to implement the solution at scale.

2.
Require that all solutions help more capital to become available to deliver at least one Sustainable Development Goal.

3.
Locate the catalysts to benefit from physical access to as wide as possible a selection of multinationals, financial institutions and start-ups.

4.
Require that each round of innovation takes the time to design for industry-wide scale.

5.
Use well-established innovation practices to deliver professional governance, including of competitive boundaries and IP.

6.
Award an independent party, which has sufficient expertise in fintech, finance and sustainable development, the mandate to structure the innovation process.

7.
Commit dedicated, meaningful resources related to firms' innovation strategies to this effort for the next three years.

8.
Measure success by the delivery of commercially viable solutions.

9.
Seek the support of key enablers, like governments, regulators and standard-setters.

10.
In all communications, cut through complexity to connect problems and solutions, and use language common to all.

0. Establish Fintech for Sustainability catalysts to trigger targeted, collaborative innovation between multinationals, financial institutions and start-ups.

Why

The work of the Taskforce has validated that unaddressed commercial and societal opportunities exist at the interface between multinationals, financial institutions and fintech start-ups.

Earlier work, both by individual innovators and the UN's landscape review, had already indicated the potential of applying fintech to sustainability issues[3] (see also Appendix 2). The Taskforce's work on practical use cases revealed that this potential becomes orders of magnitude larger if it can be designed for implementation in a variety of multinational business contexts, including financial services. Taskforce members reported that the structure of the use case teams, which brought together several industries and supply chains to combine solutions, helped them achieve new clarity on the scale of the opportunity for value creation. In turn, this clarity unlocked substantial new interest from others inside Taskforce member organisations who also came to understand the significance of the opportunities within reach.

The Taskforce's work also revealed that the existing structures and functioning of large organisations tend to position them for innovation at the firm level, but less so across organisational and sectoral boundaries. To grasp the commercial opportunities when fintech solutions are targeted at specific sustainability-related business issues, new multi-sector innovation processes are needed. This is all the more relevant given that the scale of some of the issues, and the standards that can be expected to be necessary, will require an industry-level and intra-industry approach.

How

Each of the recommendations that follow addresses important aspects of how this headline recommendation might be implemented. However, several overarching aspects can be drawn out for Fintech for Sustainability catalysts:

- They would develop a **portfolio of parallel innovation processes**.
- They would involve **innovation processes that are each focused on a specific sustainability-related challenge**, where it was felt that fintech solutions could be better harnessed to unlock progress.
- They would solicit interest in each innovation challenge from a **wide circle of fintech start-ups**, both directly and through financial institutions' own networks.
- They would involve a careful **curation process** to assess which start-ups were best positioned to engage in a pre-competitive and time-bound ideation process.
- They would require all parties, whether multinationals, financial institutions or start-ups, to be **explicit about the added value to and from them by working in a multi-sector partnership** before moving ahead.
- They would develop **actionable solutions**, with ongoing support to structure the innovation process transparently and professionally.
- They would enjoy trusted relationships with a wide range of **market authorities and standard-setters**. In certain circumstances, this would help to smooth, and later accelerate, deployment of the solutions developed.
- They would offer those seeking solutions a means by which the innovation process can be made **easier and less risky**.
- They would offer those offering solutions an additional route to develop meaningful relationships with those who can add value of their own, including through **large-scale implementation capabilities**.

1. Require that each round of innovation is anchored by at least one organisation with the commercial motivation, and the ability, to implement the solution at scale.

Why

Having a problem looking for a solution, rather than a solution looking for a problem, can benefit the cost and speed of deployment of a given innovation.

That said, it must be acknowledged that in the fast-moving world of fintech, the 'art of the possible' is constantly evolving. The Taskforce confirmed through its three parallel use cases that when an innovation process is anchored by an organisation with the commercial motivation to implement the solution, it provides clarity, focus and discipline. In the Taskforce's work, it was the supply chain use case that catered most directly to challenges that were already being felt by participating multinationals. It was therefore this use case where the most progress was made. There is an element of practicality here: such a design allows for a swift and easy calibration of the solution against reality, allowing for efficient iterations of a solution.

Furthermore, if the organisation with the commercial motivation to implement the solution is sizeable in its own right, then deployment at scale is more likely from the outset. Multinational businesses, financial institutions or start-ups that have already grown significantly may exhibit such scale characteristics on their own. They may also be connected to peers or supply chain partners for whom the solution would add value, opening up further possibilities.

How

Fintech for Sustainability catalysts should:

- Proactively **inform organisations that meet this scale criterion of the opportunity to participate**.
- Offer such 'problem owners' **customised capacity building** by an independent party at the beginning of the process, so that they can become sufficiently familiar with the commercial and societal potential of harnessing fintech to address sustainability-related business issues.
- Offer problem owners a **safe space** to explore such ideas from the very beginning.
- Consider **grouping problem owners together**, including across a whole sector, if they share the same issue.
- Help problem owners willing to anchor an innovation process scope a **clear problem definition** to provide focus for others.
- Ensure any **external dependencies** inherent in the problem definition are made transparent from the outset.

> When an innovation process is anchored by an organisation with the commercial motivation to implement the solution, it provides clarity, focus and discipline.

2. Require that all solutions help more capital to become available to deliver at least one UN Sustainable Development Goal (SDG).

Why

Aligning economic activity with a sustainable long-term trajectory for the world's people and our planet is increasingly a global business imperative.

It opens up both challenges and opportunities to firms in all sectors and of all sizes. Technology-driven innovations in finance offer much potential in this context but have not yet been systematically harnessed to target this singular challenge; although many fintech innovation, incubation and acceleration efforts are operating at different scales, they are not typically focused on achieving sustainable development. Major commercial and societal opportunities are therefore being overlooked.

Meanwhile, SDGs offer much-needed clarity as to what success in the above endeavour will mean by 2030. Agreement by the world's governments on the SDGs is a significant achievement. The 17 Goals are detailed in Appendix 3. Tying the purpose of Fintech for Sustainability catalysts to helping ensure that more capital is available to deliver at least one SDG therefore offers several related benefits:

- The SDGs offer businesses and their stakeholders the closest thing available to a common global language on sustainable development.
- The complete set of SDGs is sufficiently holistic to allow for flexibility in determining organisational relevance.
- Given global governments' agreement on the SDGs, the alignment of innovation efforts with them increases the likelihood that future policy and regulation will move in the same direction.

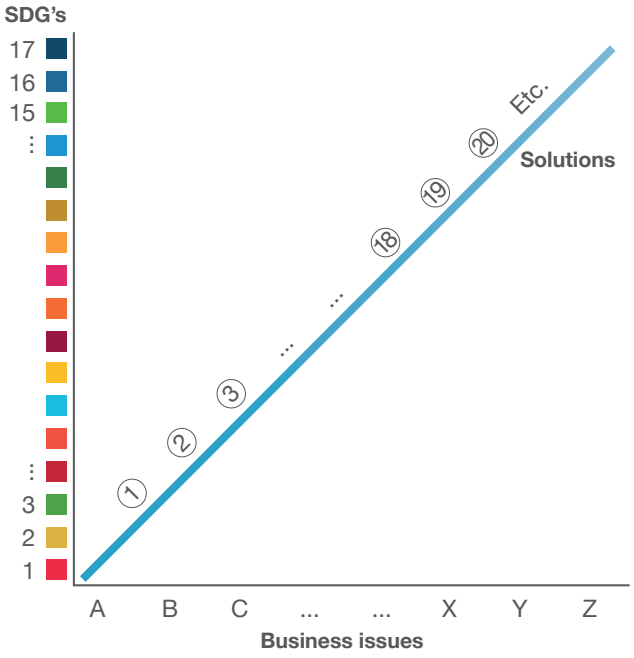
Finally, the requirement that solutions are relevant to at least one SDG is aligned with the mission of the BEI, the initiator of the Fintech Taskforce.

How

Fintech for Sustainability catalysts should:

- Use, if helpful, a simple matrix like the one shown in Figure 1 to help **map business issues against the SDGs**.
- When each innovation process is commissioned, **articulate the SDGs which it aims to help deliver**.

Figure 1: Identifying rallying theme and objectives



3. Locate the catalysts to benefit from physical access to as wide as possible a selection of multinationals, financial institutions and start-ups.

Why

Success in innovation often tends to coincide with effective collaboration between different parties. Moreover, failure in collaboration could precede failure in innovation.

This is because two important properties of an innovation process, namely the (re)combination of knowledge and subsequent action, often depend on actors effectively exchanging and co-ordinating with each other[5]. The Taskforce's experience shows that collaboration can be hard when teams are spread across geographies. Collaboration can become even harder when it attempts to address issues across sectoral boundaries.

This is why innovation clusters have both naturally emerged and been encouraged by design in particular geographies around the world. The fintech space is no different. Analysis by EY in 2016[4] looked at the combination of talent, capital, supportive policies and market demand. It concluded that the world's three leading fintech clusters are in the UK, California and New York. This is a dynamic and evolving context; other European and Asian centres are paying increased attention.

It is therefore recommended that Fintech for Sustainability catalysts are located so that, by design, they benefit from physical access to as wide as possible a selection of multinationals, financial institutions and start-ups.

How

Fintech for Sustainability catalysts should:

- Enjoy **easy access to existing global clusters** of fintech innovation, commerce and finance.
- Be able to access **other clusters of science and technology innovation**, given that some of the innovative technologies needed for particular solutions may not be strictly fintech in nature.
- Prioritise **proximity to global travel hubs** if choices need to be made.
- Ensure that choice of location **does not limit the geographical relevance or ambition** of the innovation undertaken.

Two important properties of an innovation process, namely the (re)combination of knowledge and subsequent action, often depend on actors effectively exchanging and co-ordinating with each other.

4. Require that each round of innovation takes the time to design for industry-wide scale.

Why

The SDGs are truly global goals. The nature of the action required to align economic activity with their delivery is, in many cases, transformative.

Further, the time available to achieve this alignment is short and is often imposed by hard biophysical limits that are already well within sight. It is therefore imperative that solutions emerging from Fintech for Sustainability catalysts have the potential to be scaled, by design, so that they achieve both maximum positive societal impact and business value.

The temptation to fast-track solutions, despite them relying on systems that are not interoperable with those widely used by others, should be resisted wherever possible. The exception is when a realistic alternative strategy to achieve industry-wide adoption can be identified. The development of solutions that can be readily scaled up will allow for maximum uptake by other relevant stakeholders.

However, to align innovation processes with organisational commercial motivations, appropriate degrees of competitive advantage should be retained for those who are responsible for developing the solution in the first place.

How

Fintech for Sustainability catalysts should:

- **Default to using existing industry standards for data** in the design of solutions, wherever possible. If non-standard data formats are used, solutions could become bespoke and need to be redeveloped for other contexts, hampering scalability and uptake and increasing cost.
- In situations with multiple competing or incompatible standards, either within one industry or between industries, ensure that the **terms and data requirements in different standards are mapped** to each other and, where necessary, their **attributes ranked**. Otherwise, the solution might fail to prioritise the most important attributes and lead to costly redevelopment later on. Once such mappings are in place, the benefits described above could be attained.
- **Consider setting new standards** in the development process if no relevant data standards exist.
- Default to **software development using open-source solutions**. This will offer several benefits including lower cost and greater flexibility, freedom, security, accountability and inclusion. Moreover, assuming established open-source software is used for the solutions, clear and complete documentation will be available for all, and a rapid scale-up of developing capacity will be attained by tapping into existing pools of developers.
- **Default to developing solutions on an open-source basis** wherever possible and compatible with commercial drivers, allowing others to learn from and co-develop the solutions.

"The nexus of industry, sustainability, financial services and fintech offers many potentially valuable applications to firms in the Pulp and Paper Industry. For example, for years our industry has struggled with a manual, high cost and not always reliable system to identify and track sustainable wood through the processing steps to finished product at the retailer or final producer. CISL has brought together representatives from across the value chain and added banks and Fintech technology companies to the mix. These companies are committed to sustainable solutions and are developing the core of a low cost, incorruptible, automated tracking and tracing system from tree to retailer. Great news!"

Berry Wiersum, CEO Sappi Europe S.A.

5. Use well-established innovation practices to deliver professional governance, including of competitive boundaries and IP.

Why

In serving as an effective trigger for solutions to be co-generated by multi-sector groups, Fintech for Sustainability catalysts will need to engage in some level of pre-competitive industry collaboration.

Put another way, if individual firms or bilateral partnerships could already bring scalable solutions to market, they would not need to engage with a Fintech for Sustainability catalyst.

To move seamlessly from pre-competitive collaboration into subsequent phases of commercially oriented collaboration, a professional approach to the governance of several related issues is required. This starts with a clear definition of the boundary between pre-competitive and competitive stages of work.

Well-established innovation practices offer multiple starting points for setting up such governance processes. The benefits are clear and span legal compliance, particularly with respect to antitrust law; the building of trust between parties; and the ability to generate optionality for participants through open collaboration in the early, pre-competitive stages of innovation.

How

Fintech for Sustainability catalysts should:

- Set out a **clear set of policies and procedures** for delivering professional governance. Participants must actively commit to following these at the outset. In this way, time will not be wasted repeatedly negotiating process-related agreements.
- Determine at an early stage **why participants believe multi-sector collaboration can deliver greater value** than individual innovation or bilateral partnerships.
- Ensure each participant can **articulate the value they expect to bring and take** from the collaboration.
- Deploy all relevant practices in the various phases of an innovation process, such as **stage-gate-based governance** processes, **design cycles** and specific techniques related to the **sensing, ideation, validating and scaling** phases of innovation.
- Deliver total clarity to all participants on the **terms of reference** for the group's work, **evaluation checkpoints, and formal entry and exit milestones**.
- Develop for each innovation process a **clear legal structure** and set of processes, covering antitrust, IP structuring, information security and terms of the partnership, if relevant.
- Consider the use of an independent **IP custodian**.
- Make available a **shared digital space**, for information sharing and storage, which works for all organisations involved.

Well-established innovation practices offer multiple starting points for setting up governance processes.

6. Award an independent party, which has sufficient expertise in fintech, finance and sustainable development, the mandate to structure the innovation process.

Why

The Taskforce's use case teams brought together representatives of organisations with very different approaches to innovation, including variations in decision-making speed.

The diversity of insights, together with the perspectives of the participants' different market positions, was an asset. It helped to decrease the odds of crucial information being missed during the development of a solution by giving access to knowledge that lay outside the participants' own organisations. It also allowed for a portfolio approach to gathering expertise, in that it could not be known for certain at the outset which subsets of expertise would prove to be most relevant.

However, as the teams' work evolved organically, it also revealed a clear need for an independent party to be awarded the mandate to structure the innovation process, setting milestones and allocating roles and responsibilities. If a participant had taken on this role, confusion could have developed about where the boundary with their commercial interests lay, which would have been unhelpful at a stage where trust was still developing between the parties.

Similarly, in some cases, participants became expected to deliver organisational commitments related to the testing of solutions that were under development. It soon became clear that some participants were not able to keep pace with others because of organisational constraints. Others needed to consciously resist the temptation to fixate on the challenge of navigating large organisations to the detriment of developing the solution in question. Only an independent party had the authority at this stage to resolve some of the inevitable tensions that emerged and help all of the participants to retain focus on the bigger prize of achieving a multi-sector solution. Performing this role without sufficient expertise in fintech, finance and sustainable development, however, would have been extremely challenging.

How

Fintech for Sustainability catalysts should:

- Retain an **independent partner that has a proven track record in the facilitation skills** required to support multi-sector collaboration.
- Ensure that such a partner is **knowledgeable about fintech, finance and sustainable development**, and has credibility with actors across all three areas.
- Note, the Taskforce was fortunate in that CISL has strengths in both of these areas, but **other organisations also have these capabilities**.

> I am increasingly struck by the obvious momentum gathering at the back of green and sustainable finance. But to date, the focus has been on policy, regulation and existing market practice. Now, thanks to this intervention from CISL, we are beginning to see the vital role that technology will have to play if we are to truly realise the potential of green finance in mitigating climate change. The idea of a catalyst, to encourage corporates, financial institutions and start-ups to collaborate on innovation is the missing piece we need to realise Governor Carney's recommendations from his TCFD and as such the Green Finance Initiative will certainly support it.
>
> **Sir Roger Gifford, Chairman of the City of London's Green Finance Initiative**

7. Commit dedicated, meaningful resources related to firms' innovation strategies to this effort for the next three years.

Why

The yield of the Fintech Taskforce has been far beyond what was initially requested, and stipulated, in its terms of reference.

Strong traction, and 'ask', has come from some of the organisations involved that have a commercial motivation to implement the solutions profiled in the use cases. In turn, this has led to senior executives signing off organisational commitments to developing proofs of concept beyond the original life of the Taskforce. **This is remarkable, considering that the Taskforce has had only part-time staff supporting it, from both its participants and CISL**.

Taskforce members have therefore been persuaded that the scale of the opportunity facing Fintech for Sustainability catalysts is very significant and should be attractive to many other parties. Given that the Taskforce did not raise additional resources over and above the core resources of the BEI, it has also become apparent that meaningful commitment of resources is now needed to realise that potential. A contribution to this effort for at least the next three years should be written into the priorities of organisational innovation strategies.

Strong traction, and 'ask', has come from some of the organisations involved that have a commercial motivation to implement the solutions profiled in the use cases.

How

Fintech for Sustainability catalysts should:

- Secure resources to cover both upfront set-up costs and ongoing innovation process-related costs.
- Consider one, or a combination, of the following pathways to cover upfront set-up costs:
  - Invite a **small circle of founding partners** from the private sector to cover the set-up costs in return for a meaningful and visible role in the strategic development of the effort. Flexibility could be introduced to determine whether resource commitments are made directly or in kind.
  - Offer a larger circle of private sector organisations a **membership proposition** in return for discrete benefits, which would necessarily be reduced in comparison to founding partners. A **differential package** will be required for established versus start-up organisations.
  - Invite **governments to sponsor** a Fintech for Sustainability catalyst in their country, region or city if they share its strategic intent and agree with its core design principles.
  - **Partner with comparable entities** in cases where mutual benefits are clear and the value proposition is not diluted.
- In addition, develop a funding model to cover innovation process-related costs. This would most likely be built around the principle that those organisations directly involved in a given innovation process and stand to enjoy commercial benefits cover the associated marginal costs.

8. Measure success by the delivery of commercially viable solutions.

Why

Fintech for Sustainability catalysts will exist in an increasingly crowded landscape. It is critical that they add value and do not duplicate the roles that others are playing.

As currently conceived, they are envisioned to have a singular focus on catalysing specific solutions to sustainability-related business issues by harnessing fintech innovations – taking them from conception to implementation.

Others will play a vital and complementary role in raising awareness of, and reviewing, the multiplicity of issues related to the topic. That will not be the role of Fintech for Sustainability catalysts, except where specific perspectives can be derived from the solutions they have catalysed. Equally, others will also play a catalyst role for specific solutions and this is only to be encouraged; the scale of the challenge requires a step-change in our collective efforts on this front.

Measuring the success of Fintech for Sustainability catalysts by virtue of the solutions they bring forth is therefore a natural suggestion. The requirement that those solutions are commercially viable takes the effort to the next level. At its simplest, the presence (or absence) of a commercially viable model will indicate whether the solution is likely to be implemented (or not) by private sector actors; senior executive buy-in will be predicated on commercial viability, as will the endurance of the organisational interest in the solution. Without commercial viability, the prospect of seeing the solution implemented at scale will be virtually negligible.

How

Fintech for Sustainability catalysts should:

- Require that each participant in an innovation process identifies its **own viable business model** for delivering its contribution.
- Design solutions to **integrate as much as possible with pre-existing business processes** and practices.
- **Minimise the additional capabilities and data required** for the solution to function within a firm.
- **Validate commercial viability** during the piloting/testing phase of innovation.
- Acknowledge that **catalyst funding could be needed up front**, with an eye on commercial self-sufficiency later in the innovation process.
- Expect that at a portfolio level, **some innovation processes will not be successful** for one reason or another.

"Achieving increased and universal transparency in supply chains, that delivers increased benefits to our farmers & producers through cross-industry collaboration with Fintechs is an exciting step forward for Sainsbury's."

Mike Coupe, CEO J Sainsbury's plc

9. Seek the support of key enablers, like governments, regulators and standard-setters.

Why

Fintech for Sustainability catalysts are envisioned as an effort to achieve the best of private sector collaboration to help address major societal challenges.

They are not, therefore, seeking to be government-led in the first instance. However, given that they have a stated ambition to catalyse solutions that can be adopted at an industry-wide scale, a role clearly exists for governments, regulators and standard-setters. On the one hand, the task at hand for such key enablers would be to smooth the deployment of the solutions developed, should any aspects of the current landscape present obstacles. On the other hand, market authorities may be critical in accelerating the deployment of solutions to their fullest potential.

Governments may also play an influential role in the early stages through funds and programmes aimed at supporting industry innovation.

How

Fintech for Sustainability catalysts should:

- Invite governments and regulators that are known to have strategic interests in the scope of Fintech for Sustainability catalysts to **become supporters** of the effort.
- Keep supporters informed of progress via a **programme of regular seminars and other events**.
- Ensure that the terms on which this support is sought **should not unnecessarily limit the geographical scope** of interest for the Fintech for Sustainability catalyst in question.

... given that they have a stated ambition to catalyse solutions that can be adopted at an industry-wide scale, a role clearly exists for governments, regulators and standard-setters.

"I am delighted to welcome this report by the Banking Environment Initiative and the Cambridge Institute for Sustainability Leadership. The UK is a world leader in green finance and FinTech. Bringing together experts in these fields to collaborate and innovate with non-financial companies demonstrates how financial services can be a force for good for consumers, business and the environment."

Stephen Barclay MP, Economic Secretary to the Treasury, UK Government

10. In all communications, cut through complexity to connect problems and solutions, and use language common to all.

Why

The envisioned actors that will become engaged with Fintech for Sustainability catalysts range from multinational businesses to financial institutions, and from start-ups to (ultimately) market authorities.

It is no surprise that each of these stakeholder groups has its own complexities and lexicons. What is more important is that when such groups are brought together to collaborate and ultimately forge new commercial relationships, a failure to cut through complexity, connect problems to solutions and use language that is common to all can be fatal. Perversely, the more challenging this becomes, the more likely we are to resort to what we know, both in terms of the complexity of our own worlds and the language we use.

In the Taskforce's experience, failure to overcome these obstacles led to material time being wasted and opportunities to speed up progress being squandered.

How

Fintech for Sustainability catalysts should:

- Take participants in an innovation process through a **capacity-building session** in advance, both to build a shared understanding of the problems and potential solutions and to understand what counts as common language.
- Ensure participants make a **shared commitment** up front to focus on the quality and accessibility of communications throughout the innovation process.
- Retain an independent party to manage the innovation process that, ideally, is capable of '**translating**' between stakeholder groups in real time and that has a mandate to hold participants to the above commitment.
- Use **visualisation techniques** wherever possible.

... when groups are brought together to collaborate and ultimately forge new commercial relationships, a failure to cut through complexity, connect problems to solutions and use language that is common to all can be fatal.

Use-case summaries

Supply chain concept

This concept works to facilitate the delivery of the **UN Sustainable Development Goal 12:** *Responsible production and consumption – Ensure sustainable consumption and production patterns.*

Currently, it is challenging to reliably transmit information about the sustainability of commodities sourced through global supply chains. Supply chains are often heavily fragmented, involving multiple parties from end to end, and as soon as commodities have a change of owner or are mixed for processing, information about their provenance can be lost. Current approaches for verifying sustainable methods of production are typically reliant on certification systems, whereby production methods are assessed against a particular agreed standard and some form of certificate travels with commodity shipments through supply chains.

Despite all the progress that such systems have enabled, they are suboptimal in that they struggle to work in supply chains where traceability is already a challenge, are open to abuse, are slow to evolve and can introduce prohibitive costs rather than incentives. This inadequacy compounds any structural financial inequity within those same value chains, which is a major impediment to achieving several SDGs. To better understand the impact and origin of products, supply chains must become more traceable and transparent.

Addressing these issues could open up new sources of value to producers, processors, financiers, retailers and end consumers. Fintech could help here if it is used to provide secure, incorruptible insight about the conditions in which commodities were produced, while at the same time creating enabling conditions for incentives to be offered to supply chain participants to deliver against sustainability standards.

To better understand the impact and origin of products, supply chains must become more traceable and transparent.

The concept developed in this use case would actually enable financial incentives to be offered to producers in extended, fragmented supply chains in exchange for the provision of sustainability information. It would do so by providing buyers with transparent and standardised sustainability data in exchange for them providing suppliers with preferential payment terms. To enable this, the solution uses identifier technologies (virtual barcodes), distributed ledger technologies (blockchain) and data standardisation approaches.

The team working on this use case observed that there is a truly global opportunity to provide such data services to supply chain actors. Demand drivers range from the voluntary (such as commitments from companies to avoid procuring commodities whose production has contributed to deforestation) to the mandatory (such as compliance with laws relating to human rights issues or food safety).

The supply chain concept has been developed into a pilot proposal to validate the following three hypotheses:

- A joint application of the below technological solutions and processes enables a trustworthy, standardised and scalable transfer of sustainable sourcing information across otherwise fragmented supply chains:
  - identifier technology
  - processes to standardise data attribution
  - distributed ledger technology.
- Access to finance on improved terms would provide incentives for producers to submit reliable data about the sustainability of production methods.
- The above can be achieved in a way that is commercially viable for all stakeholders in a supply chain: producers, processors, retailers, consumers and (financial) service providers.

A more expansive description of this concept is included in Appendix 4.

From a layperson's perspective, the little information about investments that is available tends to be difficult to access, difficult to understand and difficult to compare.

Pensions concept

This concept actually works to facilitate the delivery of **all of the UN SDGs**. It does so by improving the conditions for aligning the investment of private capital with business activities that contribute positively towards the goals.

The team working on this concept observed that it is very difficult for retail investors, and particularly pension plan beneficiaries, to feel empowered to allocate their invested capital towards investments that are contributing positively to addressing social and environmental issues. From a layperson's perspective, the little information that is available tends to be difficult to access, difficult to understand and difficult to compare. As a result, retail investors with the best of intentions must defer to intermediaries to invest their money in a manner aligned with their values. Those intermediaries then struggle to offer their clients suitable information about the impact of the approaches they have taken. The result is no greater empowerment of those retail investors sitting as the ultimate clients in the chain.

One of the great difficulties that the investment value chain faces today in addressing this challenge is the poor quality and availability of data that is available to them from companies and assets. The aggregation and updating of data sets is labour-intensive and is therefore often outsourced to specialised firms. Fintech solutions could help by automatically connecting previously disparate sources of relevant data about companies' social and environmental impacts, bundling these data sets and making them comparable by means of standardised methods.

The data sourcing could take place via a back-end data aggregator function that collects, analyses and combines relevant impact data from various sources. The collecting could take place via application programming interfaces (APIs), updating automatically. The analysis could follow agreed impact metric methods. Indeed, groups of investors such as the Investment Leaders Group, working with CISL, have already devised a set of impact metrics that would be suitable (termed the 'Cambridge Impact Framework'[6]). Fintech solutions could help to bring about the data revolution needed to bring such thinking to life in a manner that is scalable, low cost and highly automated. The resulting data sets would be provided to retail investors via carefully designed, user-friendly interfaces.

The five hypotheses underpinning the Pensions team's thinking are:

- Data on the 'impact footprint' of businesses is not flowing through to pension savers in a manner that they can understand and react to.
- Currently, most pension savers are not engaging with their own pension investments, let alone the social and environmental impact of these investments.
- Beneficiaries are therefore also not engaging with the role their investments could play towards achieving a more environmentally and socially sustainable future.
- A meaningful proportion of beneficiaries are, in principle, willing to play a positive and active role in allocating capital towards those who are helping to tackle social and environmental issues, subject to suitable risk-adjusted returns, but don't know how to do so.
- Technology-based data solutions are starting to be developed, but most are not focused on the major 'unlocking' opportunity of making the link between pension investments and social and environmental impact.

The team focused on the contribution of businesses to climate stability as a starting point, given the relative maturity of the data available in this impact area, and worked to identify available technologies as well as relevant data sets that could be part of a solution. Based on this work, several priority questions emerged, some of which are already being addressed by other CISL initiatives:

- Do beneficiaries really care about the social and environmental impacts of their investments? Is the way in which such information is visualised for beneficiaries significant to their investment decisions?
  - Both of these questions are being addressed by consumer research that CISL's Investment Leaders Group has commissioned from consumer decision-making experts at the University of Cambridge's Department of Psychology and Judge Business School.
- What impact data is already available at the company and asset level, even if it needs to be gathered via unconventional means (eg using big data techniques)?
  - CISL's Investment Leaders Group has also commissioned a meta-study of all of the existing impact methods and data sources available to investors to provide a synthesis review.
- Which fintech start-ups are already developing solutions that could be relevant to this challenge?
  - The investigation of this question is currently being led by Taskforce members.

Use-case summaries *continued*

Energy coin concept

This concept works to facilitate the delivery of the **UN Sustainable Development Goal 7:** *Affordable and clean energy – Ensure access to affordable, reliable, sustainable and modern energy for all.*

The context for this team's work is that market conditions for renewable energy production and storage – especially solar – are changing rapidly to become cost-competitive with fossil fuels. However, the team observed three interrelated issues associated with the clean energy transition that fintech might help to solve.

First, at a global level, it is challenging for traditional investors to support decentralised renewable energy generation, in particular solar, at scale. Access to capital can therefore be a barrier for aspiring localised producers. Second, the team observed that the current generation of carbon emissions trading systems face challenges such as the over-supply of credits and their vulnerability to fraud. These can be important dissuasive forces for well-intended actors who look to this mechanism to participate in the energy transition. Third, although smaller-scale clean energy producers might be able to sell the excess energy they produce back to the centralised grid, their ability to trade this energy with local buyers on decentralised grids is limited. Despite the relative merits of different types of grid structure still being open to debate, this observation is relevant because it is often argued that centralised grids are more vulnerable than decentralised versions to system shocks.

Fintech solutions could help address each of these issues by using a dedicated clean energy coin, or token, linked to the production of renewable energy and stored on a blockchain. This would create the conditions to more directly connect decentralised solar energy generators with the carbon-offsetting and decarbonisation programmes of particular firms, local governments and even households.

Under this concept, renewable energy generators across a decentralised network would be issued with clean energy coins at the point when they have been verified as having produced new units of clean energy. Verification could be automated through the use of geo-located smart meters. Buyers of the coin would then have confidence and clarity that they are supporting solar energy generation that is taking place in a particular location. Buyers could be motivated to do so for at least two reasons. One would be their desire (or legal obligation) to offset their carbon emissions, and to do so in a highly secure and transparent way. Another, which could be complementary, could be their desire to support local energy generation in a particular geographical area, perhaps as part of social and economic regeneration plans.

The value of the clean energy coin, like that of any currency, would hinge on its acceptance as a mechanism for exchanging value within a given marketplace. Companies wishing to offset their carbon emissions in a transparent and secure way could be an initial driver of demand. A more radical idea, which is already under consideration in practice, is that local governments could accept clean energy coins generated by local producers as payment for certain municipal services, given their vested interest in encouraging investment in local social and economic development. Financial institutions, in turn, could become involved in helping to scale this concept in several ways, including providing services to enable the exchange or saving of clean energy coins and financing the energy generation equipment.

Key partners in developing and deploying such a concept would include: renewable energy producers (predominantly solar); renewable energy consumers (companies or households); financial institutions and local governments such as city authorities.

A more expansive description of this concept is included in Appendix 5.

Conclusion

Significant opportunities are on offer if multinationals, financial institutions and start-ups can better harness fintech to help solve sustainability challenges in the real economy.

Realising these opportunities will require new effort both from the current Taskforce members and many others around the world. The recommendations of the Taskforce could be delivered within existing collaborative structures, lead to the establishment of new structures, or a combination of both. The promise of both commercial and societal reward should provide the necessary motivation to all involved to put these design principles into practice.

Appendices

Appendix 1: On 'fintech' in the context of this Taskforce

There are many definitions of fintech in use but a commonly used definition is that of Schueffel (2016): "fintech is a new financial industry that applies technology to improve financial activities.[7]"

Around the world, many different services are developed, sold and used under the fintech header, and generally they indeed entail one or more aspects of a financial service. The set of technologies used to deliver these services varies and constantly evolves. Some of the better-known technologies include distributed ledgers such as blockchains, cryptocurrencies and tokens, natural language processing and other artificial intelligence technologies, cyber security technologies, identifier technologies, digital analytics technologies, search technologies and much more.

The teams and individuals of the Fintech Taskforce have taken technologies that are normally applied in fintech beyond the realm of financial services. In that sense, they have started to develop hybrid propositions. These propositions use familiar fintech technologies, but also assets of traditional financial institutions, data standards for corporate information flows, hardware and Internet of things propositions and several other components. The Taskforce's work therefore deliberately focuses on those applications of fintech that achieve a new level of value addition, namely beyond the financial economy and into the real economy.

Appendix 2: Fintech for sustainability use-case portfolio as identified by the UNEP Inquiry[8]

PORTFOLIO OF UNEP CASE STUDIES	GEOGRAPHY	UNEP CASE STUDY CHARACTERISTICS		SCALING POTENTIAL	
	GEO SCOPE	SD GOALS	SUSTAINABLE FINANCE DRIVER	ADOPTION STAGE	SCALING POTENTIAL
1.1 SME collateral management registry	Global	Jobs and growth	Financial inclusion	Conceptual	★★
1.2 Welfare conditional transfer	Developing	Poverty	Financial inclusion	Conceptual	★★★
1.3 Remittances/accounts for unbanked	Developing	Poverty	Financial inclusion	Pragmatic followers	★★★
1.4 Economic identities for refugees	Developing	Peace	Financial inclusion	Early adopters	★★★
1.5 International aid smart contracts	Developing	Poverty	Financial inclusion	Early adopters	★★
1.6 Smallholder identity and land registry	Developing	Hunger	Financial inclusion	Early adopters	★★★
1.7 Participative democracy 2.0	Global	Jobs and growth	Financial inclusion	Conceptual	★★
1.8 Enabling micrfinance 2.0	Developing	Poverty	Financial inclusion	Conceptual	★★
2.1 Pay as you go resource utilities	Developing	Energy	Capital for infrastructure	Pragmatic followers	★★★
2.2 Flexible energy supply and demand	Developed	Energy	Capital for infrastructure	Early adopters	★★★
2.3 Renewable energy P2P	Developed	Energy	Capital for infrastructure	Early adopters	★★
3.1 Small holder extension services	Developing	Hunger	Financing innovation	Conceptual	★★
3.2 Community distributed generation	Developed	Energy	Financing innovation	Early adopters	★★★
3.3 SME asset trade finance	Developed	Jobs and growth	Financing innovation	Conceptual	★★
3.4 SME smart assets	Developed	Jobs and growth	Financing innovation	Conceptual	★
4.1 Financial markets early warning system	Global	Partnership	Market integrity	Early adopters	★★
4.2 Sustainable fintech regulatory sandbox	Developed	Partnership	Market integrity	Early adopters	★
4.3 Biodiversity conservation exchange	Developing	Land-based	Market integrity	Early adopters	★★
5.1 Shared asset insurance	Developed	Consumption	Risk and resilience	Early adopters	★★
5.2 Smallholder index insurance 2.0	Developing	Food	Risk and resilience	Conceptual	★★★
5.3 Basin water rights management	Global	Water	Risk and resilience	Conceptual	★★★
5.4 Agricultural credit risk management	Developing	Land-based	Risk and resilience	Conceptual	★★
6.1 Water asset registry and ratings	Global	Water	Performance and disclosure	Conceptual	★★★
6.2 Fish supply chain traceability	Global	Ocean-based	Performance and disclosure	Early adopters	★★
6.3 Climate monitoring reporting verification	Global	Climate	Performance and disclosure	Conceptual	★★★

Appendix 3: Sustainability and the Sustainable Development Goals

The UN provides the following information on the Sustainable Development Goals (SDGs):[8]

"On 1 January 2016, the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development – adopted by world leaders in September 2015 at an historic UN Summit – officially came into force. Over the next fifteen years, with these new Goals that universally apply to all, countries will mobilize efforts to end all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind.

The SDGs, also known as Global Goals, build on the success of the Millennium Development Goals (MDGs) and aim to go further to end all forms of poverty. The new Goals are unique in that they call for action by all countries, poor, rich and middle-income to promote prosperity while protecting the planet. They recognize that ending poverty must go hand-in-hand with strategies that build economic growth and addresses a range of social needs including education, health, social protection, and job opportunities, while tackling climate change and environmental protection.

While the SDGs are not legally binding, governments are expected to take ownership and establish national frameworks for the achievement of the 17 Goals. Countries have the primary responsibility for follow-up and review of the progress made in implementing the Goals, which will require quality, accessible and timely data collection. Regional follow-up and review will be based on national-level analyses and contribute to follow-up and review at the global level."

Starting from the SDGs, CISL has developed the Rewiring the Economy plan to lay the foundations for a sustainable economy.[10] It consists of six sustainability ambitions to be delivered by three economic actors (business, government and finance) via ten interconnected tasks. The plan is a strategic compass bearing for business, government and finance leaders around the world.

The 17 SDGs are:

Goal 1:	No Poverty
Goal 2:	Zero Hunger
Goal 3:	Good Health and Well-being
Goal 4:	Quality Education
Goal 5:	Gender Equality
Goal 6:	Clean Water and Sanitation
Goal 7:	Affordable and Clean Energy
Goal 8:	Decent Work and Economic Growth
Goal 9:	Industry, Innovation and Infrastructure
Goal 10:	Reduced Inequalities
Goal 11:	Sustainable Cities and Communities
Goal 12:	Responsible Consumption and Production
Goal 13:	Climate Action
Goal 14:	Life Below Water
Goal 15:	Life on Land
Goal 16:	Peace, Justice and Strong Institutions
Goal 17:	Partnerships for the Goals

Countries have the primary responsibility for follow-up and review of the progress made in implementing the Goals, which will require quality, accessible and timely data collection.

Appendices *continued*

Appendix 4: Integrated sustainable supply chain concept

In describing this concept, the authors benefited greatly from the conversations in the Supply Chain team of the Taskforce, and particularly from the work of Jessi Baker of Provenance, Floris Kleemans of Focafet Foundation, Shona Tatchell of Halotrade and Simon Ulvund of Landmapp.

The challenge

UN Sustainable Development Goal 12: *Responsible production and consumption – Ensure sustainable consumption and production patterns.*

Currently, it is challenging to reliably transmit information about the sustainability of commodities sourced through global supply chains. Supply chains are often heavily fragmented, involving multiple parties from end to end, and as soon as commodities have a change of ownership or are mixed for processing, information about their provenance can be lost. Current approaches for verifying sustainable methods of production are typically reliant on certification systems, whereby production methods are assessed against a particular agreed standard and some form of certificate travels with commodity shipments through supply chains.

Despite all the progress that such systems have enabled, they are suboptimal in that they struggle to work in supply chains where traceability is already a challenge, are open to abuse, are slow to evolve and can introduce prohibitive costs for producers to become certified rather than clear incentives. This inadequacy compounds any structural financial inequity within those same value chains. When set in the context of multiple competing certification bodies, each seeking to become the de facto standard-setter, the result all too often is too little market penetration to deliver utility to buyers and a lack of progress towards true market scale. This is a major impediment to achieving several SDGs. To improve understanding of the impact and origin of products, supply chains must become more traceable and transparent.

This is a triple case of market failure. First, the information flows required to connect buyers who are looking for sustainably produced products with producers are failing. Second, the logic of markets has failed to deliver one standard in most commodity contexts with broad enough acceptance in the market. Third, this approach has failed to support the development of a business model whereby supply chain actors, especially producers, are incentivised at scale to provide sustainable production information having aligned with standards.

Addressing these issues could open up new sources of value to producers, processors, financiers, retailers and end consumers. Fintech could help here if it is used to provide secure, incorruptible insight about the conditions in which commodities were produced, while at the same time creating enabling conditions for incentives to be offered to supply chain participants to deliver against sustainability standards.

Opportunity

The concept developed in this use case would actually enable financial incentives to be offered to producers in extended, fragmented supply chains in exchange for the provision of sustainability information. It would do so by providing buyers with transparent and standardised sustainability data in exchange for them providing suppliers with preferential payment terms. To enable this, the solution uses identifier technologies (virtual barcodes), distributed ledger technologies (blockchain) and data standardisation approaches.

Such a solution could provide producers with financing against attractive terms, either in tenor, rate or both. It could provide corporates with improved supply chain transparency and practices, in terms of reliability and cost. It could provide financial institutions with segregated sustainable assets for lending and securitisations, as well as extra opportunities to add value for their clients. For society, the solution would lead to better-informed consumers, as well as a better pricing of sustainably produced goods.

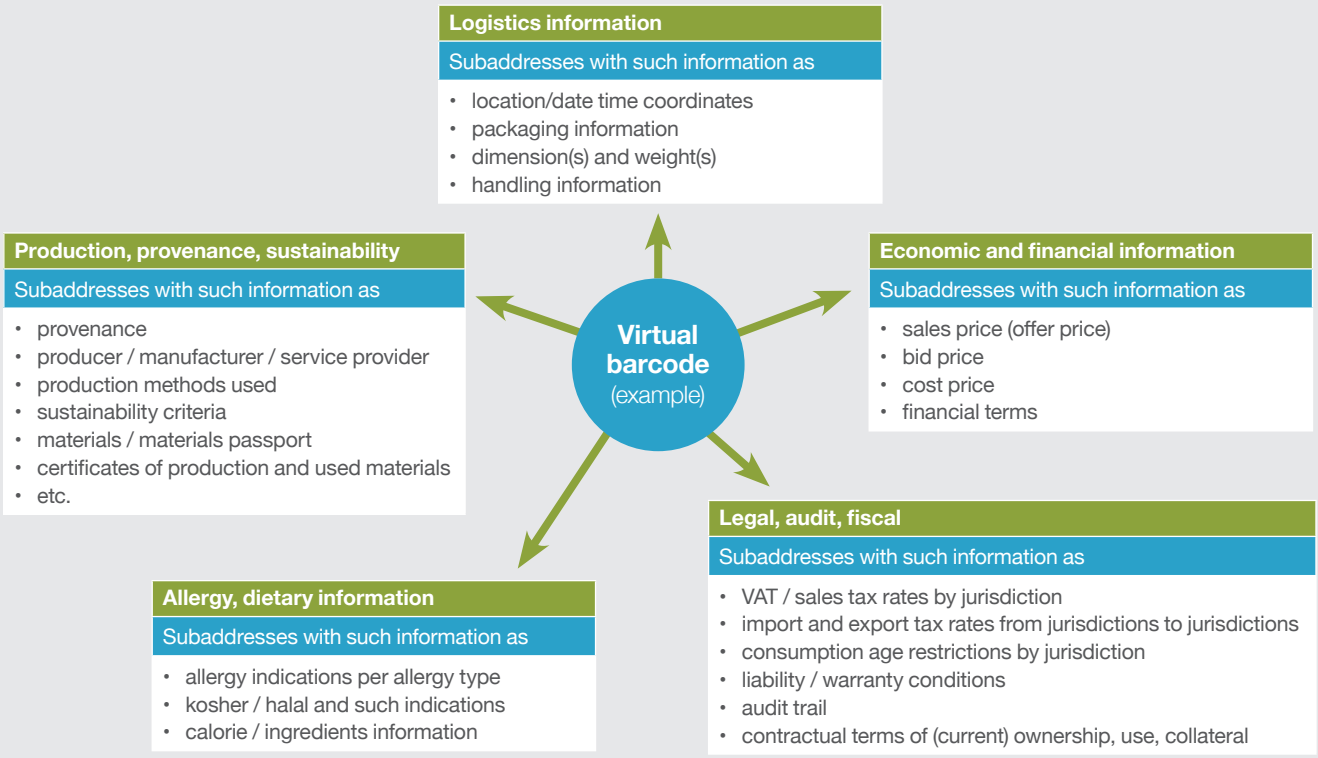
Proposed solution

The proposed solution would start by providing a standardised identifier to supply chain entities (people, organisations) and objects (eg batches of produce) so that they are identifiable across the supply chain. This identifier could then be entered into a data sharing solution (ie a distributed ledger/blockchain) to provide visibility on the identity of entities and objects to those parties in the supply chain that are allowed to see this information (see Figure 2).

The data requirements on attributes such as sustainability would be standardised by working with corporates and industry bodies, or by using pre-existing data standards. This would allow for a rapid scale-up of implementation across firms, supply chains and industries, and avoid solutions being bespoke to individual corporate contexts. The attribute data could then be attached to the identifiers and entered into the blockchain at any point allowed in the supply chain's flow of goods and services.

The physical goods and services would then flow through the supply chain together with a secure information flow attesting to the attributes of those goods and services. The data will remain intact, regardless of a change in ownership. The information flow will include invoicing information. End users, such as large corporates, could approve the pre-financing (or factoring) of particular invoices by banks at attractive rates. The approval of invoices would be conditional on provable compliance with the corporate's sustainability requirements, which the corporate can be assured has not been corrupted through the supply chain.

Figure 2: Functionality of an identifier/virtual barcode (courtesy of Focafet Foundation)



Economic model

If applied, this concept could become revenue generating through a combination of licensing and transaction fees for each of the solutions involved (ie identifier solution, data capture solution, data sharing solution and supply chain financing solution). These solutions could be offered through a separate interface that sources, via APIs, from separate solution providers. They could be offered by one of the solution providers by means of APIs to the other three solution providers, or they could be offered by one entity running and offering all of the required solutions within its own organisation.

Scaling up of the system would be driven by large corporates that require transparency and sustainability in their global supply chains. Banks could be incentivised to offer this solution to clients as a means of mitigating supply chain risk, and could treat this as a unique sustainable business origination channel. Revenues for the participating banks would accrue from the interest charged on financing and, given the expectation that this would be an attractive all-round proposition to multional companies around the world, this product offering could be expected to be facing into a growth market.

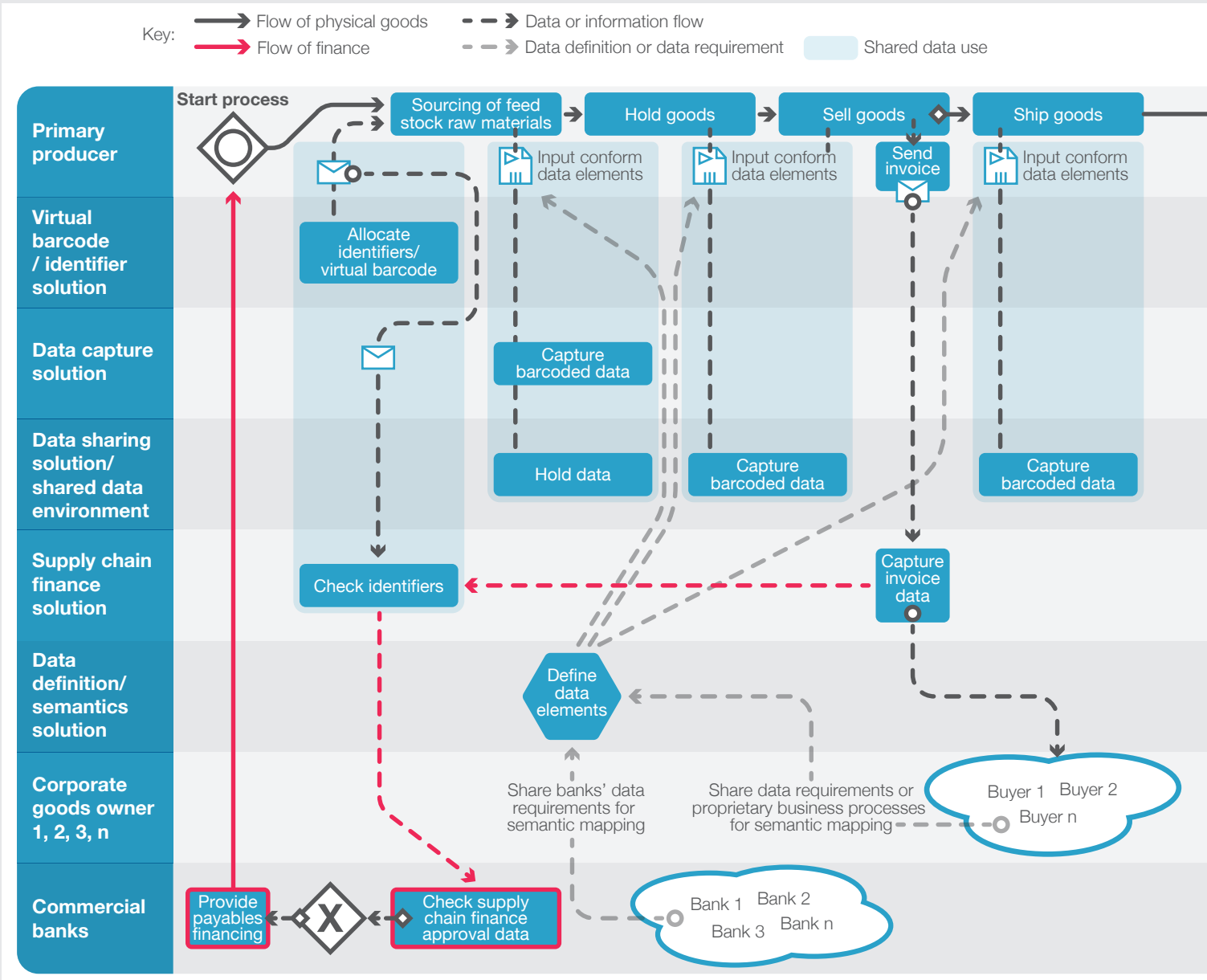
Technology walkthrough

The suggested functional architecture contains a separate ‘swim lane’ for each required function and the various flows between these functions. Figure 3 offers a visualisation of the physical flows, data flows and financing flows of this concept.

Scaling up of the system would be driven by large corporates that require transparency and sustainability in their global supply chains.

Appendices *continued*

Figure 3



A pilot to validate the functionalities and co-benefits identified above would not require on-site hosting from corporates and financial institutions. However, APIs could eventually be created alongside their core systems to automate the transaction process.

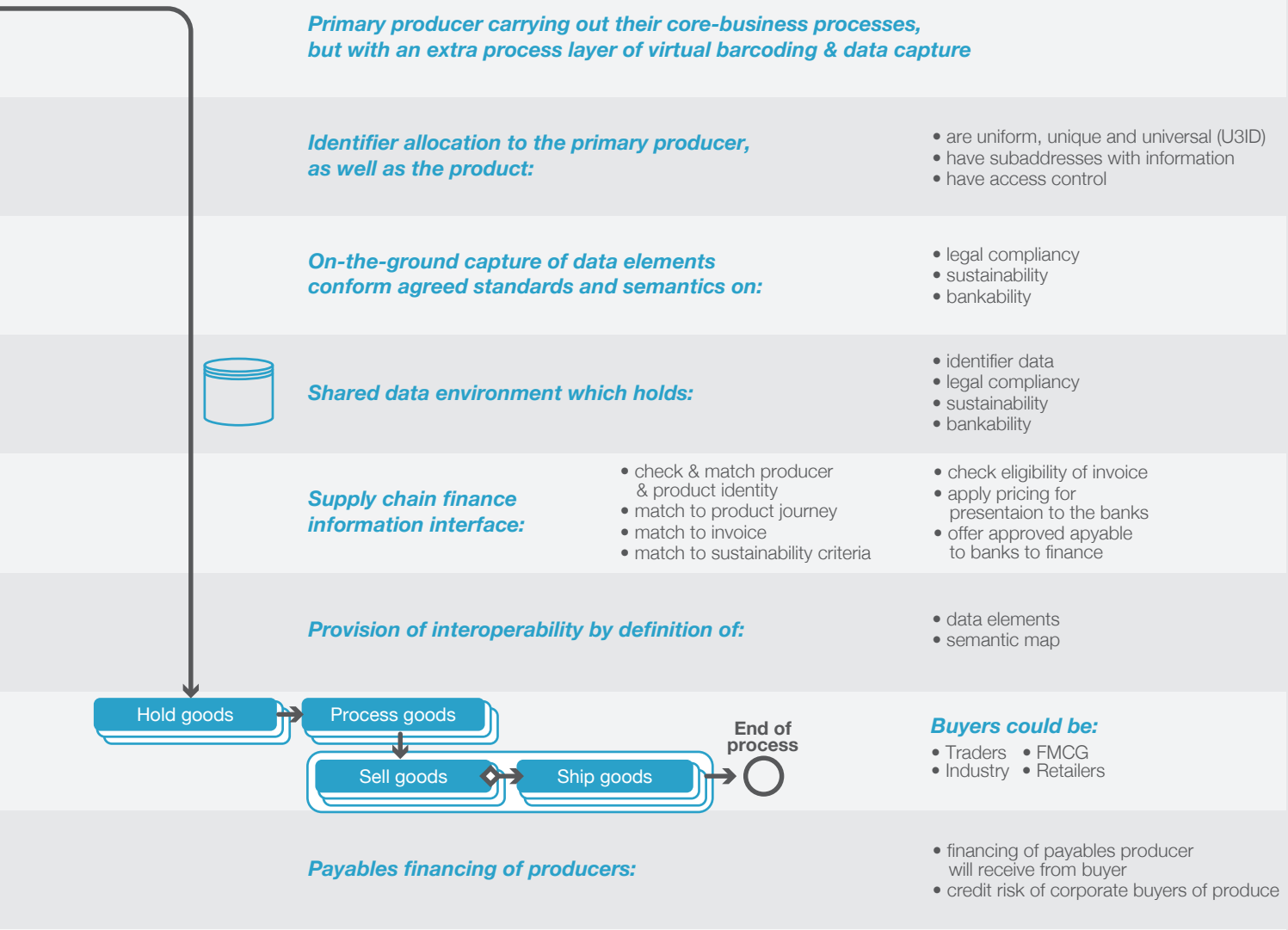
Scale-up strategy

The team working on this use case observed that there is a truly global opportunity to provide such data services to supply chain actors. Demand drivers range from the voluntary (such as commitments from companies to avoid procuring commodities whose production has contributed to deforestation) to the mandatory (such as compliance with laws relating to human rights abuses).

The scale-up strategy for this concept could consist of two pillars: a bottom-up approach and a top-down approach.

The bottom-up approach could consist of collaborating with corporates that recognise their need for improved supply chain transparency. An initial supply chain could be identified and used to validate the solution, and then the solution could be applied to other supply chains.

The top-down approach could consist of working with industry bodies whose members recognise that their industry is in need of improved supply chain transparency. Here, the opportunity would lie in reaching scale by setting industry standards through smart partnering.



Next steps

The supply chain concept has been developed into a pilot proposal to validate three hypotheses:

- A joint application of the below technological solutions enables a trustworthy, standardised and scalable transfer of sustainability sourcing information across otherwise fragmented supply chains:
  - identifier technology
  - processes to standardise data attribution
  - distributed ledger technology.
- Access to finance on improved terms would provide incentives for producers to submit reliable data about the sustainability of production methods.
- The above can be achieved in a way that is commercially viable for all stakeholders in a supply chain: producers, processors, retailers, consumers and (financial) service providers.

Appendices *continued*

Appendix 5: Energy coin concept

In describing this concept, the authors benefited greatly from the conversations in the Energy team of the Taskforce, and particularly from the work of Dr John Clippinger and the team at the Swytch project.

The challenge

UN Sustainable Development Goal 7: *Affordable and clean energy – Ensure access to affordable, reliable, sustainable and modern energy for all.*

This concept is most developed from the technical perspective. The business perspective – and particularly the economic model – needs further elaboration. If the concept were to be further developed, the roles that financial institutions and corporates could fulfil would hinge on the specifics of this economic model. The context for this team's work is that market conditions for renewable energy production and storage – especially solar – are changing rapidly to become cost-competitive with fossil fuels. However, the team working on this concept observed three interrelated issues associated with the clean energy transition that fintech might help to solve.

First, at a global level, it is challenging for traditional investors to support decentralised renewable energy generation, in particular solar, at scale. Access to capital can therefore be a barrier for aspiring localised producers. This is a concern because access to power for economic development, security and health has traditionally been limited to centralised grids around the world, despite significant portions of society not being connected to such grids.

Second, the team observed that the current generation of carbon emissions trading systems face challenges such as the over-supply of credits and their vulnerability to fraud. These can be important dissuasive forces for well-intended actors who look to this mechanism to participate in the energy transition. Third, although smaller-scale clean energy producers might be able to sell excess energy they produce back to the centralised grid, their ability to trade this energy with local buyers on decentralised grids is limited. Despite the relative merits of different types of grid structure still being open to debate, this observation is relevant because it is often argued that centralised grids are more vulnerable than decentralised versions to system shocks.

Opportunity

Fintech solutions could help address each of these issues by using a dedicated clean energy coin, or token, linked to the production of renewable energy and stored on a blockchain. This would create the conditions to more directly connect decentralised solar energy generators with the carbon-offsetting and decarbonisation programmes of particular firms, local governments and even households.

Electricity demand is slated to markedly grow during the next 30 years.[10] Much of this growth is expected to come from developing countries, where access to investment and energy sources can be structurally limited.[11] Distributed energy and clean energy token platforms could transform current energy markets by reducing the need for expensive and inefficient infrastructure, and by creating the conditions to reward producers in a decentralised network.

... it is challenging for traditional investors to support decentralised renewable energy generation, in particular solar, at scale. Access to capital can therefore be a barrier for aspiring localised producers.

Proposed solution

Under this concept, solar energy generators across a decentralised network would be issued with clean energy coins, using blockchain (or distributed ledger technology), at the point when they have been verified as having produced new units of clean energy. The coin's value would serve as a financial reward for people producing solar energy. Solar energy is particularly interesting because it can be deployed in an agile and rapid way by means of modular 'erector sets' and the energy generated can be stored in batteries – battery storage research is rapidly advancing.

The coins would be issued through an independently verifiable algorithm, and each coin would represent a quantifiable sum of avoided greenhouse gas emissions. Verification could be automated through the use of geo-located smart meters. This would allow for coding a higher reward for production locations with a higher carbon substitution (or humanitarian) impact per kilowatt hour of electricity produced. Thus, the solution could be designed such that it encourages the highest impact investments specifically in areas where carbon emissions are high and power generation is low (eg in India).

Buyers of the coin would then have confidence and clarity that they are supporting solar energy generation that is taking place in a particular location. Buyers could be motivated to do so for at least two reasons. One would be their desire (or legal obligation) to offset their carbon emissions, and to do so in a highly secure and transparent way. Another, which could be complementary, could be their desire to support local energy generation in a particular geographical area, perhaps as part of social and economic regeneration plans.

The value of the clean energy coin, like that of any currency, would hinge on its acceptance as a mechanism for exchanging value within a given marketplace. Companies wishing to offset their carbon emissions in a transparent and secure way could be an initial driver of demand. A more radical idea, which is already under consideration in practice, is that local governments could accept clean energy coins generated by local producers as payment for certain municipal services, given their vested interest in encouraging investment in local social and economic development. Financial institutions, in turn, could become involved in helping to scale this concept in several ways, including providing services to enable the exchange or saving of clean energy coins and financing the energy generation equipment.

By designing these clean energy coins and exchanges in an open way, multiple synergistic services could be developed on top of them, opening up many different business and sustainability opportunities. If the coins were first initiated and sold via a so-called Initial Coin Offering (ICO), this could offer a hybrid investment solution (debt and equity) to investors. As the value created by the users/members of the platform grows, the coin would be expected to increase in value and general utility.

Economic model

The exact economic model for a solution such as this would need to be determined. However, an algorithm would be used to determine the amount of tokens minted by a specific node per kilowatt hour of generated electricity. This dynamic, self-regulating model will be able to access a set of complex inputs of energy supply and demand data around the world, and determine on a real-time basis the number of energy tokens available for minting in each location. To achieve minting outcomes that stimulate the highest utility investments, in terms of carbon substitution and humanitarian impact, that algorithm could take into consideration the following parameters:

- Total global demand for energy.
- Total installed capacity of fossil-fuel-burning technology.
- Total production in megawatt hours of all solar renewables currently in service.
- Ratio between total installed capacity, total demand for energy and total installed capacity of fossil-fuel-burning generation.
- Value of lost load per region, localised by utility or region, county, providence, control area calculated as the economic loss of reducing one megawatt of load on the system for one hour.
- Regional/geographical ratios of the above.
- Regulatory offsets in the form of renewable energy credits by state (domestic) or country control area internationally.
- Greenhouse gas (GHG) offset as calculated by NASA, RetSceen, or similar APIs.

Appendices *continued*

Technology walkthrough

The token would be designed such that it is a valuable and independently certified medium of exchange based on the production of usable renewable technology. This includes:

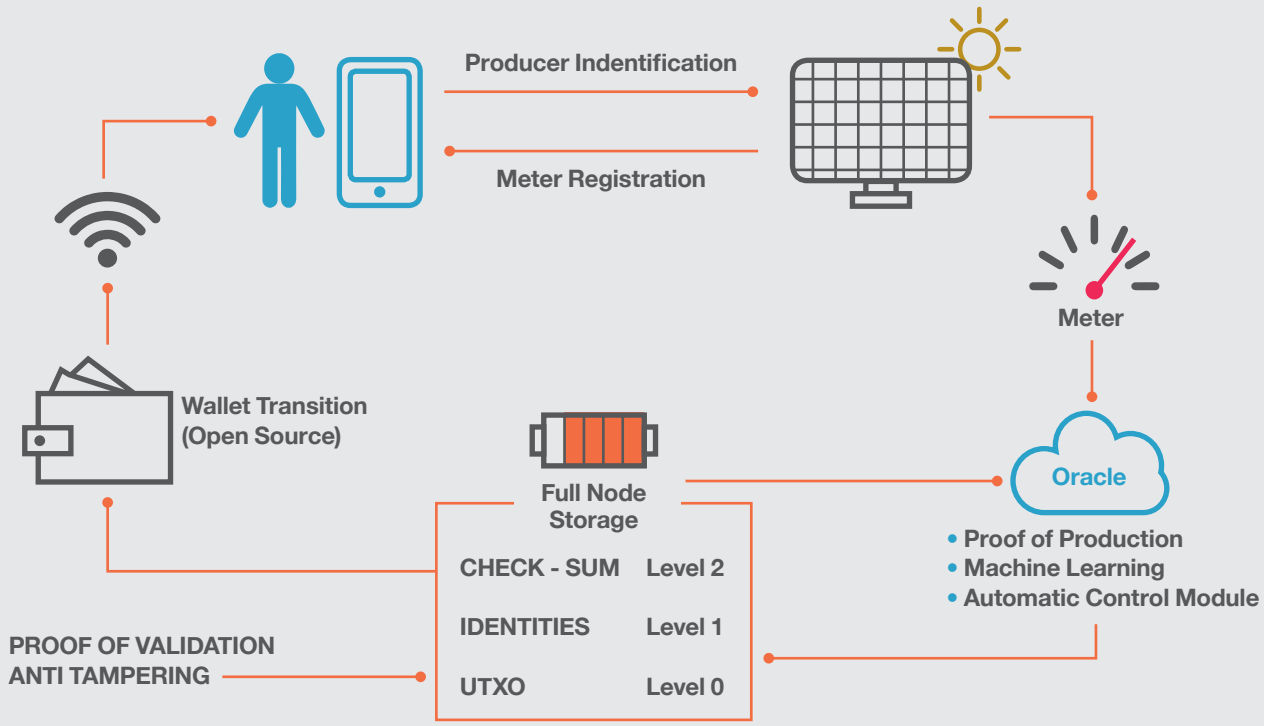
- Use of well-established technical and legal structures that safeguard the tokens' safe use and clean energy objectives, including:
  - Hardware computational wallets (current price range: $5–10) to run energy metering software while simultaneously calculating blockchain and token minting consensus algorithm.
  - Encryption technology and blockchain to verify in a tamper-proof manner that energy production is linked with the consumption of renewable resources.
  - An Control Module (ACM) based on the open source Dragonchain platform (developed and used by the Disney Corporation), which dynamically computes the appropriate weights, scores and value allocation for each member in the peer-to-peer network to control a transparent and proper supply of coins.

The solution consists of the following technical elements:

Mobile clients – an app that: acts as a currency wallet, displays a user's energy token balance and allows them to spend and receive energy tokens, and shows energy production for the nodes that are linked to the individual user's solar arrays.

Nodes – an Internet of Things device consisting of:
1) a tracking tool which measures energy production for the user's solar array;
2) a storage appliance that holds a copy of the whole blockchain;
3) a computing element that calculates the energy token reward amounts through the token minting algorithm as well as the amount of contribution to the token network to ensure tamper-proof blocks validation.

Figure 4: energy coin use flow (courtesy of Swytch Project)



Other technical requirements are:

- Each user in the chain is uniquely identified by a Private/ Public key pair; each node is uniquely identified by a hash.
- Nodes can be either unassigned or assigned: the assignment process associates a user to a node and it's not reversible.
- The process is done offline through the mobile client: the user is instructed to put their phone in 'airplane mode' during the whole process; otherwise, association is not possible.
- Users can have multiple nodes associated with their identity: a single user might own, and generate energy tokens from, multiple solar arrays.
- When a node is assigned, its geospatial co-ordinates are recorded in the chain; from then on, all transactions coming from that node must be associated with their original user and geospatial co-ordinates. Nodes continuously check for blockchain integrity, and software consistency through checksum verification.
- The transaction is rejected if the node is reset in any way or if its production data comes from a position that differs from the one that was originally recorded in the chain.
- A minting algorithm is tasked with tracking rejected transactions and handling the quarantining process and banning process for nodes that fail too many transactions or are reset.
- A transaction consists of the public key of the user associated with the node, the geospatial position of the transaction and the production amount generated from T-1 (the previous recording) to T+0 (the production record for the current transaction).

The amount of energy tokens generated through each transaction is calculated by a minting algorithm that computes a function that can be summarised as: $xS = f(P)$, where S is a single unit of energy token, P is the energy produced from T-1 to T+0; x is the amount of energy tokens generated by the transaction; and f is the function that calculates the amount of energy tokens to be generated, using the parameters previously listed under 'Economic model'.

Appendices *continued*

Scale-up strategy

Given the current state of technology, consumer maturity and policy priorities, an energy coin such as the one proposed here could be deployed rapidly on a global scale. To achieve this, a two-pillar strategy could be adopted.

A top-down pillar could consist of securing large-scale energy coin generation and purchase agreements from:

- Major purchasers of green power for server farms such as big technology companies.
- Major corporates that have green-power purchasing programmes, networks of physical locations with roof space and (possibly) retail distribution capabilities.
- City governments that aim to make their city a 'smart city' could be encouraged to accept clean energy tokens for city goods and services that reduce pollution and congestion, and that support sustainability and greenhouse gas reduction (such as city-wide buses, bike services, carpooling, purchasing of solar panel upgrades, smart meters, smart thermostats and hardware for smart homes).

Moreover, working with governments to adapt existing renewable policies to incorporate this clean energy token could eventually eliminate current inefficient carbon trading markets. Geolocation of all previously minted energy tokens would allow for the provision of traceability, transparency and fungibility with regional, national and transnational carbon offset schemes. Providing the opportunity (not requirement) to have Know Your Customer/Anti-Money-Laundering and EU General Data Regulations compliance components included in the solution would allow for compliancy with various sets of national legislation.

The solution would provide immediate revenue generation opportunities and significant compliance and verification savings for the above partners. The focus of this top-down approach would be to provide more effective and efficient methods for verifying, aggregating and exchanging carbon credits for compliance purposes.

A bottom-up strategy could be targeted at any 'prosumer' around the world. A prosumer in this case is a consumer as well as a producer of sustainable energy who is also a consumer and minter of the energy coin. Product–service combinations as well as financing could be distributed through corporate partners (see above). Also, a clear incentive structure would need to be provided for prosumers to purchase residential solar panels through the energy token platform – by providing installer/panel partner discounts; pre-allocation of anticipated energy tokens based on technology and geolocation; and enhanced mobile user experience for tracking, optimising and purchasing energy assets. The energy coin mobile app would be available around the world at no charge. Also, the app and energy coins could be supported by foundations and philanthropists to accelerate the transition from fossil fuel to renewables, as well as to provide a more equitable income distribution.

Next steps

The above elements of the energy coin concept consist mostly of existing and well-established technologies and practices that could be brought together at short notice. However, the following items still remain to be developed and/or validated:

- What will be the exact modelling of the economic model/distribution of the benefits of this system through the minting algorithm?
- To what extent will there be a benign regulatory treatment of the energy tokens by financial regulators?
- What will be the bottom-up uptake? How can consumers' questions with regard to price, security of supply and level of 'greenness' be addressed?
- How will the hardware distribution and fraud prevention take place?
- How could the distribution power and other assets of corporates (from various verticals) as well as financial institutions be put to best use?
- How could the energy token solution result in the fastest efficiency gains for these parties?

Acknowledgements

The authors would like to thank the following people and institutions for participating in the Fintech Taskforce. In co-operating with the project, they do not individually commit to any opinion on the recommendations, conclusions or statements in this report.

Barclays	Dr Rhian-Mari Thomas, Ross Taylor
The Bank of England	Michael Sheren
BNP Paribas	Amine Bel Hadj Soulami, Emmanuelle Aubertel, Jean-Philippe Hecquet
BNY Mellon	Christopher Fraser OBE, Niamh de Niese, Dean Handley
CISL	Dr Jake Reynolds, Kajetan Czyz, Laura Newman, Tamara Slater
Focafet Foundation	Floris Kleemans
Halotrade	Shona Tatchell
UK Treasury	Rhys Gordon-Jones
Landmapp	Simon Ulvund, Tafadzwa Chiganga
Legal & General	Meryam Omi
Lloyds Banking Group plc	Adrian Bryant
Provenance	Jessi Baker, Stephanie Lau
RBS	Kevin Hanley, Richard Crook
Sainsbury's	Judith Batchelar OBE, Stuart Lendrum
Santander Group	Juan Jimenez Zaballos
Sappi	Kurt Kim
Standard Chartered Bank	Sam Mathew, Alexander Kennedy
Swytch	Dr John Clippinger, Evan Caron
Unilever	Keith Weed, Mark Kaplan
Westpac Banking Corporation	Macgregor Duncan

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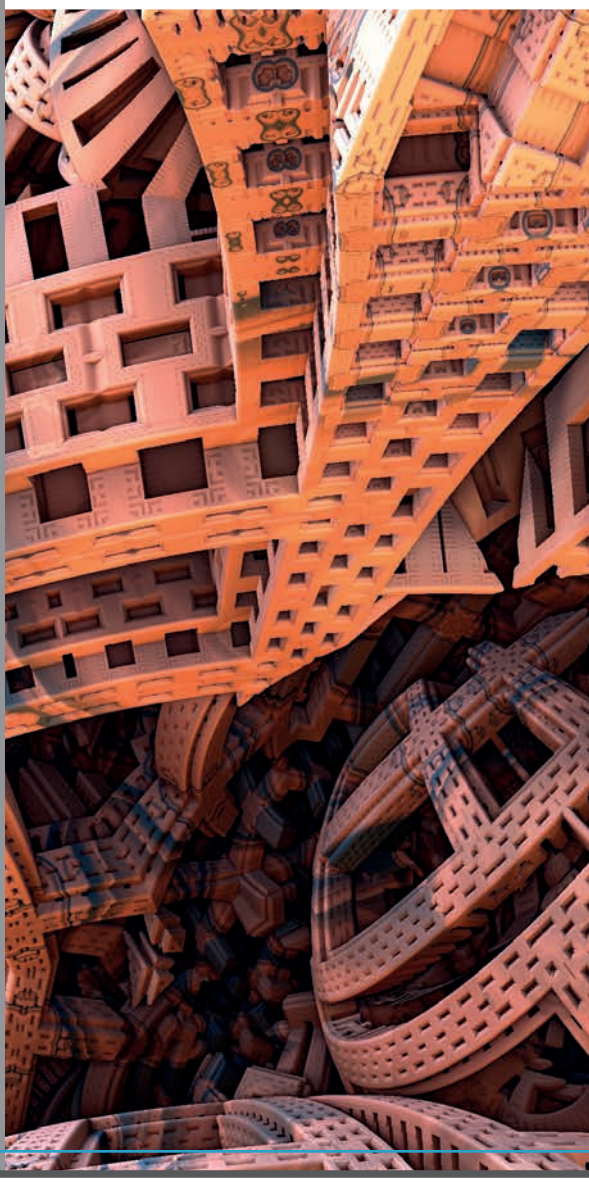

Design: adrenalincreative.co.uk
Cover: oneagency.co

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