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Sustainable digital finance in Asia: Creating environmental impact through bank transformation

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SUSTAINABLE DIGITAL FINANCE IN ASIA:

Creating Environmental Impact through Bank Transformation

SCALING INVESTMENT FOR SDG 7, 12 & 13

About this report

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Contents

Chapter 1:
Executive summary

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Data is arguably the most valuable resource in the digital economy. Used effectively and responsibly it has the potential to serve as a driving force in creating a more sustainable world. The potential is especially potent in the financial sector given its central place in the financial system, and its access to and use of data.

Using technologies such as blockchain, artificial intelligence (AI), mobile technology, internet of things (IoT), and the cloud, data can be captured by sensors in the environment and structured to integrate sustainability into existing financial products and services. These can be creatively combined into entirely new sustainable digital finance products. We use the term **"Sustainable Digital Finance"** to describe these processes.

Sustainable Digital Finance (SDF) is closely intertwined with social and environmental problems, and offers solutions to both of these challenges. Attention to date has primarily been focused on SDF's potential for aiding social progress, especially through financial inclusion. This report demonstrates that the **potential for tackling complex environmental** issues is equally great. Asia-Pacific, the geographical focus this report, is a region facing complex challenges, as the need to provide basic social services to its citizens meets an increasingly trajectory of stark environmental impacts. At the same time, the region is also home to nations with some of the highest fintech adoption rates.

This report shows how digital technology offers new ways to address sustainability problems and in doing so can fundamentally redirect financing towards more environmentally efficient users of capital. The ability to obtain and analyze environmental data (including externalities) at scale and speed vastly enhances opportunities (and requirements) to incorporate such data into risk analysis and thus pricing. This in turn changes the cost of capital for companies in the real economy. It also enables predictive analytics (scenario analysis) that can change banks' portfolios and offer insight into their alignment with science-based planetary environmental limits.

Availability of data also offers opportunities for banks to **innovate green products** both for institutional and retail customers.

Any solution that SDF offers will come from the use of data, often owned by the customers that banks serve. Environmentally well-intentioned solutions risk generating concerns over data privacy if not handled correctly, but when used responsibly and with integrity, SDF creates a win-win situation.

This report exposes the idea that banks may benefit from considering open software platforms and collaboration with "FinTechs" in delivering some of the promising new solutions.

The following specific recommendations arise from the report:

RECOMMENDATION 1 – Increase use of environmental data to enhance risk capabilities and adjust pricing: Sensor technologies such as satellites and intelligent chips will reduce the cost of obtaining environmental data from customers, allowing banks to better analyze the risk of customers' lending portfolios.

RECOMMENDATION 2 – Enhance reporting on environmental impact (including indirect Co_2 emissions): As banks are enriched with additional data, they will be able and expected to disclose both risk exposure to environmental and climate change, as well as environmental impact. This will affect capital allocation amongst banks. An essential aspect of this is to ensure that reporting is globally comparable, and that relevant, homogenous metrics underpin both accounting and voluntary disclosures.

RECOMMENDATION 3 – Use technology to promote traceability in supply chains: As consumers become more aware of the negative consequences of irresponsible production, from human rights violations and corruption to climate change, they are demanding more and more transparency across the value chain. Increasing transparency is complex given the fragmented nature of value chains. However, banks can aid the deployment of satellite and blockchain technology to increase auditability and transparency of value chains to verify that products are produced sustainably. It offers banks opportunities in terms of trade finance and instant payments.

RECOMMENDATION 4 – Digitize capital market instruments: Although Asian green bond issuance reached $43.4 billion USD in 2017, only a very small portion of green assets are financed by capital market instruments certified as "green". One of the barriers is the cost of certification and monitoring, which impose additional costs to green bond participants. Digitizing bond offerings brings down the cost of obtaining and reporting environmental data for green bonds, allowing many more companies, especially small and medium sized enterprises, to meet the requirements to issue green bonds.

RECOMMENDATION 5 – Create tailored environmentally responsible investment products: Data allows banks to provide tailored investment products that, with a higher degree of confidence, create not only a financial outcome but also achieve specific regional environmental outcomes, or support one or more of the UN's Sustainable Development Goals (SDGs). Private wealth has an important role in mobilizing capital to the SDGs and the Asia-Pacific region accounts for 38.1% of global High Net Worth (HNW) Individuals[1]. Banks can use data analytics to create personalized investment portfolios for HNW clients based on their sustainability preferences.

This may introduce a source of more "patient capital" from impact investors who still seek financial returns and thus expand this source of capital beyond the realm of philanthropy. In addition, automation driven by low cost robo-advisory services can open up investment opportunities to a larger segment of private and even retail banking customers. By making it easier for individuals to invest in accordance with their values and preferences, the total amount of capital available for SDGs may increase significantly.

RECOMMENDATION 6 – Use data to promote environmentally responsible living: Banks may open additional APIs to collaborate with external partners that commit to designing new green products. Alternatively, banks can do so in-house by analyzing data about individual consumers' consumption patterns and lifestyle choices. Algorithms can structure this data and turn it into individualized environmental footprints from consumption, compare trends across peer groups and demographics and create peer competition incentives using Social Media.

Chapter 2: Introduction

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Limiting global warming to well below 2°C and achieving the 17 Sustainable Development Goals (SDGs) will require almost $4 trillion USD a year. Presently, investment is approximately 35% of that required, leaving a $2.5 trillion USD investment gap[1-2]. In addition, the costs of deep decarbonization of the economy are hard to estimate, with a recent MIT study stating that it will cost up to $535 trillion USD by 2100 to extract carbon from the atmosphere if we don't start acting soon. By contrast, if global carbon emissions fall by 6% a year from 2021 onwards, the cost would be reduced to about $100 to $200 billion USD per year[3]. Achieving these transformational changes will require not only technological innovation and political will, but also significant innovation in finance. The global financial community is promoting an agenda of sustainable finance approaches. From the IMF/World Bank's Bali Fintech Agenda[4] to the G20 Eminent Persons' Group report titled "Making the Global Financial System Work for All"[5], leaders are urging commercial banks and other financial ecosystem actors to collaborate and provide innovative sustainable finance solutions.

Innovations in financial technology (fintech) fuel innovation in finance, lowering the costs of providing basic and advanced financial services exponentially, creating new opportunities for banks and start-ups alike. Innovation that builds on technologies such as AI, IoT, and blockchain has the power to overcome existing barriers to scaling sustainable finance and to design entirely new sustainable financial products, services, and markets. This concept is what this report terms "sustainable digital finance".

Sustainable Digital Finance refers to financing, as well as related institutional and market arrangements, that leverage technological ecosystems – including mobile payments platforms, crowd-funding, peer-to-peer lending, finance-related big data, artificial intelligence, machine learning, blockchain, digital tokens, and the internet of things – to contribute to the attainment of strong, sustainable, balanced and inclusive growth, by directly and indirectly supporting the targets set in the Sustainable Development Goals.

Many fintech solutions are not explicitly designed to deliver sustainable finance but can be deployed by banks to that end. The timing is right, as 2018 marked a shift in the fintech landscape, from a desire to overthrow banks to start-ups and scale-ups increasingly looking for symbiotic collaboration[6]. Financial institutions also increasingly realize a need to collaborate with FinTechs to innovate their business model and product offerings. 82% of these institutions expect to increase fintech partnerships in the next three to five years[7].

Nonetheless, like every other sector, the banking sector can do more to innovate finance for sustainability. In 2017, banks helped their clients raise $7.2 trillion USD in the global debt capital markets. However, only 5-10% of bank loans are "green" in countries where environmental attributes are measured. Similarly in that same year only around 2% of the $6.7 trillion USD of bonds issued were labelled as green bonds[8]. Green bonds are being issued at a rapidly increasing pace, but digitization can make that curve even steeper. At the same time, opportunities are emerging to innovate other financial instruments. For example, banks can deploy digital technologies to automate data harvesting on green assets, reduce the number of intermediaries, increase transparency, and to innovate the ways partners of green bonds collaborate. These are just some examples that could further scale sustainable finance.

Currently, banks still mostly leverage the innovative power of FinTechs to reduce operational costs or improve customer online experience. In this process, banks are rapidly losing face-to-face contact with customers, eroding opportunities to build relationships and commitment to their brands. Today's bank is thus increasingly a distant and abstract entity, little more than a safe place for customers to park their money [8]. To reverse this trend, banks need to find ways to reengage their customer base.

For many, this will hinge on offering services that set them apart from competitors through innovation. Innovations related to the SDGs are a promising avenue to explore.

Pioneering banks that succeed in strategically deploying fintech to drive sustainability in their products and operations will not only develop new offerings and efficiencies, they will also stand to construct more purposeful businesses and brands that align with the SDGs and the Paris Accord. This process promises to deepen engagement with a new generation of millennials that are mobile first and for whom sustainability determines consumer, investment, and employment choices.

Integrating digitization and sustainability at strategic and operational levels to become a bank powering and powered by sustainable digital finance is a complex process. Transformation requires adoption of new technologies, learning, and changes in long-established practices such as incentive systems and loci of decision-making, as well as significant cultural evolution and even revolution. In practice, transformation is generally non-linear, meaning each new capability underpinning change does not necessarily need to be implemented in sequence.

Table 1.1: Three capabilities underpinning sustainable digital finance

1)	2)	3)
Use digital technologies to **CREATE SUSTAINABILITY METRICS** and digitize environmental information for green financial products.	Use digital technologies to **INTEGRATE SUSTAINABILITY INTO** existing financial services and innovate how banks distribute products and services to existing customers.	Use digital technologies to **DEVELOP NEW SUSTAINABLE PRODUCTS, SERVICES AND MARKETS** which may involve significant redesign of the banking business model.

A first stage is to deploy digital technologies to capture sustainability metrics to digitize environmental information that can inform financial services provision and existing green financial products. A second stage focuses on using digital technology to integrate sustainability into existing financial products and services.

A third stage is the most challenging and invites banks to develop new sustainable products or services and potentially even entirely new markets, enabled by digital technologies. This could involve significant business model innovation, which exacerbates the complexity and necessity of the above-mentioned cultural changes. Note that the order of the three steps reflects their relative ease of implementation and not a chronological process.

The following sections of this report are structured as follows. The next chapter offers an overview of opportunities and barriers to scaling sustainable digital finance in the Asia-Pacific region. This is followed in chapter four by a framework for classifying the start-up landscape based on three complementary capabilities that rely on digital technologies to address the SDGs in novel ways.

Chapter five presents a selection of start-up cases with relevant capabilities to sustainable digital finance and serves as inspiration for banks that are willing to develop similar in-house capabilities, or for banks that seek to develop collaborations in this space. The final chapter offers recommendations on how banks can use digital technologies to enhance their engagement with the SDGs, and zooms in on some of the crucial barriers and enablers of the requisite transformation in the financial system.

Chapter 3:
SDG 7, 12 and 13 in Asia Pacific

Chapter 3: SDGs 7, 12 and 13 in Asia-Pacific

This section looks at the barriers and opportunities to bridging the funding gap in Asia-Pacific for SDGs 7, 12 and 13. The three goals are interconnected and hence barriers may apply to more than one of the goals.

Estimates show that within Asia-Pacific, demand for additional green investment between 2016 and 2030 is:

$3
trillion USD

This investment need is spread across four sectors:

INFRASTRUCTURE
$1,800 billion USD

RENEWABLE ENERGY
$400 billion USD

ENERGY EFFICIENCY
$400 billion USD

FOOD, AGRICULTURE AND LAND USE
$400 billion USD

Only 1 in 4 USD of current financing arises from private sources and this number will need to increase if supply is to meet demand [1].

A Rapidly Digitizing Region

The presence of digital infrastructure is a prerequisite for sustainable digital finance. Asia-Pacific contains some of the most well-connected digital markets in the world. There are 2.7 billion unique mobile subscribers, approximately two thirds of the region's population, which gives an indication of the possible market size[2].

Asia-Pacific is rapidly migrating to higher speed mobile networks, with 4G taking over and 5G expected to gain a significant foothold in the region by the end of the decade. GSMA forecast that 5G connections will reach 675 million users across Asia-Pacific, accounting for more than half of the global total for 5G[2]. This development lays a critical foundation for the rapid spread of IoT and its promised advancements in the automated monitoring of green assets.'

Several Asian countries top the fintech adoption index, where **China's 69%** adoption rate is more than double the global average of 33% . **India** ranks second with an adoption rate of **52%**, while **Hong Kong** stands at **32%,** and **South Korea** and **Singapore** hold at **23%.** Additionally, Asia-Pacific boasts the highest levels of e-commerce in the world [3].

SDG 12 – SUSTAINABLE PATTERNS OF PRODUCTION AND CONSUMPTION

Consumers in Southeast Asia are voicing a willingness to pay more for environmentally-friendly products, but are turning that opinion into actual behavior for only a few small groups of products. However, sustainability is increasingly becoming a deciding factor at price parity, revealing latent preferences[4]. For many, the decision to buy sustainable products in Asia is motivated by personal health and well-being concerns, rather than overarching environmental awareness[4]. The perceived credibility of relevant brands to the sustainability agenda also appears to be a key factor in consumer decisions. High fintech adoption and a willingness to make sustainable consumption choices point to a potential readiness of Asian consumers to adopt sustainable digital finance solutions.

The ASEAN region accounted for only **4.1%** of this quantum[6]. While capital for impact investing has overwhelmingly originated in **North America** and **Europe**, participation by wealthy local Asian families and high net worth individuals (HNWI) is increasing.

As the concept of impact investing matures in the region, analysts expect this trend to continue as HNWI wealth in **Asia-Pacific** tracks to surpass **$40 trillion USD** by 2025[7].

To date, impact investors have deployed capital towards Asian FinTechs focusing mainly on financial inclusion and energy[6].

Increasing private wealth:

Over the next decade, wealth in India is predicted to triple to about $25 trillion USD according to the Global Wealth Migration Review, while China's is set to increase by 180% to $69 trillion USD[5]. As such, demand for wealth management is increasing in the region and a rapidly expanding middle class is leading to increased demand for private savings.

The Global Impact Investing Network reports a 65% increase in global impact investing assets under management (AUM) from 2013 to 2017.

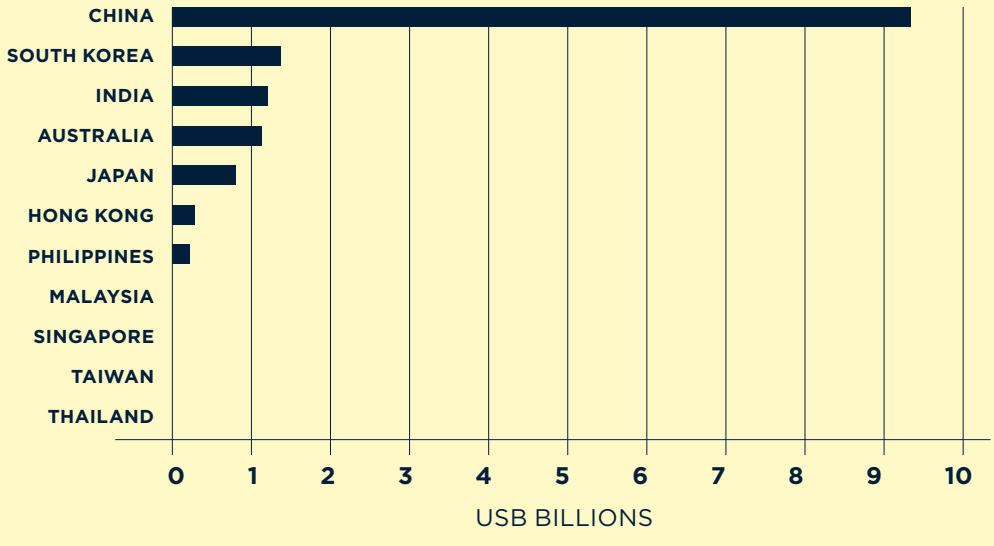
High carrying costs for impact investments produce demand-side risk and increase supply-side power, exacerbating information asymmetries and reducing credit alternatives for impact projects. In the worst cases, high transaction costs across long value chains between financiers, and impact projects may produce a negative spiral of high costs of validation that price small-scale, high-impact projects out of the sustainable finance market.

SDG 7 – SUSTAINABLE ENERGY

By 2035, Asia will consume more than half the world's energy, necessitating radical transformation towards sustainable generation. While many Asian economies have set targets for renewables in their energy mix, an investment gap exists between the reality and the stated goals. According to the Asian Development Bank Institute, the financial barrier is the main obstacle to the development of environmentally clean, renewable energy in the region[8].

Many Asian nations rely only to a limited extent on the involvement of capital markets for financing the roll-out of renewables. This reduces renewable energy developers' access to finance and increases the cost of capital. Bonds can play a role as an instrument to address the deficit by attracting investors with both high- and low-risk appetites and by acting as a magnet to attract investors that already have an interest in renewable energy projects[9]. However, certification and monitoring costs can impose additional costs to the bond participants, which can impose a barrier to scaling, but digital technologies can lower this barrier by providing cheaper verification, transparency, and credible data.

Figure 3.1: Green labelled bonds in APAC.[10]



Source: Climate Bonds Initiative

According to Dealogic, A**sian green bond issuance** reached **$43.4 billion USD** in 2017, accounting for **36%** of global volume (up from less than 10% in 2015). Still, few Asian banks and companies outside of China have issued green bonds, with the Singaporean bank DBS a notable exception that issued its first green bond in July 2017[10].

Estimates show a potential investment of up to **$250 billion USD** to 2025 in new utility-scale solar and wind projects in major **Asia-Pacific countries**, and there continues to be a strong economic case for renewable energy investments in the medium to long term[11].

Banks in the region have been cautious about lending to small and medium-sized enterprises (SMEs), including those engaged in the renewable energy market. Start-up companies, in particular, are finding it difficult to borrow money from banks because of strict Basel capital requirements. Riskier SMEs also face difficulty in borrowing money from banks[8]. Given that Asian banks categorize green renewable energy projects as risky with lower expected rate of return compared to fossil fuels ones, they are reluctant to funding such projects.

Despite recent improvements in efficiency, Asia-Pacific remains the most energy intensive region in the world. If current progress is maintained, the region will only reach European levels of energy consumption per unit of GDP by 2030[12]. While industry has attained the largest drop in energy intensity from 2012-2014[12], new progress is needed in the rapidly expanding building sector. In Asia-Pacific, energy consumption in the built environment will continue to grow rapidly due to new construction spurred by high economic growth and urbanization amid an increasing demand for cooling in warm (and warming) climates.

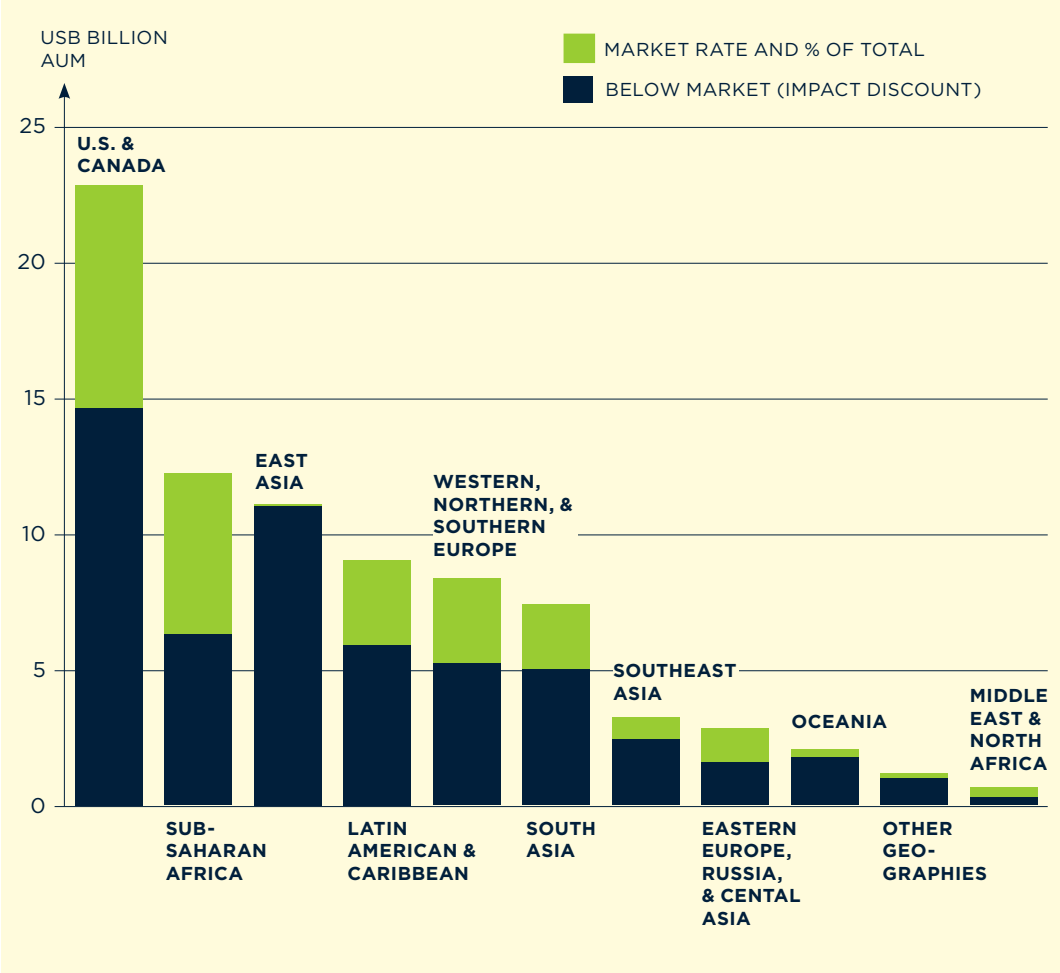
According to Navigant Research, the market revenue for energy efficient buildings in Asia-Pacific is expected to grow from $65.3 billion USD in 2017 to $111.3 billion USD in 2026[13]. The region is turning to stricter guidelines and requirements for energy efficiency in buildings, using a variety of policy tools including appliance standards and labelling, building energy codes, energy performance ratings, certifications, financial incentives, public sector demonstations, and awareness raising campaigns are all being utilized, with differentiations in comprehensiveness and depth of each policy tool.

In general, Singapore and Japan are the leaders in designing energy- efficiency programs for the construction industry that cover most stages of a building's life cycle and target both the suppliers and users of buildings. Korea, Taiwan, and Hong Kong follow, with China making substantial progress recently.

Policy implementation in most of the countries reviewed (China, India, Indonesia, Malaysia, the Philippines, and Thailand) is still in a very early stage of development.

A well-established institutional infrastructure that might support the implementation of the building energy codes is yet to be established[14].

Figure 3.2: Global impact investing: 2018 allocations by region and target return.[15]



SDG 13 – CLIMATE ACTION

A key barrier to state-supported, market-led adjustments towards Climate Action and Sustainable Economies involves a shortfall in effective, efficient, and transparent valuation of the natural capital, including major carbon sinks in marine ecosystems, mangrove forests, and peatlands. By placing a dollar value on ecosystem services - including the climate, the health of the oceans, and the stability of the local environment - natural capital valuation helps firms take concrete steps to internalize the externalities of production systems.

When integrated within the ledgers of entire economies, natural capital valuation guides the integration of true costs and benefits of natural resources and ecosystem services across entire supply chains. This helps firms manage trade-offs in strategic planning, including those between short and long-term profit, and between investments through which firms divert costs onto third parties and those that improve efficiency and reduce waste.

Advances in natural capital valuation are critical in the context of climate change and the continued prevalence of carbon intensive development paths in the developing world. In Asia, the energy mix remains dominated by fossil energy[8], while the WHO reports one third of global air pollution deaths occur in Asia-Pacific[16].

Exacerbating the problem, current IEA data shows fossil fuel subsidies in Southeast Asia exceed $17 billion USD.

While major improvements in the levelized cost of energy for utility scale solar energy will continue to accelerate the shift of energy mix towards PV, instability in the regulatory environment continues to support short-termism among planners and slow what might otherwise be a more rapid transition. The comparative cheapness of fossil energy, and the related abundance of funds for developing dirty energy projects, constitutes another key barrier to moving the region away from a carbon-intensive development trajectory.

Against this backdrop, a number of Asian countries are taking major steps to change this reality by putting a price on carbon or by implementing other carbon policies. China's national emissions trading scheme (ETS) launched officially in December 2017 and work is underway to prepare its wider implementation. Looking ahead, carbon taxes in Singapore are scheduled to come into force in 2019 to stimulate cost-effective emissions mitigation. China, the Republic of Korea and Singapore are also mentioning stimulation of low-carbon innovation as a complementary objective [17].

Meanwhile, Trucost reports that much of the financial service sector in Asia-Pacific does not fully track the carbon sources material to their business activities[18]. WWF also reports that ASEAN banks in general continue to fail to disclose how they manage climate risks in deviation from the recommendations of the Taskforce for Climate-Related Financial Disclosure (TCFD). Such failures hold serious repercussions for food and water security[19] in an increasingly less stable climatological future. Hence, a focus on emissions disclosure is very likely to increase in a cornerstone role in regional financial governance.

Beyond energy, agriculture, forestry and land use change remain significant sources of emissions in the region. Around 70% of the world's deforestation still occurs as a result of production of palm oil, soy, beef, cocoa, and other agricultural commodities.

The Global Forest Watch, a World Resources Institute partnership, uses satellites and algorithms to track tree cover loss in near-real time, and provides a nice example of how digital technology can be used to increase transparency and verification of reforestation efforts. Any individual with a cell phone and internet connection can now check if an area of forest as small as a soccer penalty box was cleared anywhere in the world since 2001[20].

These are complex supply chains and many have made commitments to reduce deforestation, however, value chain transparency tends to be low and fragmented with many manual processes[19].

In the palm oil industry there is also a current lack of visibility in the transfer of goods from farmers to oil mills, to manufacturers, to retail outlets and finally to the consumer. While leading brands have pledged to commit to a 100% sustainable certification, only 19% of global palm oil production is certified as sustainable. Due to the opaque nature of the palm oil supply chain, regulators as well as customers have been unable to determine which producers are genuinely sustainable and which are not. Emerging technologies, such as blockchain can transform supply chains through radical transparency and retail banking investments in sustainable production projects in agriculture and land use change.

In addition to supporting more transparent systems for pricing the flow of goods and services based on their climatological and other environmental spillovers, banks have a clear role to play in the absence of well-developed capital markets and venture capital for natural capital investments. Yet banks loans remain typically best suitable for financing short- to medium-term projects. Bank deposits are typically short or medium term resources - usually of 1, 2, or at most 5 years. When banks allocate resources to long-term infrastructural projects and mega-energy projects they face a maturity mismatch.

For financial instruments to seek to protect natural capital (e.g. a river or forest) over longer periods of time, a vital pre-condition involves the ability to better price natural assets across disparate geographies and access time. This ability must be further developed in ways that provide "investable supply", meaning within instruments available at scale, with liquidity and an acceptable risk-adjusted return. For example, investable supply will allow investors to expand support to large-scale projects in forest conservation, as might be accomplished through tradeable securities like bonds. Debt-based financing instruments may serve to allay some of the maturity mismatch facing bank deposits through increased liquidity, but they require good data and comparable impact metrics.

There are a number of emerging tools, such as data analytics, predictive analytics, data mining, digital wallets, and mobile satellite technology that may assist in this process.

Valuing nature is not without significant challenges. Nevertheless, the transition to a low carbon economy presents a multi trillion-dollar financing opportunity for those banks that choose to address it. This is a strong positive. Most immediately, the transition to low carbon activities requires banks to progressively reallocate capital away from carbon intensive industries, particularly coal.

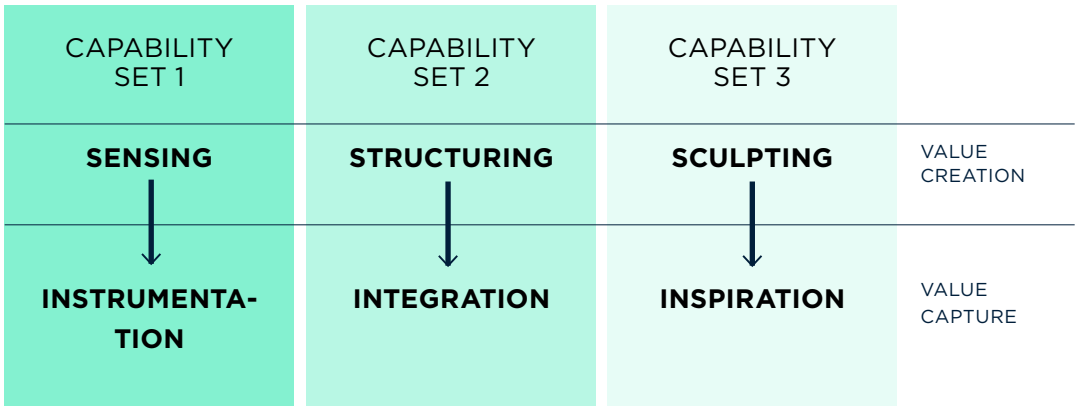
Chapter 4:
Emerging capabilities in the sustainable digital economy

Chapter 4: Emerging capabilities in the sustainable digital economy

Three complementary capability sets are emerging in the Sustainable Digital Economy that resonate with the three stages of sustainable digital transformation mentioned in the introduction to this report. Banks can develop such capabilities in-house, or can find start-ups to partner with, to incubate or possibly to imitate in order to be able to deploy these or similar new capabilities. This report proposes the below framework [1-8] to classify digital innovators according to how they leverage digital technology to create value from data.

Innovators interviewed for this report are developing new products, services, and business models around one of three emergent capabilities: sensing, structuring, and sculpting. Linked to these value-creating capabilities are three value-capturing capabilities, instrumentation, integration, and inspiration, which enable firms to turn the value they create into revenues.

Figure 4.1: Emerging capabilities underpinning the sustainable digital economy



Sensing

Sensing refers to an organization's ability to absorb environmental, climate, and social data inputs and turn them into intelligible data. When sensing is combined with instrumentation – the ability to turn sensory data into information, indicators, and instruments that other organizations are willing to pay for – the organization can start capturing value in the form of revenue. In an era of data abundance and high incongruence in data quality, comparability and reliability, the ability to generate income through instrumentation requires an in-depth understanding of extant and nascent market needs. This understanding differentiates a company from its competitors.

Sustainable investing is essentially a data-driven activity. Hence, sensing and instrumentation can help reduce search and verification costs for sustainable assets and projects, allowing for accurate determination of risks and upside opportunities of investments, whilst also reducing monitoring costs.

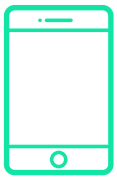
Two key considerations are important when developing a sensing capability: data responsibility and data quality. Data responsibility is of paramount importance to any organization collecting and using data. As different regulatory environments have very different approaches to this (compare the GDPR in Europe with the relevant US regulation), banks must manage data internationally whilst being consistent with both the law and the values they adhere to.

Secondly, data quality is reflected in appropriate quantity, consistency, and comparability. A tendency in sensing errs towards collecting an ever-increasing amount of data without a clear use case. This eventually leads to data-related risks, especially where collection concerns personal information.

In terms of consistency and comparability, companies need to work together and set standards to assure what is being reported is reliable and can be interpreted in a homogenous way. A recent report by Deutsche Bank[9] for instance juxtaposed two separate data sources to compare the environmental footprint of an Apple phone versus a Samsung phone and found that using one data source led to no comparable difference while the other one suggested a difference of factor 150. The underlying cause lay in the way in which greenhouse gases were attributed in both sources; Apple performed better in the second study because Apple, unlike Samsung, outsourced far more of its production.

Table 4.1: Sensing technology applications

Mobile



Smart phones, tablets and smart watches are technologies that can be used as environmental monitors. Sensors that interface with a smartphone or a digital device via associated apps can use built-in geo-location functionalities to determine position. It can for instance monitor concentration of particles in the air or other indicators that can be used in loans where the cost of capital is dependent on sustainability performance.

Satellite

Earth observation technologies, such as satellites, drones, and remote sensing technologies can detect and measure everything from air quality to fish stocks and forest growth, and can thereby help monitor sustainable investments or unsustainable activities. Such data can be used to develop bonds backed by natural capital such as forests, lakes, or other biomes. This data can also help tokenize natural resources which opens up new investment and trade possibilities.

IoT

Basic, cheap technology such as tags and identifiers (e.g. RFID chips) are becoming a reliable tool for harvesting basic binary data, while many other sensing devices are increasingly affordable, making it possible to attach them to mobile assets such as livestock or produce. Physical monitoring can be done by weighing or visual sensory devices (cameras). Intelligent and blockchain enabled chips embedded in green assets can automate data harvesting to provide richer verification of the underlying asset of green bonds and loans. For example, chips measuring solar throughput in PV panels turn technology into an intermediary in monitoring and validating the use of proceeds.

AI

Geospatial artificial intelligence (geoAI) is an emerging science that utilizes advances in high-performance computing to apply various forms of machine learning (e.g. deep learning, neural networks) and data mining to extract meaningful information from spatial big data. GeoAI has been used to predict air pollution and can thereby be applied to automate calculation of investment risks and potential upside opportunities. At the ground level, AI applications can detect and categorize produce such as fish or grades of coffee beans, enabling monitoring for sustainable and ethical farming and fishing practices.

Structuring

Structuring focuses on how organizations structure new types of data in familiar ways or familiar types of information in novel ways to serve clients in existing markets.

Structuring technologies (see table 4.2) can improve efficiencies and reduce frictions in stakeholder engagement to create value. Through effectively integrating structuring technologies with data, indicators, and/or instruments stemming from sensory capabilities, firms can capture additional value. Deploying such technologies enables banks to integrate sustainability metrics into existing 'standard' products and services for instance, thereby creating more differentiated value propositions that appeal to specific customer preferences. By improving efficiencies and reducing waste, structuring innovations also enable banks reduce the unsustainability of existing processes.

Table 4.2: Structuring technology applications

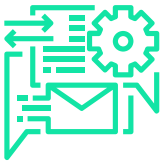
Blockchain

Distributed ledger technology offers confidence and efficiency to multiple parties engaged in green financial products such as green bonds by recording data on multiple copies of a fully transparent, immutable, and shared ledger that distributed across multiple participants and records transaction data in real time.

In the case of blockchain-based green bonds, intelligent chips embedded in green assets can automatically upload information onto the blockchain for all participants to see. Transactional activity can be automated by structuring contract data in smart contract applications on the blockchain.

First generation blockchains and the cryptocurrencies that run on them such as Bitcoin, are notorious for high energy consumption consensus protocols (proof of work) because they reward anonymous "miners" for moving transactions and maintaining an identical, distributed ledger through expending computational power. Other consensus algorithms like Proof of Stake (latency and volume problems) or Proof of Authority (centralization problems) remain at the moment impractical for high-throughput, low-value, decentralized transaction mechanisms. Other blockchains are emerging that use automated algorithmic consensus proofs, which are significantly faster, higher volume, and less energy consumptive. The Stellar blockchain underpins a network favored by projects supporting unbanked customers in developing economies and uses Federated Byzantine Agreement as consensus mechanism. Solara's "proof of fusion" is billed as Energy Additive, because of its use of solar energy and solar panels in its consensus protocol.

Big Data



With the right analytics capabilities, banks can analyze and interpret massive amounts of unstructured data at a speed and scale never before possible. Big Data generated by all types of sensing organizations can be used by firms to better account for sustainability and by the financial sector specifically to integrate sustainability into existing indexes of funds and companies or to develop entirely new indexes.

IoT

Intelligent machines have many uses for improving efficiencies across a diverse set of economies related to energy, land use, climate, and trade. Smart appliances could soon make autonomous decisions about the best time to start running, based on real time electricity price information, enhancing demand flexibility in the electricity market and reducing peak grid capacity. Smart locks can be used during international transport and connected to blockchains to reduce risk of dilution/counterfeiting/contamination of sustainable supply chains.

Artificial Intelligence (AI)

Consumption data extracted from mobile payment wallets can enable algorithms to calculate individual carbon footprints. Algorithms can offer advice on how to change consumption practices to enter into a carbon-light lifestyle. AI thus offers banks entirely new ways to work with consumption data of customers and way to integrate sustainability into existing banking products.

Robo-advisors use AI to guide investors towards suitable investments, typically Exchange Traded Funds (ETFs) that bundle securities into themed and lower-risk instruments in which risk is hedged across a portfolio. Sustainable ETFs are growing in popularity with the small investors who use robo-advisors able to offer ETFs to meet their preferences. For example, sustainability-focused robo-advisor EarthSimple[10] deals solely in sustainable ETFs. Beyond robo-advisors, AI offers the ability to track behavior and extrapolate likely future behaviors (e.g. for KYC processes) or recommendations for cross-selling sustainable products, addressing the awareness challenge for sustainable products

Sculpting

Sculpting is the most creative capability by which organizations use new data and possibly new structures to create new networks through which actors can exchange something of value. The sculpting organization creates social value through network expansion and through facilitating exchanges between counterparties that were previously disconnected. Through inspiration, a sculpting organization can turn this network into a new marketplace where it can also capture part of the value. A familiar example is facebook that provides a network structure (in this case an open platform) through which individuals can exchange information and interconnect in a new way. Through inspiration, facebook turned this sculpted network into a marketplace where they sell user data and attention to marketers.

Table 4.3: Sculpting technology applications

Blockchain

Can be applied to tokenize assets at household or community level to securitize a micro green bond or micro business. Blockchain can be used to create tokens based on many different assets including but not limited to natural capital such as energy, produce, minerals, or livestock, which can be turned into futures, collateralizable assets, units of efficient exchange. Blockchain can also introduce supply chain traceability. All these advances can help communities realize liquidity from natural capital and enable alternative investments. In addition, blockchain-based (decentralized) exchanges can be used by people to trade carbon credits rewarded for reduced emissions or other types of positive impact (e.g. SolarCoin) to expand carbon and social premium markets.

AI

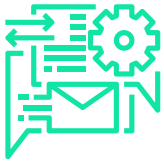
Replacing credit history with individuals' or companies' digital behavioral profiles, including metrics related to their supply chain, energy, or emissions, generated by a combination of big data and algorithms, can enable banks to open entirely new markets focusing on SDGs 7, 12, and 13. Behaviors such as social media network interactions, localization and movement tell more about carbon emissions, sustainable consumption, and the density of customers' potential credit worthiness than ordinary credit histories or collateral in most developing nations. This has the added benefit of allowing the capture of non-financial data pertinent to the SDGs.

While taking critical care to provide adequate protections for customer privacy, banks can work with micro-SMEs' behavioral profiles to compile sufficient data as guarantee to invest in projects from the household to the factory, while tracking the environmental impacts of key business processes. Advanced analytics can thus open up early stage investments into forest-preserving agroforestry initiatives, organic farms, green companies, distributed solar operations, and many other forms of small-scale sustainable production that typically lack the collateral and data history to solicit service from traditional banks.

IoT

Smart devices to measure, communicate, interpret, and disseminate information can inspire new market creation. Intelligent chips embedded in solar cells allow small groups or individual retail investors to invest in just one or a few solar cells, reducing risk and enhancing liquidity. Automation of investments and payment of returns to retail investors via smart contracts can lower transaction costs enough to make such micro investments profitable. Smart meters can be equipped with algorithms to report energy savings above baselines via digital token issuances onto a blockchain to enable seamless and immutable reporting to support both traditional financier to consultancy and peer to peer ESOC markets for energy performance contracts.

Big Data



Open banking architecture can be used strategically to apply FinTechs' advanced analytical capabilities in Big Data to existing storehouses of customer data. Open source innovation can help banks to design new products and open up new markets. Banks could incentivize FinTechs to use available data sets to design for sustainability by creating APIs targeted at partners committed to designing for sustainability. This would change the role of banks into platforms upon which FinTechs and banks can build sustainable products and services in collaboration. Applying a modular approach to partnership with technology companies opens up transformation opportunities beyond enhancements to existing products and services through the ability to consume and use technology designed to solve sustainability problems or supporting non-financial use cases. This may in turn support a stepwise, though transformational, approach to sustainability for the banking sector. Responsible use of customer data necessarily requires banks to undertake ethical and regulatory considerations when designing such solutions.

Chapter 5:
Innovation cases in sensing, structuring, & sculpting

Sensing innovations deliver valuable metrics

Sensing organizations infuse markets with new data and new information. Two of the most important impacts of sensing organizations involve promoting the trend towards homogeneity of metrics and reducing the costs of robust verification processes[1].

Metric homogeneity can reduce transaction costs, provide a foundation for standard developments, facilitate cross-border capital flows and facilitate the emergence of consistent and comparable regulatory objectives as well as corporate reporting. Improved data that becomes dynamically available at scale can also have large impacts on verification processes. By reducing verification costs of sustainability projects, sensing innovations will enable impact investments and development financing to grow more trees, support more livelihoods, and improve more lives.

Overcoming information deficiencies with transparent, high quality, and comparable data can facilitate the incorporation of sustainability objectives in capital markets to support the SDGs and empower citizen action. Envirate is a Finnish NGO that uses people's sensory inputs (seeing, feeling, and smelling) to rate how humans experience the natural world. They turn this crowd-sourced sensing capacity into open access maps of the earth, over time creating zones of environmental improvement and deterioration. In doing so, they create social value that can help direct citizen and corporate action.

Improvements in sensing technology create new data that is more reliable, more easily accessible, or - in the most radical cases - previously unavailable. Longitudinal, regularly updating, and globally homogeneous datasets, produced through citizen science (Envirate), behavior tracking (Ant Forest), or satellites (Planet), enable private investors, governments, and donor organizations to better direct attention where the need is greatest. Sensing innovations also help us decipher complex earth systems, revealing hotspots for intervention and impact.

Planet

Planet operates an armada of satellites, continuously circling the earth, consistently and repetitively mapping the entire globe.

Planet organizes the value proposition of its sensing work using a 4I framework of data-driven outputs (Information provision, Insight generation, Indicator development, and Instrumentation for policy and financial planning).

Planet also uses existing data sources with higher granularity than their own satellite data to compensate for the wide aperture of the satellite lens.

By unleashing AI and machine learning on a combination of granular and satellite data, they can extrapolate valuable insights and develop low cost dynamic and indicators for how Earth's natural capital is evolving in near real time.

For instance, Planet has used the LiDAR data of the Peruvian forests collected by the Carnegie institution in 2014. These very expensive data map Peru's land carbon for a single point in time in a scientifically valid way. Planet is overlaying these data with their much cheaper satellite data and can identify the existing spatial structures (e.g. forests). By training algorithms to correlate the spatial structure of Planet's optical data to the LiDAR data from Carnegie, they are developing a new low cost tool to map forest carbon globally. Such a tool could be used to verify the growth of natural capital (forestry) and once the algorithm is sufficiently trained, could perhaps be extended to other regions. If so, Planet could start providing a way to verify carbon capture in natural biomes on a regular basis, potentially disrupting the current way in which carbon absorption is currently verified using expensive consultants who make estimates about how much carbon a growing forest is likely to absorb in the next five years.

Sensing innovations such as Planet's could increase the actual environmental impact per dollar invested. This in turn could enthuse more people to invest because they can trust that their contribution goes further, leading to a possible triple windfall for SDG13. As new combinations of remote sensing and AI create more homogenous ways to account for carbon stock increases and other ecological gains, it becomes easier for both governments and organizations to set goals for carbon capture, and for Sustainable Finance organizations to serve an expanding pool of global impact investors. Sensing organizations can thus meet a key global objective of having both more accurate as well as more standardized data.

Improvements in sensing can also play a central role in giving citizens and local communities access to the (financial) resources they need to improve and protect their local natural resources and to start engaging in sustainable consumption and production. Identity data is essential for verifying online users throughout the financing sector. When key data do not exist or are lost, people are excluded from a global banking system that still leaves more than two billion people unbanked[2]. While this number has declined sharply since 2011, there is still a long way to go before everyone has access to basic financial services like a current and savings account and the related ability to build up a credit history. By bringing more people into the finance ecosystem, sensing innovations support the ability to play a direct role in translating impact financing into projects that preserve the natural environment while improving livelihoods.

Ant Forest

Ant Forest was born in 2016 of an effort at Ant Financial to devise a carbon wallet for users to track their carbon footprints within the AliPay ecosystem.

The application rapidly evolved to become a sensing tool that helps users track diverse behavior shifts in lifestyles that saved energy such as walking to work, paying bills online, or taking the metro.

Ant Financial pioneered a system for instrumenting these shifts within a unified metric. “Energy points” representing grams of carbon saved by each day’s activities were calibrated by a third party university team, and are earned as result of observed impact. Energy points became valuable commodities for users through the innovation of an in-app tree planting game, the Ant Forest, where users could use their energy points to plant and nourish a digital tree or sponsor the conservation of a plot of parkland. The game is social too, allowing users to steal small amounts of energy from friends or use their own to water the trees of peers and sweethearts!

Ant Forest’s primary innovation thus lies in its sensing ability. The app gives users the power to track changes in their personal environmental impacts and instrument those impacts through energy points. These enable enjoyment (value capture) within a social game. A secondary sensing innovation helps to close the loop, as IoT devices in Inner Mongolia show users how Ant Financial plants a real life tree for each digital tree a user raises to maturity inside the application. Since 2016, Ant Forest has translated its sensing and instrumentation innovations into concrete value via increased customer satisfaction and retention and a strengthening of Ant Financials’ brand and cultural identify as a force for good and a leader in sustainable finance.

A challenge with these sensing innovations is that they have to be acknowledged by regulatory agencies before they can really break ground. Even if Planet could effectively and cheaply verify carbon stock evolution in forestry at scale, it will still take regulators to officially recognize that such technological solution can replace expensive consultants and intermediary organizations. These changes are unlikely to happen overnight, and interim impact investors and financial institutions can play a proactive role in pushing for greater efficiency by recognizing the technological solution before it takes on the role of accredited “gold standard”.

In China, Ant Forest has made headway patenting its innovations in measuring changes in individual's carbon footprints, but the company must contend with uncertainty around the security of its IP as it moves overseas, and it continues to face regulatory uncertainty round the intellectual property of its work in the gamification steps that constitute a critical step in capturing ultimate value. However, Ant Forest's digitization of consumer behavior and gamification through energy points and friendly competition do not face close regulatory scrutiny and provide a nice example of how financial institutions can innovate in the sensing space while engaging with their customers in a new way.

Across the sustainable digital economy, decentralized information gathering can not only dramatically lower costs of access to financial services, but also help link those services to individual's environmental stewardship. Automated sensing at scale can also drastically reduce costs of verification processes for forest carbon absorption or shifting energy use patterns for instance. This change can in turn drive impact for existing funds, entice more people into donations, and entice more suppliers (of reforestation or efficiency projects) to take the leap toward registration and operation.

Advances in sensing and instrumentation thus make large problems more manageable and facilitate further action. For example, identification of global hotspots or problem zones as Envirate also enables donors and NGOs to select future projects based on the highest possible impact rather than the most politically viable project. In this way, information and transparency can truly empower previously powerless communities, biomes, and countries.

In the end, sensing and instrumentation helps decision makers make better choices, and to make them faster. To achieve the SDGs, it is essential that innovators improve information identification (who? which problem? where?), reduce excessive variance in instruments (how to assess?), increase homogeneity – based on scientific consensus – to organize dynamics in information flows (what?), and embed these improvements at the regulatory and finance levels. Sensing represents the first step in this process.

Structuring innovations integrate information in existing markets

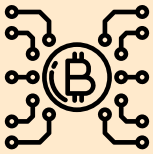
Structuring is the second capability underpinning new sources of value creation and business models and is defined as the activities through which actors embed new types of data in existing processes. Structuring thus involves a span of activities by which firms incorporate data into their business, modify or improve their operations based on newly available resources and technologies, and so modify or reshape their broader interactions within the value chain. When structuring organizations manage to integrate their improved (digital technology) structures and offerings into value propositions that attract market participants, for instance by improving efficiency and thus lowering costs, they start capturing part of the value they create.

Through structuring activities, innovators open opportunities for other actors within their value network to improve their own offerings. Financial institutions are key actors that will be affected by those structuring organizations that strengthen existing markets with improved efficiencies and enhanced value. As markets become restructured in a more efficient way and often with better data availability, opportunities for both classic and new financial service provision are emerging.

Upgrading existing economic structures that connect supply and demand in ways that facilitate trust and reduce waste can help meeting SDGs by extending the impact of existing capital allocations. Major pathways for increasing efficiencies in the Sustainable Digital Economy leverage digital tools for packetizing risks, diversifying sources of supply and demand, improving transparency, and reducing frictions in various modes of trade and exchange.

Advances in structuring may involve using information flows generated within the Sustainable Digital Economy as the backbone for various types of ‘data-backed’ loans and other financial services (e.g. inventory-backed loans, overdraft facilities based on ecosystem reputation, or loans against guaranteed sales organized within tokenized smart contracts).

DiMuto



DiMuto is a Singaporean start-up restructuring the global fruit and vegetable trade business around the principle of collaborative commerce (c-Commerce™). Using blockchain and digitized trade commerce papers, DiMuto is working to create a transparent track and trace system that runs from farm to fork.

By on-chaining trade operations between multiple players on a distributed, immutable ledger, DiMuto produces a digital trace of agreements, contracts, store locations, delivery times, and transfer points. This reduces risks of fraudulent data submissions and trade frictions and allows for a faster, reliable identification of problems, if and when they occur.

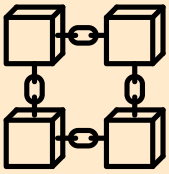
Integrating IoT data into a blockchain ledger enhances the reliability and availability of product information during international transit. By linking smart locks and temperature sensors directly to the DiMuto blockchain, the system provides quasi real time updates about the state of the cold chain during shipping. Eventually this information will reduce wastage, improve quality, and support a "race to the top" in trade transparency.

Collaborative commerce on a platform like DiMuto's allows small scale farmers to acquire trustworthy premium reputations and capture gains from trade. The transparency that comes with DiMuto's technology assures quality, reduces health and contamination risks (and facilitates attribution of who is responsible) and gives sustainable eco-farms power to reliably prove the origin of their produce. This enhances trust in farmers' claims and potentially increasing downstream willingness to pay.

Financial institutions may also utilize such platforms to provide various financial services at lower rates because they have a more rounded risk assessment of the ecosystem partners, providing vanguard lenders a competitive advantage. Partners within ecosystems like DiMuto's can also trade in bespoke tokens (e.g. the DITO token) to enhance trade liquidity, reduce FX costs, and begin inserting blockchain into additional lines of business without taking on the fixed development costs of a bespoke system.

Banks have also started to build their own supply chain provenance systems over blockchain. Realizing the benefits of traceability and reduced double counting to manage supply chain risk, these include DBS's own work in partnership with Agrocorp[3] and the we.trade banking consortium. Across the board, these emerging supply chain traceability platforms present an opportunity to inject sustainability criteria into the monitoring of agricultural or other produce, with relatively low additional costs.

The Bond



The BOND-I is the World Bank/CBA's recent issuance of the first blockchain based bond, the Blockchain Operated New Debt Instrument. The BOND-I uses blockchain as a public ledger to reduce the cost and risk of the investment structure through automation and traceability, rather than using blockchain as a cryptocurrency-based value exchange mechanism.

With the BOND-I, contract actions execute automatically once contract conditions have been met, reducing the need for intervention, significantly speeding up processing, and reducing administrative overhead and costs.

As a sustainability organization, the World Bank's bonds are automatically sustainable, however there is further opportunity to increase validation and traceability through integration of cryptocurrencies and natural asset accounting. The World Bank is actively contemplating enhancing the instrument with crypto, although this was discounted for the first issuance based on concerns with environmental impact. Developments in algorithmic consensus protocols, such as Stellar's Federated Byzantine Agreement (FBA) mean that blockchains can now run without these externalities, opening up this opportunity.

The World Bank's move has led to more bonds being issued, however to date the technology has not been applied to building and executing a green bond. The process of verifying that bonds meet green or sustainable standards remains a manual process. However, because this process and the validation that follows execution are business rules based, there is a further opportunity to apply the same technology to these processes.

Automated sustainability authentication and validation for green or impact bonds, once accepted by authorities as a replacement for today's authentication and validation procedures, presents a significant reduction in cost, risk and time, creating a broad and deep potential market for sustainable investment instruments. The reduction in absolute cost of an authentication process will lower the bar to entry for sustainable bonds, for example, opening out the market to smaller projects. Meanwhile, increased confidence in outcome data promises to expand the geographical scope of issuances to countries and projects outside traditional "safe" investment areas like Nordic construction (where data and metrics are considered easier to collect and validate) to developing economy contexts and projects.

CarbonGrid

CarbonGrid is a Singaporean-Vietnamese start-up that is tokenizing carbon emission reduction certificates (CERs) for resale over the blockchain. By tokenizing CERs, CarbonGrid restructures the market by enabling the purchase of smaller offsets while using a network of authority nodes to identify and select only high quality projects.

This may attract new demand for CERs from households, small scale emitters, and companies that can incorporate CarbonGrid's protocol directly into blockchain applications. White labelled, the protocol can then enable users across ecosystems to offset emissions associated with their transactions.

By packetizing and diversifying at the same time, actors can purchase a varied portfolio of small quantity offsets all over the world or focus their contributions on places and projects of their own choosing. Blockchain's transparency also ensures that a single project is never double-counted or double-sold. For external organizations that need to verify the veracity of offsetting claims (e.g. consultants that provide a stamp of approval on a CSR report in which claims of offsetting are made), CarbonGrid's system also offers easier verification.

While CarbonGrid provides an initial step by packetizing and diversifying CERs, other organizations are emerging that are taking next steps to dramatically reduce verification costs of actual projects to support green bonds for forestry and other forms of natural capital. Financial institutions of the future will be well-versed in these alternative products both as investment assets as well as potential hedges. Once projects are established and estimated carbon absorption is determined, future CER prices can be estimated and potentially used to hedge exposure to other financial assets such as energy commodities[2].

Moreover, as technology develops, philanthropists and donor organizations that invest in reforestation efforts for instance are likely to start asking for more transparency regarding the percentage of their contribution that goes to intermediaries (e.g. consultants and verification agencies) instead of actual re- or afforestation. While these expenses may add value, they also reduce the total amount the actual planetary impact. Efficiencies and technological verification may underpin both a growth in the total quantity of capital directed towards natural capital preservation as well as an increase in the efficiency with which this capital is spent.

These cases highlight innovations that allow participants in existing markets to value planetary resources, like a stable climate or natural biodiversity, when making discrete business decisions. By boosting liquidity and availability of CERs for a more diverse

group of actors, CarbonGrid can more effectively price the premium investors place on a carbon-neutral or carbon-positive investment event. Fairventures, another company we spoke to for this report that operates in the tropical timber market in Borneo, integrates information about sustainable agroforestry returns for smallholders. By valuing ecosystem services in a transparent way, these organizations could provide much needed signaling function to the financial community. When their value goes up, impact investments could be found to perform better as well – either because good businessmen do good or because doing good provides a signal that enhances investor confidence. Financial institutions that learn to see these as markets for information signals could keep abreast of their competition by seeing projects that will be profitable before others even consider them.

Blockchain technology is also a key enabler for opening up new businesses and technology providers to wider investor pools. While the notorious Initial Coin Offering (ICO) boom of 2017-18 effectively unleashed security investment into completely unregulated markets, leading to a very high number of fraudulent offerings, the subsequent market and regulatory reaction has led to the development of Security Token Offerings (STOs). The STO market is developing rapidly and presents an opportunity for large financial institutions to become leaders in standardizing global platforms and shaping those platforms in ways that prioritize and reward companies with strong sustainability credentials.

Accessible only to accredited investors, STOs constitute tokenized bonds or equity holdings in a company with a securitized structure that complies with US SEC regulations. STOs are thus powerful tools for opening up investments in SMEs outside cumbersome traditional processes of exchange listings or the Venture Capital market (which tends to only support ventures with high-growth (i.e. 10X) potential). For projects and businesses with a slower burn RoI, including many impact-focused SMEs, STOs can provide greater liquidity while enabling smaller investors to support sustainable ventures with very low transaction costs. STOs compliant with local regulations in Asian markets, and further supported by sustainability indicators, can provide an attractive instrument encouraging investment while promoting sustainable behaviors in growing companies seeking funding.

A nice example of this in the environmental space is Danish start-up Ekofolio that scans the earth for great sustainable forest investments (sensing capability). In a second step, the company sets up a special purpose vehicle that purchase, owns and manages the forest and lists the forest on its digital platform and invites individuals to purchase tokens that represent stakes in the forest, generate dividends, and may increase in value due to speculation or fundamental changes in the timber price and the value of the land which both affect the net asset value of your investment.

Sculpting innovations discover, open, and shape new markets

Sculptors employ existing data or collect their own data much like sensing organizations. They also integrate these data into new value propositions like structuring organizations. The fundamental difference that separates sculpting organizations from others lies in who they connect. Sculpting entails a process of designing "a specific institutional arrangement consisting of rules and conventions that make possible a large number of voluntary transfers of property rights on a regular basis"[4]. In the digital space, these organizations often cultivate interactions within multi-sided markets, flourishing in the role of market maker, broker, or platform.

For a market to come into being, three complementary factors need to coalesce. There needs be 1) demand and 2) supply for a product or service and 3) a set of minimal institutions to enable buyers and sellers to reach agreements on price. In the absence of the third factor, exchange may still occur in a shadow economy or via other, illegal ways.

In the context of investments to support the SDGs, all three factors often prove problematic. Buyers may exist, but lack ability to pay, or demand may prove latent or unknown. Supply may also be absent due to information deficits and uncertainty. And even when suppliers envisage a product that customers need, it may be very hard to find a suitable time and place to engage in exchange. Especially in poorer countries, the infrastructure and experience to actually engage in market transactions may be lacking. In other, shortfalls in judicial and regulatory institutions - such as corruption, poor contract enforcement, or the possibility of expropriation - further exacerbate difficulties and undermine trade.

What appears common across a part of the sculpting cases is a process by which innovators take a situation characterized by high levels of uncertainty - that precluded market formation – and transform that uncertainty into manageable risk. In no situation is uncertainty more salient than when entrepreneurs work to discover or open new markets. Sculptors solve this problem by transforming uncertainty into probabilistic risk, often via the deployment of a novel unit of account such as a pricing signal or measure of attention or trade flow. Through these innovations, sculptors enable pre-existing ambiguity to coalesce into collective alignment and strategic direction, with the result being a new market for exchange. In addition, these organizations identify existing or emerging human behavior or need and address it via a tailored new business model or product.

hiveonline

hiveonline is a Danish digital platform using blockchain, social networking, mobile data, and strategic partnerships to develop a holistic digital exchange system (DES) for the unbanked. The DES provides digital contracting and an accounting system for informal, unbanked microbusinesses, reputation building, tokenization of natural capital to underpin creditworthiness, and social network verification using phone records for KYC.

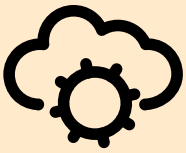
A digital currency for transactions is safer and more mobile than cash, cheaper than mobile money, and pegged to a local currency to avoid changes in monetary supply. The company is targeting initial operations in Niger, where analog lending circles have helped women to partially address the environmental shocks caused by climate change, but are limited by the use of cash and lack of formal records. Here, hiveonline collaborates with local lenders and community lending circles to enable lenders, already establishing clean energy and water solutions, to extend program rollouts.

The platform's relevance to the natural environment cannot be underestimated. By enabling the tokenization of natural capital (e.g. a cow) and social capital (e.g. network of mobile contacts), hiveonline digitizes less-fungible forms of collateral essential to the subsistence farmers and livestock breeders who form about 87% of the population and over 50% of households involved in crop production[5]. By enabling low-cost digital finance, farmers can start investing, narrow the yield gap, reduce rain dependence and produce products using more sustainable energy sources and techniques.

Sculpting organizations need to convince people and organizations that they can operate within a formal market context by connecting previously unconnected supply and demand. To do so successfully, they typically need to both disrupt and co-exist with existing financial institutions. hiveonline, for instance, creates a verifiable source of identification using phone records, and uses AI to verify whether the social network of an entrepreneur indeed reflects their stated occupation. They use neural network analysis of phone records to learn about a person's role in their community. In doing so, they aim to provide basic banking services in collaboration with local Village Savings and Loans Associations but through a completely new and digital platform.

Banks may employ sculpting innovations to address many challenges to the scaling of sustainable finance. Solutions may entail a combination of blockchain auditability, sensing technology, and digital validation deployed within novel financial products. For example, sculpting banks may extend the sustainable bond concept to sustainable community bonds by injecting rewards based on behavior-linked tokens into payment schedules, or by automating value disbursement to enable engagement of multiple, small-scale enterprises into larger development projects.

Arbol



Arbol is pioneering a global, location-specific, peer-to-peer index insurance market using blockchain, smart contracts, and public weather data. This work addresses unmet needs of farmers whose livelihoods hinge on local weather events like storms, droughts, and heatwaves.

Existing insurance is ill suited, with inflexible terms and prices driven by large US agricultural firms. Index insurance smart contracts pay out a pre-set amount whenever an agreed-upon weather threshold is reached, replacing output ambiguity (i.e. damage) with input alignment (e.g. more than 125 ml of rainfall in a 3 month period).

Arbol contracts are tokenized (ERC741), transparent, and cost-effective (no human interaction). Arbol contracts self-execute near-instantly on Oracle confirmation of a threshold event, and cannot be reneged or corrupted within an immutable blockchain. Big data and blockchain improve efficiency and to connect currently unconnected actors (i.e. a Laos farmer with a Swiss investor betting on weather outcomes). P2P insurance enables anyone to enter the market and absorb counterparty risk by trading in a new asset class widely uncorrelated to others. The tokenized contracts can be traded on a secondary exchange to ensure underlying capital remains liquid during contract duration.

By creating an open architecture for peer to peer insurance, Arbol is both disrupting a traditional insurance space while simultaneously seeking partnerships with incumbents. While such balance acts are notoriously difficult, the opportunity Arbol has identified and sought to address with their platform may very well appeal to large scale insurance companies that are willing to absorb small counterparty risks that are relatively uncorrelated to their other assets. Further, by building tokens that reflect idiosyncratic contracts between multiple parties tradeable, Arbol is creating a novel asset class of interest to hedge funds, investment bankers, or even private impact investors seeking to diversify their portfolio. The solution promises to bring much needed liquidity to a market that currently does not exist and narrow a long deemed unsolvable financing gap in smallholder agriculture.

Meanwhile, the increasing personalization of insurance contracting – to the advantages for small scale farmers that could not previously hedge their weather exposure risk – may also hold a potential dark side that regulators, insurers, and major banks. As more personalized information about potential clients becomes available (e.g. health and credit assessments), the common basis for insurance contracting – the socialization of risk which ensures that the few bad apples are protected and cross-subsidized by the many good apples – may begin to dissipate. Increasing stratification of better-known risk pools may leave the poorest and most vulnerable excluded, leaving governments to undertake greater responsibility.

This may entail socializing risk through taxation (or issuing counterparty guarantees), or accepting that some people will be left to their own devices. The choice will involve serious coordination between stakeholders like insurance companies, banks, and the regulators.

Across markets, developing sculpting skills is proving important for institutions seeking to improve financial inclusion and develop niche services. Yet without social validation and other reputational assets, issuing loans and providing basic financial services to small businesses and individuals remains expensive. As an example of a potential solution, hiveonline's technology facilitates the automation of contract administration make micro-financing across the platform more appealing to donors and investors. Blockchain architecture and online contracting creates an efficient and transparent accounting system that works in an informal economy, making it feasible to verify economic exchange and determine the risks with lending to individuals who otherwise would have no access to financial services. Such innovations open opportunities to extend investment opportunities via securitized loan portfolios, or community bonds.

More sustainable investment products can be built based on these validation and contract opportunities, such as Solar or other natural asset bonds. These can in turn be issued as Securitized Token Offerings (STOs), or bundled into ETFs, to build out the sustainability portfolio of financial institutions. The same technologies make is easier to issue, track, validate and distribute green bonds supporting development projects with targets related to climate emergency resolution or the creation of a circular economy.

Applying sculpting approaches to financial markets creates opportunities to develop new types of financial instruments supporting complex collaborations between multiple companies and devising reward systems based on non-financial, sustainable metrics and milestones. Following the lead of the sculptors, banks can start to leapfrog barriers to financing large scale projects in developing economies while supporting new, sustainability focused activities that address large-scale problems like coastal erosion and desertification.

Chapter 6:
Discussion and recommendations

Chapter 6: Discussion and recommendations

The first four chapters provided an overview of the funding gap facing the SDGs, highlighted barriers to Sustainable Digital Finance, and introduced three capabilities that start-ups in the Sustainable Digital Economy are developing to tackle the SDGs. The use cases then sampled in chapter five underscore ways banks may build, buy, or otherwise emulate these capabilities to overcome barriers to scaling sustainable finance, such as high costs of verifying sustainable assets and impacts.

For banks, collaborating with fintech start-ups hold real promise to exponentially increase the availability, attractiveness and accessibility of sustainable financial products across markets. In nearly every example of transformational change, no single business has the combination of skills, vision, expertise, distribution network and customer reach to go it alone. Echoing the comments of Christine Lagarde when presenting the Bali Fintech Agenda and the G20 EPG recommendations, it is through the power of partnerships that these initiatives succeed. Building successful and sustainable partnerships that use sensing, structuring and sculpting is critical to driving positive change in sustainable digital finance.

While we recognize policymakers retain a critical role in directing the global economy towards a greater focus on sustainability, it is the financial institutions, with their daily business of building and shaping financial markets, that must drive the change that will release mass-scale, private financing to achieve SDGs 7, 12, and 13. To this end, the insights generated from this report and the analyzed sample of start-ups support three complementary strategic directions banks may initiate to embark on the journey towards becoming organizations powered by sustainable digital finance. These three strategic directions align with the framework introduced in chapter four. Creating sustainability metrics requires a combination of sensing and instrumentation capabilities, integrating sustainability into services resonates with structuring and integration capabilities, while developing new products and markets reflects the sensing and inspiration capabilities.

Table 6.1: Three capabilities underpinning sustainable digital finance

1) Use digital technologies to **CREATE SUSTAINABILITY METRICS** and digitize environmental information for green financial products.	**2)** Use digital technologies to **INTEGRATE SUSTAINABILITY INTO** existing financial services and innovate how banks distribute products and services to existing customers.	**3)** Use digital technologies to **DEVELOP NEW SUSTAINABLE PRODUCTS, SERVICES AND MARKETS** which may involve significant redesign of the banking business model.

In realizing this agenda, banks may leverage the framework developed in this report to organize concrete operational changes. Doing so may mean overcoming barriers to change and providing sustained motivation for adapting routines, legacy systems, habits, and culture. While we recognize the importance and difficulty of bank transformation, this report only has space to acknowledge that transformation and change management requires a lot more than developing new sensing, structuring, and /or sculpting capabilities. In existing institutions, developing new skills goes hand in hand with unlearning others, which is always difficult [1]. Transformation may require replacing current core competences with new ones before core capabilities of the past become core rigidities in the present[2]. Such challenges and difficulties are inextricably linked to transformational processes across sectors, and are hardly unique to evolutions toward sustainable digital finance. Advice, case studies, and insights on the topic appear in a variety of worthy reports and books [3-6].

1) Sensing / Instrumentation

Use digital technologies to create sustainability metrics to digitize environmental information for green financial products.

RECOMMENDATION 1 – Increase use of environmental data to enhance risk capabilities and adjust pricing: Sensing technologies such as satellites, dumb and intelligent chips embedded in green assets can reduce the cost of reporting on green metrics across loan portfolios, allowing banks to better measure and disclose their environmental and carbon impacts across loan portfolios. Technologies for green tagging are rapidly evolving and banks are deploying them for green tagging of commercial real-estate and mortgage loans.

RECOMMENDATION 2 – Enhance reporting on environmental impact (including indirect Co_2 emissions): As banks are enriched with additional data, they will be able and expected to disclose both risk exposure to environmental and climate change, as well as environmental impact. This will affect capital allocation amongst banks. An essential aspect of this is to ensure that reporting is globally comparable and that relevant, homogenous metrics underpin both accounting and voluntary disclosures

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At the core of both recommendations is the belief that digital innovators and banks can, through sensing, develop more reliable, better quality, and more evolutionary data about the natural world and about the sustainability impacts of actions, processes, and organizations. These data can infuse their processes, guide the provision of financial services with sustainability in mind, and become a valuable source of competitive differentiation and customer attraction in the coming decade.

In Asia-Pacific for instance, green tagging across fast-growing real estate portfolios can help banks measure the energy performance of real-estate loans. Energy consumption in the built environment is expected to continue to grow rapidly due to a combination of new construction spurred by high economic growth and urbanization and increasing demand for cooling in warm climate regions. Energy-efficient buildings market revenue in the region is expected to grow from $65.3 billion USD in 2017 to $111.3 billion USD in 2026 [7].

The region is turning to stricter guidelines and requirements for energy efficiency in buildings, using a variety of policy tools including appliance standards and labelling, building energy codes, energy performance ratings, certifications, financial incentives, public sector demonstations, and awareness raising campaigns are all being utilized, with differentiations in comprehensiveness and depth of each policy tool. Automated data harvesting allows banks to monitor both positive and negative attributes of a portfolio and to price externalities into the cost of capital to deliver on SDG 7, 12 and 13.

The built environment provides just one example of where banks could use sustainability metrics to enhance their portfolio pricing and risk determination. Other areas where related capabilities could be useful are in determining the carbon (or ecosystem) impact of industry loans (i.e. explicit consideration of what they will be used for), co-financing sustainable energy investments (e.g. rooftop solar) with corporate clients at a lower cost of capital, and advising clients about their own ESG reporting. At the same time, banks can lead by example and become much more transparent about their own direct and indirect environmental footprint, their environmental objectives, and the strategy and plans implemented to achieve those.

Eventually, such data sources can lead to the institutionalization of natural capital accounting, facilitated by IoT-monitored and validated observations about positive impacts such as waste reduction, recycling and use of green energy, as well as negative impacts including greenhouse gas emissions and water pollution. Importantly, banks should refrain from developing idiosyncratic, non-transparent indicators and reporting standards that are not shared by the financial community.

As suggested by Simon Smiles, UBS's Chief Investment Officer for Ultra High Net Worth "a lack of a universal taxonomy for "sustainable" investments and financial products confounds day to day efforts to validate sustainable finance assets that support energy transitions, sustainable production methods, carbon reduction, and positive impact more generally". Specifically, "the lack of standardized and high-quality data about sustainability efforts does not enable fair comparisons among companies within industries. The plethora of names for all types of investments with positive externalities confuses investors and, in the worst cases, also risks lulling people into a false sense of security, by giving the impression that enormous amounts of money are sustainably invested". The reality however is different and while sustainable investment and sustainable finance are surely on the rise, an 'orders of magnitude' increase is required to meet the SDGs.

2) Structuring / Integration

Integrate sustainability into existing financial services and innovate how banks distribute products and services to existing customers.

RECOMMENDATION 3 – **Use technology to promote traceability in supply chains:** As consumers become more aware of the negative consequences of irresponsible production, from human rights violations and corruption to climate change, they are demanding more and more transparency across the value chain. Increasing transparency is complex given the fragmented nature of value chains. However, banks can aid the deployment of satellite and blockchain technology to increase auditability and transparency of value chains to verify that products are produced sustainably. It offers banks opportunities in terms of trade finance and instant payments.

By deploying blockchain technology, banks can create significant efficiencies with positive economic and environmental impacts. These efficiencies are the outcome of developing structuring capabilities that digitize existing markets and augment information transfer within those markets. DBS for instance partnered with Agrocorp to develop a blockchain trade platform that connects 4,500 Australian farmers with Agrocorp's restaurant and supermarket customers. The platform provides real-time pricing, shared delivery information, and automated trade finance approval, cutting Agrocorp's working capital cycle by 20 days and improving security [8]. Right now the platform serves primarily economic objectives but in the future it will add additional source information about the water, fertilizer, and pesticide usage of the commodities traded. This will improve food traceability and sustainability data and thereby help to address problems such as deforestation in the region by promoting deforestation-free palm oil production, a key cause of carbon emissions in Asia-Pacific [8]. This platform will also enable banks in the region to measure deforestation across their portfolio.

RECOMMENDATION 4 – Digitize capital market instruments: Although Asian green bond issuance reached $43.4 billion USD in 2017, only a very small portion of green assets are financed by capital market instruments certified as "green". One of the barriers is the cost of certification and monitoring, which impose additional costs to green bond participants. Digitizing bond offerings brings down the cost of obtaining and reporting environmental data for green bonds, allowing many more companies, especially small and medium sized enterprises, to meet the requirements to issue green bonds.

Digitization can contribute to the standardization of legal contracts that are required for issuing bonds. The combination of standardization and digitization can drastically lower costs, especially if contracts can be hard-coded in so-called smart contracts that help automate execution and issuance. By putting green bonds on the blockchain, the underlying assets can be tokenized which in theory could enhance liquidity and further reduce transaction costs. In addition, as suggested by the recommendations under the sensing / instrumentation section, digital technology facilitates environmental impact observation and measurement. Banks issuing green bonds must be able to report on their environmental impact including for example carbon emissions avoided through renewable energy, carbon stored in new forest growth and ecosystem services provided in preserved natural biomes. Sensing innovations make such reporting more affordable, trustworthy and transparent.

All these efficiency gains make it more economical to issue green bonds which reduces the required scale of the underlying project as well, potentially bringing smaller, regionally relevant initiatives within reach. This would lower the hurdle for small borrowers who would currently like to issue a green bond but are priced out of the market due to the high associated costs. In addition, down-scaling green bonds itself could have a positive impact on demand if people have a preference for investments that make a difference 'in their own backyard'.

By collaborating with an organization like Envirate, banks can create sustainable digital financial products like bonds or green loans to either invest in the revitalization of natural capital (and benefit from CO2 emission markets) or improve their reputation by providing low-cost, high impact loans to communities who have the capacity to revitalize their own neighborhoods but lack the capital to do so. If banks would open up this lending capacity to its retail and corporate customers, they would turn their sensing innovation into a sculpting one. By underpinning this new service with new digital technologies like blockchain for transactions and transparency and AI for verification of project progress and creditworthiness assessment of the community, this could also become a structuring innovation.

3) Sculpting / Inspiration

Develop new sustainable products and markets which may involve significant redesign of the banking business model

RECOMMENDATION 5 – **Create tailored environmentally responsible investment products:** Data allows banks to provide tailored investment products that, with a higher degree of confidence, create not only a financial outcome but also achieve specific regional environmental outcomes, or support one or more of the UN's Sustainable Development Goals (SDGs). Private wealth has an important role in mobilizing capital to the SDGs and the Asia-Pacific region accounts for 38.1% of global High Net Worth (HNW) Individuals [9]. Banks can use data analytics to create personalized investment portfolios for HNW clients based on their sustainability preferences.

This may introduce a source of more "patient capital" from impact investors who still seek financial returns and thus expand this source of capital beyond the realm of philanthropy. In addition, automation driven by low cost robo-advisory services can open up investment opportunities to a larger segment of private and even retail banking customers. By making it easier for individuals to invest in accordance with their values and preferences, the total amount of capital available for SDGs may increase significantly.

The most common and easiest way to do responsible or sustainable investment is through the exclusion of irresponsible companies. Such norm-based screening, encompasses the broadest perspective on "sustainable investment", and requires merely that one refrains from investing in companies where there is evidence that these companies breach minimum standards of business practice based on national or international standards and norms such as producing illegal cluster bombs. However, without actual evidence of breaches, assets by default are taken to meet the norm-based screening requirement. Informed investors are likely to know the relative ease with which assets can be frames as "sustainable investments" even if they may not align with their values.

Another example is the UN-backed PRI, a thriving global initiative with over 1,600 members representing over $70 trillion USD assets under management. As the PRI states, "signing the internationally-recognized Principles for Responsible Investment allows your organization to publicly demonstrate its commitment to responsible investment, and places it at the heart of a global community"[9]. However, becoming a signatory to the UN-PRI does not require that the signatory's assets under management are being invested sustainably, let alone with intentional, verifiable, and measurable positive social or environmental impact."

While these examples exhibit that sustainability can mean many things to many people, banks can use these sustainability gradations to their advantage. Banks can use AI/ML for instance to analyze their customers' spending and investment behavior and infer strategic investment preferences from that. Rather than proposing standardized one-size-fits-all portfolios of "ESG", "sustainable" or "impact" investments, low-cost customer-centricity may lead banks to tailor portfolio solutions to all their clients, based on the clients' idiosyncratic preferences. Mass customization is key to overcoming one barrier to greater sustainable investment in the SDGs. "Many investors find it difficult to navigate generic ESG information to identify particular investment solutions that suit their financial and sustainability goals," said UBS's Smiles. "We need more personalized investment content that captured personal sustainability preferences across different environmental, social, and governance issues, as opposed to the "one-size-fits-all" approach using standard ESG data." Financial services firms could then use these bespoke client preferences, internal sustainability data, and external providers to show investors potential investment instruments that particular fit the cause they care about[10].

RECOMMENDATION 6 – Use data to promote environmentally responsible living: Banks may open additional APIs to collaborate with external partners that commit to designing new green products. Alternatively, banks can do so in-house by analyzing data about individual consumers' consumption patterns and lifestyle choices. Algorithms can structure this data and turn it into individualized environmental footprints from consumption, compare trends across peer groups and demographics and create peer competition incentives using Social Media.

The rapidly growing middle class in Asia-Pacific is increasingly health conscious and many in urban areas experience first-hand the negative consequences of climate change in the form of air pollution – making it a customer group potentially receptive to behavioral nudging. Banks can present consumers with their environmental or carbon footprint in novel ways to help raise the awareness about their personal impact on the planet. They can learn from platforms using gamification to nudge sustainable behaviors and incorporate such ideas in their own services. For instance, banks could create individualized carbon wallets or impact tokens that directly link natural capital to private value and confer privileges in financial products such as mortgages and other lending products, to reward and incentivize green behavior.

A relatively easy way into these novel services is for banks to exploit their access to their customers' utility bill payments. They could champion energy, gas, and water efficiency by translating monthly expenditures into carbon and water footprints and incentivizing their customers in diverse ways to offset and reduce their environmental impact. More adventurous banks could underpin such environmental footprinting with blockchain technology and develop impact tokens that confer loyalty points or privileges in financial products such as mortgages and other lending products. Such impact tokens would reward and incentivize green behavior, from reducing energy consumption to engaging in online banking. Such initiatives integrate create new markets for sustainability, appeal to environmentally aware millennials and support the delivery of SDG 7, 12 and 13.

Chapter 7: Conclusion

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This report has presented three core capabilities that underpin the transformational journey from 20th century banking to sustainable digital finance. Each capability can be developed in-house over time or can be deployed through new partnerships with FinTechs and other digital innovators.

Learning new skills and capabilities that may potentially replace existing competences is hard to do, but those banks that stick to their current practices risk becoming obsolete as their core competences of the past become core rigidities in the future. Cultural change and transformation is required to successfully reap the benefits offered by digital transformation.

Partnerships too require change on both sides. On the one hand, small and nimble FinTechs will need to dive into the content of the Paris agreement and SDGs 7, 12 and 13 to understand the problems that are calling for their creativity and innovation. They can become part of an emergent ecosystem focusing on sustainable digital finance innovation. At the same time they need to develop institutional patience to work with large incumbent organizations in a way that leads to positive results that do not get stuck in an eternal pilot phase, but can actually be implemented at scale.

Banks on the other hand will need to embrace a more experimental approach by collaborating with FinTechs to rapidly test, mature, fail, learn and adjust sustainable digital products in a continuous iterative process. Also, banks can fuel an increase in the supply of sustainable digital finance solutions by opening up more of their data to innovators, so they can invest their creativity, time and energy into new products or develop applications for integrating sustainability into existing financial offerings. It is the top-down demand from banks combined with increases in bottom-up supply of sustainable digital finance solutions that can accelerate financing of SDGs 7, 12 and 13.

There is a sizeable opportunity for banks to experiment with digital technology in the environmental sustainability space. This is because the potential impact can be transformational. While the reputational downside in the case of failure is low, the upside in the case of success is potentially very sizeable. In addition, for many banks experimenting in the environmental sustainability space is relatively safe because as of yet it may not affect their bottom line, and they can learn important lessons for applying digital technologies in their core products and services.

Therefore, the combination of digital and sustainability could truly become an experimental hotbed for the banking sector.

The time is now for banks to strengthen their green license to operate and to show leadership in transitioning the economy in the direction of the SDGs. If not, the SDGs will remain aspirations for a sustainable future that receive too little financing to deliver on their promises. This report contributes to an ongoing conversation on how banks can contribute to a better, greener planet. It has provided concrete examples of the capabilities that need be developed and provided evidence of how digital technology can add value. It is now a question of moving from conversation to action. Although natural resources are increasingly scarce, the opportunities for banks to engage in digital sustainable finance in the Asia-Pacific region are increasingly abundant.

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The Sustainable Digital Finance Alliance was founded by UN Environment and Ant Financial Services to address the potential for fintech-powered business innovations to reshape the financial system in ways that better align it with the needs of sustainable development. The Alliance draws in allies from across the worlds of environment, development and finance, who, through their expertise, insights and networks can contribute to collaborative actions with timely and scaled potential.

Building on the work of the UN Environment Inquiry published in 2016, Fintech and Sustainable Development: Assessing the Implications, the Alliance published its first paper Scaling Citizen Action on Climate – ANT Financial's efforts towards a Digital Finance Solution in May 2017.

More information is available at:
www.sustainabledigitalfinance.org.

DBS is a leading financial services group in Asia, with over 280 branches across 18 markets. Headquartered and listed in Singapore, DBS has a growing presence in the three key Asian axes of growth: Greater China, Southeast Asia and South Asia. The bank's "AA-" and "Aa1" credit ratings are among the highest in the world.

Recognised for its global leadership, DBS has been named "Global Bank of the Year" by The Banker and "Best Bank in the World" by Global Finance. The bank is at the forefront of leveraging digital technology to shape the future of banking, having been named "World's Best Digital Bank" by Euromoney. In addition, DBS has been accorded the "Safest Bank in Asia" award by Global Finance for ten consecutive years from 2009 to 2018.

DBS provides a full range of services in consumer, SME and corporate banking. As a bank born and bred in Asia, DBS understands the intricacies of doing business in the region's most dynamic markets. DBS is committed to building lasting relationships with customers, and positively impacting communities through supporting social enterprises, as it banks the Asian way. It has also established a SGD 50 million foundation to strengthen its corporate social responsibility efforts in Singapore and across Asia.

With its extensive network of operations in Asia and emphasis on engaging and empowering its staff, DBS presents exciting career opportunities. The bank acknowledges the passion, commitment and can-do spirit in all of our 26,000 staff, representing over 40 nationalities.

For more information, please visit
www.dbs.com.