

October 2021

OUR CHANGING CLIMATE

APPLYING REGTECH TO GREEN FINANCE

The logo consists of three red diagonal lines above the text.
FINTECH ASSOCIATION
OF HONG KONG

The University of Hong Kong
The logo features a stylized circular icon with concentric lines and a central blue dot, followed by the text "LITELAB" in a bold, blue, sans-serif font.
Law | Innovation | Technology | Entrepreneurship

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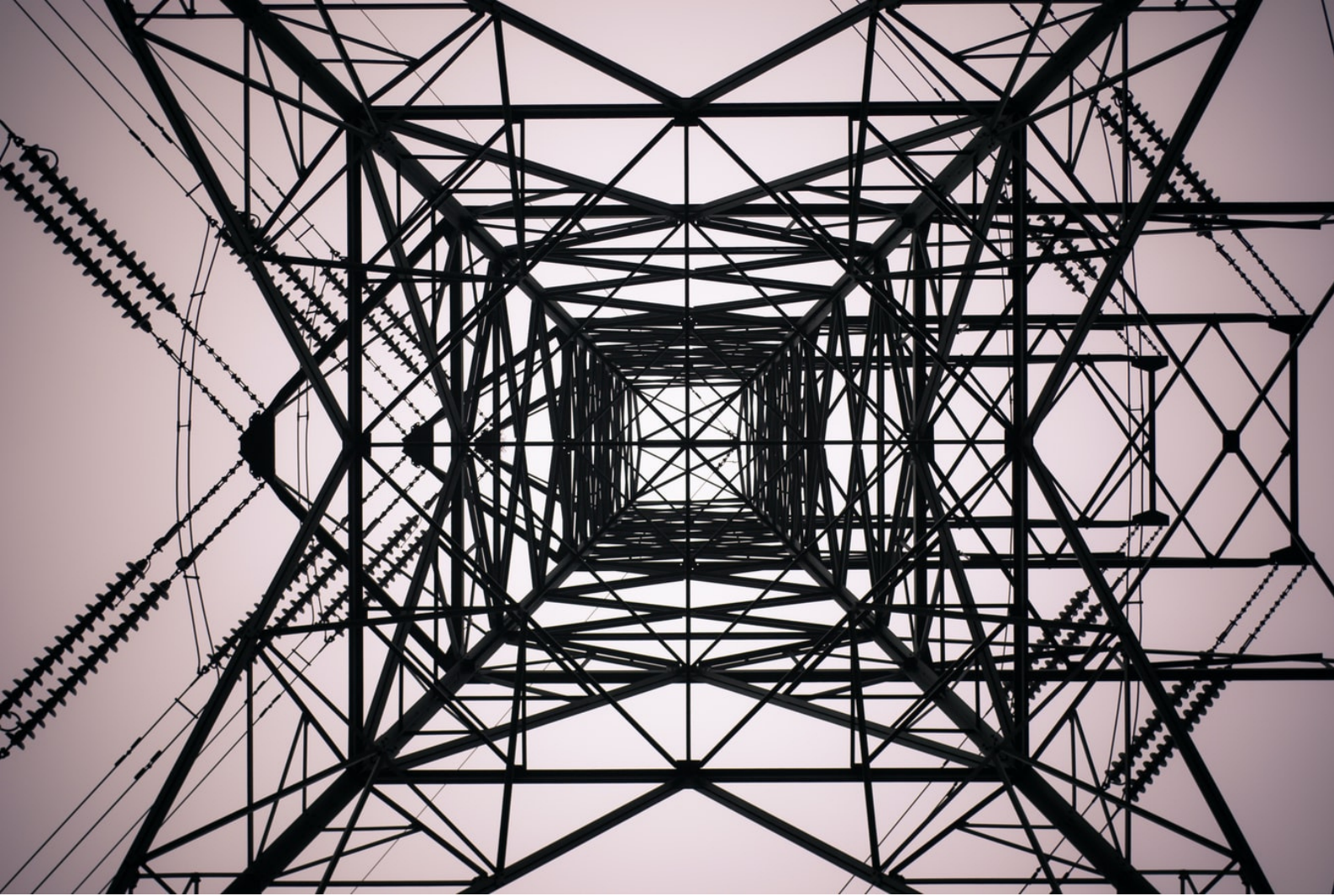
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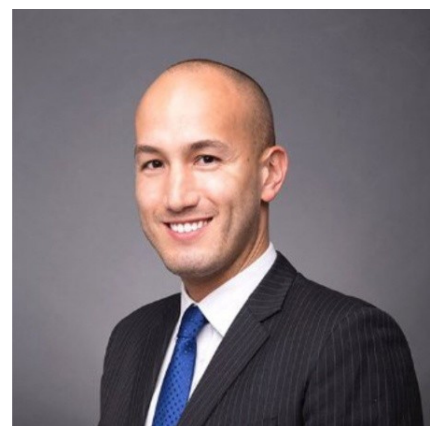
Preface

Recent years have seen the topics of ESG and sustainability move from a “nice to have” to an “operational necessity” for many firms in the finance industry.

With ESG fundraising activity exploding in recent years, the commercial opportunity for industry participants cannot be ignored.

The Fintech Association of Hong Kong is proud to launch this timely report in conjunction with the University of Hong Kong LITE Lab, which helps to further demystify the ESG and sustainable finance landscape at a critical time for the finance industry.

A big thank you to the LITE Lab team for collaborating with us on this pivotal piece of research.



Benjamin Quinlan

Chairman,
Fintech Association of Hong Kong

CEO and Managing Partner,
Quinlan & Associates

The world is facing ESG challenges we cannot ignore anymore. In recent years, ESG has been recognized at regional and global levels. Laws, regulations and industry/government policies have been enacted and developed at full speed.

This is the remarkable time when the world is combining all the efforts into one agenda including, sustainable investing, capital allocation, laws, regulations, technologies, operations, businesses, governance etc.

This is the most critical time.

I am proud to support and be the supervisor for this paper to crack the code and open the lock of ESG. In this paper, we will examine the regulatory development trends of ESG, particularly on how ESG fosters regulatory technological innovation, and how ESG gives rise to new opportunities and challenges to the economy, policy making, business process and operation and for all mankind.

This marks the great collaboration between the Fintech Association of Hong Kong and the University of Hong Kong LITE Lab; which is something we should pursue more in the future to establish more partnerships in the tech ecosystem.



Irene Lee

Board Member,
Fintech Association of Hong Kong

Director, Compliance and Operational
Risk Control, UBS AG





This white paper is the proud product and confluence of three important trends – regtech, sustainable finance and talent development.

Law, Innovation, Technology and Entrepreneurship Lab (LITE Lab) at the University of Hong Kong Faculty of Law is an interdisciplinary and experiential programme that, amongst other things, enables and supports undergraduate students to co-design law, regulatory and policy research with under-resourced organisations.

Full credit for this white paper should go to LITE Lab student Kelvin Lam Ho Yin, who was part of the LITE Lab 2020/21 cohort. The topic of green finance is of great interest to my Fintech Association of Hong Kong Regtech Committee co-chair, Irene Lee and myself. Many thanks to Irene for supervising Kelvin in researching and preparing this overview of a rapidly expanding area which is increasingly being recognized as one of the defining challenges of this generation... for the sake of all our future generations.

We look forward to further positive developments and playing a part in growing the space.



Brian W Tang

Board Member,
Fintech Association of Hong Kong

Founding executive director,
LITE Lab@HKU

Managing Director,
ACMI

The Future of Finance is Green!

There is hardly any doubt that Sustainable Finance and ESG Investments are re-shaping investor behavior and finance industry offerings.

The significant inflows into ESG Funds in 2020 more than doubled that in 2019, and RegTech solutions are an integral part to address some of the gaps that exist before mainstream adoption of this agenda can truly take off.

Fintech Association of Hong Kong is very pleased to lead this timely initiative.

Working with University of Hong Kong LITE Lab, this White Paper not only delineates clearly the current landscape, it is also a step forward in building out the talent pipeline much needed to drive this important agenda for Hong Kong.

Kudos to the LITE Lab team for this excellent effort !



Helene Li

General Manager,
Fintech Association of Hong Kong





Executive Summary

Green finance is gaining momentum in the banking and asset management industry. While we see an increasing trend towards investments in green projects, it poses some regulatory challenges to the financial system. While Hong Kong regulators recognised some international criteria or principles, they have not set out a set of unified standards or definitions of green investment or green financial products in Hong Kong. Greenwashing – the practice of falsely or misleadingly portraying a company's products or investments as environmentally sound (ie labelling an investment as 'green' but in fact, it is not) is misleading, yet common. These regulatory challenges damage investors' confidence and harm the development of green finance.

Regulators have started different initiatives in response to climate risks and regulatory challenges from green finance. There is a trend demanding more disclosure on governance, risk management, investment strategies and environmental metrics.

The use of technologies in the financial industry is also getting more attention. Regulatory technologies (Regtech) make good use of technologies to solve regulatory challenges. While technologies that focus on the prevention and detection of financial crimes and know-your-customer (KYC) processes are widely known, through this white paper, we will introduce some applications of regtech in the context of green finance.

We spoke to experts and industry professionals in the fields of banking, technology and environmental protection. This white paper starts with a summary of the current trends in regtech and green finance respectively and the regulatory trends. It suggests how regtech can be applied in green finance and the challenges of applying regtech. It is hoped that this white paper will encourage the development of regtech in the context of green finance to make our world more sustainable.



Key **regulatory challenges** in green finance:

- Greenwashing - the practice of falsely or misleadingly portraying a company's products or investments as environmentally sound, which deceives investors and affects investors' confidence
- Insufficient reporting and disclosure and inconsistent presentation and measurement of environmental data among companies and investment prevent investors from making a meaningful comparison and an informed decision
- Exclusion and miscalculation of climate risk lead to mispricing and misallocation of resources
- Insufficient climate risk management and governance increases the probability of a financial crisis

Key examples of **applications of regtech** in green finance:

- Using social media, eco-labelling and blockchain technologies to combat greenwashing
- Using blockchain for land registration to decrease the risks for investing in green projects
- Using data technologies, such as cloud and machine learning for disclosure, comparison and monitoring of climate risk and environmental data
- Using data technologies and statistical tools, such as scenario analysis, simulation and stress testing to enhance risk management and governance framework




Landscape of Regtech

The use of technology in the financial industry is getting more attention. Regulatory technology (Regtech) can be defined as a sub-category of financial technologies (fintech) that helps achieve regulatory aims, such as minimisation of systematic risks, countering fraud and financial crimes, protecting consumers and investors and making the financial industry more sustainable. However, Arner (2016)[1] argued that this definition lacks vision as to the true potential of regtech. Regtech represents the next logical evolution of financial services regulation and should develop into a fundamental base underpinning the entire financial services sector. The distinction is important in the context of green finance because although financial regulatory forms a main part of the regulatory space, regtech can also work on different areas, such as regulations on environmental protection and regulations on land uses and redevelopment projects.

Since the Global Financial Crisis in 2008, financial regulators around the world have increased their regulator surveillance and monitoring in the financial markets. Different laws and regulations require regulated entities (such as banks and asset managers) to monitor their data, report their data and fulfil other regulatory obligations. On the other hand, there are more laws and increasing regulatory supervision in other regulated areas. In the wake of climate change and increasing awareness of sustainability, governments around the world have enacted laws to limit air, water and noise pollution, manage waste and chemical disposal etc. These laws also create regulatory burdens for businesses and citizens. However, from the regulated entities' point of view, fulfilling regulatory burdens, such as monitoring data and reporting data; and from the regulators' point of view, analysing regulatory data, by human beings are often costly, time-consuming and prone to human errors.

[1] Arner, D. W., Barberis, J., & Buckley, R. P. (2016). FinTech, RegTech, and the reconceptualization of financial regulation. *Nw. J. Int'l L. & Bus.*, 37, 371.



The growing demand for tools to supplement and replace human in handling regulatory challenges has called for the development of different technologies. Different increasingly powerful and sophisticated technologies such as cloud, big data, machine learning and artificial intelligence etc, are developed to enhance the efficiency and the effectiveness of risk management and regulatory compliance. It allows different stakeholders, including regulators, regulated identities, customers and the public to obtain and analyse regulatory data and make prompt regulatory decisions. Ultimately, regtech facilitates different aspects of regulatory work processes, including regulatory monitoring, regulatory reporting, fulfilling regulatory obligations and analysing regulatory data.

As illustrated in a Hong Kong Monetary Authority's whitepaper on regtech[2], know-your-customer (KYC), digitalisation of reporting and compliance process through facial recognition, cloud and machine learning algorithms increases the accuracy, speediness and efficiency of screening potentially risky customers. This benefits different parties, for example,

- for regulated entities, regtech reduces human errors and costs, identify and enables professionals to focus on higher-value tasks, such as screening through risky customers;
- for customers of financial services, regtech helps speed up the KYC process and customers have an improved customer experience. Regtech also facilitates financial inclusion by easing the citizens' access to financial services; and
- for regulators, regtech helps the monitoring and supervision of risks at regulated entities and ultimately at regulators' and the whole financial system level. Also, instant reporting and analysing of regulatory allows regulators to design, implement and evaluate regulatory decisions promptly.

It is recognised that regtech can enhance the competitiveness of the banking sector, strengthening Hong Kong's status as an international financial centre, promote Hong Kong's development as an innovation and technology hub, support Hong Kong's role in the Greater Bay Area and strength Hong Kong's role as an East-West connector.

The publication also mentioned a few technologies used in regtech, such as cloud computing, Application Programming Interface, Artificial Intelligence, Machine Learning, Natural Language Processing, Optical Character Recognition, Internet of Things, Distributed Ledger Technology and Biometrics. Some of the technologies mentioned will be touched upon in this white paper.

The paper also shows that there is significant interest from investors with total global investment activity in regtech reaching USD 3.4 billion in 2019. With the increasing trend of efficient regulatory monitoring and regulatory compliance burden, it is expected that regtech will be in high demand in facilitating regulatory work processes.

[2] Hong Kong Monetary Authority., KPMG. (2020). Transforming Risk Management and Compliance: Harnessing the Power of Regtech. Access from: <https://www.hkma.gov.hk/media/eng/doc/key-information/press-release/2020/20201102e3a1.pdf>



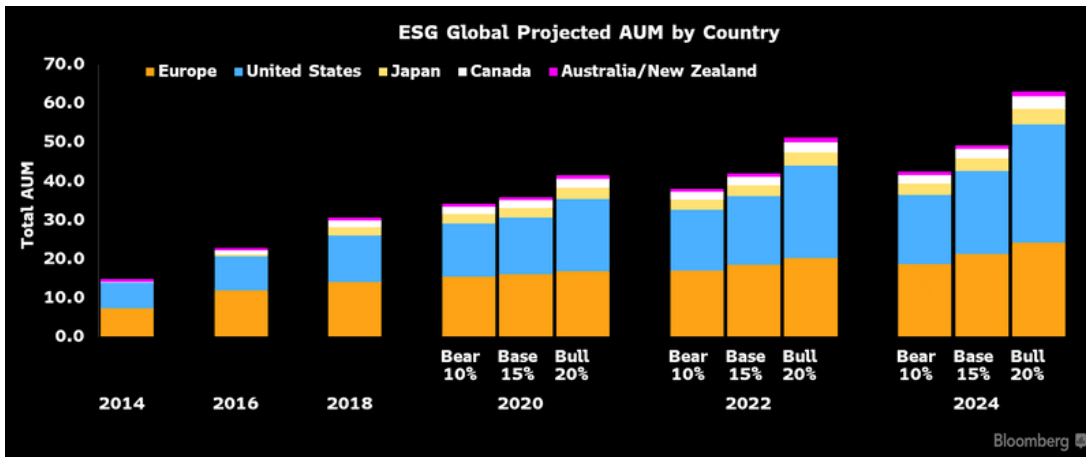
Landscape of Green Finance

Climate change has increasingly become a common concern of humankind. 196 countries have signed the Paris Agreement at the 2015 United Nations Climate Change Conference to combat change and hold the increase in global average temperature to well below 2°C above pre-industrial levels.

Green finance and sustainable investment have become popular topics in the banking and asset management industry. Green finance in this white paper is defined to include the two-way interaction between the environment and finance. It includes a few aspects, such as **raising capital for and investing in green projects, incorporation of environmental consideration in financing and investment decisions** and **disclosure and management of environmental risks**. According to the Organisation for Economic Co-operation and Development (OECD), green growth means achieving economic growth while reducing pollution and greenhouse gas emissions, minimising waste

and improving efficiency in the use of natural resources. As stated by the United Nations Environment Programme, the purpose of green financing is to increase the level of financial flows (from banking, micro-credit, insurance and investment) from the public, private and not-for-profit sectors to sustainable development priorities. The aim is to align financial systems, working with countries, financial regulators and the financial sector, to direct capital allocation to sustainable development that will shape the production and consumption patterns of tomorrow.

Green finance represents a growing portion of overall capital market investments. While there is no definitive figure on the number of investments in green and sustainable finance, there are various survey estimating the number of investments pursuing ESG strategies. The Global Sustainable Investment Alliance reported that more than US\$30 trillion was managed according to responsible investment



Source: GSIA, Bloomberg Intelligence [3]

criteria worldwide in 2018[4]. The US SIF Foundation's biennial report estimated US\$12 trillion in asset under management (AUM) invested in ESG strategies[5]. Over 1900 institutions with an AUM of nearly US\$90 trillion have signed the Principles for Responsible Investment. Bloomberg Intelligence estimated that global ESG assets are on track to exceed US\$53 trillion by 2025, representing more than a third of the US\$140.5 trillion in projected total assets under management[6].

According to Refinitiv, cited by SCMP[7] green and sustainability bond and loan issuance increased 182% from US\$286.7 billion in 2020H1 to US\$809.5 billion in 2021H1. John Lee, head of Greater China global banking at UBS, cited by SCMP, suggested that about 41 sustainable bond transactions worth US\$19 billion were recorded in Greater China in 2021H1 compared to 23 deals worth US\$7.6 billion in 2020.

Hong Kong Quality Assurance Association (HKQAA) developed the Green Finance Certification Scheme to provide third-party conformity assessments of Green Finance issuers[8]. It provides two types of certification, both for the pre-issuance and post-issuance stage. The former is an as-at certificate that requires validation of the adequacy of the Environmental Method Statement in producing positive environmental effects. The latter requires verification of the continuous implementation and effectiveness of the Environmental Method Statement regarding the proposed positive environmental effects.

[3] See <https://www.bloomberg.com/professional/blog/esg-assets-may-hit-53-trillion-by-2025-a-third-of-global-aum/>


[4] See <https://sdg.iisd.org/news/gsia-report-finds-increase-in-sustainable-investing/>

[5] See <https://www.ussif.org/files/US%20SIF%20Trends%20Report%202018%20Release.pdf>

[6] See <https://www.bloomberg.com/professional/blog/esg-assets-may-hit-53-trillion-by-2025-a-third-of-global-aum/>

[7] <https://www.scmp.com/business/banking-finance/article/3143202/what-driving-almost-200-cent-growth-sustainability-linked>

[8] See http://www.hkqaa.org/en_certservice.php?catid=26



Currently, significant parts of green finance are through banks. Banks play an important role in allocating capital through the provision of various services, such as extending green loans and credits to start-ups, small business and multinational corporations, offering long-term investment accounts and green savings products to retail clients, providing discount and/or better-than-usual terms to green companies and NGOs, financing green projects, underwriting green stocks and bonds etc (Akomea-Frimpong, 2021) [9]. We see increasing popularity of green bond issuance as a financing option for environmental projects. According to Climate Bonds Initiative[10], 37% of the proceeds of green bonds arranged in Hong Kong go to 'buildings' and 21% of the proceeds go to 'water'. Swire Properties has taken a sustainability-linked loan with Credit Agricole CIB. The interest rate of the loan is reduced if Swire meets two conditions. Swire has to retain its listing on the Dow Jones Sustainability World Index and it has to reduce its energy use intensity to a set target for its Hong Kong portfolio. The loan is being used to finance green projects, such as new energy-saving technologies and green buildings.

[9] Akomea-Frimpong, I., Adeabah, D., Ofosu, D., & Tenakwah, E. J. (2021). A review of studies on green finance of banks, research gaps and future directions. *Journal of Sustainable Finance & Investment*, 1-24.

[10] See <https://www.climatebonds.net/resources/reports/hong-kong-green-bond-market-briefing-2019>

Factors explaining the rise of green finance

Risk and regulatory perspective

- Our planet is affected by different environmental problems, such as water shortage, food supply and pollution issues. The Oxford Dictionary named 'climate emergency' as the 2019 Word of the Year. Some environmental problems become global governance concerns and governments around the world have implemented environmental regulations to counter their adverse impacts. These regulations increase the operating costs of polluting businesses and ultimately the risk premium of investments into these businesses.
- Some projects that solve environmental problems receive government financial supports. The UK government implements different initiatives that promote the use of renewable energy sources and encourage the installation of solar panels through reduced value-added tax (VAT) and government funding. These government supports make investments into green industries more attractive.

Investment strategies

- While active management strategies face competitive pressure from index investing in the asset management industry, green finance and sustainable investment have become the highlight of new funds being launched and receiving inflow investments. The 'green' brand of investment gives justifications for asset managers to deviate from their traditional investment strategies of purely maximising investors' value to taking into account the sustainability of investments and incorporating attractive green investment projects into the portfolio.

Societal and structural change

- The incorporation of green and sustainability considerations into investment decisions can be understood as a result of societal changes. While some high-net-worth individuals donate most of their wealth for philanthropic causes, some of them also express a preference for allocating their investment and wealth in a more sustainable way[11]. These high net worth individuals direct their investment managers to explore ways to incorporate impact investment and to create wealth in a more sustainable way over the long term.
- Investors are putting pressure on companies and institutional investors over environmental issues. There is an increasing shareholder activism trend that demands companies to disclose their environmental protection practices, targets and data and incorporate environmental considerations into their business and investment decisions. An analysis of over 2,000 academic studies carried by the asset management firm DWS and the University of Hamburg showed that there is a positive correlation between ESG strategies and strong financial performance with only 10% of studies finding a negative link[12].

[11] See U.S. Trust. (2018). U.S. Trust Insights on Wealth and Worth.

[12] See <https://download.dws.com/download?elib-assetguid=2c2023f453ef4284be4430003b0fbee>

Demand for green investment opportunities

- Investors are increasingly aware of the impacts of their investments. On one hand, they are aware that their traditional investments have created some adverse consequences to the environment and they want to incorporate environmental considerations into their investment decisions. For example, some investment strategies have explicitly prohibited investing in non-renewable energy and resource-mining sectors. On the other hand, some investors hope to put their investments into great use and use their investments to make an impact to support the green industries. For example, they hope their investment can help the development of non-renewable energy and organic farming and ultimately achieve green and sustainable objectives.

Demand for funding in green and sustainability projects

- The Organisation for Economic Co-operation & Development[13] estimated that as much as US\$6.9 trillion will be needed each year up to 2030 to meet climate and development objectives. While public funds alone will not be sufficient to meet the exponential growth in sustainable investment, private investments are filling in the funding gap.

[13] See <https://www.oecd.org/environment/cc/climate-futures/policy-highlights-financing-climate-futures.pdf>

[14] See <https://www.legco.gov.hk/yr18-19/english/counmtg/hansard/cm20181115-translate-e.pdf>

[15] See <https://www.greenfinanceplatform.org/policies-and-regulations/green-bond-grant-scheme>

[16] See <https://www.hkma.gov.hk/eng/news-and-media/press-releases/2020/12/20201217-4/>

[17] See https://www.hkex.com.hk/News/News-Release/2020/201201news?sc_lang=en

[18] See <https://www.dimsudaily.hk/hk-governments-us-2-5-billion-green-bonds-offering/>

The Hong Kong government has the ambition to promote Hong Kong as a green finance hub. It has implemented a few important initiatives:

June 2018



The Government launched the Green Bond Grant Scheme[15] to subsidise eligible green bond issuers in obtaining certification under the Hong Kong Quality Assurance Agency's Green Finance Certification Scheme. In 2018, a total of US\$2.2 billion of green bonds were issued in HK and in 2019, a total of US\$10 billions of green bonds are arranged and issued in Hong Kong.

November 2018



The Legislative Council approved to launch of a green bond issuance programme with a borrowing ceiling of HK\$100 billion[14].

December 2020



Green & Sustainable Finance Cross-Agency Steering Group[16] was formed to provide strategic direction and co-ordinates regulatory and market development efforts.

December 2020



The Hong Kong Stock Exchange launched the Sustainable & Green Exchange[17]. STAGE will rise as a central hub for data and information on sustainable and green-finance investment.

January 2021



The Hong Kong government launched US\$2.5 billion green bonds under the Government Green Bond Programme[18]. The Hong Kong government will issue green bonds worth HK\$175.5 billion in the next five years.

10:50 MOSCOW
 11:05 EDINBURGH
 11:05 LONDON/LHR
 11:10 BUCHAREST/OTP
 11:30 KIEV/BORISPOL
 11:35 DUBLIN
 11:45 EAST MIDLANDS
 12:15 SOFIA
 12:30 LONDON/LGW
 12:30 NEWCASTLE
 12:40 ST PETERSBURG
 12:40 LONDON/LGW
 12:45 MANCHESTER

Regulatory Trends & Green Finance

International Level

Regulatory trends **globally**



Regulatory trends in **Europe**



Regulatory trends in **Asia Pacific**



Regulatory trends in **America**



April 2016



The US **Securities and Exchange Commission** (SEC) published a concept release^[19] to seek public comment on modernising certain business and financial disclosure requirements. The SEC recognise the emergency of sustainability reporting framework and inquired which and if frameworks should be used for additional disclosure requirements.

June 2017



The **Financial Stability Board's Task Force on Climate-Related Financial Disclosures** (TCFD) has developed global standards for financial disclosures. Its recommendations cover four thematic areas, including governance, strategy, risk management and metrics and targets^[20].

[19] See <https://www.sec.gov/news/pressrelease/2016-70.html>

[20] See <https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf>



March 2018



The **European Commission** published its Action Plan on Financing Sustainable Growth[21], which sets out a comprehensive strategy to further connect finance with sustainability.

September 2018



The **China Securities Regulatory Commission** established the ESG information disclosure framework for listed companies and developed a standard template for listed companies' disclosure of ESG information to enhance the comparability of such information among enterprises[23].

November 2018



China initiated the Green Investment Principles for the Belt and Road to enhance the level of infrastructure and economic development across Belt and Road countries, aiming to embed the principles of sustainable development in new investments in Belt and Road projects[26].

June 2018



The **EU** set up a technical expert group on sustainable finance[22] to assist in four key areas of the action plan through the development of:

- a unified classification system for sustainable economic activities;
- an EU green bond standard;
- benchmarks for low-carbon investment strategies; and
- guidance to improve corporate disclosure of climate-related information.

October 2018



Seychelles offered the world's first blue bond to finance ocean-based projects, to expand its marine protected areas and boost its fisheries sector[24].

November 2018



The **Asset Management Association of China** (AMAC) published a systematic and comprehensive voluntary standard for China's asset management industry which include guides on approach to green investing. AMAC also requested asset managers carry out a self-assessment on their green investing practices and submit their self-checking reports to the regulator every year[25].

[21] See https://ec.europa.eu/info/publications/sustainable-finance-renewed-strategy_en

[22] See https://ec.europa.eu/info/publications/sustainable-finance-technical-expert-group_en

[23] See <http://finance.jrj.com.cn/2018/02/09073024091121.shtml>

[24] See <https://www.worldbank.org/en/news/press-release/2018/10/29/seychelles-launches-worlds-first-sovereign-blue-bond>

[25] See

<https://www.amac.org.cn/industrydynamics/guoNeijiaoLiuDongTai/jjhywhjs/esg/202001/P020200120447423886721.pdf>

[26] See <http://cpc.people.com.cn/BIG5/n1/2018/1202/c419242-30436543.html>



April 2019



Bank of England issued a supervisory statement[27], enhancing banks' and issuers' approaches to managing the financial risks from climate change. The statement highlighted physical risks, transition risk and distinctive elements of the financial risks from climate change, including its far-reaching efforts and magnitude, uncertainty and long time horizons, the combination of different risks and that the risks are dependent on short-term actions. While few firms adopted a strategic approach, the statement set out four main expectations, covering governance, risk management, scenario analysis and disclosure.

June 2019



The **EU** published non-binding guidelines on reporting climate-related information[28] to supplement the non-binding guideline on non-financial reporting. The guidelines integrate the TCFD's recommendations.

September 2019



The **European Technical Expert Group on sustainable finance** published its final report on climate benchmarks and benchmarks' ESG disclosure[29]. The final report recommends a list of minimum technical requirements for the methodologies of EU Climate Transition and EU Paris-aligned benchmarks. The report also recommends a set of ESG disclosure requirements.

July 2019



The **UK** government published its green finance strategy[30]. The strategy hopes to align private sector financial flows with clean, environmentally sustainable and resilient growth, supported by Government action. The strategy paper consists of three chapters, discussing

- how financial risks and opportunities are integrated into mainstream decision making and that markets for green financial products are robust
- how to accelerate finance to support UK's carbon targets and clean growth
- how to ensure UK financial services capture the domestic and internal commercial opportunities arising from green finance

December 2019



The Regulation (EU) 2019/2088 of the **European Parliament**[31] on sustainability-related disclosure in the financial services sector was published. The purpose of the regulation is to achieve more transparency on how financial market participants and advisers consider sustainability risks in their investment decisions and insurance or investment advice.

[27] See

<https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2019/ss319>

[28] See https://ec.europa.eu/finance/docs/policy/190618-climate-related-information-reporting-guidelines_en.pdf

[29] See https://ec.europa.eu/info/files/190930-sustainable-finance-teg-final-report-climate-benchmarks-and-disclosures_en

[30] See <https://www.gov.uk/government/publications/green-finance-strategy>

[31] See <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R2088&rid=1>



February 2020



The Basel Committee established the **Task Force on Climate-related Financial Risks** (TCFR) to undertake work on climate-related financial risks. The TFCR conducted a stocktake of members' existing regulatory and supervisory initiatives on climate-related financial risks[32]. Although TFCR does not currently have a view on potential prudential treatments or supervisory expectations related to the mitigation of climate-related financial risks, TFCR is considering the extent to which climate-related financial risks are incorporated in the existing Basel Framework and identify effective supervisory practices to mitigate such risks.

April 2020



Sustainable Finance Network of the **International Organization of Securities Commissions** (IOSCO) published a report to provide an overview of existing sustainability and climate change initiatives and key areas for improvement by securities regulators[33]. The report put emphasis on three recurring issues:

- multiple and diverse sustainability framework and standards;
- a lack of common definition for sustainable activities; and
- greenwashing and other investor protection challenges.

May 2020



China excluded 'clean coal' from a list of projects eligible for green bonds. Previous list includes coal washing plants that remove impurities, and technologies that cut pollution during combustion. Climates Bonds Initiative, cited by Reuters[34], suggested that it is a significant step that will be welcomed by international investors. The People's Bank of China has also added shared bicycle services as well as infrastructure supporting new energy vehicles to the list.

June 2020



The **Monetary Authority of Singapore** (MAS) issued three consultation papers on its proposed Guidelines on Environmental Risk Management (Guidelines) for banks, insurers and asset managers[35]. The Guidelines focus on three areas, including governance, risk management and disclosure. The Guidelines aim to enhance financial institutions' resilience on environmental risk and strengthen the financial sectors' role in supporting the transition to an environmentally sustainable economy.

[32] See <https://www.bis.org/press/p200227.htm>

[33] See <https://www.iosco.org/news/pdf/IOSCONEWS564.pdf>

[34] See <https://www.reuters.com/article/us-china-environment-finance-idUSKBN2350FW>

[35] See

<https://www.mas.gov.sg/publications/consultations/2020/consultation-paper-on-proposed-guidelines-on-environmental-risk-management-for-asset-managers>



June 2020



The Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment was published[36]. The regulation establishes an **Europe Union**-wide classification system or framework intended to provide businesses and investors with a common language to identify to what degree economic activities can be considered environmentally sustainable.

December 2020



The **MAS** published guidelines setting out its expectations on environmental risk management for all banks, merchant banks, and finance companies[39].

January 2021



The Green Finance Industry Taskforce, convened by the **MAS**, issued a proposed taxonomy for Singapore-based financial institutions to identify activities that can be considered green or transitioning towards green[41].

November 2020



The **European Central Bank** (ECB) published a guide on climate-related and environmental risk[37] and an ECB report on institutions' climate-related and environmental risk disclosures[38]. The guide explains how the ECB expects banks to prudently manage and transparently disclose such risks under current prudential rules. In early 2021, ECB asked banks to conduct a self-assessment in light of the supervisory expectations outlined in the guide and to draw up action plans on that basis. The ECB will then benchmark the banks' self-assessments and plans, and challenge them in the supervisory dialogue. In 2022, it will conduct a full supervisory review of banks' practices and take concrete follow-up measures where needed.

January 2021



22 leading insurers and insurers developed a guidance for the insurance industry to identify and disclose the impact of climate change on their businesses[40].

[36] See <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32020R0852>

[37] See <https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.202011finalguidonclimate-relatedandenvironmentalrisks-58213f6564.en.pdf?1f98c498cb869019ab89194a118b9db4>

[38] See <https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.ecbreportinstitutionsclimaterelatedenvironmentalriskdisclosures202011-e8e2ad20f6.en.pdf?10a778f9643eb81c72e658f32c95a44>

[39] See <https://www.mas.gov.sg/regulation/guidelines/guidelines-on-environmental-risk-management>

[40] See <https://www.unepfi.org/publications/insurance-publications/insuring-the-climate-transition>

[41] See <https://www.mas.gov.sg/news/media-releases/2021/industrytaskforce-proposes-taxonomy-and-launches-environmental-riskmanagement-handbook>



March 2021



The **Bank of England** announced that the bank's mandate will be updated to reflect the importance of environmental sustainability and the transition to net-zero[42].

March 2021



The disclosure regulation **EU 2019/2088** started to apply[44]. The regulation urges financial market participants and financial advisors to update their disclosed product information on sustainability issues. The regulation was adopted in spring 2019. Financial market participants need to publish information regarding their strategic handling of sustainability risks and their product's negative sustainability impacts.

April 2021



The **EU** published the sustainable finance taxonomy[45]. The taxonomy is a EU-wide classification system for environmentally sustainable economic activities. The taxonomy will help define what can be labelled as a sustainable investment in the EU. The taxonomy includes economic activities with performance criteria to assess the activities' contribution toward environmental objectives, including climate change adaption and climate change mitigation.

March 2021



The **SEC** created a Climate and ESG Task Force in the Division of Enforcement[43]. The task force will develop initiatives to proactively identify ESG-related misconduct. The initial focus will be to identify any material gaps or misstatements in issuers' disclosure of climate risk under existing rules. The task force will also analyse disclosure and compliance issues relating to investment advisers' and funds' ESG strategies.

April 2021



People's Bank of China said it would include climate change among the issues it considers in implementing its monetary policy and supervisory role in future and will encourage financial institutions to help meet China's goal of becoming carbon neutral. The PBOC will assess the impact of climate change on China's financial stability and monetary policy and consider climate change in financial sector stress tests. PBOC will increase its support for green finance through ratings of commercial banks, deposit insurance rates and macro prudential assessments. China will continue to increase its allocation of green bonds in its foreign exchange reserve investments and control investments in high-pollution assets[46].

[42] See <https://www.bloomberg.com/news/articles/2021-03-03/bank-of-england-gets-new-mandate-to-drive-net-zero-goals>

[43] See <https://www.sec.gov/news/press-release/2021-42>

[44] See <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R2088&rid=1>

[45] See

https://ec.europa.eu/commission/presscorner/detail/en/IP_21_1804

[46] See <https://www.reuters.com/world/china/china-require-financial-institutions-move-towards-green-finance-cbank-governor-2021-04-20/>



June 2021



The **Bank of England** planned to launch Climate Biennial Exploratory Scenario (CBES) in June 2021 to explore the financial risks posed by climate change[47]. The exercise will test the resilience of the current business models of the largest banks, insurers, and the financial system to climate-related risks and therefore the scale of adjustment that will need to be undertaken in coming decades for the system to remain resilient[19].

June 2021



ECB asked banks to conduct a self-assessment and to draw up action plans on climate-related and environmental risk. No major bank in the euro zone meets all of the ECB's expectations in assessing climate-related risk. It is expected that ECB will put more pressure on banks to adjust to align with the ECB's supervisory expectations[48].

July 2021



US **SEC** said it was considering rules to tackle greenwashing. The new rules may require sustainable fund managers to disclose the criteria and underlying data used to support the label[50].

July 2021



Shanghai Environment and Energy Exchange officially launched the national carbon emissions trading scheme. The scheme is part of China's plan to make use of market mechanisms to bring its carbon emissions to net zero by 2060. More than 2,000 power plants will be able to trade carbon emissions contracts on that platform[49].

2022



The **ECB** will conduct a full supervisory review of banks' practices and take concrete follow-up measures where needed[52].

August 2021



Bank for International Settlements (BIS) and the HKMA will investigate how tokenized green bonds can improve sustainable investment[51]. They will build a prototype digital infrastructure that explores the possibility of investments in small denominations, combined with real-time tracking of environmental outputs. The project will target the full bond life cycle including the issuance process, payment of interest and redemption.

[47] See <https://www.bankofengland.co.uk/stress-testing/2021/key-elements-2021-biennial-exploratory-scenario-financial-risks-climate-change>

[48] See <https://www.reuters.com/business/sustainable-business/ecb-will-see-it-that-banks-meet-climate-risk-expectations-elderson-2021-06-16/>

[49] See <https://www.reuters.com/business/sustainable-business/china-launch-national-ets-july-16-shanghai-exchange-2021-07-15/>

[50] See <https://www.reuters.com/business/sustainable-business/us-sec-consider-new-sustainable-fund-criteria-data-disclosure-rules-2021-07-07/>

[51] See <https://www.bis.org/press/p210824.htm>

[52] See https://www.ecb.europa.eu/pub/pdf/other/ecb_mepletter210326_L_alucq_and_others-b360962c80.en.pdf



Regulatory Trends & Green Finance

Hong Kong

In September 2018, the **Securities and Futures Commission** (SFC) published its Strategic Framework for Green Finance^[53], which covers three major areas, including:

- enhancing listed company, asset manager and investment product disclosures and their consideration of ESG factors, especially environmental and climate risks;
- facilitating the development of green or ESG-related investment products, and supporting investor awareness and capacity building; and
- promoting Hong Kong as an international green finance centre.

The SFC recognised that while climate change is an urgent, potentially existential source of financial risks for businesses, investors need relevant information about ESG risks, especially those associated with climate change, in order to make informed investment decisions and allocate capital efficiently.

From March to September 2019, the SFC conducted an industry-wide survey to understand to what extent licensed asset management firms and leading institutional asset owners consider environment, social and governance (ESG) risks, particularly those relating to climate change^[54]. The survey focused on asset managers and asset owners' sustainable investment practices (including their commitment, investment processes, post-investment ownership practices and ESG disclosure). The survey found that:

[53] See [https://www.sfc.hk/web/files/ER/PDF/SFCs%20Strategic%20Framework%20for%20Green%20Finance%20-%20Final%20Report%20\(21%20Sept%202018....pdf](https://www.sfc.hk/web/files/ER/PDF/SFCs%20Strategic%20Framework%20for%20Green%20Finance%20-%20Final%20Report%20(21%20Sept%202018....pdf)

[54] See <https://www.sfc.hk/web/files/ER/ENG%20Survey%20Findings%20Report%2016%2012%202019.pdf>



- 83% of firms surveyed and actively involved in asset management, considered at least one environment, social and governance factor in order to understand a company's investment potential and facilitate better investment decisions and risk management.



- 68% of firms surveyed clearly acknowledge that ESG factors could be a source of financial risk and have an impact on investment portfolios.



- Most of the firms surveyed were in favour of strengthening ESG disclosure rules for listed companies, as proposed by The Stock Exchange of Hong Kong Limited (SEHK) in May 2019, so that more high quality, decision-useful ESG and climate change-related information could be available for use in their investment and risk management processes.



- 63% of firms surveyed practise responsible ownership, for instance, through voting and corporate engagement. However, the SFC noted that asset managers did not take a consistent approach to disclosing ESG factors and consideration and integrating climate-related risks into their investment decisions.



- 35% of the surveyed firms which have considered ESG factors have implemented a consistent approach to systemically integrate ESG factors in their investment and risk management processes, rather than doing so on an ad-hoc basis



- In addition, only a limited number of asset managers had processes in place to manage the financial impact of climate-related risks. SFC noted that these practices may not meet the expectations of asset owners and they are not on par with the latest international developments in this area.

In October 2020, the SFC published a Consultation Paper on the Management and Disclosure of Climate-related Risks by Fund Managers [55]. The SFC focused on four areas: (i) governance; (ii) investment management; (iii) risk management; and (iv) disclosure.

In August 2021, the SFC issued its Consultation Conclusions[56] and said it would amend the Fund Manager Code of Conduct to require fund managers managing collective investment schemes (CIS) to consider climate-related risks in their investment and risk management processes and make appropriate disclosure to meet investors' growing demand for climate risk information and to combat greenwashing.

Fund managers should develop governance structures, policies and procedures which are commensurate with the nature, size, complexity and risk profiles of their firms and the investment strategies adopted. Fund managers are expected to start implementing the practices no later than August 2022.

The SFC hopes to achieve the following objectives:

- increase awareness of the impact of carbon emissions and the associated risks;
- ensure proper handling of climate-related risks, which are a source of financial risk;
- promote clear, comparable and high-quality disclosures to provide more useful information for investors to make informed decisions and combat "greenwashing"; and
- develop appropriate regulatory requirements in a constantly evolving environment where different terminologies are in circulation and methodologies are evolving.

[55] See <https://apps.sfc.hk/edistributionWeb/api/consultation/openFile?lang=EN&refNo=20CP5>

[56] See

<https://apps.sfc.hk/edistributionWeb/gateway/EN/circular/intermediaries/supervision/doc?refNo=21EC31>



In April 2019, the **Hong Kong Monetary Authority** (HKMA) conducted its first stocktake exercise on selected Authorised Institutions (AIs) to understand local developments in green and sustainable banking, including their practices on governance, management and disclosure of environmental and climate-related risks[57]. It is found that:



- In terms of awareness level, 74% of the surveyed AIs identified certain impacts of environmental and climate-related risks that were potentially significant, such as greater transactional losses, increased credit risk and hence higher risk-weighted assets.



- In terms of progress, 72% of the surveyed AIs indicated they had engaged, to different extents, in green and sustainable banking and financial activities, such as issuing green bonds and granting green loans.



- In terms of risk management, around half of the surveyed AIs addressed climate and environmental risks in their corporate governance and/or risk management frameworks.



- 46% of the surveyed AIs have disclosed information about their green and sustainable banking activities and the associated risk management approaches.

In May 2019, the HKMA announced a three-phased approach to promoting green and sustainable banking[58].

- Phase I – developing a common framework to assess the “Greenness Baseline” of individual banks and providing technical support to banks;
- Phase II – engaging the industry and other relevant stakeholders in a consultation on the supervisory expectations or requirements; and
- Phase III – implementing, monitoring and evaluating banks’ progress.

HKMA hopes that the three-phased approach can build climate resilience within the banking system, to raise banks’ awareness of climate change. The approach can also allow HKMA to understand AIs’ readiness in the development of green and sustainable banking so that HKMA may provide the necessary guidance and support. At a later stage, the HKMA may formulate supervisory requirements which are suitable for our local circumstances after a having comprehensive understanding of AIs’ development progress.

In May 2021, HKMA announced a guideline on Green and Sustainable Finance Grant Scheme[59]. The three-year scheme will provide subsidy for eligible bond issuers and loan borrowers to cover their expenses on bond issuance and external review services up to HK\$800,000 per transaction. General bond issuance expenses include costs for arrangement, legal audit, listing fees for eligible first-time green and sustainable bond issuers, while external review costs include transaction-related external review fees, including pre-issuance external review and post-issuance external review or reporting for eligible green and sustainable bond issuers and loan borrowers.

[57] See <https://www.hkma.gov.hk/media/eng/doc/key-information/guidelines-and-circular/2020/20200630e1a1.pdf>
[58] See <https://www.hkma.gov.hk/eng/key-functions/banking/banking-regulatory-and-supervisory-regime/green-and-sustainable-banking>
[59] See [https://www.hkma.gov.hk/eng/news-and-media/press-releases/2021/05/20210504-4/#:~:text=04%20May%202021,-HKMA%20announces%20guideline%20on%20the%20Green%20and,Grant%20Scheme%20\(GSF%20Grant%20Scheme\)&text=The%20GSF%20Grant%20Scheme%20will,and%20last%20for%20three%20years.](https://www.hkma.gov.hk/eng/news-and-media/press-releases/2021/05/20210504-4/#:~:text=04%20May%202021,-HKMA%20announces%20guideline%20on%20the%20Green%20and,Grant%20Scheme%20(GSF%20Grant%20Scheme)&text=The%20GSF%20Grant%20Scheme%20will,and%20last%20for%20three%20years.)



The **Stock Exchange of Hong Kong** (SEHK) published consultation conclusions on its review of the ESG reporting guide and related listing rules in December 2019[60]. The SEHK enhanced the ESG reporting framework by:

- mandating that issuers disclose a broad statement setting out the board's consideration of ESG matters, follow four reporting principles in preparing ESG reports and disclose the process used to identify specific entities or operations included in the ESG report; and
- enhancing the disclosure requirements in relation to environmental and social factors (eg requiring disclosure of the significant climate-related issues which have impacted and may impact the issuer).

In addition, the SEHK shortened the deadline for listed companies to publish ESG reports to allowed them to be published online. Previously, the Listing Rules require issuers to publish an ESG report no later than three months after publication of the issuers' annual report, which could be seven months after the financial year-end. Under the new rules which took effect on 1 July 2020, issuers are required to publish an ESG report within five months after the financial year-end.

In December 2020, the Hong Kong Stock Exchange (HKSE) launched the Sustainable and Green Exchange (STAGE), an investment product platform supporting sustainable and green finance in Asia[61]. STAGE features 29 sustainable-theme products, including sustainability, green and transition bonds. STAGE allows issuers to provide investors with more information on their sustainable investment products, promoting transparency and facilitating access. Issuers included on STAGE must provide additional voluntary disclosures on their sustainable investment products, such as the use of proceeds reports, as well as annual post-issuance reports

In August 2021, the HKSE signed a memorandum of understanding with the Guangzhou Futures Exchange[62] for strategic cooperation in promoting sustainability and facilitating the development of Greater Bay Area. Under the memorandum, the two exchanges will explore the feasibility of cooperation on product development in both onshore and offshore markets, with the aim of supporting China to peak carbon emissions by 2030 and reach carbon neutrality by 2060.

[60] See https://www.hkex.com.hk/News/Regulatory-Announcements/2019/191218news?sc_lang=en

[61] See https://www.hkex.com.hk/News/News-Release/2020/201201news?sc_lang=en2

[62] See https://www.hkex.com.hk/News/News-Release/2021/210827news?sc_lang=en



In May 2020, a Green and Sustainable Finance Cross-Agency Steering Group was launched by among others, the SFC and HKMA, to coordinate the management of climate and environmental risks facing the financial sector in Hong Kong[63].

In July 2021, the Cross-Agency Steering Group announced the next steps to advance its collaborative strategy to bolster Hong Kong's position as a leader in green and sustainable finance and help transition the financial ecosystem towards carbon neutrality[64]. The group has identified three priorities.

First, the group supports the efforts by the International Sustainability Standards Board under the IFRS Foundation to develop a new standard which would be built on the TCFD framework. The SFC, HKEX will collaborate with the Financial Reporting Council and the HK Institute of Certified Public Accountants to work on a roadmap to evaluate and potentially adopt the new standard.

Second, the group is seeking to capitalise the unique position of HK as the China's gateway and international finance centre to set up a Carbon Market Work Stream to assess the feasibility of developing HK as a regional carbon trading centre to strengthen collaboration in the Guangdong-HK-Macao Greater Bay Area. The stream will actively explore opportunities in cap-and-trade carbon market and the voluntary carbon market in China and overseas.

Third, the Green and Sustainable Finance Cross-Agency Steering Group has launched a cross sector platform - The Centre of Green and Sustainable Finance. Under the centre, here are two working groups, namely the capacity building working group and data working group. According to HKMA, the centre coordinates the efforts of financial regulators, government agencies, industry stakeholders and the academic in capacity building, thought leadership and policy development. It will also serve as a repository for resources, data and analytics which support the transition to a more sustainable pathway.

[63] See <https://www.hkma.gov.hk/eng/news-and-media/press-releases/2020/05/20200505-8/>

[64] See <https://www.info.gov.hk/gia/general/202107/15/P2021071500458.htm>



Regulatory Trends & Green Finance

Short Summary

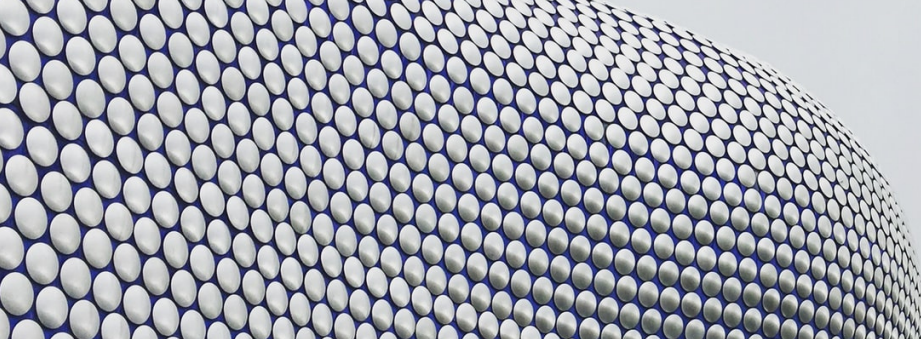
The key points from the TCFD recommendations, SFC consultation conclusions and guiding principles on the HKMA whitepaper are as follows:

Governance

- TCFD recommends the disclosure of the organisations' governance around climate-related risk and opportunities.
- SFC requires the board to have oversight of the incorporation of climate-related considerations into investment and risk management processes and oversee progress against goals for addressing climate-related issues. SFC requires management to maintain an appropriate management structure for managing climate-related risks and reporting to the board.
- HKMA suggests that the board should have primary responsibility for an AI's climate resilience. It should have a sufficient understanding of the climate-related issues in determining the AI's approach to address them.
- HKMA suggests that the board should exercise oversight of the development and implementation of the AI's climate strategy, including embedding climate-related risks into the AI's risk appetite framework.

Investment management and strategy

- TCFD recommends the disclosure of the actual and potential impact of climate-related risks and opportunities on the organisation's businesses, strategy and financial planning, where such information is material.
- SFC requires fund managers to identify climate-related risks which are relevant to each investment strategy and fund they manage, assess their impacts and prioritise material risks in their investment management processes. They should ensure climate-related risks are taken into account in its investment management process for funds.
- HKMA suggests that climate considerations should be embedded throughout the strategy formulation process, from strategic assessment to action plan development.
- HKMA suggests that organisation structure, business policies, processes, and resources availability should be reviewed and enhanced to ensure effective integration of climate strategy into the operation and corporate development of an AI.



Risk management

- TCFD recommends the disclosure of how the organisation identifies, assesses and manages climate-related risks.
- SFC requires fund managers to incorporate climate-related risks into their existing risk management framework due to their potential adverse impacts on the value of investments and in response to growing investors' concerns about climate change. Fund managers should implement adequate procedures for identifying, assessing, managing and monitoring material climate-related risks. Climate-related risks should be treated in the same manner as other material risks, including market, liquidity and counter-party risks.
- SFC requires fund managers to apply appropriate tools and metrics including carbon footprint related metrics (eg WACI), forward-looking metrics or physical climate-related metrics to assess and quantify climate-related risks. When the risks are assessed to be material, fund managers should adopt appropriate measures to manage the risks.
- HKMA suggests AIs should identify the transmission channels and assess the impacts of physical and transition risks arising from climate change on their business. Concrete plans should be devised to address any information and data gaps.
- HKMA suggests AIs should build capability over time to measure climate-related risks using various methodologies and tools, among which scenario analysis should be actively explored.
- HKMA suggests AIs should implement processes to monitor and report exposures to climate-related risks to ensure that such exposures are consistent with their risk appetite and that timely and regular updates are provided to the board and senior management. AIs should carry out measures to control and mitigate exposures to climate-related risks to ensure effective management of these risks

Disclosure, metrics and targets

- TCFD recommends the disclosure of the metrics and targets used to assess and manage relevant climate-related risks and opportunities, where this information is material.
- SFC requires fund managers to make adequate disclosure in writing covering its governance arrangements for the oversight of climate-related risks and how climate-related risks are taken into account during the investment and risk management processes. Fund managers should disclose its governance structure and risk management processes as long as the climate-related risks are relevant to the investment strategy of the fund.
- SFC requires fund managers to make disclosures relating to how climate-related risks are being factored into the portfolio construction process as well as the key tools and metrics used in the investment and risk management processes. Fund managers are required to disclose the steps taken to incorporate relevant and material climate-related risks into the investment management process and the types of investment strategies or funds under their management for which climate-related risks have been assessed to be irrelevant. Fund managers should ensure that their conclusions are justifiable and maintain appropriate internal records which explain why climate-related risks are considered to be irrelevant for these types of investment strategies of funds.
- HKMA suggests AIs should develop an appropriate approach to disclosing climate-related information and enhance transparency. When considering the information to be disclosed, AIs should take the TCFD recommendations as the core reference.



Regtech Applications in Green Finance

Using social media, eco-labelling and blockchain technologies to combat greenwashing

'Green finance' and 'Sustainable investment' have not been defined consistently. There is currently no universal certification on green investment or green financial products worldwide, partly because the concepts are evolving. There are concerns over **'greenwashing'**, which refers to the practice that labels financial products and investments as 'green' in the hope of getting investments easily, but they are in fact not 'green'. The 'green' label may entitle green borrowers and issuers to a enjoy lower cost of borrowing and higher equity return. Some bad players in the market falsely or misleadingly portray a product or investment as environmentally sound and attract cheap capital. However, it deceives investors and affects investors' confidence in genuine green investments.

In the context of ethical corporate marketing practices, Parguel (2011)[65] suggested that consumers are overwhelmed by corporate social responsibility communication and have trouble identifying truly responsible firms. The confusion encourages 'greenwashing' and makes CSR initiatives less effective. Parguel's study investigated the role of independent sustainability ratings on consumers' responses to companies CSR communication and found that sustainability ratings could act to deter greenwashing and encourage virtuous firms to persevere in their CSR practices.

[65] Parguel, B., Benoît-Moreau, F., & Larceneux, F. (2011). How sustainability ratings might deter 'greenwashing': A closer look at ethical corporate communication. *Journal of business ethics*, 102(1), 15-28.



Bringing Parguel's CSR study into the context of green finance, allowing greenwashing to continue without proper regulatory supervision will have two negative consequences. First, it allows projects that are not 'green' (ie for environmental good) to be labelled 'green'. This misleads and deceives investors. It is unfair and causes injustice to genuinely green projects.

Second, investors who want to invest in real green projects may be discouraged because they are unable to tell whether a particular project is genuinely 'green'. Projects that bring genuinely positive environmental impacts will no longer be able to attract the capital needed because there are projects which are not genuinely 'green' using the 'green' brand.

It is a regulatory challenge that ought to be addressed. There is a need to ensure that all green financial products issued and marketed are genuine, and to develop internationally compatible disclosure guidance as a basis for product issuers to disclose environmental information. There should also be a high level of transparency that allow investors and the public to evaluate and monitor the environmental progress and impacts of the investments and projects that are labelled green.

Combating greenwashing is one of the reasons why the SFC proposes to amend the FMCC. The SFC proposes to issue a circular^[66] setting out baseline requirements and enhanced standards for larger fund managers and hopes that these measures can improve the comparability of information across different fund managers to help investors make more informed decisions.

Scholars, such as Bowen (2014)^[67], have expressed their hope that greenwashing will soon be eliminated in the wake of advances in **information technology**. Greenpeace targets Shell's green communications through their website 'Arctic Ready' which mocks the Shell's marketing efforts (Fernando, 2014)^[68]. While companies magnify and publicise the good and bright sides of their activities, they tend to hide any downsides. NGOs advocating for environmental protection are using technologies, such as **social media platforms**, to monitor and communicate with the public. NGOs share their investigations online and seek to bring public pressure on greenwashing companies.

Lyon (2015)^[69] suggested eliminating greenwashing with the use of **environmental certification** by trusted third parties, through eco-labelling. These labels, such as Marine Stewardship Certification and Forest Stewardship Certification focus on one single issue oriented to renewable resources, such as food, agriculture or forest products.

[66] See <https://apps.sfc.hk/edistributionWeb/api/consultation/openFile?lang=EN&refNo=20CP5>

[67] Bowen, F. (2014). *After greenwashing: Symbolic corporate environmentalism and society*. Cambridge, England: Cambridge University Press.

[68] Fernando, A. G., Suganthi, L., & Sivakumaran, B. (2014). If you blog, will they follow? Using online media to set the agenda for consumer concerns on "greenwashed" environmental claims. *Journal of Advertising*, 43, 167-180

[69] Lyon, T. P., & Montgomery, A. W. (2015). The means and end of greenwash. *Organization & Environment*, 28(2), 223-249.



Regulators are advocating for an **industry-wide code of practice** to level the playing field. As mentioned above, the EU has published the EU taxonomy[70], which is a classification system, establishing a list of environmentally sustainable economic activities. The taxonomy will provide companies, investors and policymakers with appropriate definitions for which economic activities can be considered environmentally sustainable.

The SFC has issued a guidance note in the Code on the Unit Trusts and Mutual Funds[71]. Green or ESG funds may adopt ESG investment strategies such as screening (positive or negative screening), thematic, ESG integration and impact investing. To substantiate 'invest primarily', the SFC would expect:

- for a fund adopting screening strategies or thematic investment strategies, it should demonstrate that at least 70% of its total net asset value is invested in securities or other investments reflecting the stated green or ESG related investment focus; or
- for a fund adopting other strategies, such as ESG integration or impact investing, it should demonstrate to the SFC, on a case-by-case basis, how the fund could comply with this requirement.

Nassiry (2018)[72] suggested sustainable development requires **supply chain transparency**. Beyond the famous bitcoin payments and remittances, **distributed ledger technologies** can help track assets in the supply chain of natural resources. Blockchain offers the potential to transform how natural resources are recorded and traced across several subsectors, including forestry and fisheries to carbon accounting and energy. DiCaprio (2017)[73] suggested governments and banks are collaborating with technology firms to see if blockchain can be used to solve persistent problems like traceability, identification and trust.

Provenance[74], a UK non-governmental organisation piloted a **blockchain** project that tracked the provenance of yellowfin and skipjack tuna caught by local fishermen in Indonesia as a part of a sustainable supply chain. Before the introduction of the system, records were made on paper and were difficult to verify. The project goal was to aid robust proof of compliance to standards at origin and along the supply chain, prevent the double-spend of certificates and explore how these new technologies could form the basis of an open system for traceability powering consumer-facing transparency for food and other physical goods. The system used a mix of **mobile technology** and blockchain.

Fishermen registered their catches to the blockchain via text message. Additional data is later verified and added by NGOs. Once the information is transmitted through the supply chain, it cannot be altered, and the data are visible throughout the product's whole journey. Consumers can access essential information about the products they are purchasing and consuming. The project was a success and it allows proof of compliance at origin, which tracked responsibly caught fish.

[70] See https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en
[71] See page 2 <https://apps.sfc.hk/edistributionWeb/api/circular/openFile?lang=EN&refNo=19EC18>
[72] Nassiry, D. (2018). Green bond experience in the Nordic countries.
[73] See <https://www.asiapathways-adbi.org/2017/07/blockchain-pilots-making-waves-in-developing-asia/>
[74] See <https://www.provenance.org/tracking-tuna-on-the-blockchain>



Regarding downstream investments, it remains uncertain whether investments and projects will usually follow a unified set definition or code of practice for green projects. The SFC relies on the global recognised green or ESG criteria or principles in deciding whether a fund is a green or ESG fund[75]. The criteria and principles include:

- United Nations Global Compact Principles
- United Nations Sustainable Development Goals
- Common Principles for Climate Mitigation Finance Tracking
- Green Bond Principles of the International Capital Market Association
- Climate Bonds Taxonomy of the Climate Bonds Initiative.

However, the scope of the criteria and principles is very broad. For example, principle 7 of the United Nations Global Compact Principles states that 'Businesses should support a precautionary approach to environmental challenges' while principle 8 states that '(Businesses should) undertake initiatives to promote greater environmental responsibility'.

Climate change and carbon emissions, renewable energy and clean water management, pollution and waste minimisation, and eco-design, eco-technology and innovation are generally considered within the framework for environmental protection but there are borderline-green projects which may or may not be recognised as a green project. These projects usually display an arguable degree of environmental protection elements or that environmental protection is an ancillary effect of the project. For example, the use of technologies in the manufacturing sector which aims to increase production efficiency may have an ancillary effect of reducing energy consumption; building projects which incorporate green design thinking may have an ancillary effect of reducing the needs for indoor air conditioning and lighting. It remains ambiguous whether these projects can be claimed to be 'green'. Situations may be more complicated when a particular project has the potential of achieving some of the environmental protection goals while causing environmental harm. For example, the installation of hydroelectric power plants and dams has the potential of reducing fossil fuel consumption and air pollution while it can cause damages to the ecosystem.

Lee (2018)[76] is sceptical of the needs to regulate greenwashing. He argued that regulating greenwashing may not necessarily increase the positive environmental externality of green products. Even if greenwashing is regulated, firms may not act green when the additional Corporate Social Responsibility (CSR) cost is too high or when the corresponding CSR issue is not as important. He found that allowing greenwashing may incentivise some firms to go genuinely green as long as there are some informed customers in the market.

[75] See <https://apps.sfc.hk/edistributionWeb/api/circular/openFile?lang=EN&refNo=21EC27>

[76] Lee, H. C. B., Cruz, J. M., & Shankar, R. (2018). Corporate social responsibility (CSR) issues in supply chain competition: Should greenwashing be regulated?. *Decision Sciences*, 49(6), 1088-1115.



Regtech Applications in Green Finance

Using blockchain for land registration to decrease the risks for green investments

According to the World Bank, more than 70 per cent of the world's population lacks a 'legally registered' title to their land[77]. Only one-third of countries worldwide track property ownership digitally, which is critical for **effective land management**. A lot of green projects in developing countries are affected by the lack of **land registration** and **property ownership systems**. Asset managers and banks are unable to verify the land titles as well as the genuine use of the land without a developed land registration system. Shang (2018)[78] suggested that without formal access to a land registry, people struggle to justify ownership of their own property and thus live in fear of losing their land and the source of their economic livelihood. Often, projects such as reforestation and biofuel require a substantial upfront investment. If landowners' ownership is not recognised, they are less likely to invest in their property.

Reducing Emissions from Deforestation and Degradation (REDD+) is a climate initiative involving more than 40 countries with the objective of mitigating climate change through reducing net emissions of greenhouse gases through enhanced forest management in developing countries. REDD+ initiative combines several conservation management approaches, including forest access restrictions, livelihood support, and incentive-based approaches such as payments for ecosystem services (Sunderlin, 2012) [79]. Property rights over forest directly determine who is eligible to receive protection incentives and who is responsible for meeting the initiative's contractual obligations. However, the land rights in developing countries are often less clear. The ambiguity affects the effectiveness, efficiency and fairness of projects related to those lands. Naughton-Treves (2014)[80] suggested that forest carbon projects must directly engage in the clarification and strengthening of land and carbon rights in the tropics to ensure effective, efficient and equitable outcomes are realised. Hence, land tenure issues are essential to forest conservation and to a broader context, investment projects that are related to land.

[77] See <http://www.worldbank.org/en/topic/land>

[78] A Blockchain-based land titling project in the Republic of Georgia

[79] Sunderlin, W. D., & Sills, E. O. (2012). REDD+ projects as a hybrid of old and new forest conservation approaches. *Analysing REDD+: Challenges and choices*, 31-50.

[80] Naughton-Treves, L., & Wendland, K. (2014). Land tenure and tropical forest carbon management. *World Development*, 55, 1-6.



A few countries, such as the Republic of Georgia, Ukraine, Brazil, the Republic of Honduras and the United Arab Emirates have pioneered the adoption of **Blockchain** technology to improve their land registry and transfer processes[81].

The land registry system in the Republic of Georgia was previously managed by the Bureau of Technical Inventory and the State Department of Land Management. These two agencies had significant functional overlap, as each ran its own land registry system that was generally not transparent[82]. This enabled government officials to take advantage of the system and illegally change land records for their own benefit. Such conduct was difficult to detect or identify due to the opaque system. Bitfury of Exonum[83], an open-source blockchain framework, created a land-registry system supported by blockchain technology in partnership with Georgia's National Agency of Public Registry. The goal of the project was to strengthen property owners' rights, enhance citizens' trust in government and reinforce data security.

In Ghana, over 80% of land titles lack the documentation to prove ownership (Mwanza, 2018)[84]. This facilitated expropriation and fraud. It is common for land already owned by someone to be sold off by another person and multiple people can be under the impression simultaneously that they own a piece of land exclusively. BenBen[85], a company specialising in building land-based transaction system, tries to solve this problem. It creates a land registry and verification platform for financial institutions. The platform captures transactions and verifies the data. It works with financial institutions to update current registries, enables smart transactions and distributes private keys for clients to allow property transactions between parties.

The characteristics of blockchain offer a few benefits to the green projects related to land. First, blockchain offers a more secure, efficient way of storing and transmitting information. Through the land titling system, important information, such as registered owners, pieces of lands are stored into the network (ie in blockchain's term, nodes of the participating network of computers). Through blockchain's immutability characteristic, citizens know their records are safe and their ownership rights cannot be unilaterally altered by corrupted government officials or unfairly contested. Blockchain allows the land titles to be inspected and audited in real-time and retrospectively. Landowners can prove their legitimate ownership of their land by showing their timestamp and digital certificates.

Regtech supplements or partially replaces the official land registration system in developing countries. It makes more green projects in developing countries viable and feasible due to the recognition of land titles and incentives for investment. With a land registration system supported by blockchains, landowners are less likely to be subject to fraud, or land and property titles being in dispute and the related administrative and bribery costs. Also, a transparent land registration system allows investors and asset managers to conduct **due diligence** to verify the titles of the land in a more efficient way.

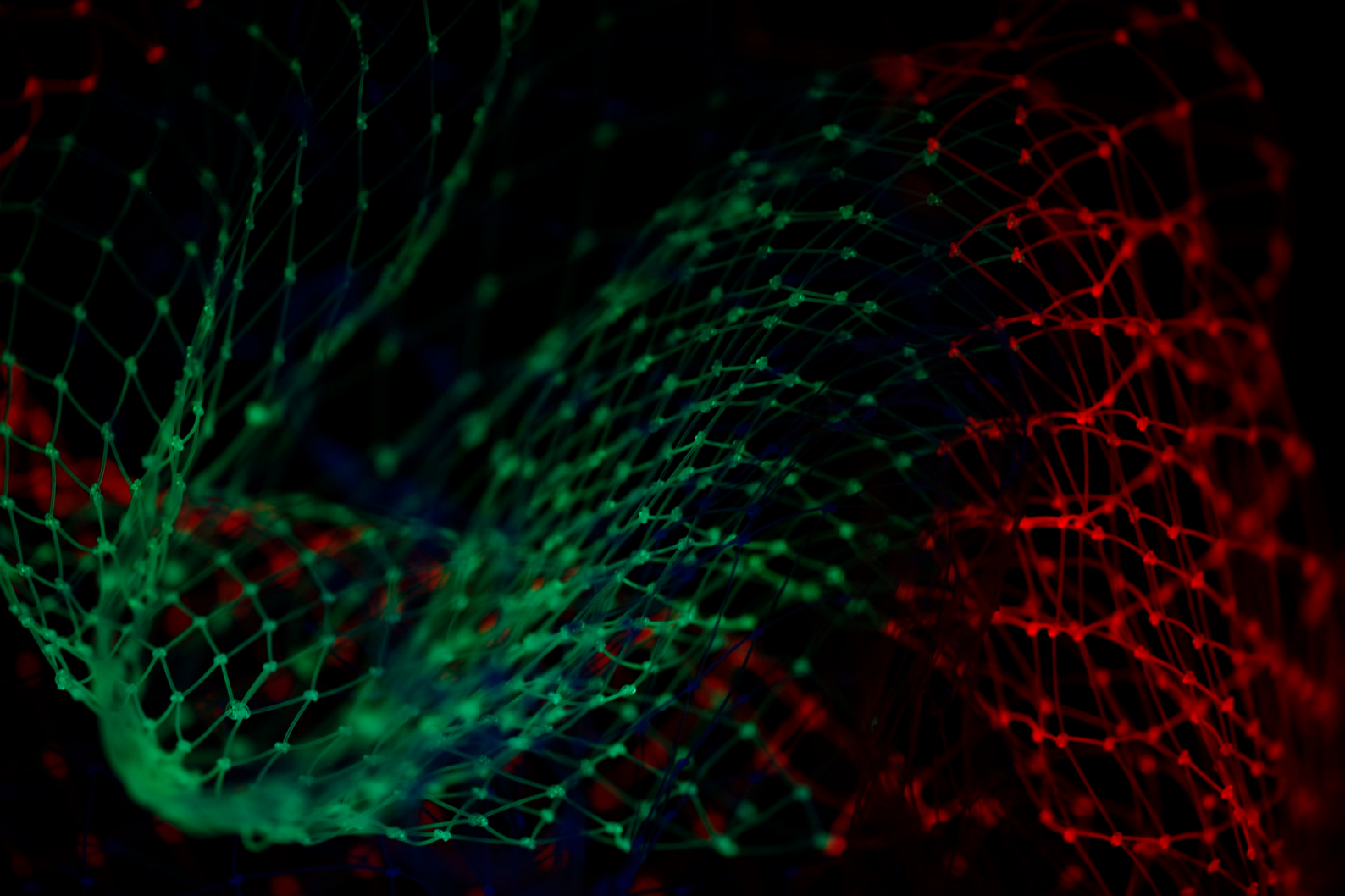
[81] Graglia, Michael, and Christopher Mellon. "Blockchain and Property in 2018: At the End of the Beginning." *Innovations* 12, no. 1-2 (2018): 90-116. Available at https://doi.org/10.1162/inov_a_00270.

[82] See <https://www.reuters.com/article/us-africa-landrights-blockchain/african-startups-bet-on-blockchain-to-tackle-land-fraud-idUSKCN1G00YK>

[83] See <https://exonum.com/index>

[84] Weiss, Mitchell, and Elena Corsi. *Bitfury: Blockchain for Government*. Harvard Business School Case 818-031, Harvard Business School, October 16, 2017.

[85] See <http://www.benben.com.gh/>



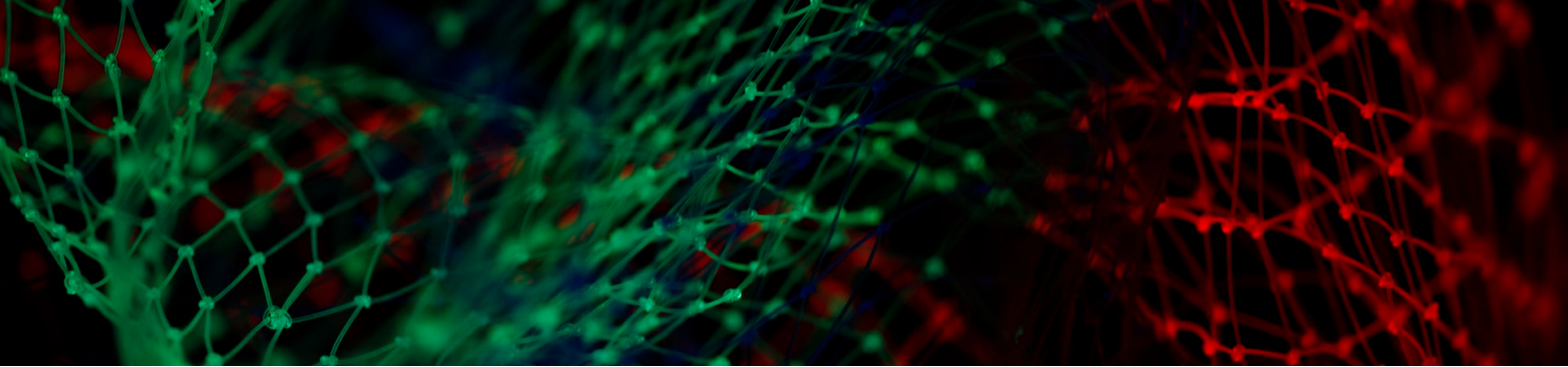
Regtech Applications in Green Finance

Using data technologies, such as cloud & machine learning for disclosure, comparison and monitoring of climate risk and environmental data

The Financial Stability Board's Task Force on Climate-Related Financial Disclosures (TCFD)[86] noted that **inconsistencies in disclosure** practices, a lack of context for information, use of boilerplate, and non-comparable reporting are major obstacles to incorporate **climate-related risks** and opportunities as consideration for their investment, lending and insurance underwriting decisions. The lack of consistent information also prevents investors from considering climate-related issues in their **asset valuation and allocation processes**.

The TCFD suggested three major benefits for better disclosure. First, by having better disclosure, and hence better **transparency**, parties can more effectively evaluate climate-related risks to companies, suppliers and competitors. Second, investors and businesses can make better **informed decisions** on where and when to allocate capital through disclosed current and past operating and financial results. Third, better disclosure allows better **evaluation of risk** and exposures over the short, medium and long term.

[86] See <https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf>



The SFC requires all offering documents of SFC-authorized funds to contain information necessary to make an informed judgement of the investment[87]. The SFC expects the offering documents (including the product key fact statements) of the Green or ESG funds to disclose at a minimum the following:

- A description of the key investment focus (eg climate change, green, low carbon footprint, sustainability, etc.) and targeted objective (eg. Financial return, mitigating climate change or environmental damage, etc.) of the Green or ESG fund;
- A description of the investment strategies adopted by the Green or ESG fund, including:
 - The relevant green or ESG criteria or principles considered;
 - The expected exposure to the investments that reflect the stated green or ESG investment focus;
 - The investment selection process and criteria adopted by the Green or ESG funds, such as assessment criteria of the underlying investments, ESG analysis and evaluation methodology, reference ESG benchmark being tracked and the characteristics and general composition of the benchmark;
- A description of whether an exclusion policy is adopted by the Green or ESG fund and types of exclusion
- A description of risks associated with Green or ESG fund's investment theme.

The SFC also requires managers of the Green or ESG funds to **regularly monitor and evaluate** the underlying investments to ensure the Green and ESG fund continues to meet the stated investment objectives and requirements.

The SFC proposes to require fund managers to make adequate disclosure covering the governance arrangements for the oversight of climate-related risks and how climate-related risks are taken into account during the investment and risk management processes[88]. The SFC expects fund managers to make disclosures relating to how climate-related risks are being factored into the portfolio construction process as well as the key tools and metrics used in the investment and risk management processes.

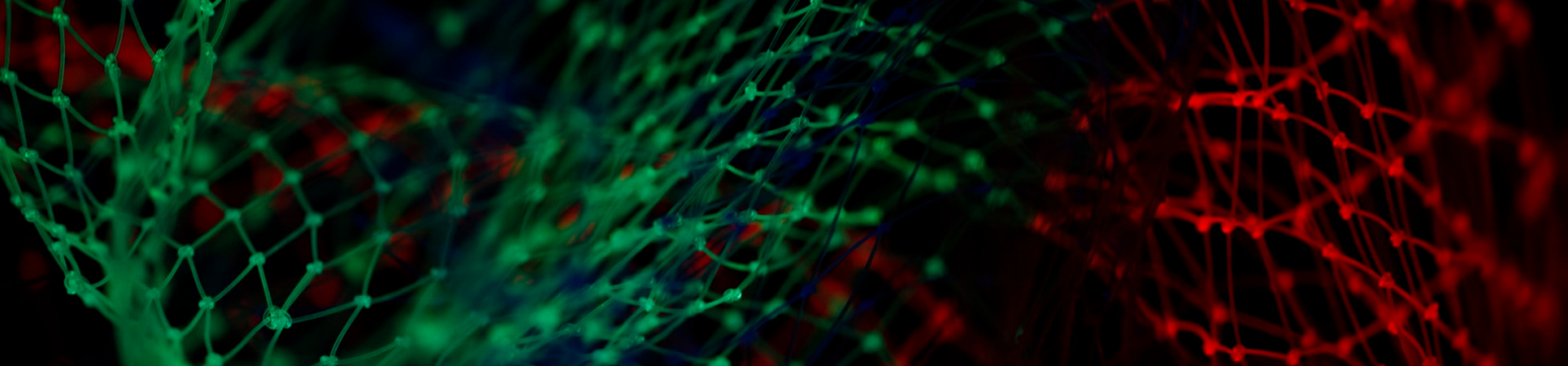
A majority of companies listed in Hong Kong currently prepare their accounts in accordance with universal financial reporting standards, such as Hong Kong Financial Reporting Standards (HKFRS) or International Financial Reporting Standards (IFRS), to facilitate investors in comparing the financial information of different companies. Some companies have started using Impact Reporting and Investment Standards (IRIS+) which covers over 500 metrics across industries and Global Reporting Initiative (GRI) which produces sustainability and ESG reporting standards for companies[89]. However, there is currently no universal standard on the preparation of ESG information, including information on climate change. Hence, the ESG information of different companies cannot be easily and directly compared and the quality of the information disclosed varies (IFEC, 2019)[90].

[87] See https://www.sfc.hk/-/media/files/PCIP/FAQ-PDFS/Post_Authorization_Compliance_Issues_20210428.pdf

[88] See <https://apps.sfc.hk/edistributionWeb/api/consultation/openFile?lang=EN&refNo=20CP5>

[89] See <https://s3.amazonaws.com/gjin-web-assets/iris/assets/files/metric-details/GRI-IRIS-Alignment.pdf>

[90] See <https://www.ifec.org.hk/web/en/investment/investment-products/green-finance/disclosure.page>



In response to the ESG trend, HKSE amended its **ESG Reporting Guide** and **Listing Rules** and introduced, among others:

- Introducing mandatory disclosure requirements to include:
 - a board statement setting out the board's consideration of ESG matters;
 - application of Reporting Principles "materiality", "quantitative" and "consistency"; and
 - explanation of reporting boundaries of ESG reports;
- Requiring disclosure of significant climate-related issues which have impacted and may impact the issuer;
- Amending the "Environmental" key performance indicators (KPIs) to require disclosure of relevant targets[91].

In particular of the environmental aspect, it introduced a new aspect to require disclosure of significant climate-related issues which have impacted and may impact the issuer; amended **key performance indicators** (KPIs) regarding emissions, energy use and water efficiency, water reduction etc to require disclosure of relevant targets; revising a KPI to require disclosure of greenhouse gas emissions.

The **Listing Rules** have been revised to require issuers to publish an ESG report more timely, and in no later than three months after publication of the issuers' annual report[92].

The increasing disclosure requirements will increase regulated entities compliance burden but technologies may help ease their burdens. As will be shown below, technologies, including big data, artificial intelligence, mobile platforms, cloud, blockchain and the Internet of things, can help businesses and investment managers disclose climate risk and relevant environmental data and help investors and asset managers comparing it.

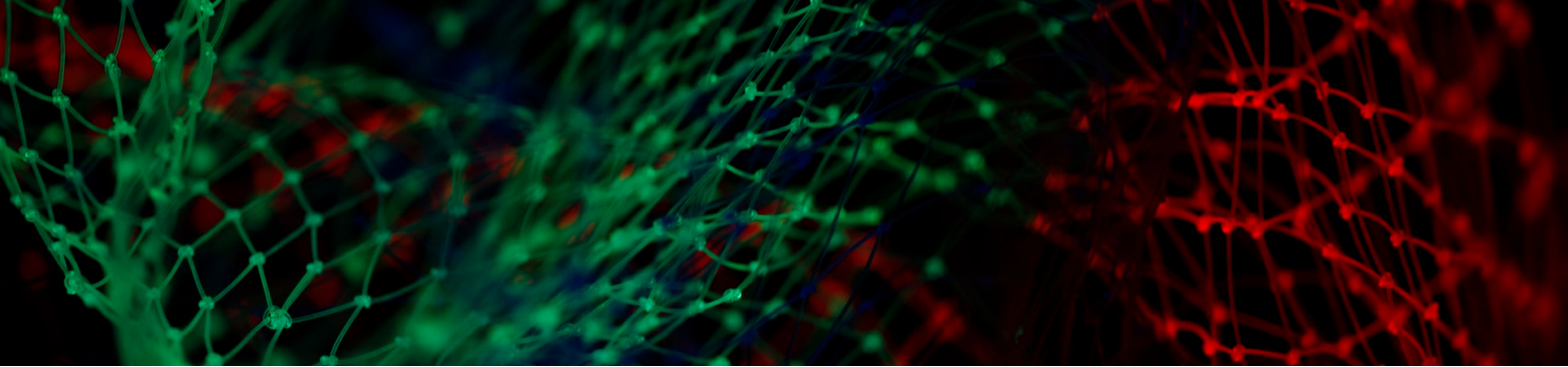
Technologies, such as **automation tools** help regulated entities (ie issuers) to report and disclose their data. It is common for regulated entities to report their KPI from their business operations[93]. These KPI typically include:

- emissions (the types of emissions and respective emissions data, direct and energy indirect greenhouse gas emission and intensity, total hazardous waste produced and intensity, description of emission target set and steps taken to achieve them etc);
- use of resources (direct and/or indirect energy consumption by type, waste consumption etc);
- environmental and natural resources (description of the significant impacts of activities on the environmental and natural resources and the actions taken to manage them); and
- climate change (description of the significant climate-related issues which have impacted and those which may impact the issuers and actions taken to manage them).

[91] See <https://en-rules.hkex.com.hk/rulebook/environmental-social-and-governance-reporting-guide-0>

[92] See https://www.hkex.com.hk/News/Regulatory-Announcements/2019/191218news?sc_lang=en

[93] See https://www.hkex.com.hk/-/media/hkex-market/listing/rules-and-guidance/environmental-social-and-governance/exchanges-guidance-materials-on-esg/app2_envirokpis



First, technologies can help with **data collection**. Technologies allow data to be collected automatically during business operations. The amount of greenhouse gas and hazardous waste can be derived from the number of hours worked by a manufacturing production line. The amount of greenhouse gas and hazardous waste can be automatically added and recorded whenever the manufacturing production line is running. Some companies have developed internal systems for purposes other than fulfilling regulatory reporting duty. Logistics companies likely have a system **tracking** their vehicles' movements and operations. Applications are developed to integrate and transform data from these vehicles into data for calculating KPI with little efforts.

Technologies can also help with securely **convey and store data**, such as block-enabled tracking, encryption tools and new types of database architectures. Immutable, publicly auditable digital ledgers technologies (of which blockchain is one type) can help enforce the integrity of data by automatically logging it and providing an immediate indication when it has tampered (In, 2019)[94]. Therefore, the quality of the data collected can be increased.

In an interview conducted with CRIF, a company specialising in credit and risk management solution, it said it was a partner of the Energy Efficient Mortgage Initiative in the European Union. The Initiative is a global, market-led initiative to mobilise capital markets and implementing ESG best practices in the financial sector in support of the EU Green Deal and Renovation Wave Strategy. The initiative aims to design and deliver a market-led protocol to enable the recording of data relating to energy-efficient mortgage assets and which will be made accessible via the design of a common data portal.

[94] In, S. Y., Rook, D., & Monk, A. (2019). Integrating alternative data (also known as ESG data) in investment decision making. *Global Economic Review*, 48(3), 237-260.

[95] See https://www.hkex.com.hk/-/media/HKEX-Market/Listing/Rules-and-Guidance/Environmental-Social-and-Governance/Exchanges-guidance-materials-on-ESG/step_by_step.pdf?la=en

[96] See <https://www.miotech.com/en-US/>

Second, technologies can help with **data preparation and processing**. Technologies allow input data to be changed to a particular format. In ESG reports, companies report their environmental data in different formats including: paragraphs, graphs, and tables. The HKSE has published a 'Step-by-step Guide to ESG Reporting', in relation to the disclosure of ESG targets. The HKSE recommended that the disclosure should fulfil five principles, namely, specific, measurable, attainable, relevant, and time-bound.

Example disclosure of a S.M.A.R.T. target

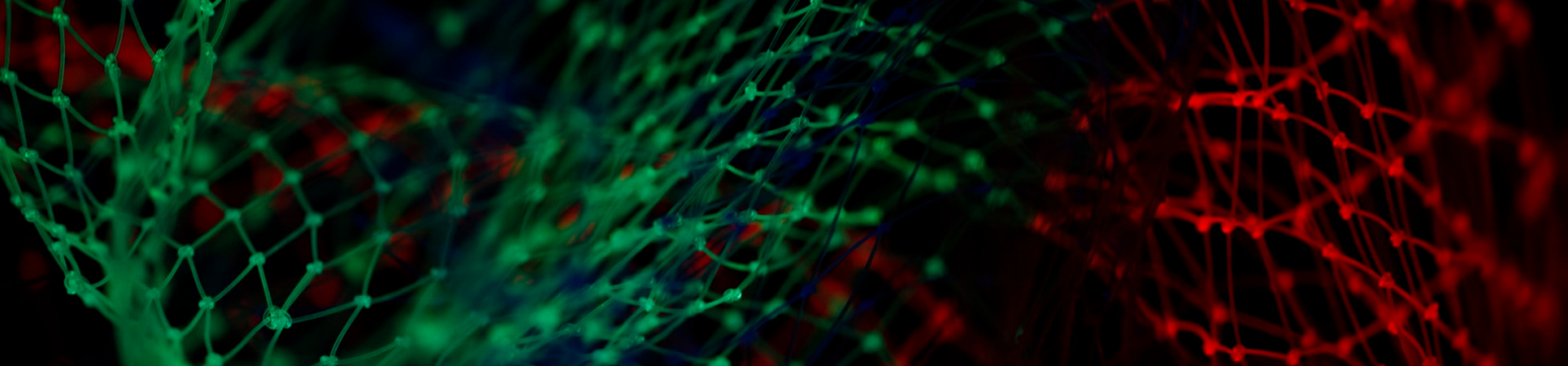
Below is an example of a S.M.A.R.T. target from a multinational retailer that sells clothing, home and food products:

"Our goal is to become a zero-waste business...By 2025, the 50 key raw materials used for our products will come from sources verified as respecting the integrity of ecosystems, the welfare of animals and the wellbeing of people and communities. This will cover over 80% of raw material usage by volume..."

- **Specific** – it specifically states the desired outcome to become a zero-waste business.
- **Measurable** – it can track and analyse how many materials are verified.
- **Attainable** – the company has control over which suppliers they work with and can require product verification from their suppliers to meet this target.
- **Relevant** – it applies to 80% of their material usage by volume.
- **Time bound** – the company aims to achieve the target by 2025.

Source: HKEX[95]

If issuers follow a systematic way of disclosing their information, **machine learning** tools can easily retrieve specific items from the disclosed information. Miotech[96] developed an **Artificial Intelligence** that incorporates machine learning and natural language processing. With Artificial Intelligence, quantitative data can be easily extracted from ESG reports. Technologies also allow unstructured and qualitative data to be processed by machine learning tools. **Natural language processing** allows important information contained in paragraphs to be extracted. **Optical character recognition** tools can digest information from graphs and tables. The tool is trained to highlight certain keywords, such as 'pollution', 'environment' to increase the accuracy. This is particularly useful in analysing management discussion on environmental target and policies.



Third, technologies can help with **data engineering**. RS Metrics has developed ESGSignals[97], which can be used to visually observe the impact of a firm's ESG performance based on **satellite analytics**. The system gathers high-resolution images from satellites, aeroplanes and drones and analyses images according to a few measures, including land usage (perimeter of property and construction), environmental impacts (air quality, pollutants and emissions), employment (employee cars), clean energy (renewable energy project progress) and production and raw materials usage (semi-trailer trucks, rail cars, stockpiles and products).

QuantCube[98] analyses satellite data by combing satellite information and on-ground information, such as the level of sulphur dioxide and nitrogen dioxide particles and information about wind speed and direction. By connecting a pollution cloud to a site, the pollution can be traced back to its source and the pollution information can be contributed back to the polluting source[99].

Compared to other regulatory tools, satellite analytics provides two main benefits. Whereas in most cases, environmental data is self-reported by the company, satellite images are an independent and objective source of information. This is less likely to be subject to biased or fraud. Second, satellite images provide a way to verify the accuracy and authenticity of information disclosed. It deters companies from over-reporting their ESG efforts or down-playing their pollution levels.

Fourth, technologies can help with **data transformation**. Part of the problem for ESG integration in financial decision lies in the inaccessibility and unavailability of good, reliable and consistent ESG data (In, 2019)[100]. As different definitions encompass the elements of the underlying construct differently, ESG measures have inevitably become incomparable (Griffin, 1997)[101].

Organisations are working to set a **standard** for ESG and environmental data disclosure. International Integrated Reporting Council (IIRC) is a coalition of industry participants that promotes a standardised framework of ESG disclosure in corporate reporting[102]. The Global Reporting Initiative (GRI) has worked with various stakeholder groups to develop sustainability reporting standards[103]. These standards include a list of business activity groups with relevant sustainability topics that correspond to each group. The Sustainable Accounting Standards Board (SASB) seeks to promote uniform accounting standards for sustainability reporting[104]. The SASB has developed the SASB Materiality Map which lists relevant ESG-related, sector-specific factors that the organisation deems to be material.

Technologies can help with transforming and aggregating the data from one format to another format. **Robotic process automation** has gradually proved that it is capable of contributing to this process. It demonstrates that it can be more user-friendly, supportive of a large amount of data, capable of instant data monitoring and analysis and capable of minimising human errors, such as fat finger errors and duplicated entry.

[97] See <https://rsmetrics.com/esgsignals/>

[98] See <https://www.q3-technology.com/>

[99] See <https://wholesale.banking.societegenerale.com/en/insights/news-press-room/news-details/news/will-satellites-become-the-eyes-sustainable-investing/>

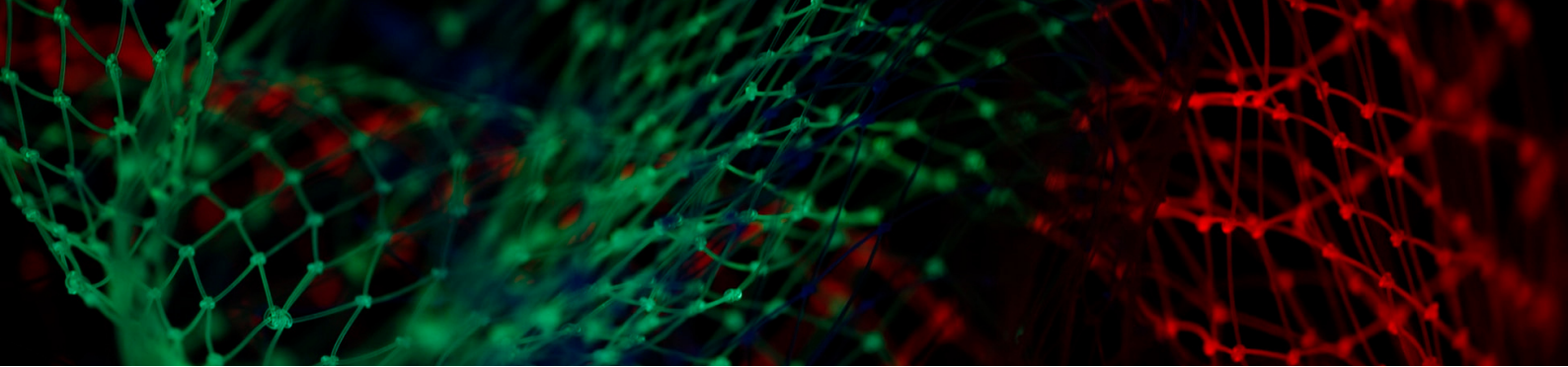
[100] In, S. Y., Rook, D., & Monk, A. (2019). Integrating alternative data (also known as ESG data) in investment decision making. *Global Economic Review*, 48(3), 237-260.

[101] Griffin, J. J., & Mahon, J. F. (1997). The corporate social performance and corporate financial performance debate: Twenty-five years of incomparable research. *Business & Society*, 36(1), 5-31.

[102] See <https://integratedreporting.org/>

[103] See <https://www.globalreporting.org/>

[104] See <https://www.sasb.org/>



In the context of environmental data, technologies help in two ways. First, technologies enable companies to transform their environmental raw data into a standardised format. Second, technologies enable investors and other parties to transform the standardised environmental data into data useful for investment decisions. The SASB has developed the SASB Navigator which allows users to analyse disclosure quality of SASB topics for 4,000+ companies' public filings, examine and benchmark against industry performance for SASB metrics, and access evidence of financial impact[105].

Fifth, technologies can help with **data presentation**. Visual analytics tools are capable of transforming often complicated data into an easy-to-digest format. Visual analytics turn disclosed environmental data and KPI into different formats, such as **tables, graphs, scores and rankings**. Refinitiv has created 'ESG Scores'[106] that transparently and objectively measure a company's relative ESG performance, commitment and effectiveness across 10 main themes based on publicly reported data. Sustainalytics[107] give companies different ESG risk rating based on exposure and management. Miotech[108] has invented a system that gives companies different ESG ratings based on multidimensional **metrics** supported by its comprehensive rating methodologies. Parties can compare the ratings of different companies in the same industry and across a timeline. These tools allow parties, such as investors, fund managers and the board of companies, to have a better understanding of climate risk and key metrics. The board of companies can understand the trend in data and KPI and make management decisions. Fund managers and investors can compare the disclosed data and allocate their investments accordingly.

Permira monitors portfolio company progress using iLevel, a portfolio monitoring tool also used for financial oversight and reporting[109]. Permira developed a set of ESG-related KPIs against which all portfolio companies are required to report[110]. These include data on energy, safety performance, workforce and material ESG incidents. Apax Partners has a data collection system through which the firm monitors, track and reports on the ESG performance of portfolio companies[111]. Apax gathers qualitative and quantitative data from its portfolio companies. The system is designed to highlight each portfolio company's performance in what Apax regards as key areas of investment risk and opportunity. This data allows Apax Partners to get a better understanding of the **materiality** of certain ESG KPIs to the overall operations of a portfolio company as well as on an aggregated level.

The above is built on the assumption that the data is comparable, for example, they are under the same metrics or definitions. Otherwise, the comparison between firms is less meaningful. In the fund's space, three Dutch investors, APG, PGGM and AlInvest initiated a project to develop a practical tool for General Partners (GPs) to facilitate regular ESG reporting to Limited Partners (LPs) during the lifetime of a fund. They created an ESG Reporting Template for Private Equity. Through **standardisation** of reporting of data, investors can easily compare and track their investments' efforts on ESG[112].

[105] See <https://www.prnewswire.com/news-releases/sasb-releases-robust-research-and-analytics-tool-300347955.html>

[106] See <https://www.refinitiv.com/en/sustainable-finance/esg-scores>

[107] See <https://www.sustainalytics.com/esg-ratings/>

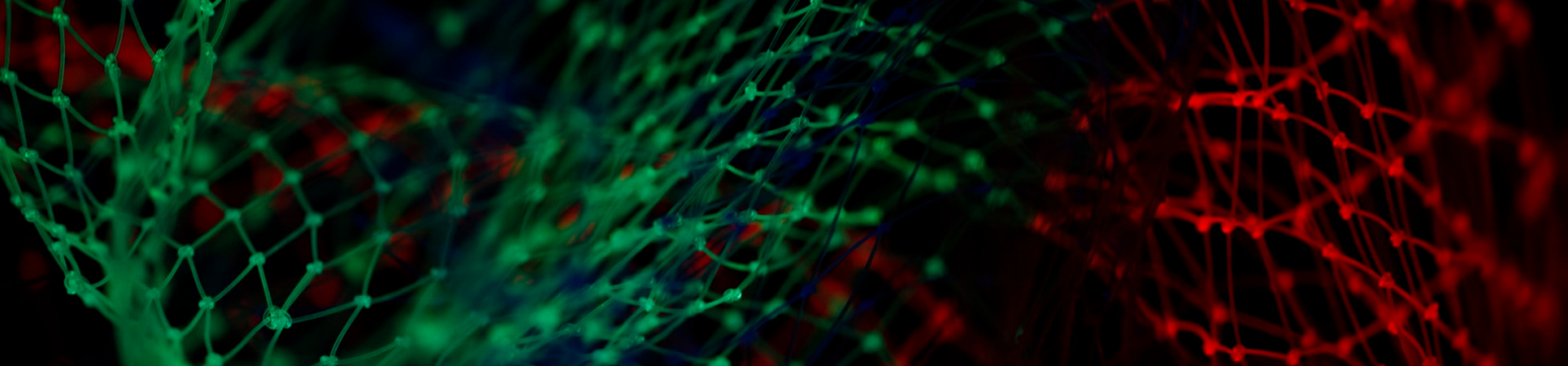
[108] See <https://www.miotech.com/en-US/article/5d64f51328eb50003cb7e79f>

[109] See <https://www.finextra.com/pressarticle/59250/permira-chooses-ilevel-to-manage-portfolio-data>

[110] See <https://www.unpri.org/download?ac=4839>

[111] See https://www.apax.com/imported-media/771543/001501_Sustainability-Report_FINAL.pdf

[112] See <https://www.unpri.org/private-equity/case-study-three-dutch-investors-on-esg-monitoring-reporting-and-dialogue-in-private-equity/3316.article>



Machine learning tools are capable of spotting whether a particular ESG report is well written or falling below disclosure standards. Miotech leverages its database and machine learning tools to identify mistakes or misrepresentations on ESG reports. Based on the data comparison with peer companies in the same industries, significant transparencies, errors and outliers can be more readily detected.

The Hong Kong Exchanges and Clearing (HKEx) has built an **Artificial Intelligence** algorithm that could not only read unstructured data from most complex corporate filings but also infer sufficient context to make an assessment about the substance of those documents[113]. Historically, the process of checking whether each company is disclosing the relevant information that the Listing requires of them was conducted manually, using a thematic and sample approach. However, Artificial Intelligence allows the HKEx to monitor reports of more than 2,500 companies listed on its market more efficiently. The Artificial Intelligence was trained to look for contents that are not always straightforward. As an example given, listed companies must disclose the attendance record of their directors in broad meetings during the year. This information may be presented in a graphic, next to a board member's photo, in prose, a table or in some cases, it may be missing from the report. The HKEX relied on the use of Artificial Intelligence to read and analyse attendance data, as well as information related to more than 100 different Listing Rules. This shows that the capabilities of machine learning and Artificial Intelligence can be unleashed and used in the context of monitoring the disclosure of climate risk.

[113] See https://www.hkexgroup.com/Media-Centre/Insight/Insight/2021/Lukas-Petrikas/AI-is-Bringing-a-Generational-Change-to-the-RegTech-Industry?sc_lang=en and https://www.hkexgroup.com/-/media/HKEX-Group-Site/ccd/Media-Centre/Insights/pdf/HKEX_PAI_paper.pdf



Regtech Applications in Green Finance

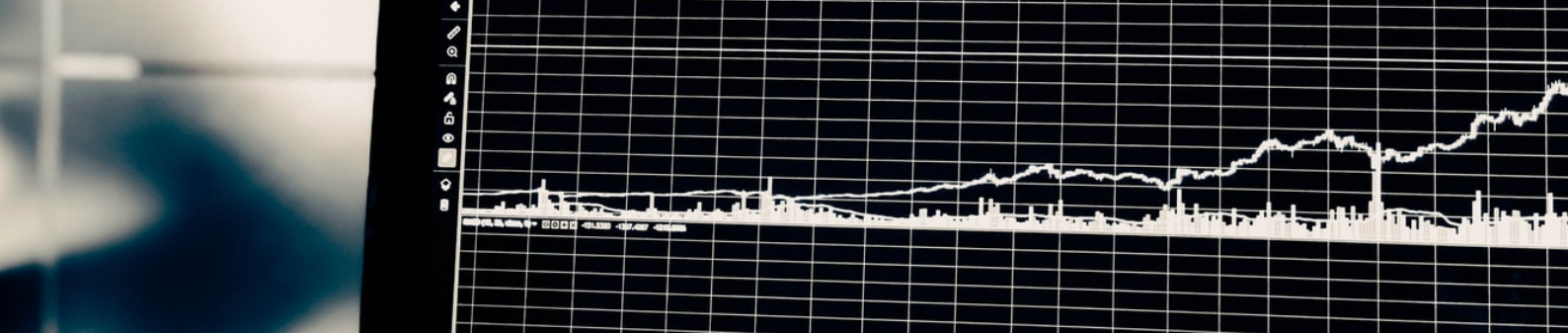
Using data technologies and statistical tools, such as scenario analysis, simulation and stress testing to enhance risk management and governance framework

According to the Intergovernmental Panel on Climate Change (IPCC), the average temperature around the globe is currently about 1.5°C higher than preindustrial levels[114]. The rise in average temperature with the increase of greenhouse gas emission has contributed to climate change. Climate change may result in physical risks, transition risks and liability risks[115]. These risks pose challenges to the financial system.

Physical risks are climate risks resulting from extreme weathers and natural catastrophic losses that increase the cost of operations of businesses and risks of investments. The impacts can be direct, for example when a drought or a flood affects agricultural productivity; and indirect, for example, when a typhoon or hurricane destructs transportation infrastructure and ultimately disrupt global supply chains. The direct and indirect physical risks can affect businesses and ultimately the default rates, and credit losses of those businesses. These affect portfolios that invested money into, and banks which have lent money to those businesses.

[114] See <https://www.ipcc.ch/sr15/>

[115] See <https://www2.deloitte.com/gr/en/blog/risk-advisory/2020/financial-risks-stemming-from-climate-change.html>



Transition risks are climate risks resulting from mitigation challenges as societies move towards environmental protection. Governments around the world are implementing initiatives to move the society and economy towards environmental protection and this increases the costs of running businesses that pollute or violate the principles of environmental protection. Resources extraction and energy businesses are likely to be affected while manufacturing and other secondary industries may also be affected. Governments may impose a pollution quota on how much a business can create and a special carbon tax added to polluting businesses. Businesses will have to make certain adjustments that require mobilising substantial amounts of capital to invest in climate change mitigation and adaptation to be completed within the timeline. These affect the profitability and business sustainability of businesses.

Liability risks refer to risks when a customer or company seeking compensation for losses they have suffered as a result of physical or transactional risk related to climate change. The primary liability risk can be that insurance companies would receive more insurance claims because of natural disasters and other unpredictable losses. Insurance premiums may have to be adjusted to cover the expected increase in compensation. Also, investors investing in businesses affected by climate change may suffer a loss. If asset managers and investment advisors have not made sufficient disclosure on material risk factors to the investors, they may face lawsuits.

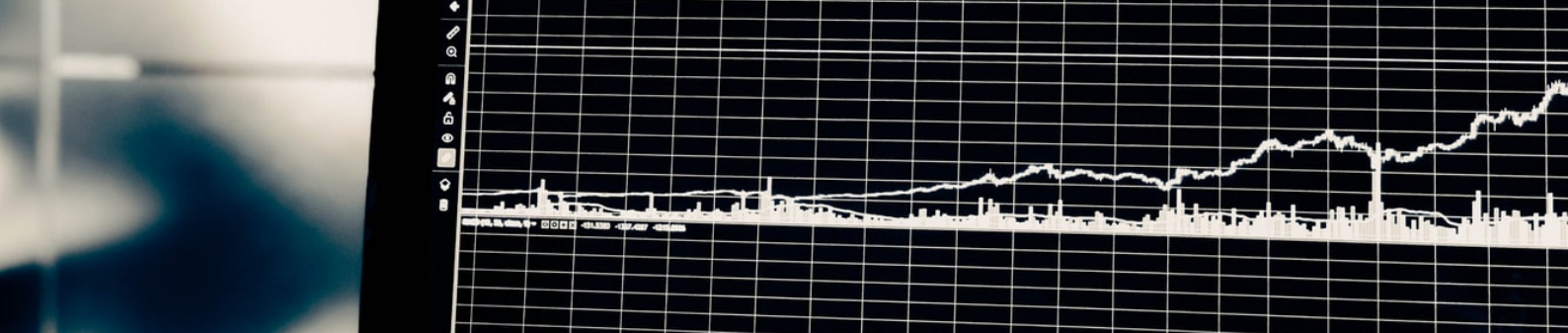
The failure of incorporating these risks can lead to a mispricing of assets and misallocation of capital. A sudden shock, such as a natural disaster, can have spill over effects on the economy. Climate risks can affect different sectors in the economy and potentially become a financial crisis if the financial sector has underestimated the climate risk and have not prepared sufficiently to handle these risks.

Regulators are calling for an efficient **risk management** mechanism. According to the SFC consultation paper[116], fund managers would be expected to incorporate climate-related risks into their existing risk management framework due to their potential adverse impact on the value of investments and in response to growing concerns of investors about change. It is proposed to amend FMCC to include duties for fund managers to implement adequate procedures for identifying, assessing, managing and monitoring material climate-related risks.

The Prudential Regulation Authority (PRA) in the UK published a policy statement[117] setting out not only the expectations as a firm's responses to manage financial risks arise from climate change but also a strategic approach in order for those to be properly and effectively addressed. It is recognised that climate-related risks have the potential to affect **financial stability**. It is recommended that banks and other financial institutions must effectively collaborate with supervisors to assess both qualitatively and quantitatively the impacts of physical and transition risk, and adopt appropriate key metrics indicators to monitor these risk. One of the key themes relates to risk management, which focused on:

[116] See <https://apps.sfc.hk/edistributionWeb/api/consultation/openFile?lang=EN&refNo=20CP5>

[117] See <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/letter/2020/managing-the-financial-risks-from-climate-change.pdf?la=en&hash=A6B4DD1BE45B2762900F54B2F5BF2F99FA448424>



- Identification of material exposures to physical and transition risk;
- Development of sustainability risk policies covering specific sectors/customers;
- Measurement of short-term and long-term risks;
- Models enhanced to include climate-related risks in the credit decision-making process; and
- Reporting and management information to drive board and senior management to discuss, challenge and take decisions relating to the firm's management of the financial risks from climate change.

The PRA recommended that climate risk analysis should be conducted to size the risk exposure across the financial system, using a consistent and comparable set of data-driven scenarios.

In one of the interviews conducted for this paper, CRIF[118], a company specialising in credit and risk management solution, said it has integrated ESG factors into credit life cycle processes through ESG impact analysis on the portfolio, sustainable credit policy, review of the origination process. It has also optimised risk evaluation by integrating ESG factors into the risk appetite framework and credit risk models.

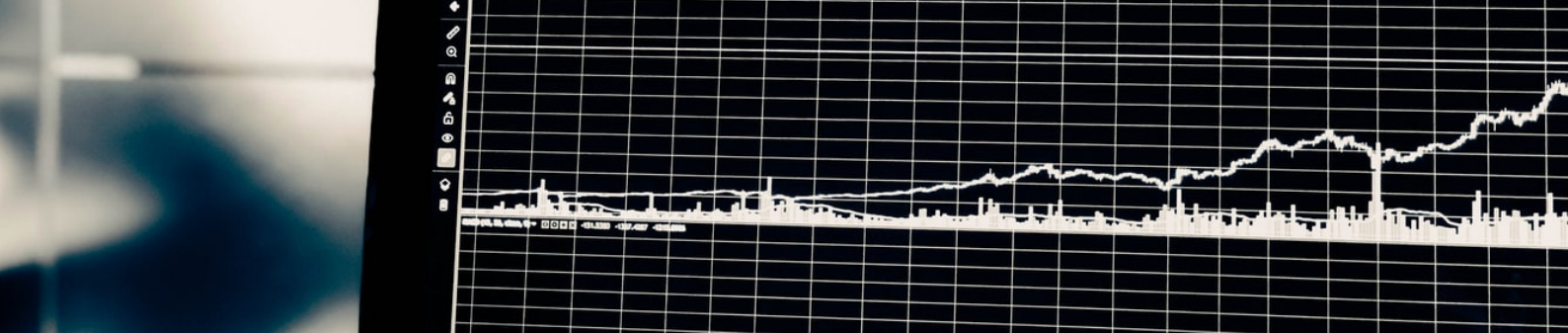
S&P Global has been including climate risk exposure into **credit ratings** for some time[119]. It integrates ESG factors into all of its products and services, including the calculation of different indices, such as Dow Jones Sustainability Indices and Carbon Efficient Indices. S&P uses Trucost carbon data to divide companies into deciles within their own industry based on their carbon intensity. These deciles are used to weight inclusion in the benchmark according to set formulas.

An S&P white paper[120] also suggested some macroeconomic **modelling** frameworks that have been developed to analyse the impacts of climate change. Integrated assessment modelling helps us understand the correlation between human development, societal choices, and the natural world, including climate change. This helps policymakers draft climate change policies factoring in future projections of various dimensions. Some of these models incorporate geographical and physics data and estimation into the calculation. For example, Representative concentration pathways is a greenhouse concentration trajectory adopted by the Intergovernment Panel on Climate Change. It describes different climate futures which depend on the volume of greenhouse gases emitted. It helps different models to arrive at an accurate conclusion.

[118] See <https://www.crif.com/>

[119] See <https://www.spglobal.com/en/research-insights/featured/quantifying-climate-risk>

[120] See <https://www.crisil.com/content/dam/crisil/our-analysis/reports/gr-a/whitepapers/2020/02/quantifying-climate-risk.pdf>



The International Finance Corporate, a member of the World Bank Group[121], suggested that **climate risk analysis** should adhere to established patterns of risk analysis, which follow the identification, analysis, quantification, mitigation and monitoring. Companies need to assess business risks of climate change in light of their particular strategy, risk tolerance, and other business specificities. For example, a food company would need to focus on the availability for crop production, supply chains and other factors. The identification and analysis of potential risks begin by taking multiple sources of data and modelling them in various scenarios.

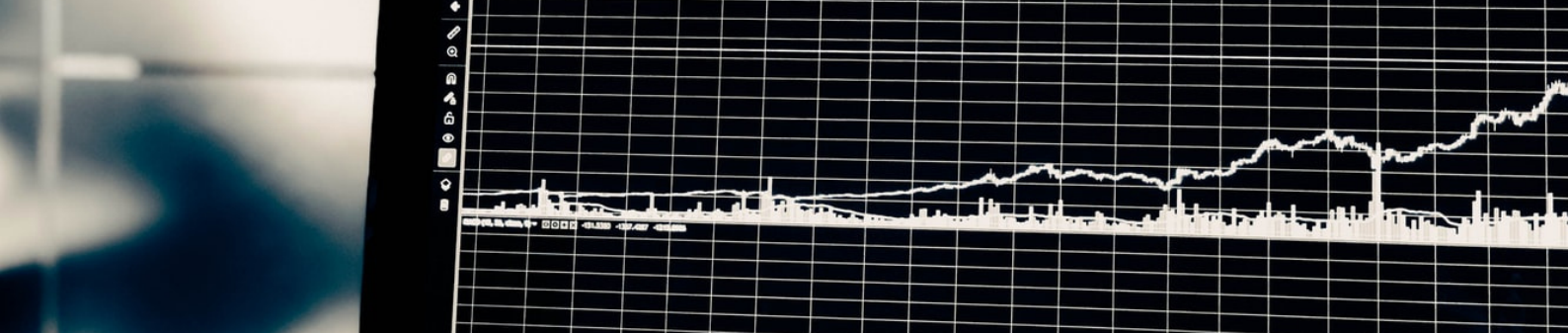
Computer algorithms are increasingly helpful in conducting different statistical modelling, including sensitivity analysis scenario analysis and simulation. Scenario analysis refers to the process for identifying and assessing the potential implications of a range of plausible future states under conditions of uncertainty. It builds on hypothetical constructs and not designed to deliver precise outcomes for a forecast. **Scenario analysis** allows different parties to have an estimate of what will happen based on assumptions, such as macroeconomic and financial market variables and the rate of climate change and remedial action.

Models allow a business to understand how its assets, systems and critical operations are exposed to the frequency, severity, and duration of climate change and to determine how this exposure will change over time. **Sensitivity analysis** gives an estimation of how the target variables, such as financial performance and resilience are affected based on the changes in other input variables, such as the change in frequency and intensity in natural disasters. With this information, a business can begin to analyse the impact of climate risk on operations, financial returns, performance and the ability to meet customer needs. Furthermore, businesses can then determine the best approaches, plans and options to mitigate climate risk, including increasing its resilience to climate risk as well as purchasing risk mitigation insurance for hedging.

The Bank of England published a discussion paper and explains that it will use its 2021 biennial exploratory **scenario** to explore the financial risks posed by climate change[122]. The three scenarios include early policy action (optimistic scenario); late policy action (pessimistic scenario); and no additional policy action (baseline scenario). In different scenarios, there are different assumptions regarding climate risks. For example, in the early policy action, it is assumed that a carbon-neutral economy starts early and a structural reallocation and remedial will take place. So, there will be no other macroeconomic shock. In the late policy action, it is assumed that the global climate goal is met but the transition is delayed and so remedial action must be more severe to compensate for the late start. In this scenario, it assumed action to address climate change is delayed by ten years and will bring significant disruption to the economy.

[121] See [https://www.ifc.org/wps/wcm/connect/9a31c7b5-4ddf-4d4e-9f37-
ea9cddb32015/Note-10-EMCompass-How-New-Data-Tools-Can-Assess-
Climate-Risks.pdf?MOD=AJPERES&CVID=lt8amXR](https://www.ifc.org/wps/wcm/connect/9a31c7b5-4ddf-4d4e-9f37-
ea9cddb32015/Note-10-EMCompass-How-New-Data-Tools-Can-Assess-
Climate-Risks.pdf?MOD=AJPERES&CVID=lt8amXR)

[122] See [https://www.bankofengland.co.uk/paper/2019/biennial-exploratory-
scenario-climate-change-discussion-paper](https://www.bankofengland.co.uk/paper/2019/biennial-exploratory-
scenario-climate-change-discussion-paper)



A publication by Deloitte[123] suggested how climate risk can be incorporated into the risk management framework to take into account the credit risks, such as the probability of default, loss given default, concentration risk etc. Simulations can be run to obtain necessary risk data, such as operational risk, market risk, liquidity risk and reputation risk. **Computer algorithms** may calculate different probabilities of results given the data input. This allows parties to plan and implement different risk management measures and mitigate the negative impacts brought by climate risks.

Consulting firms have used different data technologies and **statistical tools** to predict the spill over economic losses due to climate risk. McKinsey[124] estimated that losses from flooding could devalue exposed home by US\$30 to \$80 billion or 15 to 35 per cent by 2050. This could in turn impact property tax revenue in some of the most affected counties by 15 to 30 per cent. There could be knock-on impacts on the whole economy. For example, when infrastructure is destructed by natural disasters, the local economies can be affected. McKinsey estimated that in Ho Chi Minh City, direct infrastructure asset damage from a 100-year flood could rise from about US\$200 to \$300 million today to US\$500million to US\$1 billion in 2050. The knock-on costs to the whole economy could rise from US\$100 to \$400 million to between US\$1.5 billion and \$8.5 billion.

In December 2020, the HKMA[125] invited financial institutions to participate in a pilot exercise on the **climate risk stress test**. Stress testing refers to a computer test run by algorithms that analyse how banks and investment portfolios react during a stressed period. During the stress test, participating banks will need to assess physical risk and transition risk separately under different scenarios in order to allow for a better understanding and assessment of the impact of each of these risks. It is hoped that the stress test will assess the climate resilience of the banking sector as a whole and facilitate the capability building of participating banks for measuring climate risks.

After arriving at an estimated casualty and economic losses figure, technologies can also allow different parties in the markets to evaluate their existing risk management and investment allocation policies. State Street has back-tested numerous approaches to integrating climate risk into passive portfolios and many of these approaches deliver significant returns for less than 20bps of risk[126].

[123] <https://www2.deloitte.com/gr/en/blog/risk-advisory/2020/financial-risks-stemming-from-climate-change.html>

[124] <https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-risk-and-response-physical-hazards-and-socioeconomic-impacts>

[125] <https://www.hkma.gov.hk/media/eng/doc/key-information/guidelines-and-circular/2020/20201204e1.pdf>

[126] See <https://www.spglobal.com/en/research-insights/featured/quantifying-climate-risk>



Conclusion

Green finance and regtech are becoming popular topics in the banking and asset management industry. While the OECD estimates that as much as US\$7 trillion will be needed each year up to 2030 to meet climate and development objectives, Bloomberg estimated that the global ESG assets are on track to exceed US\$53 trillion by 2025. Hong Kong government has launched different initiatives in support of green finance. The market in green finance is expected to grow exponentially building on the increasing investment opportunities and demand, the supportive government policies, strong expertise, robust green bond infrastructure.

However, there remain regulatory challenges in green finance. Greenwashing is misleading yet common; there are insufficient reporting and disclosure and inconsistent presentation and measurement of environmental data; climate risk has been excluded and miscalculated and there is insufficient climate risk management and governance.

We estimate the regulatory trends in green finance to include four perspectives: namely businesses and investment managers will need to (1) disclose more and unified environmental data related to their business operations and

investments; (2) establish an effective risk management mechanism that takes into accounts climate risks; (3) incorporate environmental data and climate risks into their investment management and strategies; (4) have a robust governance and management that monitors the progress and oversees climate risks and opportunities.

This white paper suggests four regtech applications in green finance. Combining existing technologies and new technologies, regtech has the potential of playing a big part in combating regulatory challenges.

To make technologies more effective, regulators should continue to take the lead in the development of green finance to encourage market developments. Regulators should create and adopt a globally unified standard and benchmark for green finance. Regulations should ensure there is sufficient disclosure to enable investors and the public to understand the nature of the investment as well as to empower them to monitor and evaluate the environmental progress of those investments. Banks can be a catalyst when the need for green finance is creasing. Companies which are not disclosing data might face a competitive disadvantage in the future.



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ABOUT FINTECH ASSOCIATION OF HONG KONG AND ITS REGTECH COMMITTEE

Fintech Association of Hong Kong is a not-for-profit ecosystem builder that has over 1300 members representing 300+ firms and is the largest FinTech association in Hong Kong. Our wide-ranging membership comprises global and domestic FinTechs, financial institutions, technology service providers, consultancies, law firms, academia and students.

Fintech Association of Hong Kong's Regtech Committee is one of its most active committees, and has launched collaborative initiatives such as the Regtech Live! events, the APAC Regtech Network and World Regtech Summit, and has been recognised by the Hong Kong Monetary Authority as "play[ing] a key role in the [regtech] ecosystem."

<https://ftahk.org/>

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October 2021

OUR CHANGING CLIMATE

APPLYING REGTECH TO GREEN FINANCE

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