

This report has been developed on behalf of Sustainable Finance Ireland to inform the development of Ireland's Sustainable Finance Roadmap.

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DIGITAL ESG DATA INPUT PAPER

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Digital ESG data

Input paper to Ireland's Sustainable Finance Roadmap

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The report is edited by Green Digital Finance Alliance (GDFA) executive director Marianne Haahr and with support and consultation from Financial Centers for Sustainability (FC4S) and Sustainable Finance Ireland. The content is the responsibility of the author. It has been developed in a sprint editorial and research process of only ten days and it is therefore a first input into the design of a sustainable finance roadmap for Ireland. GDFA is a UN-convened nonprofit foundation with a mission to scale green finance with fintech. FC4S is a UN-convened network of financial centers with a mission to scale alignment of financial and capital markets with the SDGs.

1. Introduction

Computer driven assessment of financial data and humanled assessment of non-financial information are two preponderant trends in financial and capital markets. Machine learning, Big Data and Artificial Intelligence (AI) play fundamental roles in the financial system. Fully automated wealth management services and algorithmic trading, for instance, are used to optimize financial decisions. The challenge of combining digital technology and Environmental, Social and Governance ESG data relates to the characteristics of the underlying data, which when compared with traditional financial accounting data is none standard and incomplete. Most ESG risks tend to be under-disclosed, none-standardized, and inconsistent which significantly limits the ability for automated ESG analysis.

The first generation of digital ESG data solutions for finance mainly leverage AI for Big Data analysis to pick up additional signals about company behaviors online through automated textual analysis. These data sets are harvested with high frequency and analyzed in combination with company self-disclosed data to create automated company ESG scores. New disclosure regulatory requirements contained in the new Sustainable Finance Disclosure Regulation (SFDR), the sustainable finance taxonomy and in emerging national climate disclosure regulation aligned to the Taskforce for Climate Related Financial Disclosures (TCFD) is currently driving demand for a second generation of digital ESG solutions. Disclosure requirements are shifting from company to business unit level, from qualitative to quantitative metrics and from climate only to extend to nature risk metrics which call for more geolocation specific data. For some risks the data layer is available, such as for deforestation risks, as government funded open-source satellite repositories are open source. For other risks data is not available. It is demanding a shift in the data foundation digital ESG providers leverage from mainly relying on Internet available data to also requiring more geolocation specific data harvested from the real economy. It also means a shift from mainly leveraging Natural Language Processing (NLP) capabilities of AI towards starting to look into leveraging Internet of Things (IoT), satellites and other remote sensing technologies. It is very early days in the transition from first to second generation digital ESG data solutions and nature risk disclosure requirements will further accelerate it over the coming years.

To successfully manage this transition a system-wide approach is needed where the public and the private sector collaborate to improve the data foundation that unlock innovative supply of this new generation of digital ESG applications. Public sector data infrastructure plays an important role in designing a data foundation that is fit for purpose. This can include, but is not limited to, digital infrastructure for energy data, for real estate data, geolocated emissions data and nutrient and pollution leakage data, biodiversity-sensitive area data and habitat connectivity data. Part of these data sets are available in different public databases.

Small nations tend to be highest on the digital adoption index. Ireland is no exception. It ranks 6th out of 28 EU Member States in the Digital Economy and Society Index 2020. The country has a unique mix of a progressive central bank being a frontrunner in sovereign green bond issuance. It is an important player in the EU capital markets and has a vibrant fintech community. This paper explores potential niche positionings of Ireland in the digital ESG data market. It firstly outlines the current state of play in the digital ESG data market highlighting current data gaps and country practices. Thereafter it identifies a set of opportunity avenues for Ireland in the digital ESG as an input into the development of the sustainable finance roadmap.

2. Current ESG data gap

Digital technology is not a silver bullet to address all the ESG data challenges but applying digital technology to ESG data harvesting and deployment to a similar degree as to other parts of finance is the only viable way to scale sustainable finance. Digital ESG solutions need a fit-for-purpose data foundation. There is plenty of public sector data but most of it is unstructured and not clean, which inhibits it from acting as an input into digital ESG solution design. The degree of digitization of the real economy, and therefore also the state of the data foundation, varies greatly across jurisdictions. It also varies according to financial sector whether banking, asset management, funds, or insurance.

The current data chain and associated data gaps look different depending on whether the use case is for greening the loan books of a bank or for delivering on net-zero commitments of insurers, asset managers and funds. Other factors include whether the use case involves assessing climate or assessing nature-related financial risks as part of a greening agenda. The first has a more mature data value chain with a greater supply of standardized data products whereas for nature-related risks the data market is in its very early stages of development with less standardized product offerings.

2.1 Climate-related data – gaps and digital ESG opportunities

The Task Force on Climate-related Financial Disclosures (TCFD) framework has established itself as best practice with a global footprint. It is currently moving from principles to rules by becoming integrated into regulatory requirements across several jurisdictions. New Zealand¹ was the first to issue a TCFD-aligned disclosure regulation this year and the UK’s TCFD-aligned law is currently in draft. In addition, the European Commission has incorporated the TCFD recommendations into the Guidelines on Reporting Climate-Related Information to support companies in disclosing climate-related information under the European reporting requirements. Digital ESG solutions aligned to TCFD are currently mainly based on company-disclosed data and mainly for scope one emissions.

Table 1 Data layer per asset class

Asset classes				
	<i>Listed equities</i>	<i>Listed green fixed income</i>	<i>Real estate</i>	<i>Non-listed SMEs</i>

		instruments and transition bonds		
Data layer	Disclosure of emissions Social media Reg flags (fines etc.) Reporting initiatives incl. GRI/CDP etc.	Mainly reporting from issuers with low degree of automation of data collection. 3 rd party verifier	Property registry Energy consumption Energy label (EPC) Metrological data	Credit book data Sector average emissions to leverage AI for emissions calculations
Technology deployed	AI in the form of NLP for textual analysis		AI, IoT, Big Data.	AI, Big Data.
Data gap	Scope 3 emission data and for some also scope 2	Less a question of a data gap and more a question of efficiency and credibility of impacts.	Real-time energy consumption EPC on parts of the building stock Data on flexibility readiness	Measured carbon emissions scope 1,2, & 3 1.5-degree transition pathway
Potential additional technologies to address data gap	Satellites for emission data & physical climate risks IoT	IoT, intelligent chips, satellite data, data tokens, DLT	Satellites for real estate heat mapping AI linked to smart meters for real-time consumption data	AI to analyze SME transaction data incl. utility bills for automated energy efficiency rating

Listed equities

Nearly 60 percent of the world’s 100 largest public companies support the TCFD, report in line with the TCFD recommendations, or both. On average across the TCFD recommendations, 42 percent of companies with a market capitalisation greater than \$10 billion disclosed at least some information in line with each individual TCFD recommendation in 2019. Energy companies and materials and buildings companies are leading on disclosure, with an average level of TCFD-aligned disclosures of 40 percent for energy companies and 30 percent for materials and buildings companies in fiscal year 2019. According to the Financial Stability Boardⁱⁱ there is a need for progress in improving levels of TCFD-aligned disclosures given the urgent demand for consistency and comparability in reporting. The biggest reporting gaps are in disclosure of the potential financial impact of climate change on their businesses, strategies, and financial planning. There are significant geographical differences in TCFD disclosures with financial institutions and companies in Europe having the highest percentages of TCFD-aligned disclosures.

Digital ESG data solutions available to the financial services industry on listed equities mainly leverage three data layers for AI analysis. First, company disclosure data, sentiment analysis and public databases on company red flags. Overlaying of disclosure data with sentiment data from web and social media-trolling analysis enables a higher frequency of company rating than if the data layer was limited to the annual corporate annual and sustainability reports. Several of the largest ESG data providers leverage artificial intelligence supervised analysis (algorithms) of company disclosure reports and applied machine learning techniques to score companies on alignment with the four TCFD recommendations and the underlying 11 indicators. From a digital technology perspective this is mainly leveraging textual analysis using the Natural Language Processing (NLP) capabilities of artificial intelligence based on a data taxonomy, where

algorithms are trained to pick specific words and categorise these to automatically analyse texts, in this case textual analysis based on TCFD keywords.

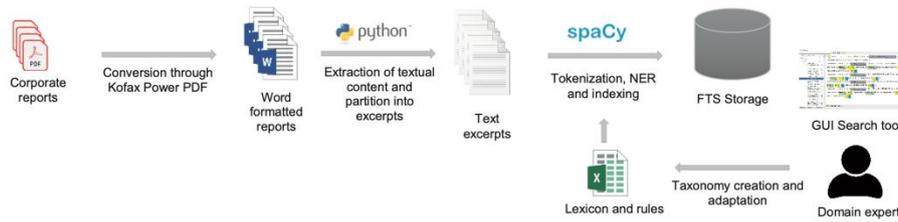


Figure 1 Design of AI supervised TCFD indexing of financial service institutions developed by Central Bank of Spain

The biggest gap in this company disclosure data layer is found among the category of smaller companies, geographically for companies in Latin America and from an industry perspective the technology and media and the consumer goods industries lag behind TCFD-aligned disclosures. In total 26 percent of the FSB-surveyed companies disclose scope 1, 2, 3 emissions. For all sectors company scope 3 carbon emissions is the biggest data gap. Scope 3 includes everything beyond the direct operations and electricity use of the company, including supply-chain operations and end-product usage by customers. Regulators are increasingly focusing on scope 3. The same is true for asset owners and asset managers as the number with net-zero commitments is rapidly increasing, which generates an increasing demand for scope 3 emissions data to account for emissions from corporate value chains.

Table 2 Average percentage of disclosure by industry (FSB, TCFD 2020 status report)

Average Percentage of Disclosure by Industry	
Energy	40%
Materials and Buildings	30%
Insurance Companies	27%
Ag., Food, and Forest Products	25%
Banks	23%
Transportation	23%
Consumer Goods	18%
Technology and Media	13%

The EU taxonomy will take climate-related disclosures to the next level of requiring financial institutions to understand which parts of their portfolio make a significant contribution to the EU environmental strategy. It requires a thicker and deeper data layer for FI to assess the taxonomy alignment of their portfolio. It will shift the requirements from being able to use disclosed and sentiment data to requiring emission

data from the real economy. Central banks and financial regulators across multiple regions are currently developing green finance taxonomies with some degree of alignment to the EU taxonomy to avoid fragmentation of regulatory requirements, which will fuel demand for digital-first solutions to taxonomy alignment tools.

Listed fixed income instruments and transition bonds

The sustainable bond market has grown rapidly in recent years, and green bonds have emerged as an effective investment tool to finance the transition to a low-carbon economy. Design of green and sustainable bond frameworks and use of proceeds and proof of impact reporting data collection push up issuance costs. Bond trading is highly digitized. Several exchanges and treasuries for sovereign bond issuances have started to deploy the next generation of digital

technologies of distributed ledger technology, or DLT, to further accelerate automation. The World Bank was the first to issue a DLT-powered sustainability linked bond (with CBA in Australia in 2018). It enabled the book-building to happen automatically, governance was digitized, and bids were entered directly on the digital platform, but coupon payments were settled off-chain. BBVA has issued a green bond on the blockchain, and BIS innovation lab is this year including a proof of concept of a tokenized digital bond into its innovation lab program.

Hence the use of DLT in the bond market is most mature in using the technology for structuring, registration, sales, and distribution rather than for green and broader ESG metrics.ⁱⁱⁱ Currently data collection from the underlying assets is mainly based on manual reporting. A gradual shift from manual reporting to a more automated approach (e.g., leveraging data token approach) where IoT is leveraged for reporting directly from the underlying asset is more ready for some assets and in some jurisdictions. Renewable energy is the readiest asset for the testing of a fully automated reporting via DLT-enabled chips incorporated into the asset and via data tokens communicating directly to the wallet of the investors.

Real estate

Real estate is the largest asset class in the world and it accounts for between 30 to 40 percent of all emissions. In the EU buildings are responsible for 40 percent of energy consumption. In the EU, 200 million dwellings were built in the last century, making the renovation of the existing building stock by 2050 a major and unprecedented challenge. An Energy Efficient Mortgage (EEM) Label was established in 2020 by the European Mortgage Federation. Ambitious climate targets of an increasing number of countries require massive private investments into energy efficiency, and the electrification of heating and energy systems of building stocks.

Financial institutions are in a perfect position to accelerate decarbonisation of real estate, through their touchpoint with end customers and ability to finance the investments. Easy access to energy data for financial institutions is fundamental to scale up lending to energy renovations. Financial service institutions in most countries have to navigate data infrastructures composed of a myriad of centralised databases with different data owners. In many jurisdictions data relevant for energy efficient mortgage or green mortgages are distributed between four to eight data registries with varying degrees of data quality and accessibility. The latter is further complicated by data privacy rules that apply to geo-localised energy consumption data in many jurisdictions and the former because some data points are manually entered. Data infrastructure design pushes up the information search costs in the identification stage of EE mortgage finance or other financing solutions to decarbonise real estate.

The necessary raw data regarding basic physical building parameters and building geolocation can be found in property registries. Local weather data is available from methodological services, while energy consumption data tends to be housed with different utilities for heating, water and electricity. EPC labels tend to vary in data quality and often lead to generic retrofit advice. The UK, Ireland, Denmark, Belgium and Portugal have all issued more than one certificate per 10 citizens.^{iv} There is current on-going work to design and test a framework of ten “next-generation EPC features” which include elements such as data from smart meters and “smart readiness” of the building, which is a measure of the building’s ability to store renewable energy and provide

access energy back to the grid in an increasingly renewable and flexible energy system. Member states in the EU are required to introduce smart metering for electricity for remote reading. However, for most countries there is also a need to enable remote reading of energy consumption for heating and water. The data gap mainly affects banks' ability to access data that is reliable data and all in one place, and to access software that can generate remote retrofit plans which are specific to the building and which factor in the building's readiness to become part of a flexible energy system.

Non-listed SMEs

A rising demand for SME carbon data is driven by corporates moving to scope 3 emission accounting and for asset managers and owners with net-zero commitments invested into banks with SME credit lines. Transaction costs of scope 1, 2 and 3 emissions data collection and analytics are too high if not automated for SMEs. Standards are emerging for carbon accounting on SME sectors including the ACT framework developed by ADEME in France and PCAF in the Netherlands may also become applicable to SMEs. There is currently supply of a first generation of automated tools for rough estimation of SME carbon footprint based on sector averages and turnover data entered into online calculators. These tools do not offer advice on transition pathways for the SMEs or tools and technologies to be deployed to support the transition.

Banks and mobile payment platforms are well positioned to leverage transaction data to add carbon emissions of specific behaviors into an automated greenness rating. One of the data sets most ready for automated tracking is leverage AI to read utility bills and thereby calculate an energy intensity score. Policy makers can support the establishment of climate databases either building on existing LCA open source^v data bases or developing country specific, with carbon footprints of all products. Such a dataset will further enable development of software for increasingly automated SME greenness rating.

2.2 Nature-related data – gaps and digital ESG opportunities

For nature, unlike for climate, there is currently no equivalent such as tons of carbon that can provide an easily comparable metric between different assets or portfolios. There is also not one agreed international target to which financial institutions can align their capital allocations or investment strategies and processes, such as the 1.5-degree scenario for climate. That may only emerge for nature after the adoption of the post-2020 biodiversity framework convention this year. However, in recent years there has been an increasing focus by regulators and financial service institutions on nature-related financial risks. The Central Bank of the Netherlands was the first to assess the dependencies of the national financial system on biodiversity and therefore to explore the financial stability risks triggered by biodiversity loss. It found that 36 percent of the Dutch financial system is either highly or very highly dependent on nature. Banque de France has followed with an assessment of the biodiversity risks of its own portfolio and the NGFS has recently launched a new working group to look at the effects of biodiversity loss on financial stability. France has amended its article 179 of the energy transition law adding an obligation to disclose biodiversity risks for French asset managers. Looking at the EU level, the sustainable finance taxonomy regulation has two pillars on biodiversity and the SFDR regulation introduced this year has several nature-related indicators if adopted in their current draft form. Lastly, the upcoming launch of the TNFD will start to further shape both disclosure practices and expectations of nature-related material risks and dependency disclosures of financial institutions.

The market response to the increased focus on biodiversity risks in finance has been the emergence of six measurement tools with underlying methodologies available for FI to start to understand their nature related risk exposure at portfolio or instrument level as 70% of investors believe a lack of available data is a key barrier to making investments that support biodiversity^{vi}. The table below outlines each metric and the underlying data layers.

Table 3 Metrics for biodiversity risks and footprint measurements available to FIs (adapted from Guide on biodiversity measurement approaches by Finance for Biodiversity Pledge)

Nature metrics in finance						
Measurement tool	BFFI - Biodiversity Footprint Financial Institutions	STAR & IBAT	Global Biodiversity Score & GBSFI	ENCORE	BIA	CBF Corporate biodiversity footprint
Metric and level	PDF ^{vii} = Potentially Disappeared Fraction of species, indicating the percentage of species lost on 1 m2 land or in 1 m3 water in one year time.	Risk of extinction at site level – contribution to reduced extinction risk	MSA ^{viii} = average of native species abundance ratios in a given ecosystem	Not a financial metric but the first step in linking a portfolio to environmental pressures	MSA	MSA
Asset categories	Corporate loans Listed equity Private equity Corporate bonds Sovereign bonds Mortgages Impact funds Green bonds Project finance Commodity trade	Project finance	Corporate loans Listed equity Private equity Corporate bonds Mortgages Commodity trade		Listed Equity Corporate bonds	equity, bonds, sovereign bonds, Green bonds, corporate loans, private equity, real assets, commodities, project finance
Data layer /database infrastructure	Exiobase or Ecoinvent + company reported data	Redlist, geolocation and scientific literature on pressure – impact links	Exiobase	Scientific literature on environmental pressures linked to business processes	EXIOBASE + Corporate disclosure	Reported data by companies + If only revenue and main sector are available, the CBF EEI/O model allows for an estimation of a company's production and consumption
Technology	Conversion software transform input data into impacts (not sensors, IoT, or satellites) mainly AI and Big data.	Software link input data on to the Redlist and 6,000 species maps	Conversion software transform input data into impacts (not sensors, IoT, or satellites) mainly AI and Big data.	Require sector classification and sector inputs from users. Mainly AI	Conversion software transform input data into impacts. (not sensors, IoT, or satellites) mainly AI and Big data.	Conversion software transform input data into impacts. (not sensors, IoT, or satellites) mainly AI and Big data.

Deployment of digital technology is mainly in the form of software for conversion of input data drawn from corporate reports and from global input-output data bases with trade flow data (mainly EXIOBASE and Ecoinvent). These databases are leveraged to estimate environmental pressures of specific trade flows which can be ascribed to specific companies. The data sets in

the input-output databases are not harvested from the real economy using digital technologies but are mainly harvested from international trade statistics.

In addition, to the six outlined nature risk metrics for FIs to deploy are digital solutions for FIs to measure specific eco-system risks of specific investment decisions. Most mature is the supply of solutions for FIs to measure de-forestation risks. The reason is that data to assess de-forestation risks is increasingly available via open satellite data repositories such as Sentinel II and other government funded satellite data sets. The least mature supply side is digital ESG tools for FIs to measure ocean related risks of financial decisions. For assessing both ocean and deforestation risks an important limiting data factor is access to asset geolocation data of corporate activities for ESG data providers to assess nature material risks, dependencies and impacts of portfolios and specific securities. There are more than 250 biodiversity databases worldwide, but the data in these is structured to location it is not linked to economic activities. Without company asset geolocation and geolocation of supplier lists these datasets are difficult for digital ESG data providers to deploy.

Lastly, some of the main gaps in the currently leveraged databases for biodiversity foot printing include plastic leakage in value chains which can be linked to securities and emissions to marine environments for ocean risks and impacts of investments. In addition, invasive species are not included, and the data also makes it difficult to measure positive impacts of portfolios or of individual financing instruments.

2 Emerging practices and national positionings

The limited time available for the development of this paper has not allowed for a complete mapping of emerging practices but rather a selection of cases. Several nations have started to strategically work on their digital data infrastructure to scale sustainability. However, it is few states that have done this solemnly with a sustainable finance use case in mind, but rather with finance being one among multiple possible use cases.

United Kingdom Spatial Finance and the Catapult Satellite London is a green finance leader globally and the UK has strategically worked with addressing green data gaps to enable digital ESG data solutions for finance. UK has shaped a leadership position in spatial finance, which is the deployment of earth observation data to help green financial decision making. More specifically the UK's position focus on making asset geolocation data available to enable climate physical risks assessment by financial service institutions. It was initiated by University of Oxford and the Smith School as the Spatial finance initiative with a focus on developing repositories of physical asset geolocation and overlaying this with satellite data to develop climate scenario analysis to enable climate physical risk assessment. Early 2021, the UK announced to take this positioning a step further via an investment of £10 million in a new national green finance research centre that will advise lenders, investors, and insurers, enabling them to make environmentally sustainable decisions, and support a greener global economy. New physical hubs in Leeds and London will support companies and start-ups commercialise products that can green global finance, including tools that measure storm and flood risk facing properties or the pollution created by companies and the liabilities that result.

Norway - Open Ocean Data Platform and the WEF C4IR Centre In 2020 WEF and the Aker Group in Norway established the Centre for the Fourth Revolution Norway (C4IR Norway) dedicated to harness digital innovation for a sustainable ocean economy. The C4IR collaborate with the Government of Norway and the High-Level Panel for a Sustainable Ocean Economy. A strategic element of the C4IR in Norway is the Open Ocean Data Platform, which seeks to address the current data gap in marine ecosystems. The Open Ocean Data Platform is not established with finance as the specific use case, but it is a data platform to be leveraged both by corporates, finance, and governments. It builds on Norway's history of responsible ocean management and industrial blue economy experience and is established as a public private partnership. Oceans constitutes the world's largest eco-systems with large carbon storage capacity and rich biodiversity, however, for finance to account for ocean material risks, dependencies and impacts data needs to be made more readily available as the data foundation is much less mature for oceans than for land based eco-systems.

Switzerland – Draft Green Fintech Strategy and environmental data eco-system. Switzerland aims to become a global hub for green digital finance. As the first ever country Switzerland launched a draft green fintech action plan early April 2021^{ix}. It identifies five concrete group of actions for Switzerland to improve framework conditions for green digital finance, whereof one is to foster access to data. The draft strategy identifies the need to establish an international Sustainability Data Platform. If established by market participants it could provide benefits not just to green fintechs, but also to data providers and financial institutions. Such a platform would cover data from ESG data providers, company sustainability disclosures, geospatial data, such as from satellites. Given the complexity of establishing such a platform, an initial action identified by the draft strategy is to convene interested market participants to jointly prepare a feasibility analysis including scoping the universe of data sets and examining features the platform would require to serve green fintechs and other users optimally.

China – sensed data and environmental data cloud China is one of the countries with the largest number of sensed climate and environmental data sets harvested at facility levels as well as emissions data harvested by satellites. Data infrastructure which has been developed has part of the war against pollution rather than for a green finance use case. Gradual opening of Chinese capital and financial market and the building of wealth management departments in Chinese FI's as well as an increasing number of Chinese FI having joined the TCFD, means that this data is increasingly experiencing a re-purposing to the use case of green finance. It has developed environmental credit scores for deployment by finance.

Netherlands – Digital data infrastructure on environmental data Netherlands has positioned itself as an important hub for biodiversity in finance. Several proactive steps by Dutch policy makers and financial regulators have shaped a nation eco-system with competencies in biodiversity finance. The Central Bank (DNB) was the first in the central banking community to undertake an assessment of the dependency of the Dutch financial system on biodiversity. Incumbent banks in the Netherlands have focused on digital solutions to decarbonise real-estate and to green farming and food production. The Netherlands has developed a soil index, which leverages soil analysis and satellite data to index soils. That data is being leveraged by the banking sector for innovative products including Rabobank biodiversity linked loan to dairy farmers. The soil index is leveraged to track soil improvements linked to the behavioural shifts of the lenders in terms of

the carbon soil content. It is with an aim to enable farmers to sell soil carbon credits on the voluntary carbon market with Rabobank as the carbon banking intermediary. These innovations have mainly been driven by the incumbent FIs and the government, whereas the fintech eco-system has focused less on green innovation and more on neo-banking.

Japan – Green bond digital data platform Japan has launched a Green Bond Issuance Promotion Platform as a step to leverage digital technology to make it easier for stakeholders to tap into the market. In addition, the Japanese Ministry of the Environment provides subsidies for expenses required by those who support companies, municipalities, and other bodies that work to issue Green Bonds, in the form of issuance support (granting external reviews, consultation on establishing a Green Bond framework, etc.). The aim is to maintain credibility in the environmental effects of Green Bonds and to reduce the issuer’s transaction costs.

Denmark – Energy data lake in Denmark there is current work ongoing to establish an energy data infrastructure mainly driven by the data needs to enable the transition to a flexible energy system. It is an energy system, where supply and demand no longer managed by a central utility but by the buildings themselves and where locally surplus energy is sold back to the grid. Centre Denmark is an energy data platform or data lake, where partners can get access to energy data from the utilities sector to develop digital projects and products. In the data platform, it is possible to acquire data on consumer behavior from the water, heating and electricity sectors. The usability of the data for finance is to be tested over the coming years with the test case being deployment of the data to scale energy efficient mortgages. The initiative is led by the technical university and several utilities. The Danish Energy Agency is part of the EU project to explore a digital ready EPC building label. The Energy agency has been running challenges offering grants to enable prototyping of the best ideas of how to use energy data for innovative software solutions. Denmark also hosts the Building Energy Efficiency hub.

3 The case of Ireland – exploring a niche positioning

As Ireland’s financial services ecosystem evolves from a predominantly asset servicing focus to being the European headquarters for many asset managers following the UK’s departure from the EU, Ireland’s role in capital markets, product development, innovation and the distribution of funds globally is fundamentally changing the footprints of international asset managers in Ireland. Ireland can draw on its position as a country of ETFs to leverage digital tools to enable ETFs to become a strategic tool for asset owners, asset manager and insurers currently making time bound net-zero climate commitments. They will be searching for ETFs in the form of thematic net-zero transition funds, that leverages digital solutions to transparently enable investors to follow where the ETF is on its transition pathway. It is not a position which has a readily available data foundation and therefore Ireland can take the lead in designing the data foundation over time. Especially, to address the current data gaps in scope 3 emissions in corporate value chains. Ireland also has a global positioning in the insurance and reinsurance industry to build a digital ESG niche around. Ireland has the second-highest number of reinsurance companies in Europe, with its asset size corresponding to over 30 per cent of GDP^x. This could be to deliver nature and climate digital data to the increasing catastrophe bond market or digital data for insuring against biodiversity material risks. Where Ireland is less digitized is in the SME sector, so an ESG data role to enable greening of SME finance is not a niche role the

country is most ready to play at the current point in time. Below are five opportunity avenues for Ireland to explore as part of the sustainable finance action plan development journey.

4 Opportunity avenues for Ireland in digital ESG

The ESG data gaps globally and the Irish current strengths and positioning has enabled the identification of five opportunity avenues as input into the process of formulating the sustainable finance roadmap.

Opportunity avenue # 1 Green data science skills hub: ESG talent with data and computer science skills is in short supply. Ireland is well positioned to develop a global niche and positioning via development of specialised MSc degrees in green data science for finance. This can build on the current UCD Smurfit Business Schools MSc in Renewable Energy and Environmental Finance. Ireland can develop a green data incubator connected to the university for digital ESG innovations and work with the Irish financial services sector to offer master thesis opportunities and traineeship programs as an applied part of the education. Green data science can be offered as remote programs to attract students globally.

Recommendation # 2 Net zero insurance Nation or Digital Cat Bond Catapult Insurance is increasingly developing products and services in the climate and nature risk space and cat bonds are scaling in the current low interest rate environment. Cat bonds needs data on physical climate risks and nature related physical risks. For this use case a digital data layer on asset geolocation is key. Ireland can explore collaboration with the UK Catapult Satellite and the new Green Finance centre hosted by University of Oxford to develop this role. Ireland can explore the potential of establishing its own national catapult to leverage and re-purpose national and international data for deployment by the insurance sector. It can be a cat bond catapult, which can broaden its mandate with time to look at broader data for design of insurance products in the nature risk space as TNFD and regulation matures.

Recommendation # 3 Digital real estate passport for decarbonisation of the real estate asset class There is an opportunity for the banking sector in Ireland to collaborate with the utility companies, the National Energy Agency and the building retrofit value chain participants to explore the most fit for purpose digital infrastructure to lower the transaction costs of banks to issue energy efficient mortgages. One option is to look at the way Centre Denmark is designed, and another option is to learn from the experiences of the UK in exploring the options of a digital real-estate passport layering all data points of a building into one digital passport. The UK did not perceive this as feasible, but it may be an idea with a better fit to the Irish context.

Recommendation # 4 Develop further deep dive research and design digital ESG data road maps: Work with Irish FIs to map the data chain for their ESG data priorities such as TCFD, SFDR and the EU taxonomy six pillars per segment of the Irish financial sector. Design data roadmaps per sector showing gaps and steps to be taken by the FIs, the ESG data analytics providers and the Irish policymakers and regulators to overcome these. Ireland has several open datasets and databases such as the national biodiversity data repository under the open data initiative. An immediate step can be to map the open data sets with ESG relevance available in the country and their investor readiness as well as to identify the translation needs of these data sets to become deployable by digital ESG solution providers. Thereafter Sustainable Finance Ireland and FinTech

Ireland can run a digital ESG data challenge, where a selected number of Irish FIs formulate an ESG problem to be solved and the FinTech community competes to design a prototype software solution leveraging the open data available and any data sets made available by the FIs. The results of the challenge will point to where the existing open-source data is most relevant and machine readable, which can feed into recommendations on how to improve the open data infrastructure for the use case of finance. This work can be anchored in a digital ESG data working group.

Recommendation # 5 Transition Funds Frontrunner Ireland is recognised in Europe for its ETF experience and expertise. The maturity of the Irish model ensures that ETF issuers have access to service providers who offers market leading, highly automated and scalable global solutions supported by the Irish fintech industry. Ireland can explore a role in designing transition ETFs starting with specific themes around net-zero transition ETF for technology companies. This will require digital solutions to monitor the transition progress of the fund underlying assets. To begin with these data sets can be harvested via algorithms undertaking automated indexing of the companies TCFD disclosure combined with additional data inputs on scope 2 and 3 emissions. Transition ETFs could offer investors a visual dashboard of where the ETF is on its net-zero transition pathway. First it can be climate transition funds and with time new green themes can be developed as FIs start to define nature related commitments. Then it can move towards nature related transition themes incl. net-zero deforestation transition funds, or other nature related risk themes where the data is currently most mature and available. Support needed to this opportunity pathway is development of sector net-zero transition pathways, digital data roadmap development and challenges and accelerator programs with mature fintechs to develop or re-purpose software for automated labelling and tracking of net-zero transition funds. Ireland could take inspiration from Japan by developing a green transition fund platforms and subsidizing the additional data costs to kick-start the supply side.

5 References

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- ^v LCA of 500 food items: <https://lca-net.com/projects/show/lca-of-500-food-items/>
- ^{vi} (2021) Unearthing Investor Action on Biodiversity. Credit Suisse, IUCN, ZSL and The Nature Conservancy. [file:///Users/mariannehaahr/Downloads/unearthing-investor-action-on-biodiversity%20\(1\).pdf](file:///Users/mariannehaahr/Downloads/unearthing-investor-action-on-biodiversity%20(1).pdf)
- ^{vii} The PDF metric (PDF.ha.yr) measures the Potentially Disappeared Fraction of species per hectare (per cubic meter for aquatic biodiversity) per year. The result is then used to calculate the biodiversity footprint in m2 per Euro invested.
- ^{viii} Definition of MSA metric is: Mean Species Abundance (ratio between the observed biodiversity and the biodiversity in its pristine state). Calculation of the Mean Species Abundance is based on PBL Netherlands Environmental Assessment Agency's GLOBIO model of five terrestrial pressures (land use, nitrogen deposition, climate change, fragmentation, and infrastructure/ encroachment) and five aquatic pressures, and their impacts on biodiversity.
- ^{ix} Green fintech Action Plan Switzerland: https://backend.finance.swiss/download/26/2021_Green_Fintech_Action_Plan_final.pdf
- ^x Reinsurance in Ireland: Development and Issues: <https://www.centralbank.ie/docs/default-source/publications/quarterly-bulletins/quarterly-bulletin-signed-articles/reinsurance-in-ireland-dev-issues.pdf?sfvrsn=4>