



INPUTS TO NATIONAL APPROACHES

**AN ANALYSIS OF SUSTAINABLE
FINANCE ROADMAPS:
CHARTING THE PATH TO FINANCIAL
SYSTEM TRANSFORMATION**

Coalition of Finance Ministers for Climate Action

and

UNDP Financial Centers for Sustainability

—

A Product for the Helsinki Principle 5 Workstream

November 2021

Foreword

The 2021 work program of the Coalition of Finance Ministers for Climate Action stressed the importance of financial systems incorporating climate change considerations into financial decisions. The Coalition identified five priority work areas under Helsinki Principle 5, one of which was sustainable finance roadmaps. The Principle 5 Workstream agreed to produce a report assessing a sample of roadmaps from various countries to identify commonalities and differences across them. The findings will be discussed in a workshop to facilitate country experience sharing and identification of best practices.

To further the Coalition's work in this area, this research was led by UNDP Financial Centers for Sustainability (FC4S), in collaboration with the World Bank, under the direction of the Coalition. The roadmaps from 30 countries have been analyzed, including the experiences of the following Coalition Member countries: Canada, Japan, Luxembourg, Mexico, Nigeria, Switzerland, Germany, and Ireland. The Coalition is grateful to FC4S, UNDP, and the World Bank for their work on this report.

Interviewees

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The note benefited from contributions from Delfina Monteverdi (UNDP FC4S) and Ignacio Benito (UNDP FC4S), as well as input from the Helsinki Principle 5 Workstream Members and interviewees from other Ministries of Finance. Camila Sanz provided technical advice, Sean Lothrop provided the editing, Benjamin Holzman provided graphic design. The development of this report was made possible by a grant from Sustainable Finance Ireland and from support from the Coalition.

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Introduction

As governments around the world strive to combat the burgeoning threat posed by climate change, policy makers are engaged in a groundbreaking effort to realign their national financial systems to support the objectives of sustainable development. Having long viewed their institutional objectives as either ancillary or irrelevant to climate policy, finance ministers increasingly recognize the financial system's vital crosscutting role in promoting climate change mitigation and adaptation, as well as sustainable development more broadly. By structuring incentives and developing actions to support investment in environmentally and socially responsible sectors, technologies, and production models, policymakers can transform the financial system into an engine for low-carbon growth.

To organize the different range of actors involved in the transition to sustainable finance around a common conception of their roles and responsibilities, national authorities have deployed strategic roadmaps. These roadmaps can help prioritize actions and coordinate activities among stakeholders, including policymakers, supervisors, regulators, associations, corporations, and other financial sector participants to accelerate the expansion of sustainable finance. These documents generally provide recommendations, i.e., suggested actions for various stakeholders to enhance sustainable finance within financial systems. Furthermore, these reports have served as important inputs to the development of actionable sustainable finance strategies, along with several other inputs and agreements, including those from international forums, networks, and organizations.

A 2017 analysis by UN Environment Program (UNEP) and the World Bank found that while national roadmaps differ in their scope, content, and methodology, they share common features that contribute to their success as policy instruments. This report examines the international experience and draws lessons to inform the design and implementation of effective sustainable finance roadmaps specifically, without delving into sustainable finance strategies or policy action plans, which generally specify a plan of actionable measures in an established period of time.¹

Criteria for Developing a Roadmap

Building on existing literature, our analysis identifies 13 key criteria for an effective sustainable finance roadmap. The list presented below incorporates and expands upon the findings of previous analytical work, including the *2017 Roadmap for a Sustainable Financial System* report published by UNEP and the World Bank Group. While each national roadmap must be tailored to the country context, effective documents typically include:

¹ We excluded national strategies from this analysis since they go one step further than roadmaps in terms of policy. They tend to be more country-specific and provide details on the implementation of an already decided course of action, clarifying how financing should be mobilized in order to achieve sustainability objectives and, in some cases, covering a broader scope than financial aspects only.

1. **Input from a diverse range of stakeholders:** A broad consultative process involving policymakers, technical experts, academics, financial market participants, and representatives of environmental organizations and other civil society groups can help produce a comprehensive and feasible roadmap that secures the buy-in of key actors in the public and private sectors.
2. **A designated policy champion:** To ensure that it is a meaningful guide to public policy and not merely an aspirational statement, the sustainable finance roadmap requires appropriate institutional leadership.
3. **A strong narrative:** The roadmap should clearly explain the case for aligning the national financial system with sustainable development goals and should situate that process within the context of the country's national policy framework and international commitments.
4. **A comprehensive needs assessment:** The roadmap should describe the requirements for aligning the financial system with sustainable development goals over a given time horizon, based on projected business-as-usual financial flows to high-carbon sectors.
5. **A low-carbon financing estimate:** To convey the magnitude of the challenge, the roadmap may include an estimate of the investment gap in low-carbon sectors.
6. **An analysis of barriers to sustainable finance:** The roadmap should identify general challenges, such as underdeveloped capital markets or remuneration policies that encourage an excessive focus on short-term outcomes, as well as sustainability-specific obstacles, such as the inadequate mainstreaming of environmental impact into financial decisions.
7. **An analysis of alternative scenarios:** The roadmap should include multiple projected scenarios for the evolution of the financial system that reflect the diverse risks and opportunities facing the country, as well as their respective probabilities of materializing.
8. **Precise, actionable recommendations:** Appropriate policy measures will vary by country but often relate to disclosure, business practices, financial instruments, and knowledge-sharing networks. The roadmap should include concrete and detailed recommendations in these and any other relevant areas.
9. **Prioritization and sequencing:** The roadmap should clearly indicate which measures are the most urgent and/or feasible in the near term, and it should identify actions that are prerequisites for deeper reforms.
10. **A capacity-building plan:** Aligning the financial system with sustainable development goals will require the development of new organizational competencies, as the scope of financial policy and regulatory mandates must expand to encompass a broader set of objectives and a more complex framework for institutional coordination.

- 11. Monitoring arrangements, including progress indicators:** A sound framework for measuring progress can highlight areas for further improvement while also evaluating the effectiveness of measures that have already been implemented. Robust monitoring arrangements must include clearly defined oversight responsibilities and a regular reporting schedule.
- 12. Accountability mechanisms:** Accountability for results helps to sustain reform momentum and prevent policy reversals. The roadmap should identify the agency or institution responsible for implementing each recommendation within a given timeframe.
- 13. Ongoing analysis and public engagement:** Periodically evaluating the overall state of sustainable finance is crucial to keep policymakers and the public informed about the larger trajectory of the government and financial industry's efforts to achieve its environmental objectives. Continual public engagement promotes financial actors' compliance with their obligations, and regular analysis and reporting signals to the private sector, civil society, and the international community the strength of the government's commitment to aligning its financial system with sustainable development goals.

A roadmap that encompasses these 13 criteria requires strong analytical underpinnings. A 2021 World Bank report endorses the use of country-specific analyses to assess the potential tradeoffs and co-benefits between financial and environmental policy objectives. Even in countries where domestic institutions have the capacity to perform such an analysis without the need for external assistance, governments may partner with an international organization and apply an internationally accepted framework to enhance the objectivity of the assessment, perhaps bolstering its credibility. For example, the UN FC4S Assessment Programme has allowed financial centers to track progress on key actions defined in roadmaps and to identify potential pathways to advance sustainable finance.

About this Analysis

While the development of sustainable finance roadmaps is a recent phenomenon, analysis of the international experience allows the synthesis of broad recommendations regarding their design and implementation. Analysis by FC4S showed that the development of national roadmaps accelerated from 2014 through 2018, and by 2020 a total of 40 had been drafted. The pace at which new roadmaps are being produced has since slowed, though this is due in part to the fact that these are long-term documents. In addition, the urgent need to address the COVID-19 pandemic and associated economic shocks may have diverted attention away from long-term planning. Nevertheless, five countries produced sustainable finance roadmaps in 2020, and multiple financial centers have shown interest in developing similar documents.

Given the growing demand for knowledge on sustainable finance roadmaps, Financial Centers for Sustainability (FC4S) Network and the Coalition of Finance Ministers for Climate Action (CFMCA) prepared this report to analyze these roadmaps, which aim to mobilize private capital to support sustainable development. This document analyzes the structure and characteristics of 41 sustainable finance

roadmaps² developed by 30 countries between 2014 and 2021.³ A UN organization or other multilateral institution participated in the drafting process for 24 of the 41 roadmaps. The report also includes examples of different reform types drawn from case studies of sustainable finance roadmaps in Canada, Germany, Ireland, Japan, Luxembourg, Mexico, Nigeria, and Switzerland. These case studies were developed through interviews with representatives from finance ministries and other relevant institutions, as well as a desk review of national policy and strategy documents. The case studies shed light on how sustainable finance roadmaps operate in diverse country contexts. Finally, a natural language processing (NLP) analysis was conducted to identify recurring topics across roadmaps. While the report highlights the diverse characteristics of sustainable finance roadmaps, it also reveals common elements that contribute to their success. In addition to the 13 criteria for effective roadmaps listed above, several general lessons emerge from the analysis.

Data quality and availability are crucial, and policymakers should leverage innovations in sustainability-related data collection. Enhanced reporting requirements were included in 93 percent of the roadmaps examined, and 39 percent recommended measures to improve data availability. Establishing standards for the reporting of sustainability-related information can enable the collection of more granular, comprehensive, consistent, and relevant data to inform an effective sustainable finance roadmap. Addressing data gaps can strengthen assessments of sustainability challenges, reveal opportunities, and enable market participants to better incorporate sustainability concerns into their activities.

Facilitating environmentally and socially responsible investment decisions requires building capacity and raising awareness within the financial system. Recommendations related to capacity-building and outreach were included in 73 percent of the analyzed roadmaps, and were also highlighted in the case studies. Inadequate education and training are major obstacles to the development of sustainable finance, as finance professionals require the relevant knowledge, skills, and capabilities to accurately assess diverse sustainability issues and opportunities. The establishment of formal capacity-building activities across market players is vital to mainstream sustainability in financial systems.

Developing environmental, social, and governance (ESG) risk management and reporting capabilities is vital from both a sustainability and a prudential perspective. Financial institutions are facing increasing demand from institutional asset owners, retail investors, policymakers, and civil society to engage in ESG risk management and reporting, but they are also reacting to rising concerns about the magnitude of the physical and transition risks posed by climate change. While they still rely on outside data providers, financial institutions are increasingly investing in their own in-house ESG capacity. A full 63 percent of the roadmaps examined include recommendations related to ESG risk management and reporting.

To ensure that a roadmap provides appropriate recommendations, the drafting process should include a diverse array of stakeholders. The 2021 World Bank report identified several ministries, the central bank, and other regulators as key stakeholders that should be involved in drafting a sustainable finance roadmap. However, the case studies presented here highlight the importance of including experts in

² While sharing the same general objective of overcoming existing barriers to the financing of the Sustainable Development Goals (SDGs) – including achieving the goals of the Paris Agreement – and better embedding sustainability into domestic financial systems, these guiding documents differ in designation, drafting methodology, and proposed approach.

³ Nine countries in the sample produced two roadmaps each, and one (Switzerland) produced three.

sustainable finance, political and economic policymakers, and financial professionals in the development process, as well as representatives from all institutions responsible for implementing the recommendations.

Roadmaps can present general recommendations for reforming the financial system as a basis for pursuing more specific objectives related to sustainable finance. The types of recommendations most frequently included in the roadmaps were related to reporting (featured in 93 percent of roadmaps), institutional responsibilities (80 percent), risk management (71 percent), the reallocation of capital (73 percent), and setting sectoral objectives (this is an all-encompassing category), all of which are sector-wide issues with a particular sustainability valence. In some cases, the general recommendations of a roadmap established the basis for more specific, actionable measures presented in a related sustainable finance strategy.

Characteristics of Sustainable Finance Roadmaps

Table 1. Summary of Recommendation Types & Prevalence in Roadmaps Assessed

Recommendation Type	Percentage of Roadmaps Including that Type
Reporting & disclosure	93%
Institutional responsibility	80%
Capital supply & allocation	73%
Risk management	71%
Capacity building	71%
Standards	66%
Product & market innovation	63%
Regulation	61%
Data collection	39%
Formal education	32%
Research	32%
Fiscal incentives	27%

Each sustainable finance roadmap is a unique product that reflects the national institutional environment, the policy process, and the characteristics of the finance sector. The organization, scope, and content of each roadmap reflects the needs of the institution that commissioned it, the capabilities of the agency that drafted it, the range of actors involved in its development, and the local economic and political context. Nevertheless, a cross-country analysis reveals important commonalities among roadmaps produced in different environments.

Of the 41 roadmaps analyzed in this report, 33 approached sustainable finance from an environmental, social, and governance (ESG) perspective. The ESG perspective implies that the ultimate goal of these roadmaps is to develop a set of standards for financial decision-making that incorporates the environmental and social impacts of investments, while recognizing the needs and rights of a range of stakeholders. Another seven roadmaps focused exclusively on the environmental aspects of sustainable finance. The Social Finance Roadmap for Malaysia adopted a social perspective, which prioritizes mobilizing new financial resources to address key social problems that are weighing on economic growth.

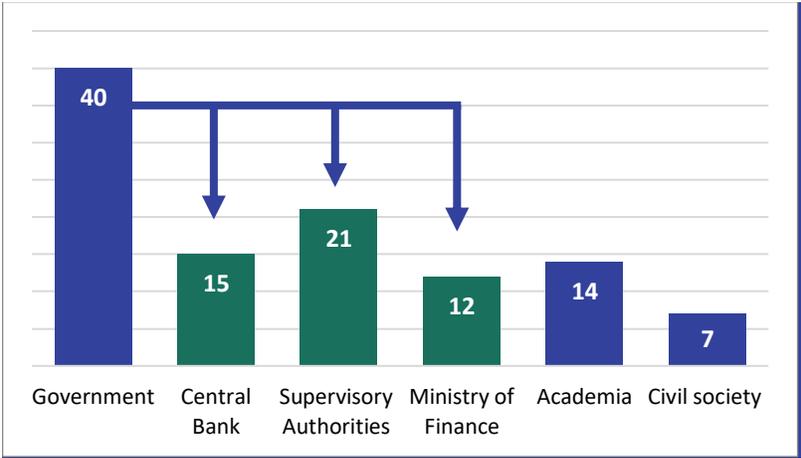
Most roadmaps in the sample were drafted with input from both the public and private sectors. The drafting process for 34 of the 41 roadmaps involved private-sector stakeholders, while 34 included the participation of public-sector stakeholders. Stakeholder participation ranged from leading the drafting process to participating in working groups, roundtable discussions, interviews, and surveys.

In eight cases, the private sector oversaw, rather than merely participated in, the roadmap-development process. Some of these processes were overseen by private-sector-led institutions, such as the Swiss

Funds and Asset Management Association (SFAMA), Finance Norway, or the Aotearoa New Zealand’s Sustainable Finance Forum, while others were led by forums or councils consisting of both public and private experts, like the Canadian Expert Panel on Sustainable Finance (summoned by the Ministry of Finance and Environment). Public institutions oversaw the drafting of 16 roadmaps, 10 of which were prepared by financial regulators such as the People’s Bank of China or the French Financial Markets Authority, while the remaining six were prepared by government regulators like the Malaysian Innovation Agency and the National Treasury of South Africa. International institutions and nongovernmental organizations were included in the development processes for 24 of the 41 roadmaps, and in all cases these processes involved UN-related organizations such as the UNEP Inquiry, the UNEP Finance Initiative, or the Principles for Responsible Investment (PRI).

Roadmaps’ recommendations overwhelmingly concentrated on the public sector. Forty roadmaps included at least one recommendation involving a public institution, and seven focused exclusively on the public sector. Fifteen roadmaps included recommendations directed to the central bank, while 12 addressed to the Ministry of Finance, and 21 targeted other supervisory bodies, including financial and capital market regulators, securities and exchanges commissions, or prudential authorities. Fourteen roadmaps included recommendations for academic institutions, while just seven for civil society (Figure 1).

Figure 1: Number of Roadmaps with Recommendations Targeting the Government, Academia, and Civil Society⁴



Thirty-five of the 41 roadmaps included recommendations for the general financial system, with 27 containing at least one recommendation directed at the banking and asset management sectors and 25 including at least one recommendation targeting capital markets. 18 roadmaps contained recommendations for the insurance sector, and 19 for pensions and superannuation (Figure 2). 14

⁴ There exists overlapping between categories in this graphic, as for Figure 2. For instance, the category “Government” includes the categories Central Bank, Supervisory Authorities and Ministry of Finance, but neither of them is exclusive. A Roadmap might include recommendations targeting more than one of them.

roadmaps specifically mentioned the Task Force on Climate-related Financial Disclosures (TCFD) and its guidance on standardizing sustainable finance reporting. Some roadmaps directly identified the institutions that would be responsible for implementing their recommendations, while others addressed the government more broadly (Table 1).

Figure 2: Number of Roadmaps with Recommendations Targeting the Financial Sector

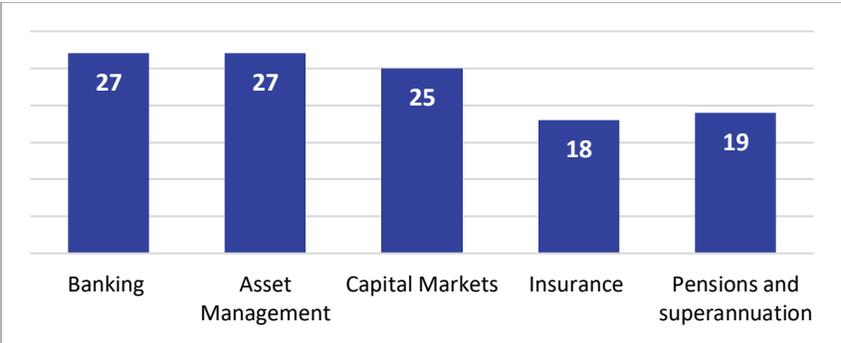


Table 2. Recommendation Type and Percentage of Roadmaps Including that Type, with Examples

<p><i>Capital supply and allocation</i></p> <p>73%</p> <p>Measures to increase the supply of capital to activities and sectors with a positive environmental impact, such as fiscal incentives for sustainable investment or the use of innovative financing mechanisms such as green bonds</p>	<p>Designing a Sustainable Financial System in Bangladesh (2015): “Review and continue to develop the existing refinancing scheme”; “use public finance to provide credit enhancement for green projects and green securitization in order to kick-start the development of a green bond market.”</p> <p>Australian Sustainable Finance Roadmap (2020): “Australia’s financial system participants support the development of labelling standards that provide consumers with access to consistent labelling and disclosure of the sustainability of financial services products to provide clarity to consumers on the quality of products, and how sustainability is considered and managed within these products.”</p>
<p><i>Risk management</i></p> <p>71%</p> <p>Measures to strengthen institutional capacity for environmental risk management, including the introduction of climate change risks into supervisory frameworks</p>	<p>Climate and Environmental Risks and Opportunities in Mexico’s Financial System (2019): “Implement governance mechanisms (including relevant committees, capabilities and reporting obligations) to include environmental risks in mainstream risk management activities.”</p> <p>Social Finance Roadmap for Malaysia (2016): “Measurement and evaluation professionals to incorporate considerations of social risk identification and mitigation during impact assessments and ensure social due diligence is conducted with rigor that is equal in measure to financial due diligence.”</p>
<p><i>Institutional responsibility</i></p> <p>80%</p> <p>Measures to allocate responsibility for environmental impact among financial institutions—for example, by clarifying the relevance of ESG issues within the context of fiduciary duty.</p>	<p>National Sustainable Finance Roadmap of Mongolia (2018): “Ensure the accuracy and quality of E&S due diligence conducted by business units, banks could adopt sustainability risk-adjusted performance measures. This will also contribute to promoting and incentivizing good performance and management of sustainability responsibilities.”</p> <p>Fiduciary Duty in the 21st century: Germany Roadmap (2017): “BaFin should issue guidance to fund managers clarifying that the Capital Investment Code (<i>Kapitalanlagegesetzbuch – KAGB</i>) requires consideration of material ESG issues”.</p>

<p>Reporting & disclosure</p>	<p>Aligning Colombia’s Financial System with Sustainable Development (2015): “Strengthen financial institutions’ disclosure of their green finance performance.”</p>
<p>93%</p>	<p>Investor Duties and ESG Integration in China (2018): “Ensuring and monitoring the effectiveness of the mandatory environmental disclosure framework for companies, and aligning with international disclosure standards for ESG issues.”</p>
<p>A wide range of transparency and accountability measures, guidelines, and best practices, either voluntary or mandatory</p>	<p>Financing the Future: Report of the Italian National Dialog on Sustainable Finance (2016): “Stock Market Disclosure: <i>Borsa Italiana</i> – in addition to its new reporting guidelines to raise the level of disclosure on its markets, including flows of green revenues – could take further actions to increase the level of transparency and facilitate the engagement of responsible investors. The introduction of a voluntary certification scheme on the sustainability of funds (e.g. the LuxFlag model) could also help transparency and accountability on the issuers’ side.”</p>
<p>Data collection</p>	<p>Final Report of the Expert Panel on Sustainable Finance – Canada (2019): “Establish the Canadian Center for Climate Information and Analytics (C3IA) as an authoritative source of climate information and decision analysis.”</p>
<p>39%</p>	<p>How Data Provision Can Help Understand Better Environmental Sources of Financial Risk and Integrate Them More Effectively into Mainstream Financial Decision-Making – Mexico (2018): “Identify the extent and quality of current data holdings and perform a gaps assessment to promote further interactions with data suppliers. Consider both data that can inform the identification, assessment, exposure and mitigation of current risks as data that can serve to inform about future risk exposure.”</p>
<p>The creation, upgrading, or expansion of data collection systems, as well as other improvements in data quality and availability</p>	<p>Roadmap for Green Competitiveness in the Financial Sector – Norway (2018): “The financial sector adopts the TCFD recommendations. The Norwegian financial sector will end up with better data for risk assessments if it begins early on climate disclosure. It also makes sense to phase in climate disclosure now rather than risk having to respond suddenly to changes in Norway and/or Europe.”</p>
<p>Standards</p>	<p>Fiduciary Duty in the 21st Century - France (2018): “Develop and set standards for key sustainability issues in sustainable investments, complete empirical research on the financial effects of ESG factors, develop methods and key performance indicators.”</p>
<p>66%</p>	<p>Capitalizing Sustainable Finance in Argentina: A Stocktake and Review of Sustainable Finance Opportunities for Argentina (2018): “International standards, such as the Equator Principles, the Principles for Responsible Investment, the Principles for Sustainable Insurance and others, provide access to best ESG risk managing practices that can help offset risk and improve the quality of lending and investment portfolios.”</p>
<p>The adoption of existing international standards for sustainable finance, such as those promulgated by the Task Force on Climate-related Financial Disclosure, as well as the development of new standards</p>	

Capacity-building

71%

Skills development and training programs for staff at financial institutions

Final Report of the Expert Panel on Sustainable Finance – Canada (2019):

“Reserve a pool of federal funding for non-profit and professional service providers facilitating education, training and collaborative initiatives to improve understanding and action on climate-related financial risks and opportunities.”

Investor Duties and ESG Integration in China (2018):

“Investment managers should provide appropriate education, analytical tools and professional training on ESG issues to their investment teams and operational staff.”

Formal education

32%

Activities that incorporate sustainable finance into formal educational curricula, either by expanding existing undergraduate and graduate-level programs or by developing new ones

Financing the Future: Report of the Italian National Dialog on Sustainable Finance (2016):

“Universities and academic bodies could enrich their educational offer on green finance sector reform and integrate these skills into professional curricula for continuing development.”

Luxembourg Sustainable Finance Roadmap (2018):

“Integrate financial literacy and sustainable finance into school curricula and tertiary education.”

Regulation

61%

Reforms designed to strengthen the credibility, predictability, and transparency of regulatory oversight

Luxembourg Sustainable Finance Roadmap (2018):

“Provide a credible, reliable, predictable and stable regulatory framework. Structural change requires long-term investments, whose inherent risk can be taken only if the framework is reasonably predictable.”

Roadmap for Aligning the Moroccan Financial Sector with Sustainable Development (2016):

“The Moroccan Capital Market Authority (AMMC) will shape its regulatory framework to better control the reporting requirements of green funds.”

Fiscal incentives

27%

Fiscal policies explicitly designed to promote sustainable finance, such as tax exemptions, subsidies, and favorable loan terms

New Zealand’s Sustainable Finance Forum: Roadmap for Action (2020):
 “Strategically increasing the pricing of externalities, through the imposition of costs (taxes) for certain social and environmental harms, and/or payments for social and environmental goods that do not fetch a market price.”

Delivering a Sustainable Financial System in India (2017):
 “The withholding tax on external commercial borrowings (ECBs) is currently set at five per cent, which should be removed for green bonds. A preferential withholding tax rate has previously been given to long-term infrastructure investment, setting a precedent for the use of this fiscal incentive for green bonds. In addition, removal of 40 per cent ceiling on re-financing through ECB for green bonds would support market expansion.”

Product & market innovation

63%

Measures to promote innovation and leverage technology to create new sustainable finance products and market systems

Roadmap Keuangan Berkelanjutan: Roadmap for Sustainable Finance in Indonesia (2014):
 “Development of financing/investment products and/or schemes with the aim to increase the sustainable finance portfolio including product assessment, development of the financing/investment guideline to support the FSI’s staffs in conducting analysis of the feasibility of implementing sustainable financing/investment in the priority economic sector.”

Aligning Kenya’s Financial System with Inclusive Green Investment (2015):
 “New product development in emerging areas will require massive awareness-raising efforts in the target market. Better industry organization and collaboration between the largest insurance firms in Kenya and the Association of Kenyan Insurers is needed, with support from the Insurance Regulatory Authority in creating guidelines for appropriate and cost-effective products.”

Research

32%

Analytical work either prepared or commissioned by national governments in the field of sustainable finance

Final report of the expert Panel on Sustainable Finance – Canada (2019):
 “The federal government should sponsor a research effort under the Canadian Center for Climate Information and Analytics (C3IA) (Recommendation 4) to develop two or three base climate-related scenarios, including a 2°C or lower scenario.”

Shifting the Trillions: A sustainable financial system for the great transformation - Germany (2021):
 “Evaluate the current state of research, work towards eliminating any gaps in knowledge, and make research findings available to practitioners.”

Examples from Case Studies

A detailed examination of some of the roadmaps implemented to date reveals how the recommendations described above operate in different country contexts. The case studies presented below encompass ten roadmaps implemented in five countries (Figure 2).

The box in this section showcases two countries' (Germany and Ireland) approaches to sustainable finance roadmap development which have been especially inclusive, involving a wide range of stakeholders.

Table 3. Case Studies: Countries and Roadmaps

Japan	Fiduciary Duty in the 21st Century: Japan Roadmap (2017) Sustainable Investment in Japan: An Agenda for Action (2019)
Luxembourg	Luxembourg Sustainable Finance Roadmap (2018)
Mexico	How data provision can help understand better environmental sources of financial risk and integrate them more effectively into mainstream financial decision-making (2018) Climate and Environmental Risks and Opportunities on Mexico's Financial System: from Diagnosis to Action (2020)
Nigeria	Nigerian Sustainable Finance Roadmap (2018)
Switzerland	Design of a Sustainable Financial System (2015) Proposals for a Roadmap towards a Sustainable Financial System in Switzerland (2016) Sustainable Asset Management: Key Messages and Recommendations of SFAMA and SSF (2020) Sustainability in the Swiss Financial Sector (2020) ⁵

Capital Supply and Allocation

- Nigeria's 2018 roadmap identifies the issuance of green bonds as a primary financing mechanism. It recommends that the authorities "scale up the creation and identification of sustainable assets," highlighting that "non-sovereign and corporate issuance will help develop the domestic green bond market and hold great potential for Nigeria and the continent." At the end of 2017, after developing guidelines for issuers and investors, Nigeria issued Africa's first sovereign green bond. A year later, a partnership between FMDQ Securities Exchange,⁶ the

⁵ This report was not included in this section, nor in the NLP analysis, because it is not available in English.

⁶ FMDQ Securities Exchange, <https://fmdqgroup.com/>

Climate Bonds Initiative,⁷ and Financial Sector Deepening Africa⁸ launched the Nigerian Green Bond Market Development Program to support the creation of a non-sovereign green bond market to finance Nigeria's transition to low-carbon growth. With technical support from the program, Access Bank⁹ issued a US\$41 million five-year green bond in 2019, which was the country's first corporate green bond.

- In Switzerland, the Canton of Geneva issued the country's first green municipal bond in 2016. The process in line with the 2015 report Design of a Sustainable Financial System, which suggested that "public actors at the governmental, federal, state and municipal levels could explore the possibilities of issuing Green Bonds." Nevertheless, the "Sustainability in the Swiss Financial Sector Report" that was developed by the Federal Council in 2020, states that, while the issue of green bonds is very welcomed by the Confederation, the creation of additional stock exchange segments for sustainable companies / plants is a matter for the private stock exchange operator and is possible without regulatory intervention by the state.¹⁰
- Luxembourg's 2018 roadmap raised awareness of the need for policies designed to mobilize capital for sustainable finance. The roadmap recommended that the government "increase the offer of liquid products," and in response Luxembourg issued Europe's first sovereign sustainability bond¹¹ in September 2020. The issuance followed the government's publication of a framework for sustainability bonds¹² aligned with the recommendations of the European Taxonomy for Green Financing.
- In 2020, Mexico became the first country in the world to issue a sovereign bond linked to Sustainable Development Goals (SDG). The seven-year SDG Bond had a total value of US\$890 million.¹³ It was designed to raise funds to address social, environmental, and other issues and mobilize private capital to finance SDG-oriented public programs. Less than a year later, Mexico renewed its commitment by issuing a second 15-year SDG sovereign bond with a total value of US\$1.48 billion. Moreover, the Total Mexico ESG Index was jointly developed by S&P Dow Jones Indices and one of the two Mexican stock exchanges (*Bolsa Mexicana de Valores*)¹⁴ to highlight strong ESG companies and enable investors to allocate to such companies without requiring them to take on major risks in the market.

⁷ Climate Bonds Initiative, <https://www.climatebonds.net/>

⁸ Financial Sector Deepening Africa, <https://www.fsdafrica.org/>

⁹ Access Bank. Green Bond FAQs. <https://www.accessbankplc.com/pages/Sustainable-Banking/Our-Environmental-Footprints/Green-Bond-FAQs.aspx>

¹⁰ The Federal Council of Switzerland. 2020. Sustainability in the Swiss Financial Sector Report. https://www.sif.admin.ch/sif/en/home/finanzmarktpolitik/nachhalt_finanzsektor.html

¹¹ The Luxembourg Government. 07/09/2020. Luxembourg's sovereign sustainability bond: press release. https://gouvernement.lu/en/actualites/toutes_actualites/communiqués/2020/09-septembre/07-gramegna-obligation-souveraine.html

¹² The Luxembourg Government. 2020. Luxembourg's Framework For Sustainability Bonds. <https://gouvernement.lu/dam-assets/documents/actualites/2020/09-septembre/02-cadre-obligations-durables/20200831-Luxembourg-Sustainability-Bond-Framework.pdf>

¹³ Government of Mexico. 2020. Press release N. 071 Tax authorities launches the first sustainable sovereign bond linked to the UN SDGs in the world. <https://www.gob.mx/shcp/prensa/comunicado-no-071>

¹⁴ S&G Dow Jones. S&P/BMV Total Mexico ESG Index. <https://www.spglobal.com/spdji/es/indices/esg/sp-bmv-total-mexico-esg-index/#overview>

Risk Management

- In 2020, the Mexican government approved the creation of a Sustainable Finance Committee (SFC) at the Financial System Stability Council (FSSC) to explore issues related to sustainable development and their implications for the stability of the financial system. The SFC has established four working groups coordinated by the Bank of Mexico, one of which is focused on ESG risk measuring. Building on the work done by the Association of Mexican Banks (AMB) since the publication of the Banking Sustainability Protocol,¹⁵ this working group has developed a tool to assess the environmental and social risk management system of commercial banks¹⁶, which will complement the existing system used by the country's national development banks. In addition, the Ministry of Finance, the Bank of Mexico, and the National Banking and Securities Commission are jointly developing a new methodology to include "E" factors in central bank stress tests and generate guidelines for commercial banks. This methodology will be developed by the National Autonomous University of Mexico and will include information from the Network for Greening the Financial System's scenarios for Mexico and the national scenarios presented in the latest report of the Intergovernmental Panel on Climate Change. In 2021, the Mexican Association of Retirement Fund Administrators (MARFA), supported by the Ministry of Finance, announced¹⁷ the creation of a subcommittee on responsible investment, which will serve as a focal point for fund administrators as they integrate ESG criteria into the investment processes. This initiative is in line with Mexico's 2020 roadmap, which recommended that the authorities "set out and disclose clear timelines and commitments at the board level to incorporate social and environmental aspects into major plans of action, credit, asset allocation and risk management policies, annual budgets, and business plans."
- In 2019, a working group on risk management was established by the Swiss State Secretariat for International Finance to analyze the integration of climate-related and environmental risks into strategic arrangements and risk management frameworks. Building on the findings of this working group, the Swiss Federal Council recommended that "financial market players publish methods and strategies for taking account of climate and environmental risks when managing their clients' assets, in accordance with the existing legal duties of loyalty and diligence." The Secretariat for International Finance is now preparing a proposal for how to implement this recommendation, which will be delivered to the Federal Council by the end of 2022.
- Luxembourg's 2018 roadmap called for "screening public investments for their ESG soundness and carbon footprint." The country's public pension fund presented its first-ever climate assessment in 2020 as part of the PACTA Coordinated Projects. According to the public pension fund's Sustainable Investor Report, "1.5 billion of its relevant portfolios valued at 31 December 2019, representing approximately 7.5% of the total assets of [the fund], were retained as climate relevant". The fund's board agreed to measure the carbon intensity of its investment company

¹⁵ Association of Mexican Banks. Banking Sustainable Protocol. <https://abm.org.mx/banca-sostenible/protocolo.html>

¹⁶ Summary of the Webinar "ESG and Climate Risk Management for Mexican Banks". <https://www.greenfinancelac.org/wp-content/uploads/2019/03/Resumen-del-Taller.pdf>

¹⁷ AMAFORE. 2021. AMAFORE announces the creation of the Sustainable Investment subcommittee. <https://amafore.org/lib/inher/pdf/Comunicado-amafore-inversiones-responsables-220221.pdf>

on an annual basis and to assess its alignment with the Paris Agreement every three years.

Institutional Responsibility

- Mexico's SFC is the country's lead agency for sustainable finance. It sets the agenda for analyzing and managing climate risks and their potential repercussions on financial stability and defines the role of supervisors in providing guidance to market participants. The SFC is presided over by the Deputy Minister of Finance and Public Credit; it consists of eight voting members representing each of the national financial regulators, six observers from the private sector, and a permanent guest representative from the federal government responsible for the 2030 Agenda. Since 2015, the Ministry of Finance has been acting as the National Designated Authority¹⁸ before the Green Climate Fund (GCF), and it is responsible for coordinating the evaluation of projects that will be submitted to the GCF to access financing. In order to guarantee the alignment of the projects with the national climate policy, the Ministry of Finance collaborates closely with the Ministry of Environment and Natural Resources and with the National Institute of Ecology and Climate Change.¹⁹
- In 2018, Luxembourg's Ministry of Finance and the Ministry of Environment, Climate and Sustainable Development requested support from UNEP to develop a sustainable finance roadmap. Elaborated with the support of Innpact, a Luxembourg-based impact financing specialist, Luxembourg's roadmap was drafted under the guidance of a Steering Committee composed of members from the Ministries of Finance and Environment, Climate and Sustainable Development, UNEP, and Luxembourg for Finance, and in close collaboration with representatives from public and supervisory institutions, the financial system, academia, and civil society. The process involved public consultations, interviews, and the establishment of working groups focused on creating a strategy, promoting innovation, developing expertise, and measuring progress. Luxembourg's roadmap includes detailed recommendations, provides context on the financial market both from a regulatory and a private sector perspective, explains global macroeconomic trends and key features of Luxembourg's financial center, and presents an assessment of sustainable finance initiatives already implemented. Moreover, the roadmap built upon the EU Action Plan, ensuring alignment between national and regional sustainability goals.

Reporting and Disclosure

- The Nigerian roadmap highlighted the need to make financial information on sustainability more consistent, leveraging international best practice, including initiatives such as TCFD. The FMDQ Securities Exchange²⁰ has been working with the Climate Bonds Initiative on guidelines for green

¹⁸ Green Climate Fund: México. <https://www.greenclimate.fund/countries/mexico#contact>

¹⁹ The SFC has established four working groups: Sustainable Taxonomy coordinated by the SHCP, ESG risk measurement coordinated by the Bank of Mexico, ESG disclosure and standard reports coordinated by the National Banking and Stock Commission (CNBV), and opportunities for capital mobilization coordinated by the National Commission of the Retirement Savings System (CONSAR).

²⁰ FMDQ Securities Exchange. <https://fmdqgroup.com/>

bond issuance.²¹ The Financial Services Regulation Coordinating Committee (FSRCC) has also drafted Guidelines on Sustainable Finance Principles for the Nigerian Capital Market²² in April 2021, which states that regulated entities should establish the standards for their organization and a sustainable operations approach and ensure appropriate disclosure on ESG issues. Reporting is not yet mandatory, but institutions are encouraged to regularly report and disclose under those guidelines.

- Japan’s 2017 roadmap recommended that “the Ministry of Economy, Trade and Industry (METI) and the Financial Service Authority (FSA) should review the quality and comparability of the corporate disclosure of material ESG information, following the report of the [Financial Sustainability Board’s] TCFD”. In 2018, the METI established the Study Group on Implementing the TCFD Recommendations for Mobilizing Green Finance through Proactive Corporate Disclosures²³ to examine appropriate disclosure methods for green finance. In 2019, the METI, the FSA, and the Ministry of Environment established the TCFD Consortium as a public-private partnership to support dialogue and cooperation among organizations to improve their climate-related financial disclosures. The METI published the world’s first Guidance for Climate-related Financial Disclosures²⁴ in December 2018 and updated²⁵ it in 2020. As of March 2021, 317 companies in Japan had committed to reporting according to the recommendations of the TCFD.
- Mexico’s 2020 roadmap recommended that the authorities “provide clarity and regulatory expectations on the future direction of sustainability reporting rules, including what constitutes material information for the purposes of corporate reporting.” One of the SFC Working Groups led by the National Banking and Securities Commission has focused on reporting requirements and guidelines for financial institutions. Although reporting is still not mandatory, the SFC is working with financial institutions, the private sector, and academia to raise awareness of the differences among reporting standards. Finally, the Ministry of Finance and several major industry associations have established a dialogue that includes the classification of activities that substantially contribute to climate change mitigation and adaptation²⁶. Similarly, Mexico’s 2018 roadmap recommended that the government “map different tools available to understand key environmental sensitivities of business production processes.”
- Luxembourg’s 2018 roadmap recommended that the authorities “develop effective reporting systems and guidelines for ESG reporting.” The government’s aim is to keep its national reporting and disclosure practices closely aligned with EU norms. The EU Sustainable Finance Disclosure Regulation (SFDR) was published in June 2021, and Luxembourg has begun adapting

²¹ Department of Climate Change of Nigeria. 2020. Nigeria Sovereign Green Bonds.

<https://climatechange.gov.ng/2020/09/21/brief-on-green-bonds/>

²² Securities Exchange Commission. 2021. SEC Guidelines on Sustainable Finance Principles for the Nigerian Capital Market.

<https://sec.gov.ng/sec-guidelines-on-sustainable-financial-principles-for-the-capital-market/>

²³ Ministry of Economy, Trade and Industry of Japan. 2018. METI Establishes Study Group on Implementing TCFD Recommendations for Mobilizing Green Finance through Proactive Corporate Disclosure.

https://www.meti.go.jp/english/press/2018/0723_002.html

²⁴ Ministry of Economy, Trade, and Industry of Japan. 2018. Guidance for Climate Related Disclosures.

https://www.meti.go.jp/english/press/2018/pdf/1225_006b.pdf

²⁵ Climate Bonds Initiative. 2020. Japan Green Finance State Market.

https://www.climatebonds.net/files/files/CBI_JPN_SotM_20_02D.pdf

²⁶ Vice presidency of Regulatory Policy of the Government of Mexico. 2020. Finanzas Sostenibles. <http://www.iimv.org/iimv-wp-1-0/resources/uploads/2020/09/JAQ-Finanzas-Sostenibles-CNBV-Mexico.pdf>

it to the country's context. The implementation of new reporting standards will follow the guidelines of the SFDR.

Data Collection

- Japan's 2019 roadmap called for establishing a knowledge hub for sustainable investing. It envisioned "a rigorously curated platform [that] would serve as a central repository for the distribution of sustainable investing research and commentary, both from within and outside of Japan...structured so that individuals, firms, and associations could equally access and leverage its resources – all of which would be published in or translated into Japanese." In 2019, the Ministry of Environment established the Green Finance Portal²⁷ to support the issuance of green bonds and disseminate information about green finance policies in Japan and abroad. The portal is being used to educate green finance stakeholders on the latest market developments and to introduce relevant projects, such as the Financial Support Program for green bond issuance. More public evidence on the impact and outreach of the portal is still necessary to fully evaluate its effectiveness.
- Both of Mexico's roadmaps addressed the role of data quality and availability in developing a sustainable finance market. Mexico's 2018 roadmap recommended that the authorities "consider the potential benefits of adopting technological developments to improve environmental data disclosure and use by financial decision makers." Furthermore, the 2020 roadmap suggested "the creation of an architecture or data repository of publicly available information related to climate and environmental and social risks and...its use by financial institutions". Mexico's two stock exchanges are working on an ESG disclosure pilot project, the objective of which is to create a system where companies can upload all their ESG data, which can then be provided to different users, reducing information costs. Even without mandatory reporting, the system would make it transparent to investors which companies are producing the data and which companies are not.

Standards

- Switzerland's 2016 roadmap determined that it was necessary to develop and set standards for key sustainability issues and to disclose the relevant indicators. In 2019, two working groups were established to propose legislative amendments on transparency issues and risk assessment, respectively. Currently, the work of the Ministry of Finance is guided by the Sustainability in the Swiss Financial Sector Report published in 2020. One of its recommended measures is the systematic disclosure of comparable environmental and climate information. Following this line of action, the MoF proposed that the Federal Council officially support the TCFD and start working on mandating the implementation of TCFD recommendations in all economic sectors. The Swiss government officially became a supporter of the TCFD in January 2021,²⁸ and the Federal Council called on Swiss companies across the economy to implement

²⁷ Green Finance Portal. <http://greenfinanceportal.env.go.jp/>

²⁸ It has been approved, but legislation has not yet come into effect.

these recommendations on a voluntary basis.²⁹ In addition, the 2020 report states that moderate and supportive regulatory interventions in this matter could be justified for reasons of efficiency in view of the expected effectiveness of the measure, but would also have to be coordinated with the numerous activities in the sector. This summer, Switzerland announced the drafting of legislation to make climate-related financial disclosures based on the TCFD recommendations mandatory for larger companies across all sectors of the economy. Public companies, banks and insurance companies with 500 or more employees, more than CHF 20 million in total assets or more than CHF 40 million in turnover will be obliged to report publicly on climate issues. Moreover, one of Switzerland's State Secretariat for International Finance working groups has been reviewing the regulatory framework and examining possible adaptations to Swiss financial market law concerning transparency and the prevention of greenwashing. Potential amendments to the financial market legislation and other measures are expected to be presented by the end of 2021.

- In 2018, UNEP recommended that Mexico “develops a sustainability taxonomy to help identify the underlying environment-related risk of brown vs green assets.” In this regard, the Working Group led by the SHCP at the SFC, is considering the previous work done by ABM and CCFV on the Green Finance Taxonomy³⁰ and Recommendations for a Sustainable Finance Taxonomy,³¹ respectively. The taxonomy development that is currently in process, led by the SHCP, is considering not only environmental factors but social and governance also.

Capacity-Building

- Mexico's Green Finance Advisory Board created the Sustainable Finance Institute³² to train finance professionals on the climate, environmental, social, and corporate governance aspects of their activities. Training initiatives being implemented by the institute include the preparation of courses for certification by the European Federation of Financial Analysts Societies and the International Association for Sustainable Economy, as well as workshops for stock issuers introducing the TCFD and Sustainability Accounting Standards Board disclosure standards.
- Swiss Sustainable Finance (SSF)³³ and Sustainable Finance Geneva (SFG)³⁴ have developed highly in-demand workshops and courses for financial professionals. These organizations are composed of members and partners from the financial, academic, and public sectors. Since 2019, they have been co-hosting Building Bridges,³⁵ a forum for discussion and cooperation among financial and other private sector actors, public authorities, international organizations, nonprofit groups, and academics dedicated to achieving the transition to a sustainable financial

²⁹ The Federal Council of Switzerland. 2021. Federal Council sets parameters for binding climate reporting for large Swiss companies. <https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-84741.html>

³⁰ Association of Mexican Banks. Green Finance Taxonomy. <https://abm.org.mx/banca-sostenible/taxonomia.html>

³¹ Sustainable Finance Committee. Market Infrastructure for Sustainable Development. <https://www.ccfv.mx/finanzas-verdes/taxonom%C3%ADas>

³² Sustainable Finance Committee. Sustainable Finance Institute. <https://sites.google.com/ccfv.mx/consejo-consultivo-de-finanzas/instituto-de-finanzas-sostenibles>

³³ Swiss Sustainable Finance. <https://www.sustainablefinance.ch/>

³⁴ Sustainable Finance Geneva. <https://www.sfgeneva.org/>

³⁵ Building Bridges, <https://buildingbridges.org/en/home/>

system. Switzerland has made notable advances in capacity-building, and the 2020 roadmap developed by Swiss Funds and Asset Management Association (SFAMA) and SSF emphasized that “once responsibilities are defined, an organization should make sure relevant employees receive appropriate training to enable them to integrate sustainability factors into the investment process”. Accordingly, the Sustainability in the Swiss Financial Sector Report suggests that the state should actively promote excellent financial education and training at all levels over the competencies in sustainable finance that need to be systematically integrated.

- Nigeria’s roadmap emphasized the importance of raising awareness of sustainable finance in the private sector. It stated that “there are several possible dimensions to sustainable finance awareness raising including developing modules on sustainable finance within academic institutions such as business schools or within professional bodies or networks.” Although Nigerian universities do not currently offer courses in sustainable finance, the Financial Center for Sustainability Lagos³⁶ is working with foreign institutions to mainstream sustainable finance into university curricula, and since 2020 it has worked with PricewaterhouseCoopers to provide training models to the banking and insurance industry. In addition, FMDQ Securities Exchange Limited has recently developed the Nigerian Green Bond Market Development Program³⁷ and organized workshops to promote awareness of sustainable finance and build the capacity of actors in the financial system.

Formal Education

- Luxembourg’s 2018 roadmap specifically called for “integrating financial literacy and sustainable finance into school curricula and tertiary education.” The Ministry of Finance and the Luxembourg Sustainable Finance Initiative³⁸ partnered with the University of Luxembourg to create the Sustainable Finance Specialization³⁹ within its Master of Science in Finance and Economics degree program. This new specialization is designed to expand and strengthen financial professionals’ knowledge of sustainable finance and promote the integration of sustainability into the operations of the financial system. In addition, the House for Sustainable Governance and Markets⁴⁰ was founded to provide a virtual platform for sharing sustainability research and to improve connectivity between public and private institutions. Several financial stakeholders have also implemented their own education and training programs. For example, the Luxembourg Stock Exchange set up the LGX Academy,⁴¹ which offers courses aimed to “integrate sustainable finance into all financial sector training,” in line with the recommendations of the roadmap.

³⁶ Financial Center for Sustainability Lagos. <https://www.fc4slagos.com/>

³⁷ FMDQ Securities Exchange. 2021. Nigerian Green Bond Market Development Program. <https://fmdqgroup.com/fmdq-exchange-reiterates-its-support-for-the-development-of-the-nigerian-green-bond-market/>

³⁸ Luxembourg Sustainable Finance Initiative. <https://lsfi.lu/>

³⁹ Université de Luxembourg. Sustainable Finance Track.

https://www.fr.uni.lu/formations/fdef/msc_in_finance_and_economics/m2_sustainable_finance

⁴⁰ Université de Luxembourg. FDEF House for Sustainable Governance and Markets.

https://www.en.uni.lu/fdef/fdef_house_for_sustainable_governance_and_markets

⁴¹ Luxembourg Green Exchange. LGX Academy. <https://lgxhub.bourse.lu/academy>

- As recommended by the Sustainability in the Swiss Financial Sector Report, Switzerland’s formal educational institutions are gradually incorporating sustainable finance topics into their curricula. Academic research on sustainable finance is also increasing. The University of Zurich has founded the Center for Sustainable Finance and Private Wealth⁴² and the Fintech Innovation Lab,⁴³ both of which examine sustainability-related issues in the financial system. Additionally, the Swiss Confederation is working to support the financial sector’s activities in education. Encouraging state-recognized and accredited Swiss higher education institutions conduct research in cooperation with the financial sector.

Regulation

- Luxembourg’s 2018 roadmap recommended that the public sector “provide a credible, reliable, predictable and stable regulatory framework” in which private actors can “manage climate-related risks.” In this context, Luxembourg’s Financial Sector Surveillance Commission has begun implementing regulations on ESG risk management. In addition to promulgating the European standards for risk management, the commission published a circular on managing ESG risks in June 2021. These regulations apply to all credit institutions designated as “smaller institutions” under the Single Supervisory Mechanism,⁴⁴ as well as all branches of non-EU credit institutions.⁴⁵

Fiscal Incentives

- Luxembourg’s roadmap called for an “analysis and redesign of the system of incentives and taxation” to encourage long-term sustainable investment. In January 2021, the government introduced reduced subscription tax rates for investments that qualify as environmentally sustainable under the EU taxonomy.

Product and Market Innovation

- In 2020, the Mexican government began piloting a national Emissions Trading System⁴⁶ for energy and industrial facilities with direct annual emissions equal to or greater than 100,000 tons of carbon dioxide. The government allocated a volume of emissions rights free of charge to the facilities involved based on their historical emissions levels. The project is now in its second phase, and the credit system is being prepared with support from the Ministry of Finance.

⁴² University of Zurich. Center for Sustainable Finance and Private Wealth. <https://www.csp.uzh.ch/en.html>

⁴³ University of Zurich. Fintech Innovation Lab. <https://www.fintech.uzh.ch/en.html>

⁴⁴ Banque Centrale du Luxembourg. Single Supervisory Mechanism. https://www.bcl.lu/en/About/missions_bcl/stabilite_financiere/Mecanisme-de-surveillance-unique/index.html

⁴⁵ Commission de Surveillance du Sector Financier. 2021. Circular CSFF 21/773. https://www.cssf.lu/wp-content/uploads/cssf21_773eng.pdf

⁴⁶ Government of Mexico. Pilot program for the emissions trading system. <https://www.gob.mx/semarnat/acciones-y-programas/programa-de-prueba-del-sistema-de-comercio-de-emisiones-179414>

Research

- Switzerland’s 2020 roadmap developed by SFAMA and SSF highlighted the importance of ongoing research, and the “Sustainability in the Swiss Financial Sector” report recommends that state-recognized or accredited universities should conduct research in cooperation with the financial sector, with new knowledge flowing into all areas of financial activity – from risk management, to product development, to customer advice. In 2020, the Swiss Federal Office for the Environment and the State Secretariat for International Finance invited financial institutions and associations to participate in a second test to analyze the climate impact of their financial portfolios according to the Paris Agreement Capital Transition Assessment (PACTA) scenario analysis methodology. All Swiss banks, asset managers, pension funds, and insurance companies could test their portfolios anonymously and voluntarily. To date, 179 financial institutions have tested their portfolios, representing about 80 percent of the Swiss financial market and including half of all properties held by institutional investors and three-quarters of residential buildings covered by mortgages.

Roadmaps as part of Strategic Resets: Ireland and Germany Cases

Many countries have developed sustainable finance roadmaps as part of larger efforts to realign the financial sector with their strategic priorities. Germany and Ireland provide examples of how sustainable finance roadmaps can contribute to a broader agenda for financial transformation.

- In 2019, the German State Secretaries’ Committee for Sustainable Development asked the Ministry of Finance, together with the Ministry for Environment, Nature Conservation, and Nuclear Safety and the Ministry for Economic Affairs and Energy, to prepare a Sustainable Finance Strategy designed to position Germany as a leading center for sustainable finance. The federal government appointed a Sustainable Finance Advisory Committee comprising representatives of various stakeholder groups⁴⁷ to advise on the development and implementation of the Sustainable Finance Strategy. In March 2021, the committee presented 31 recommendations in its report “Shifting the Trillions – A Sustainable Financial System for the Great Transformation.” The report’s preparation involved 42 committee members, as well as observers from financial and corporate associations, public authorities, and supervisors. In May 2021, the government launched the “German Sustainable Finance Strategy”⁴⁸ focused on financial market policy and regulation, which used the roadmap as an input – leveraging its recommendations and establishing actionable measures to advance this agenda. This concrete action plan includes eight chapters covering the following topics: strengthening sustainable

⁴⁷ Namely banks and credit institutions, asset managers and owners, fintech and index providers, rating agencies, the real economy, insurance companies and pension funds, academia, civil society, associations, supervisors, among others.

⁴⁸ Federal Ministry of Finance of Germany. 2021. German Sustainable Finance Strategy.

https://www.bundesfinanzministerium.de/Content/EN/Standardartikel/Press_Room/Publications/Brochures/sustainable-finance-strategy.pdf?__blob=publicationFile&v=8

finance at the global and European level, improving transparency, strengthening risk management and supervision, improving and implementing impact assessment methods, financing transformation, the German government in capital markets, strengthening institutions, generating and sharing knowledge, and creating efficient structures for implementing the Sustainable Finance Strategy. The German Sustainable Finance Strategy is connected with the German national Sustainable Development Strategy (which goes beyond financial market policy).

- Also in 2019, the Irish government published “Ireland for Finance,”⁴⁹ a strategic framework to establish Ireland as a top-tier provider of specialized international financial services. As an output of this, in October 2021 the Irish Department of Finance, Sustainable Finance Ireland, Skillnet Ireland and the UNDP FC4S, published Ireland’s first national sustainable finance roadmap⁵⁰. The roadmap was developed over a six-month period and involved eight working groups representing a range industry actors.⁵¹ The working groups identified and assessed 90 opportunities to accelerate the development of sustainable finance, which formed the basis for 18 strategic actions outlined in the Sustainable Finance Roadmap. These are clustered under five key headings – talent development, industry readiness, leveraging digital, enabling environment, and promotion and communications. The Irish roadmap was informed by the FC4S toolbox, including the UNDP FC4S Assessment Programme. The key roadmap output is the establishment of an International Sustainable Finance Center of Excellence to be developed in partnership with the UNDP.

⁴⁹ Government of Ireland. 2019. Ireland for Finance. <https://www.gov.ie/en/publication/526a06-ireland-for-finance/>

⁵⁰ Sustainable Finance Ireland. 2021. Ireland’s Sustainable Finance Roadmap. <https://www.sustainablefinance.ie/wp-content/uploads/2021/10/Irish-SusFinance-Roadmap-FINAL-FINAL-OCTOBER-2021.pdf>

⁵¹ Including State representatives, public bodies, financial actors including asset owners, asset managers, investment funds, insurers, domestic and international banks, as well as experts on education and capacity building and innovation, data and digital technologies.

Natural Language Processing Analysis

To further assess the focus areas and content of sustainable finance roadmaps, a sample of these documents was analyzed through a computer science technique called natural language processing (NLP).⁵² The NLP analysis found the words and phrases used most often in the various documents and then grouped them based on automatically identified topics. This approach enables a highly visual assessment of roadmap themes and the relationships among them. The NLP technique complements the more traditional descriptive analysis presented above.

An analysis of the overall frequency⁵³ with which various words are used in the sample highlights the roadmaps' most prominent themes. As expected, "Financial/Finance" and "Sustainable" top the word list. "Investment" and "Risk" are also among the words used most often in the documents, as they relate both to the "double materiality" concept, which encompasses both financial institutions' investment decisions impacting the socio-environmental system, as well as the fact that climate change creates risk for financial institutions. Other words among the top-10 include "Climate" and "Green," in line with the roadmaps' focus on environmental issues.

Figure 3 shows the automatically generated word clouds⁵⁴ representing various roadmap topics:

1. The first word cloud includes financial institutions from both the sell and the buy side ("Banking," "Stock Exchanges"), public entities ("Ministries"), investment types ("Infrastructure," "Renewable Energy,") and financial products ("Loans," "Lending," "Credits," "Rate"). Most of the roadmaps represented in the first word cloud have a broad scope and encompass both private and public actors. This is expected given the previously described range of institutions who contributed to the drafting processes. The topic represented by this cloud is *Financial Institutions and Products*.
2. The second cloud features individual agents in the financial system ("Consultants," "Managers," "Shareholder") and institutional investors ("Pensions") as the main actors, as well as words related to investment decisions ("Guidance," "Advice") and compliance with rules and norms ("Commission," "Law," "Regulation," "Prudent" and "Stewardship"). The topic of this cloud is *Demand-Side Actors*.
3. The third word cloud focuses on regional and international designations ("Asian," "European," "World"), technologies and systems ("Fintech," "Banking"), and knowledge products and

⁵² The independence of the observations is not guaranteed due to the presence of more than one roadmap per country (10 countries published more than one roadmap). Moreover, 23 percent of the roadmaps in the sample were drafted and released by PRI, UNEP FI, and The Generation Foundation under the "Fiduciary Duty in the 21st Century" program, which may bias the results. To address this, all roadmaps corresponding to the same country were consolidated in a unique file and treated as a unit.

⁵³ The Z-score was used to measure the relative frequency of each word's appearance. For more details, please refer to [APPENDIX B – Methodology](#).

⁵⁴ The Word cloud is a visualization technique to represent sets of words that compose a topic. The size of words is proportional to their importance.

standards (“Taxonomy,” “Expertise,” “Tool,” “Guidance,” “SDGs”). The topic of this cloud is *Technical Perspectives*.

4. The fourth cloud emphasizes domestic and international oversight (“TCFD,” “Regulation,” “Emissions,” “Recommendation”), efforts and mechanisms to advance sustainable finance (“Transition,” “Credit,” “Energy”), and the agents tasked with implementation and compliance (“Managers”). The topic of this cloud is *Climate Disclosure*.
5. The fifth word cloud emphasizes major financial institutions (“Banking,” “Treasury Authority”), sectoral strategies and policies (“Regulation,” “Transition,” “Commitment”), and the equitable treatment of stakeholders (“Infrastructure,” “Access,” “Inclusive”). The topic of this cloud is *Financial System Management*.

Figure 3: NLP Word Clouds

Topic 1: Financial Institutions and Products



Topic 2: Demand-Side Actors



Topic 3: Technical Perspectives



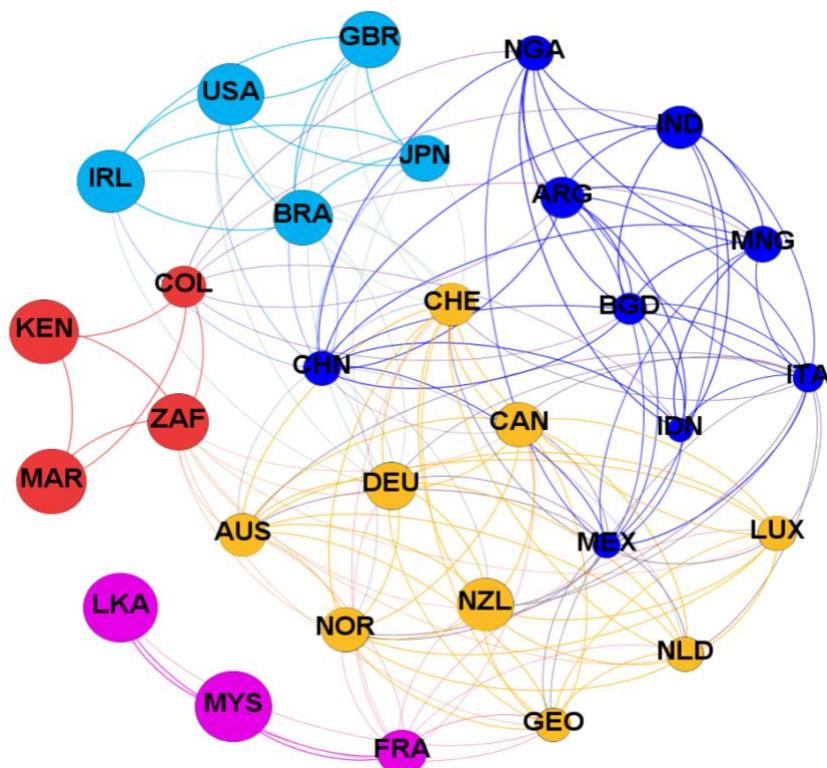
Topic 4: Climate Disclosure



Topic 5: Financial System Management



Figure 4: Country Network



Three letter country abbreviation: Argentina (ARG); Bangladesh (BGD); China (CHN) India (IND); Mexico (MEX); Indonesia (IDN), Mongolia (MNG); Nigeria (NGA); Italy (ITA); Ireland (IRL); Japan (JPN); the United Kingdom (GBR); the United States (USA); France (FRA), Malaysia (MYS); Sri Lanka (LKA); Australia (AUS); Germany (DEU); Canada (CAN); Georgia (GEO); Luxembourg (LUX); the Netherlands (NLD), New Zealand (NZL), Norway (NOR); Switzerland (CHE); Morocco (MAR); Kenya (KEN); Colombia (COL) and South Africa (ZAF).

Figure 4 shows filtered interconnections between the countries included in the sample, following the cloud clustering and color scheme described above.⁵⁵ Roadmaps associated with the first cloud, *Financial Institutions and Products*, include most of the middle-income countries⁵⁶ in the sample. These documents have a broad scope and involve a wide range of private and public actors, showing the lowest correlation intra-group among the clusters. The roadmaps linked with the second cloud, *Demand-Side Actors*, are mainly those of high-income countries⁵⁷ plus Brazil. Roadmaps associated with the third cloud,⁵⁸ *Technical Perspectives*, tended to be either developed or reviewed by regulators. Many of the roadmaps associated

⁵⁵ The nodes represent countries in the sample; the colors denote the topic to which they most closely correspond; and node size is proportional to the strength of the connection to each topic. A filtered subset of all the connections between nodes is represented by edges, which symbolize the relationship between each pair of nodes. For clarity purposes, a filter was applied so that approximately 80 percent of the edges were discarded. The edges shown correspond to highly correlated documents taking a threshold of 0.85.

⁵⁶ Argentina (ARG), Bangladesh (BGD), China (CHN) India (IND), Mexico (MEX), Indonesia (IDN), Mongolia (MNG) and Nigeria (NGA), and one high-income economy, Italy (ITA). Source: [World Bank Country and Lending Groups – World Bank Data Help Desk](#)

⁵⁷ Ireland (IRL), Japan (JPN), United Kingdom (GBR) and the United States (USA).

⁵⁸ France (FRA), Malaysia (MYS) and Sri Lanka (LKA).

with the fourth cloud, *Climate Disclosure*, were produced by countries with early public sector engagement in sustainable finance,⁵⁹ and these documents tended to include more concrete recommendations, with a narrower scope. Moreover, a correlation analysis revealed that countries with documents under this topic have the highest similarities in language within the sample.⁶⁰ Finally, roadmaps linked to the fifth cloud, *Financial System Management*, were produced by the remaining middle-income countries⁶¹ of the sample, underscoring the cross-cutting role of regulatory institutions.

The NLP analysis reveals that the roadmaps in the sample tend to concentrate on environmental rather than social or governance issues. It also demonstrates that the topics covered target a specific area, especially the roadmaps in the second, third, and fifth word clouds. The group of roadmaps in the second word cloud have a focus on demand side actors (including consultants, managers, shareholders, and pensions); those in the third word cloud address the role of fintech to advance sustainable finance; and those in the fifth word cloud focus on the role of financial regulators. Finally, the analysis shows that in general, roadmap content tends to correlate with socioeconomic development, since countries within a given income group tend to face similar challenges around sustainable finance and consequently adopt similar strategies to address them.

⁵⁹ Australia (AUS), Germany (DEU), Canada (CAN), Georgia (GEO), Luxembourg (LUX), the Netherlands (NLD), New Zealand (NZL), Norway (NOR) and Switzerland (CHE).

⁶⁰ For a complete correlation analysis among the sample documents, see Appendix C.

⁶¹ Morocco (MAR), Kenya (KEN) Colombia (COL) and South Africa (ZAF).

Conclusions and Recommendations

Despite the diversity of sustainable finance roadmaps, the analysis reveals several key elements that contribute to their success. National roadmaps differ markedly in terms of their scope and content, with each reflecting the specific needs of the country, the institution that required the roadmap, and the range of actors involved in its development. The impact of these roadmaps on the financial system has also varied due to multiple policy and socioeconomic features that are beyond the scope of this report. Nevertheless, several general conclusions emerge from the analysis.

Effectively identifying market failures and designing viable policy and fiscal interventions to support the development of sustainable finance markets requires a coherent, systematic approach backed by clearly defined institutional responsibilities. Drafting national roadmaps offers an opportunity to strategically and systematically design actions, incentives and institutions to support sustainable financial systems.

The parallel process of creating roadmaps in multiple countries provides governments with the flexibility to tailor their approach to the national context while also establishing a basis for cooperation, standardization, where appropriate, and the development of best practices at the regional and global level.

The **involvement of a heterogeneous and interdisciplinary group of participants** in the roadmap development process is key to the sustainable finance transformation. A 2021 World Bank report⁶² identified ministries, the central bank, and other regulators as key stakeholders that should be involved in drafting a sustainable finance roadmap. However, the case studies presented above highlight the importance of an even more inclusive and participatory drafting process. Experts in sustainable finance, policymakers, technical experts in economics and environmental policy, and actors from the broader financial ecosystem should all take part in the roadmap development process. A broad-based participatory process involving the institutions that will ultimately implement the recommendations is crucial to set realistic goals and obtain buy-in from key stakeholders.

A roadmap should **define a concrete set of clear and feasible actions** to advance the transition to sustainable finance. Even when the roadmap is merely designed to establish the strategic framework for a more detailed action plan, it should avoid vague language or impractical objectives. Broad, overly aspirational goals can weaken the utility of a roadmap, and unspecific recommendations should be replaced with well-defined actions supported by clear lines of accountability.

Roadmaps should clearly **identify the actors responsible for implementing each recommendation and establish appropriate monitoring and oversight arrangements.** Accountability for results is crucial to sustain reform momentum and demonstrate the government's ongoing commitment to achieving its objectives for sustainable finance. Roadmaps should specify which institutions are tasked with monitoring progress; some of these may be existing agencies, while others may be established for the express

⁶² World Bank. 2021. Toolkits for Policymakers to Green the Financial System.
<https://openknowledge.worldbank.org/handle/10986/35705>

purpose of overseeing the transition to sustainable finance. The roadmap should include performance indicators, though they may be refined or elaborated upon in a subsequent action plan.

Periodically **assessing and publicly reporting** the state of sustainable finance and the changes underway within the financial system helps sustain progress and prevent backsliding. Transparency incentivizes actors to comply with their obligations and commitments, and the regular publication of analyses and reports can help communicate achievements and signal to the private sector, civil society, and the international community the strength of the government's commitment to sustainable finance. For instance, the UNDP FC4S Assessment Programme has allowed financial centers to understand their market's state as well as track progress on key actions to advance this agenda.

Improvements in **data quality and availability** are fundamental to the sustainable transformation of financial institutions. Establishing frameworks and standards for the reporting and disclosure of sustainability-related information can provide the evidentiary basis necessary for investment in sustainable development. Addressing data gaps can strengthen the evidentiary basis for monitoring and assessing sustainability challenges and opportunities, enabling market participants to incorporate sustainability more effectively into their decisions. A full 93 percent of the roadmaps examined addressed disclosure and reporting, and these areas were the most common focus of roadmap recommendations. As the lack of reliable and readily accessible data on sustainability issues has posed a challenge for every financial system, 39 percent of the roadmaps examined recommended measures to improve data availability.

Responsible investment decisions can be improved through **building capacity and raising awareness** about sustainable finance within the financial system. Seventy-three percent of the examined roadmaps recommended capacity-building programs and expanded education and training opportunities for finance professionals. The dearth of relevant education and training programs is one of the biggest threats to the growth of the sustainable finance ecosystem, as finance professionals require the knowledge, skills, and capabilities to accurately assess diverse sustainability issues and opportunities. Mainstreaming sustainable finance should involve extensive training and capacity-building across the financial system, encompassing private firms as well as public institutions.

'To Do' List for Developing Sustainable Finance Roadmaps

- ☑ Develop a broad consultative process.
- ☑ Designate appropriate institutional leadership.
- ☑ Build a strong narrative for financial system alignment with sustainable development goals.
- ☑ Describe the requirements for aligning the financial system with sustainable development goals.
- ☑ Include an estimate of the investment gap in low-carbon sectors.
- ☑ Conduct an analysis of challenges and obstacles to scaling sustainable finance.
- ☑ Include multiple projected scenarios for the evolution of the financial system.
- ☑ Develop precise and actionable recommendations.
- ☑ Indicate which measures are the most urgent/feasible and identify prerequisites for deeper reforms.
- ☑ Develop a capacity-building plan to strengthen organizational competencies.
- ☑ Define the monitoring arrangements including progress indicators.
- ☑ Identify the agency or institution responsible for implementing each recommendation.
- ☑ Periodically evaluate the overall state of sustainable finance and renew public engagement.

The analysis of these sustainable finance roadmaps provided insights into motivation, features, and usefulness of the roadmaps as part of overall sustainability strategies. These conclusions could aid in the identification of work on this topic for both the Coalition and FC4S. In particular, the following could be considered:

1. In partnership with FC4S, the Coalition could organize a to raise awareness about the roadmap development process and its benefits, based on experiences and analysis.
2. The above conclusions could inform a training program.
3. Finance ministries can take steps to improve data availability and quality.
4. FC4S could develop a guide/recommendations/check list for finance ministries that are planning to lead the development of sustainable finance roadmaps.
5. Finance ministries could consider ways to include sustainable finance roadmaps in their overall climate plans, taking into account interlinkages with other Helsinki Principles.

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<https://openknowledge.worldbank.org/handle/10986/35705>

Appendix A: List of Sustainable Finance Roadmaps used in the Analysis

Country	Title	Publication Date	Access
Argentina	Capitalizing Sustainable Finance in Argentina: A stocktake and review of sustainable finance opportunities for Argentina	nov-18	Link
Australia	Fiduciary Duty in the 21st Century: Australia Roadmap	aug-16	Link
	Australian Sustainable Finance Roadmap	jun-20	Link
Bangladesh	Designing a Sustainable Financial System in Bangladesh	oct-15	Link
Brazil	Fiduciary Duty in the 21st Century: Brazil Roadmap	oct-16	Link
Canada	Final report of the expert Panel on Sustainable Finance	2019	Link
Canada	Fiduciary Duty in the 21st Century: Canada Roadmap	sep-17	Link
China	Establishing China's Green Financial System: Summery report of the Green Finance Task Force	mar-15	Link
China	Investor Duties and ESG Integration in China	mar-18	Link
Colombia	Aligning Colombia's Financial System with Sustainable Development	jun-15	Link
France	Sustainable Finance: What is the Role of the Regulator? AMF Roadmap	nov-18	Link
France	Fiduciary Duty in the 21st Century: France Roadmap (Executive summary)	nov-18	Link
Georgia	Roadmap for Sustainable Finance in Georgia	apr-19	Link
Germany	Fiduciary Duty in the 21st Century: Germany Roadmap	jun-17	Link
Germany	Shifting the Trillions: A sustainable financial system for the great transformation (Germany)	feb-21	Link
India	Delivering a Sustainable Financial System in India	apr-17	Link
Indonesia	Roadmap Keuangan Berkelanjutan: Roadmap for Sustainable Finance in Indonesia	dec-14	Link
Ireland	Fiduciary Duty in the 21st Century: Ireland Roadmap	jun-18	Link
Italy	Financing the Future: Report of the Italian National Dialog on Sustainable Finance	dec-16	Link
Japan	Sustainable Investment in Japan: An Agenda for Action	sep-19	Link
Japan	Fiduciary Duty in the 21st Century: Japan Roadmap	apr-17	Link
Kenya	Aligning Kenya's Financial System with Inclusive Green Investment	oct-15	Link
Luxembourg	Luxembourg Sustainable Finance Roadmap	oct-18	Link
Malaysia	Social Finance Roadmap for Malaysia	jun-16	Link

Malaysia	Sustainable and Responsible Investment Roadmap for the Malaysian Capital Market	nov-19	Link
Mexico	Climate and Environmental Risks and Opportunities in Mexico's Financial System: from Diagnosis to Action	feb-20	Link
Mexico	How data provision can help understand better environmental sources of financial risk and integrate them more effectively into mainstream financial decision-making	oct-18	Link
Mongolia	National Sustainable Finance Roadmap of Mongolia	nov-18	Link
Morocco	Roadmap for Aligning the Moroccan Financial Sector with Sustainable Development	nov-16	Link
Netherlands	A Roadmap for a Sustainable Dutch Financial Sector: Conclusions of the UNEP Inquiry country engagement with the Netherlands	feb-16	Link
New Zealand	Sustainable Finance Forum: Roadmap for Action	nov-20	Link
Nigeria	Nigerian Sustainable Finance Roadmap	dec-18	Link
Norway	Roadmap for Green Competitiveness in the Financial Sector	jun-18	Link
South Africa	Financing a Sustainable Economy: Technical Paper	may-20	Link
Sri Lanka	Roadmap for Sustainable Finance in Sri Lanka	apr-19	Link
Switzerland	Design of a Sustainable Financial System	jun-15	Link
Switzerland	Sustainable Asset Management: Key Messages and Recommendations of SFAMA and SSF	jun-20	Link
Switzerland	Proposals for a Roadmap towards a Sustainable Financial System in Switzerland	jun-16	Link
United Kingdom	The United Kingdom: Global Hub, Local Dynamics	jan-16	Link
United Kingdom	Fiduciary Duty in the 21st Century: UK Roadmap	oct-16	Link
United States of America	Fiduciary Duty in the 21st Century: US Roadmap	oct-16	Link

Appendix B: Methodology

Document sampling

The first step for building the international stocktake on sustainable finance roadmaps was a desktop research to map out all the documents to be analyzed (from now on referred to as “roadmaps”, although they were not always named as such). All of these documents are differently structured, with diverse authors, sections included, objectives addressed, targeted actors, and even diverging sustainable finance definitions and approaches.

The document selection was based on the following criteria:

1. The central objective of the document is to conduct or help drive the sustainability transformation of the financial system.
2. The document includes *recommendations*, defined as suggestions or proposals that actor(s) should implement to enhance sustainable finance.
3. The scope of the document is national. Regional or international reports were excluded, even when complying with the other characteristics, since the objective of this report is to understand the implications for a country that develops the roadmaps – to this end, we believe that the recommendations need to be adjusted to the particularities of each country.
4. All of the reports included are publicly available documents.

Two kinds of documents frequently comply with these criteria but were excluded from the analysis: national strategies and financial regulator’s guidelines.

In the first case, we have decided to exclude national sustainable finance national strategies from the sampled documents since they usually go one step further than a roadmap in terms of sustainable finance policy, providing details on the implementation of an already decided course of action, clarifying how financing should be mobilized in order to achieve the sustainability objectives, and, in some cases, covering a broader scope that exceeds financial aspects.

The financial regulator’s guidelines – which are even sometimes named “roadmaps” – consist of instructions and recommendations on how to comply with certain practices related to sustainable finance. As their central objective is usually to address only one specific sustainable finance topic, they do not include major steps or recommendations needed to reach a global sustainability transformation of the financial system. As shown in Appendix A, documents developed by financial regulators were included in the sample only when they complied with the previously mentioned requirements and were not aimed at working as official guidelines for financial institutions.

Categories definition:

The categorization was developed both by identifying the aspects that previous documents considered essential to drive the sustainability transformation of financial systems, such as the UNEP and World

Bank's Roadmap for a Sustainable Financial System⁶³ or the World Bank's Toolkit for Policymakers to Green the Financial System,⁶⁴ and also by considering observed features and trends in the sample of documents. Following these criteria, the recommendations were registered under 18 detailed categories. However, this exercise was not fully exhaustive, since some recommendations that did not fit into this categorization were not included in the analysis. Moreover, a few recommendations could be assigned to more than one category.

Natural Language Processing Analysis procedure:

The results were obtained using topic modelling, a technique that automatically identifies words that match together in the set of documents. The model used extracted the patterns of word clusters and frequencies of words for the 41 roadmaps separately. The outcomes are displayed in three different types of graphics:

- Bar chart with the most common words of the roadmaps.
- Word clouds identifying the most relevant issues and actors on each roadmap, with a proposed set of names for the automatically developed topics.
- A node graph to analyze the predefined topics within the roadmaps sample, and whether there were regional approaches or other features by groups of countries.
- A heat map presenting the correlation between different roadmaps considering the identified topics.

Pre-processing step:

The text from the roadmaps was pre-processed using the natural language toolkit (NLTK) Python library (<https://www.nltk.org/>). To improve the analysis, and following standard procedures, the part-of-speech tag (i.e. the grammatical role) of each word was identified and text was lemmatized. This procedure reduces noise by considering terms with same meaning as equals, and extracting terms that do not contribute to the core content of roadmaps, by transforming inflected forms of words into their respective roots (i.e. plurals to singulars, conjugated verbs to infinitive, among others). Characters from each text were converted into lower case; punctuation marks, symbols, numbers and a list of stop words of common used in English (provided by NLTK) were removed.

Document-Term matrix and TF-IDF normalization:

The pre-processed text was used to construct the Document-Term matrix where rows corresponded to each country (i.e. Roadmap) and columns to the set of unique words in the entire corpus. The matrix inputs represented the frequency of appearance of each word in the corresponding Roadmap.

⁶³ The World Bank and UN Environment Program. 2017. Roadmap for a Sustainable Financial System.

<https://sustainabledevelopment.un.org/content/documents/245112128312112017153333RoadmapforaSustainableFinancialSystem.pdf>

⁶⁴ The World Bank. 2021. Toolkits for Policymakers to Green the Financial System.

<https://openknowledge.worldbank.org/handle/10986/35705>

Term Frequency-Inverse Document Frequency (TF-IDF) normalization was applied to the matrix, using Scikit-Learn (Sklearn) Python library (<https://www.scikit-learn.org/>). In general, given a collection of documents D , a word w and a particular document d (in the corpus), TF-IDF normalization is computed by:

$$w_d = f_{w,d} * \log \log \frac{|D|}{f_{w,D}}$$

Where $f_{w,d}$ is the frequency of w in d (original input of matrix), $|D|$ corresponds to the size of the corpus (numbers of rows) and $f_{w,D}$ to the number of documents in which w appears (inputs different from zero in the column of w). This normalization is used to highlight relevant terms and attenuate common words of the corpus.

In addition, words that appeared in less than 10 percent and more than 90 percent of the roadmaps were removed. This step is not necessary after TF-IDF normalization, but it reduces noise and the number of columns from the original document-term matrix improving the performance and speed of further analyses.

Topic detection:

Non-negative matrix factorization (NMF) was applied with Sklearn and used for topic detection. NMF is based in the decomposition of the document-term matrix (after TF-IDF normalization) into two non-negative factors ($W * H$) that minimize the Frobenius norm. After fixing the parameter “number of topics”, W can be interpreted as the projection of the documents in the topics and H as the weight of the individual words in each topic.

NMF presents two mayor advantages when compared to other algorithms. First, the elements of the factors are non-negative providing a straightforward interpretation. Second, although the Frobenius norm will generally decrease by the addition of a new topic, the benefit obtained does not always justify its inclusion. Therefore, NMF provides a semi-objective method to approximated the optimal number of topics, known as the “elbow method”. After this, a visual inspection based on words and concepts repetitions in the topics was applied to fix the parameter.

To represent each topic, word clouds (based on H matrix inputs) were made considering only the terms with higher weight (setting a maximum of 35 words). The size of the terms was established proportionally to their weight in the topic.

Network:

The network displays interconnections between the sampled countries which have one or more Roadmaps. Relationships between documents were computed by taking the correlation of W matrix and represented with a graph using Gephi 0.9.2 (<https://gephi.org/>). In this, nodes represent each individual roadmap and edges correspond to highly correlated documents taking a threshold of 0.85 (approximately 80 percent of the edges were discarded). Nodes colors denote the topic to which they correspond considering their highest projection, while the size was established proportionally to this projection. Importantly, this graph is missing the second topic projection.

Heatmap:

A correlation heatmap is a graphical representation of the correlation matrix indicating the dependence

between different variables. The correlation ranges from -1 to +1, and values closer to 0 (darker) mean there is no relationship between the two variables. The closer the correlation is to 1 (i.e. the more positive correlation they have) the stronger the relationship between documents is. In other words, the higher the number and the brighter the color, the greater the correlation between the corpus (text) of countries' Roadmaps.

It was calculated using the Pearson correlation coefficient, which measures how the value of two different variables vary with respect to each other. The coefficient can be calculated using the following formula:

$$r = \frac{\sum (x_i - \underline{x})(y_i - \underline{y})}{\sqrt{\sum (x_i - \underline{x})^2 \sum (y_i - \underline{y})^2}}$$

Where \underline{x} is the mean value of the variable X and \underline{y} is the mean value of the variable Y. x_i and y_i represents different observations of X and Y. In the case of this document, X and Y represent pairs of Roadmaps.

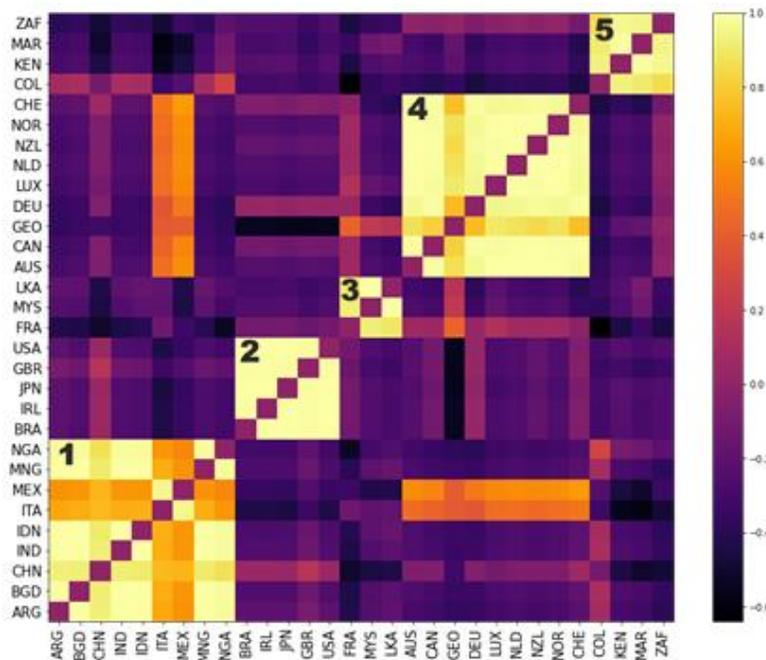
Appendix C: Heat-map

To numerically measure the level of relationship that countries' roadmaps have with each other, without applying any filtering and considering the automatically generated topics, a heat map analysis was developed. In addition to highlighting previously unnoticed bilateral correlations/similarities among pairs of roadmaps (such as the Australian and the Mexican ones, which can be founded on countries strongly recommending to adhere and implement the TCFD standards on reporting and disclosure, or giving a high priority to developing efficient data recollection systems), the graph also describes the relationship among countries within each cluster (broader themes might create noise intra-group).

The five light yellow squares on the main diagonal of the graph represent the five topics discussed previously. Both topics one and four comprise 30% of the sampled countries each, although the correlation is naturally stronger in "Climate disclosure", being a more specific topic than "Financial Institutions and Products". This heatmap also underscores the high correlation (approximately 0.6) that Mexico (which relates to topic one) has with issues covered in topic 4.

"Demand side actors" (including 17% of the countries) presents the strongest correlation of all five groups. "Financial System Management" and "Technical Perspectives" represent 13 and 10% of the countries analyzed, respectively. Both topics show high and similar correlation (0.8 or above).

Figure 5: Heat-map



Appendix D: Roadmap for a Sustainable Financial System The World Bank and UNEP (2017) – Recommendations

1. Identifying the narrative: Outlining why a national financial system needs to be aligned with national sustainable development outcomes, setting out the scope of key terms such as financial system and sustainable development in a national context.
2. Assessing overall needs: Describes the national sustainable finance requirements over a particular time period, as well as the magnitude of business-as usual flows to high-carbon sectors.
3. Estimating necessary flows: Allows to understand the magnitude of the challenge, and generate a directional estimate of the investment gap.
4. Identifying potential barriers: Including generic ones (such as underdeveloped capital markets or remuneration policies that incentivize short-termism) or specific to sustainable finance (such as a lack of clarity over definitions, or information about sustainable projects).
5. Aligning with international experience: Any sustainable finance roadmap would be firmly aligned with national priorities and would involve clear domestic leadership.
6. Building scenarios: Takes into account possible future scenarios for the financial system, to consider diverse risks and opportunities, and their probabilities.
7. Identifying suitable measures. The specific recommended actions are a function of several factors and diverge among countries. Common measures include those related to disclosure, business practices, financial instruments, and knowledge-sharing networks.
8. Sequencing of measures and priorities. Pivoting from tactical innovation to a more systemic approach to sustainable financing at a national level will reveal sequencing issues.
9. Building capacity. Aligning the financial system with sustainable development goals will require capacity building because new competencies and capabilities will need to be developed in key areas. New institutional configurations, such as those related to the scope of financial policy makers' and regulators' mandates, along with their interface with other policy institutions, might need to be addressed.
10. Measuring progress: An effective framework for measuring progress can highlight areas for improvement and also help assess the effectiveness of measures that have been introduced.