

A Global Survey of Finance Ministries: The Climate Policy Questions They Face and State of Analytical Tools for Addressing Them

A contributing report for the Coalition of Finance Ministers for Climate Action's Helsinki Principle 4 workstream:
Revamping Economic Analysis and Modelling to Drive Climate Leadership for Finance Ministries

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About this report

This report is a central product of the Helsinki Principle 4 (HP4) workstream of the Coalition of Finance Ministers for Climate Action. It advances the overarching goal of integrating climate action into economic and fiscal policy. It is part of an initiative to enhance macroeconomic analysis and modelling tools for Ministries of Finance, equipping them to assess the economic impacts of climate risks, mitigation efforts, and adaptation strategies.

This report is based on a survey of 59 Ministries of Finance. Recognizing the urgent need for Ministries of Finance to access tools capable of addressing today's critical climate policy challenges, this report aims to provide insights that are specifically tailored to diverse contexts and adaptable to the timescales required by decision-makers. As the first global survey of its kind, it offers a systematic exploration of the key climate policy issues facing Ministries of Finance and examines the extent to which they possess the necessary tools to tackle these issues. The survey was complemented with, and informed by, in-depth interviews with 15 Ministries of Finance.

In addition to this report, a series of complementary documents are underway, including a Compendium of Practice—which provides an overview of modelling and analytical tools available to finance ministries—and several thematic reports focused on specific climate policy needs and associated tools. A separate report captures the overarching goals of the broader program.

The results of this demand-led exercise will also inform the wider initiative and other outputs that are targeted to provide support to the ecosystem surrounding Ministries of Finance. This research will complement other efforts, including a 2023 baseline survey for Latin America and the Caribbean that provides an overview of the state of fiscal policy for climate action.

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Disclaimer

This work is in draft form for comment and is not for wider circulation. It was prepared at the request of and with the guidance of the Co-Leads of the Coalition's HP4 work program and the Steering Group of members assembled for this work program, with input from its technical advisory group. The views, findings, interpretations, and conclusions expressed are a synthesis of the diverse views of the authors, contributors, and reviewers. While many Coalition members and partners may support the general thrust of the arguments, findings, and recommendations made in this report, they do not necessarily reflect the views of the Coalition, its members, or the affiliations of the authors, nor does this report represent an endorsement of any of the views expressed herein by any individual Member.

Table of contents

Key messages.....	4
Summary Report – Key findings from surveys and interviews	7
Introduction.....	7
1. Assessment of climate-related risks and opportunities	12
2. Priorities for climate policy design and implementation	15
3. Evaluation of climate-related investments and expenditures	17
4. Existing analytical tools and approaches.....	19
5. Climate-related analytical capabilities.....	25
6. Conclusion.....	28
Appendix 1: Technical report - Survey	29
Appendix 2: Technical report – Interviews	89
Supplementary material.....	102
I. Survey methodology	103
II. Survey - List of countries.....	105
III. Survey questions.....	106
IV. Additional qualitative survey results	123
V. Interview structure	128
VI. Interview information consent	129

Key messages

The world's first comprehensive survey of Ministries of Finance (MoFs) and supplementary interviews sheds light on how MoFs worldwide are approaching the transition to a low-carbon and climate-resilient economy. The report finds that while MoFs are increasingly aware of the pressing need to address climate action and are actively implementing a range of climate policies, a significant proportion have not yet undertaken analysis of the economic, fiscal, and financial impacts of the policies necessary to drive forward the green and resilient transition. There is a notable gap between the demand for, and the availability of suitable economic modelling and analytical tools in use by MoFs to inform climate action. This poses an important barrier to MoFs driving forward the transition at the pace and scale required. Overcoming these limitations will demand a strong response by MoFs, in partnership with supporting agencies, to rapidly enhance the supply of analytical tools and capabilities needed to address the most pressing climate policy questions they face.

Key findings from the survey of 59 Finance Ministries, of which 27 were Advanced Economies (AEs), and 32 were Emerging and Developing Economies (EMDE)¹, include:

- 1. There is broad recognition among MoFs of the physical and transition risks associated with climate change, reflecting a strong awareness of its potential impacts, as well as the economic opportunities arising from climate action.**
 - MoFs are particularly concerned about the potential impacts of **physical climate change** (including acute climate-related events such as heatwaves and chronic factors such as increased droughts) on GDP and government finances (revenues and expenditures), and, to a lesser extent, inflation, employment, and competitiveness. They also show high concerns about **transition risks** (those risks posed by the transition to low-carbon economies). Emerging market and developing countries (EMDEs) are on average more concerned about both physical and transition risks than advanced economies (AEs).
 - MoFs see a wide range of **economic opportunities** emerging from proactive climate action, albeit with MoFs from advanced economies perceiving higher levels of emerging economic opportunities than EMDEs. Key opportunities identified include economic diversification, opportunities related to the expansion of renewables and competitive and comparative advantages. Low-income developing countries (LIDCs) generally reported a narrower range of potential benefits.
- 2. Ministries of Finance are increasingly acting on climate change, but there is variety in responses across countries and development status.**
 - While almost all MoF surveyed consider climate action an important economic issue, only one third see it as central to their **core mandate**. Most see it as the responsibility of other departments to drive climate action, and view the Ministry of Finance in a supporting role.
 - MoFs are actively implementing, or involved in the implementation, of a range of **climate policies**. More than half of MoFs surveyed, for example, are using taxes and pricing mechanisms, providing green fiscal subsidies, or are engaged in shaping national climate strategies. Implementation is more advanced in AEs compared to EMDEs in some policy areas – particularly green fiscal subsidies, resilience of public finances, and integration of climate considerations into central banks and financial supervision.

¹ This includes 63% of all AEs and 21% of EMDEs.

- Fiscal sustainability, followed by economic growth and efficiency, are the top priorities for policymakers when designing climate-related policies, with a strong emphasis on the long-term financial impact of such measures.
- 3. Most MoFs are in the early stages of establishing the climate-related analysis needed to inform the transition to low-carbon and climate-resilient economies.**
- Most Ministries of Finance have not quantified the **investments and public expenditure** needed for the green and resilient transition. Only 25% of MoFs have conducted analysis of public expenditure and financing needs for adaptation and resilience, while around half have done so for decarbonization and low-carbon growth. Furthermore, most MoFs have yet to conduct analytical efforts to identify and develop new revenue-raising measures specifically tailored to support a low-carbon economy.
 - Few MoFs have so far integrated **physical climate change and transition considerations** into their core analytical functions, including policy appraisal, financial sector policy, tax and fiscal policy, budget protections and macroeconomic forecasting.
 - The majority of MoFs do not use dedicated **climate-economy models**, with around 56% of respondents reporting not using any specialized models for mitigation or adaptation.
- 4. Ministry of Finance face many barriers and challenges to scaling up analytical tools and capabilities for climate action.**
- Over 4 in 5 MoFs report facing significant **staffing and skill constraints** in climate-economy analytics. Two thirds face model development challenges, while half of MoFs experience financial constraints in their ability to invest in improving analytical capabilities.
 - MoF also **lack access to the analytical tools** needed to answer their policy questions, relying on a small number of model types, and many rely heavily on external models. Some ministries have noted that unclear communication regarding the structural design and uncertainties of external models can result in misinterpretations of analyses and the improper application of results.
 - MoFs often face **data and information gaps**, with 78% of MoFs highlighting they face data challenges when using analytical tools for climate action. MoFs also highlight several pressing climate-related policy and analytical questions that they lack sufficient information to address, including around quantifying the costs of mitigation and adaptation at sufficiently detailed and disaggregated levels and timescales.
- 5. There are strong options for addressing the gaps between the demand and supply of robust analytical tools and capabilities in MoFs.**
- MoF highlighted a need for various forms of **support to boost their climate-related analytical capabilities**. This includes better access to the latest climate-economy modelling developments, better access to case studies from other countries, and improved technical assistance for in-house capacity building, alongside improved resources for data collection.. MoFs also highlighted a need for better knowledge and experience sharing of best practice of analysis, especially among MoFs that face similar challenges.
 - MoFs have varying **climate-economy modelling and analysis needs**, depending on their stage of climate policy implementation. Ministries with advanced capabilities often require more granular analytical tools and models that support the design of specific policies and regulations. MoFs with less developed capabilities require simple but robust estimates for the identification of trends and changes in key macro indicators to inform government strategy and mapping of broader risk and opportunities.

- Although MoFs, across all development stages highlighted the need for a diverse, flexible, and pragmatic suite of analytical tools to address the different policy and analytical questions they face, and that are (or can be) tailored to their national circumstances.
- Many MoFs are clear on the types of **external collaborations** that can be useful. Many MoFs, for instance, rely heavily on external models, and recognize that they would benefit from long-term training and more active involvement in model development and improved model transparency to enable them to adapt and refine models over time to ensure they can provide suitable answers for addressing the unique policy questions they face. Further, efforts to standardize data sources and methodologies across government departments could facilitate better cross-comparisons and help MoFs more effectively review and challenge policy proposals.

6. Despite the challenges, many MoFs are making progress in enhancing their analytical capabilities.

These Ministries are creating a growing repository of valuable examples and insights, offering lessons for the global MoF community and the organizations that support them. In-depth examples of the *experience and knowledge* of this growing community are available in the Compendium of Practice that complements this survey. Guidance on how Ministries of Finance can strengthen their analytical capabilities for analysis and modelling to drive climate action, and what the international community can do to support them, will be provided in a complementary paper.

Summary Report – Key findings from surveys and interviews

Introduction

Green and resilient transitions demand sweeping structural transformations across all sectors of the economy, including energy, transportation, industry, and agriculture, and all levels of government and society. Ministries of Finance (MoFs) play a pivotal role in this process. Positioned at the intersection of economic, fiscal, and financial policy, MoFs oversee public spending and wield significant influence over national strategies, investment plans, and key institutions such as state-owned enterprises and development banks. Their leadership is critical to driving the economic transformations necessary to address the climate crisis. Yet, many MoFs are not progressing at the pace required to confront the scale of this challenge. Understanding the barriers preventing MoFs from mainstreaming climate action and identifying the tools needed to overcome these challenges are critical steps and will be crucial to help them accelerate climate action.

This survey therefore represents the first systematic attempt to explore how Ministries of Finance (MoFs) around the world are approaching the transition to a low-carbon and climate-resilient economy. It examines the steps they are taking to integrate climate-related considerations into their economic analysis and modelling approaches, the efforts they are undertaking to understand the impacts of the pressing climate policy questions they face, and the challenges they face.

Objectives and Audience

The objective of this exercise was twofold:

- I. Gain a deeper understanding of how MoFs are currently thinking about climate-related risks and opportunities, and how these are being integrated into their analytical and decision-making frameworks;
- II. Identify potential technical gaps and implementation challenges, and highlight areas that would most benefit from increased support.

This report is primarily targeted at Ministries of Finance and the international community, including multilateral development banks, international organizations, research institutions and others working with Ministries of Finance. Its key aim is to offer Ministries of Finance valuable insights into the progress of their peers while equipping the international community with guidance on how to better support Ministries of Finance in strengthening their climate analytical capabilities.

Survey

For this purpose, the survey asked questions around five themes:

- **Assessment of climate-related risks** including physical climate risks, as well as national and global transition risks and **opportunities** associated with climate action;
- **Priorities for climate policy design**, focusing on key decision-making criteria, the current status of various policy considerations, and their level of **implementation**;
- **Evaluation of climate-related investments** for adaptation, decarbonization, and diversification costs, as well as projected **expenditure** needs and potential new sources of fundraising
- **Existing analytical tools and approaches**, divided into two segments: (a) general analytics, including practices related to general economic modelling, covering model types, data and

- software usage, and collaboration and (b) climate analytics, including the integration of climate-related considerations into economic models, the use of climate and transition scenarios, scenario-specific dynamics and climate-related data;
- **Climate-related analytical capabilities** and the key challenges they face in integrating climate considerations into their priorities, analytics, and broader practices and the Coalition's role in supporting MoF's efforts to address these challenges and strengthen capabilities.

59 Ministries of Finance completed the survey (see Table S1), of which 27 were Advanced Economies (AEs), and 32 were Emerging and Developing Economies (EMDEs), as classified by the IMF. To provide more granular insights, for any qualitative analysis of responses, the latter group is further split into Emerging Market Economies (EMEs) and Low-Income Developing Countries (LIDCs).²

All in all, 63% of all AEs responded to the survey and 21% of EMDEs. All regions (as per the World Bank's Regional Groups) are represented, although regional participation is strongest in the Europe and Central Asia region, where 40% of all countries participated (although only those from Europe), and weakest in Middle East & North Africa, where 20% of countries participated. The regional imbalances also reflect current Coalition membership patterns (over 90% of responses came from Coalition members). Survey respondents represent 33% of global GDP, and 20% of global emissions.

For each quantitative question, analysis was conducted to determine potential differences between advanced and emerging and developing economies. Relevant differences are reported throughout, but in many cases, there was no statistically significant difference between the two groups. More details can be found in Appendix 1.

Interviews

The survey was complemented by semi-structured interviews with 15 Ministries of Finance on the state of climate mainstreaming into their work, the most pressing policy and analytical questions they face, and the key challenges they experience around modelling and analytical tools. Given the limited sample size, the interviews and the resulting findings are not representative.³ However, they provide additional insights into dynamics and complexities that the survey was unable to fully cover. This includes issues such as how Ministries of Finance use tools to influence policy decision, the roles of institutional politics, capacity constraints and dynamics of external collaboration.

Table S1: List of countries participating in the survey and interviews

<i>Andorra</i>	<i>Dominican Republic</i>	<i>Republic of Korea</i>	<i>Serbia</i>
<i>Argentina</i>	<i>Ecuador*</i>	<i>Latvia</i>	<i>Seychelles</i>
<i>Australia*</i>	<i>Egypt</i>	<i>Lithuania</i>	<i>Sierra Leone*</i>
<i>Austria*</i>	<i>Estonia</i>	<i>Luxembourg</i>	<i>Singapore</i>
<i>Bahamas</i>	<i>Eswatini</i>	<i>Malaysia</i>	<i>Slovakia*</i>
<i>Bahrain</i>	<i>Finland*</i>	<i>Marshall Islands</i>	<i>Spain</i>
<i>Bangladesh</i>	<i>France</i>	<i>Mexico*</i>	<i>Switzerland*</i>
<i>Belgium</i>	<i>Germany</i>	<i>Mozambique</i>	<i>Uganda*</i>
<i>Bhutan</i>	<i>Greece</i>	<i>Namibia</i>	<i>Uruguay</i>
<i>Cambodia</i>	<i>Guinea</i>	<i>Netherlands</i>	

² This distinction was not made for quantitative analysis as to not reduce the statistical power of the analysis.

³ The 15 Ministries were selected based on a range of factors including geographic diversity, income level, institutional capacity, and experience in climate policy, as well as their availability and interest in the initiative. While all regions (World Bank Regional Groups) are represented, we did not secure interviews with countries in the Central Asia and East Asia subregions.

<i>Canada*</i>	<i>Hungary</i>	<i>Nigeria</i>	<i>Interviews only</i>
<i>Cabo Verde</i>	<i>Iceland</i>	<i>Norway</i>	<i>Brazil</i>
<i>Chile</i>	<i>Indonesia</i>	<i>Palestine</i>	<i>European Commission</i>
<i>Colombia</i>	<i>Ireland</i>	<i>Paraguay</i>	<i>Morocco</i>
<i>Cyprus</i>	<i>Italy*</i>	<i>Peru</i>	<i>United States</i>
<i>Denmark</i>	<i>Jamaica</i>	<i>Philippines</i>	
<i>Djibouti</i>	<i>Japan</i>	<i>Portugal</i>	

**Countries that also participated in semi structured interviews*

Structure of the report

This report discusses key findings from both exercises, starting with a section discussing high-level findings from the interviews that provide the context for the survey, before discussing in turn the results according to the five themes listed above.

The full survey and interview results and more details on their methodology are available in Appendices 1 (Survey) and 2 (Interviews).

Box S1: Integrating climate considerations into economic analysis and modelling – Insights from Interviews

Ministries of Finance (MoF) are increasingly aware of the pressing need to address climate action, yet many face significant limitations in their capabilities to perform climate-economic modelling and analysis to address the questions they face. Findings from the 15 in-depth interviews conducted to inform the initiative on ‘Revamping Economic Analysis and Modelling to Drive Climate Leadership for Finance Ministries’ and the design of the Global Survey summarised in sections 1-5 demonstrated a number of key trends and inspired the more detailed survey work.

In particular, many MoFs are in the early stages of establishing climate-related analysis. The interviews found that a range of factors need to be addressed that currently hold back MoF’s climate-economy modelling and analysis. These include a lack of specialized analytical tools and models that are sufficiently targeted to the climate policy question at hand; external models that are often insufficiently customized to local contexts; challenges in cross-agency and external collaboration; limited internal resources and competing priorities that shift with the political landscape; insufficient adaptability of in-house workhorse models to incorporate climate considerations; and lack of comprehensive, consistent, and timely data and access to such data where it exists.

To close this gap, MoFs require adaptable analytical tools and models that can respond to diverse policy demands and shifting political landscapes, and tools that enable rapid policy insights on both mitigation and adaptation strategies. Strengthening these analytical capabilities hinges on close collaboration with external stakeholders, including international organizations and academia, and improvements in data accessibility, model transparency, and standardized methodologies. With better-resourced tools, enhanced internal capacity, and established best practices from other cross-cutting policy areas, the interviews have shown that MoFs can move beyond climate awareness to effectively integrate climate considerations into their core economic functions, setting a strong foundation for resilient, data-driven climate policy.

At the same time the interviews also suggested that MoFs have varying climate-economy modelling and analysis needs, depending on their stage of climate policy implementation and internal resources available. Analytical requirements, policy priorities, and challenges and responsibilities vary substantially across MoFs. Ministries with advanced capabilities often require more granular analytical tools and models that support the design of specific policies and regulation, often with a very detailed sector- or spatial focus, and detailed policy evaluation. MoFs with less developed capabilities and resources often first need simple but robust estimates for the identification of trends and changes in macro-critical indicators to inform government strategy and the mapping of broader risk and opportunities.

The interviews suggest that enhanced collaboration, tailored solutions, and strong political leadership are vital for MoFs to overcome barriers to enhancing their analytical capability and integrating climate considerations into their core operations. The interviews showed that building stronger partnerships with international organizations, academia, and other external stakeholders is critical to addressing analytical gaps and fostering long-term sustainability of analytical capability. Co-developing models collaboratively can help to ensure they are tailored to local needs while simultaneously building internal capacity. Improvements in data accessibility, model transparency, and the adoption of standardized methodologies can further accelerate climate-related analysis and help MoFs adapt tools from other policy areas. At the same time, achieving strong political buy-in and establishing dedicated governance structures for good analytics, combined with equipping

interdisciplinary teams with the necessary skills, are essential for translating analytical outputs into actionable policies.

The following five sections dive deeper into these issues based on the more detailed survey results. They cover Ministries of Finances' assessment of risks and opportunities resulting from climate change, their priorities for climate policy design, the steps they have already undertaken to evaluate climate-related investment and integrate climate into their analytical tools and approaches, and the challenges they experience, based on their response to the Global Survey. These are occasionally complemented with further insights from interviews where they are relevant and add additional perspectives.

1. Assessment of climate-related risks and opportunities

The survey results show that there is widespread acknowledgement among MoFs of physical and transition risks, indicating high levels of awareness of climate change and its consequences. However, the perceived severity of risks varies. Average levels of concern regarding all risk categories – physical, national and local transition risks (see Box S2 for definitions) – are highest among EMDEs.

Box S2: What are physical and transition risks?

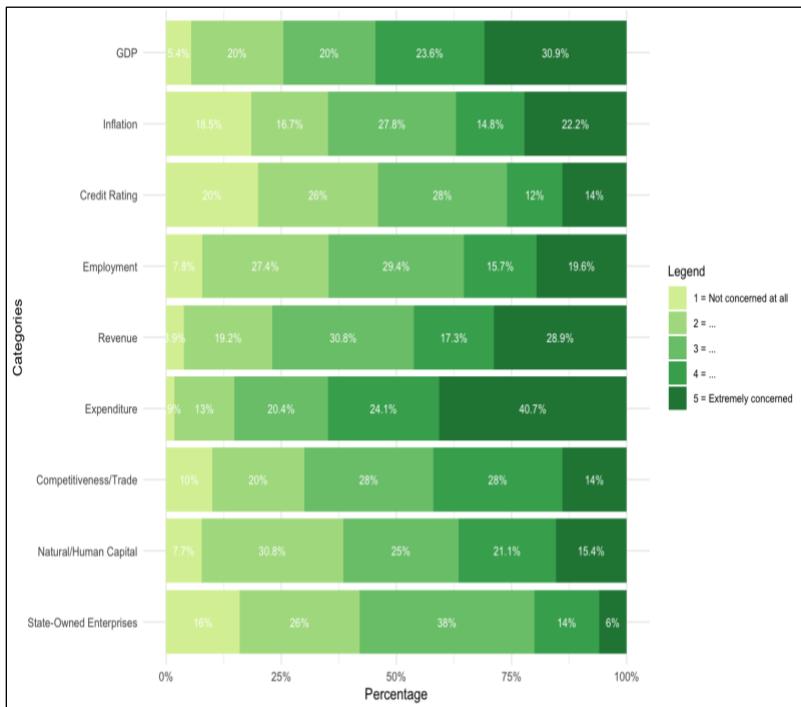
- **Physical climate risks** refer to risks caused by both acute climate-related events such as heatwaves, storms, wildfires and flash floods, as well as chronic factors (i.e., gradually changing factors) such as average temperature increase, increased droughts and desertification, sea-level rise, coastal erosion, and ocean acidification.
- **National transition risks** are those risks posed by the domestic transition to a low-carbon economy on various macroeconomic variables. For instance, electrification of transport might impact taxation from fuel taxation without measures to identify alternatives or the transition might impact jobs in certain sectors.
- **Global transition risks** refer potential macroeconomic implications resulting from a global transition to a low-carbon economy, including from the reduction in global fossil fuel demand driven by climate policies, among another factors, across the world or the potential impact of other countries climate policies on competitiveness of existing exports.

With regards to physical climate risks, MoFs are particularly concerned about the potential impacts of physical climate change on GDP, government finances (revenues and expenditures), and, to a lesser extent, on inflation, employment, and competitiveness. For instance, 65%⁴ of respondents indicated they were either concerned or extremely concerned about the impacts of physical climate risks on government spending, while 55% were either concerned or extremely concerned about GDP.

MoFs indicated less concern about real interest rates, credit ratings, and the value of state-owned enterprises (see Figure S1). Overall, comparisons show that EMDEs reported higher average levels of concern associated with the macroeconomic implications of physical risks compared to AEs. When asked to comment on specific physical risk drivers they are particularly worried about, Ministries most frequently mentioned the impact of extreme weather events (e.g. floods or droughts) and slow-onset effects (sea-level rise, salinity intrusion) on key industries, infrastructure, public health, and productivity.

⁴ All figures in the summary are approximate and rounded to the nearest whole number.

Figure S1: MoF concerns about the impact of physical climate change on key macroeconomic indicators



With regards to national transition risks, MoFs reported the highest levels of concern about the impacts of the domestic transition on government finances, GDP, and competitiveness. Similarly, MoFs are most concerned about the impact of the global transition on competitiveness, GDP, and government finances (both expenditure and revenue), while concerns regarding real interest rates, credit ratings, and state-owned enterprises (SOEs) are comparatively lower. As with physical risks, EMDEs are on average more concerned about national and global transition risks than AEs (see Table S2).

Table S2: Average MoF concerns about the impact of climate change on key macroeconomic indicators on a scale from 1 (not concerned at all) to 5 (extremely concerned)⁵

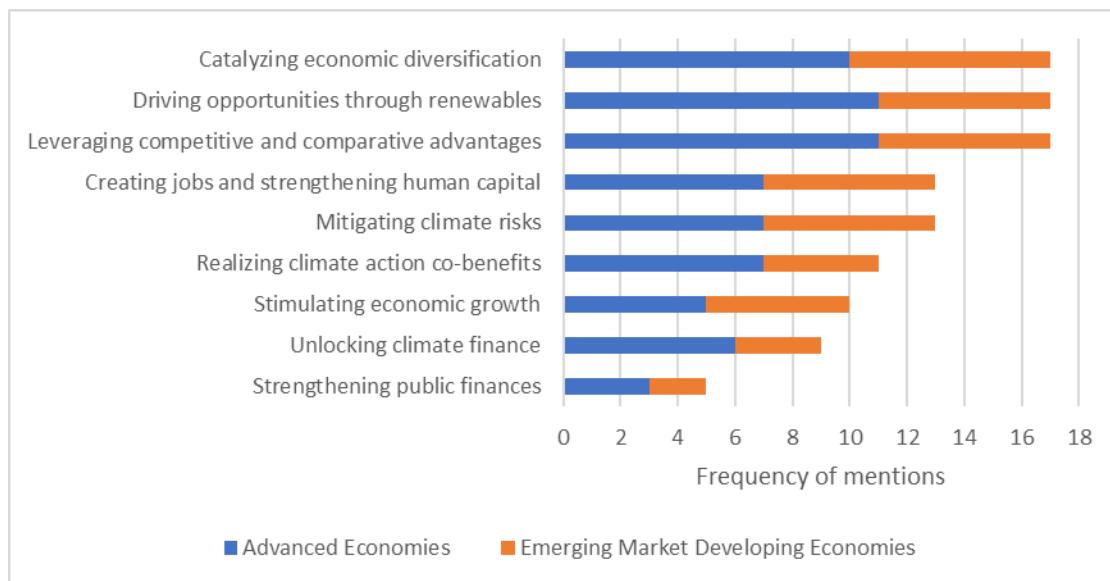
Type of Risk	AEs		EMDEs	
	Mean	Standard Deviation	Mean	Standard Deviation
Physical risks	2.7	0.9	3.6	1.0
National transition risk	3.6	1.0	3.3	1.0
Global transition risks	3.0	1.0	3.4	0.9

When asked to comment on specific transition risk drivers, EMDEs expressed high levels of concern regarding the impacts of other countries' carbon pricing (border adjustment) mechanisms and their potential impact on exports trade, domestic industries for exposed sectors, and government revenues. Other transition risk drivers identified by countries of all income levels were financial risks, government revenues, and economic impacts.

⁵ A detailed breakdown of risk perception on key economic variables is available in Table 2.2 on Appendix 1.

When asked to identify specific opportunities emerging from climate action, MoFs reported a range of opportunities, particularly around harnessing comparative advantages and increasing competitiveness (see Figure S2). Emerging market economies frequently cited opportunities around the adoption of renewable energy, whereas advanced economies reported opportunities around green technologies, intellectual property, and R&D. Additionally, the avoidance of physical climate risks, energy independence, insulation from geopolitical volatility, and protection from price instability and foreign influence are paramount priorities for ministries across all levels of development.

Figure S21: Most frequently reported themes by MoFs when asked about potential positive economic impacts or opportunities resulting from climate action



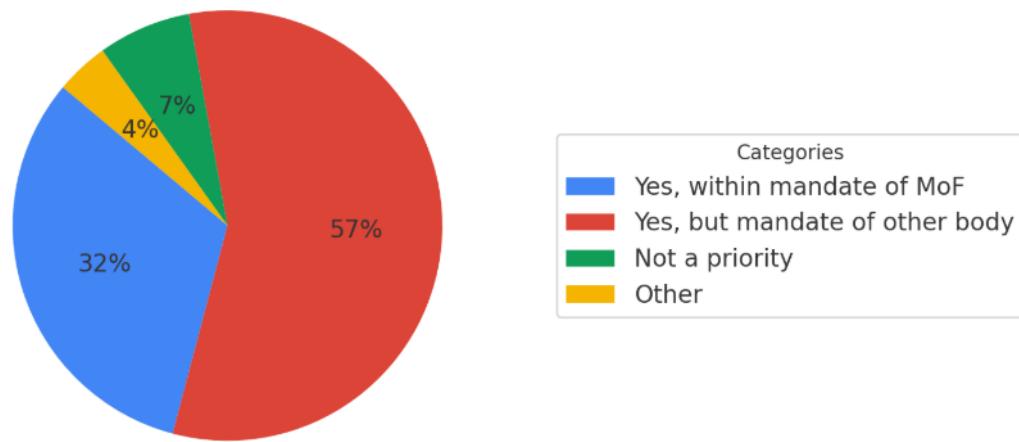
Low-income developing countries (LIDCs) generally reported a narrower range of potential benefits, and no opportunities around comparative advantage and competitiveness. For these countries, key opportunities reported by MoFs are focused on avoided physical risks, investment, and job creation.

Most MoFs are actively assessing the opportunities resulting from climate change, with around 25% of respondents indicating that their ministry plays a leading role in designing and considering the impacts of green economic policies aimed at creating green economic opportunities, and a further 39% reporting that they provide support to other government departments.

2. Priorities for climate policy design and implementation

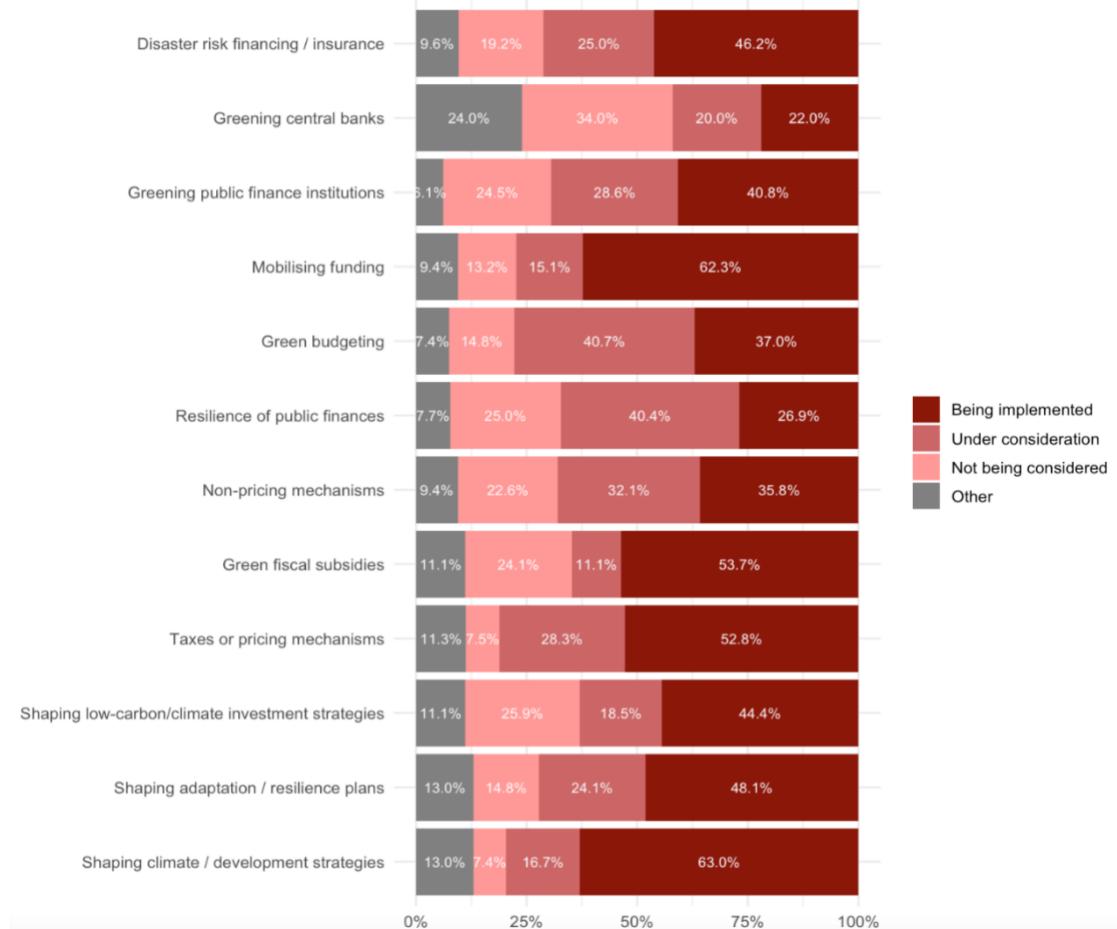
Almost all Finance Ministries (90%) consider climate action an important economic issue. However, only one third of MoFs report that it is central to their core mandate, while the majority (57%) consider it to be the mandate of other departments (see Figure S3).

Figure S3: Does the MoF consider climate action a core economic issue?



Many MoFs are actively implementing, or involved in the implementation of, climate policies in a range of different areas (see Figure S4). More than half of MoFs are engaged in shaping national climate strategies (63%), using taxes and pricing mechanisms (53%), and providing green fiscal subsidies (54%). They are less active in areas like shaping low carbon/climate investment strategies and adaptation/resilience plans, strengthening the resilience of public finances, green budgeting, and integrating climate into financial systems, with significant portions of respondents indicating these are either under consideration or not being pursued. In most areas, the level of engagement is similar between AEs and EMDEs. Only when it comes to green fiscal subsidies, resilience of public finances, and integration of climate considerations into central banks and financial supervision, implementation in AEs tends to be more advanced, while EMDEs are more likely to be at the early stages of implementation.

Figure S4: Implementation status of a series of climate-related policies in Ministries of Finance



When designing climate-related policies, MoFs pay particular attention to their consequences for fiscal sustainability, economic growth and efficiency, with over 80% of respondents rating those considerations as either important or extremely important. International competitiveness and distributional impacts were also considered important. Legal obligations, including those related to international agreements like the UNFCCC or the Paris Agreement, were rated lower in comparison, indicating that such commitments are perceived as less relevant for some MoFs when designing climate-related policies, compared to economic and fiscal considerations.

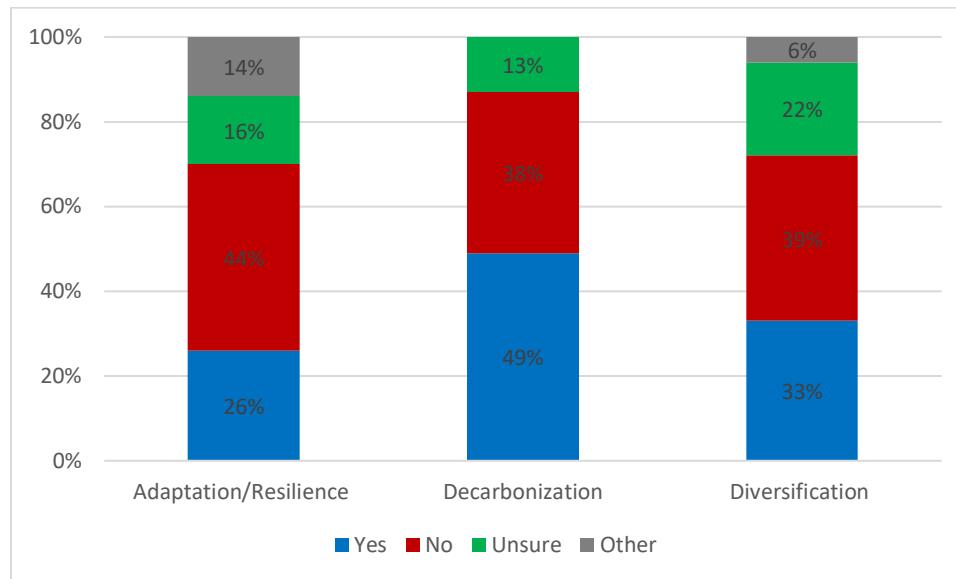
MoFs currently have insufficient information to answer a number of pressing climate-related policy and analytical questions, spanning a broad range of issues. The following key topics and questions were raised frequently:

- **Overcoming uncertainties:** MoFs struggle with limited data on physical climate impacts, economic outcomes and future market trends, hindering their ability to assess risks, plan investments, and conduct cost-benefit analyses effectively.
- **Quantifying costs and expenditures:** Ministries face challenges in estimating and planning for mitigation and adaptation costs, particularly for financing clean energy in emerging economies, and infrastructure resilience in low-income developing countries. Many advanced economies are also grappling with the unknown costs of sector-specific transitions and adaptation.
- **Improving policy design and assessment:** MoFs, particularly in advanced countries, are looking to improve policy effectiveness through better *ex-ante* assessments, *ex-post* evaluations, and clear metrics for tracking climate policy impacts.

3. Evaluation of climate-related investments and expenditures

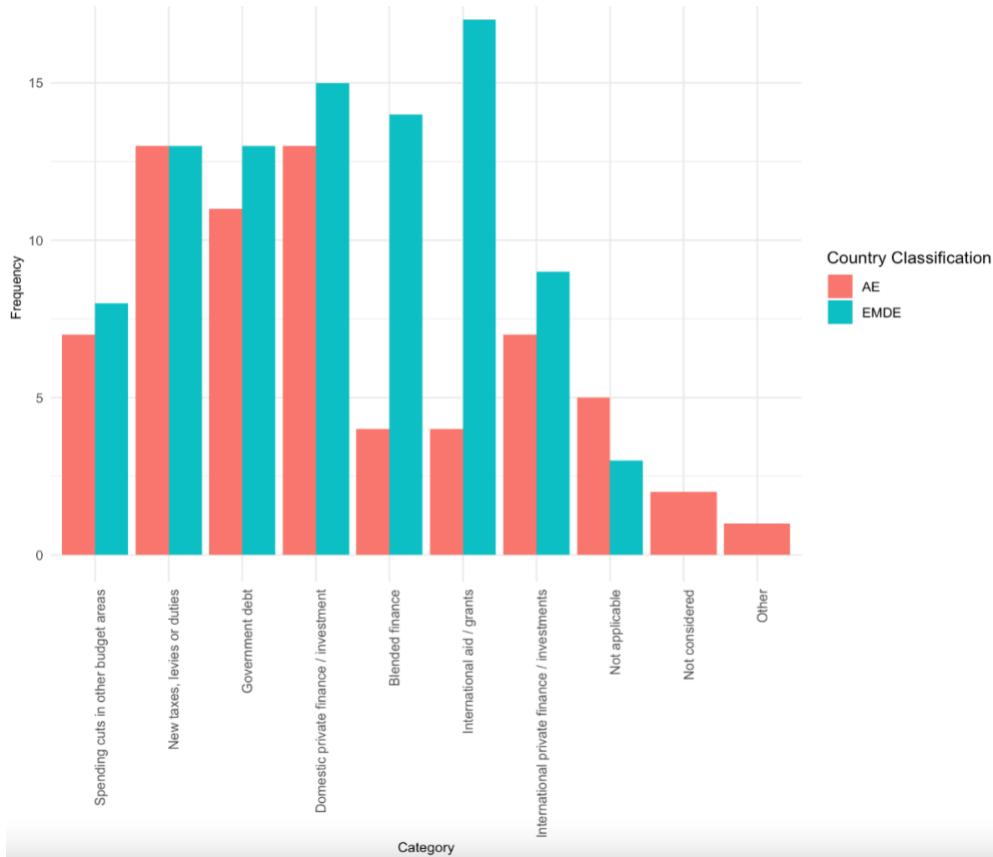
The financial implications of decarbonization, adaptation and diversification away from fossil fuels remain unquantified in a substantial number of countries (Figure S5). Almost half (44%) of MoFs have yet to conduct any analysis to estimate public expenditure and financing needs for adaptation and resilience to climate change and only around quarter (26%) report that they have done so. Substantially more MoFs (49%) have estimated public expenditure costs and financing needs associated with policies for decarbonization. However, most MoFs are yet to conduct sector specific analysis, particularly around buildings (29% have completed assessments) and agriculture and land use (35%). Moreover, only around a third of MoF (39%) have estimated financing needs for economic diversification (i.e. expenditure costs and financing needed for transitioning key sectors away from fossil fuels, such as compensation for fossil-fuel industries or infrastructure or for re-skilling of labor force in areas dependent on fossil fuels). No significant differences between AEs and EMDEs were observed across the three areas.

Figure S5: Has the MoF conducted any analysis to estimate public expenditure and financing needs for adaptation/resilience, decarbonization and economic diversification?



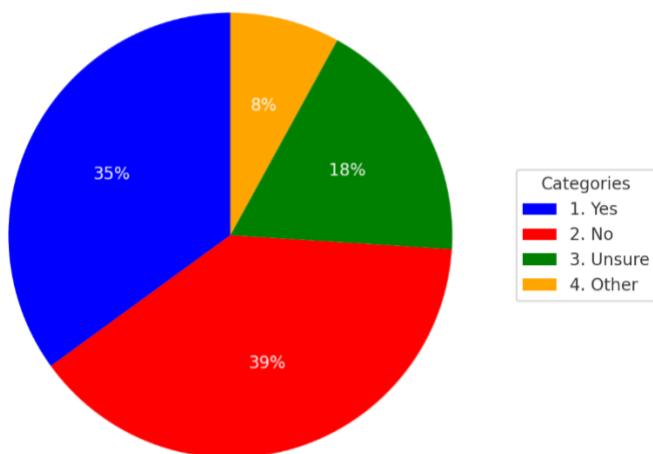
Ministries are considering a diverse array of funding sources to address climate-related financial needs (see Figure S6). Domestic private finance, new taxes, levies and duties, government debt (e.g. green bonds), and international aid are the most prominent financing options. Blended finance, international investment, and budget reallocations are also part of the funding mix, reflecting broad strategies for supporting climate initiatives across different budgetary and economic contexts.

Figure S6: From which sources of funding does the MoF assume the majority of the fiscal costs related to climate adaptation, transition to net-zero, and diversification can be mobilized from?



Most Ministries of Finance have not undertaken analytical efforts to identify and design new revenue-raising measures tailored for a low-carbon economy (see Figure S7). 35% of MoF have done so, while a notable portion, 22%, selected ‘unsure’, reflecting either uncertainty or a lack of clarity about whether such analytical work had been undertaken.

Figure S7: Has the MoF led analytical work to identify and design new measures for raising revenue in a low-carbon economy?



4. Existing analytical tools and approaches

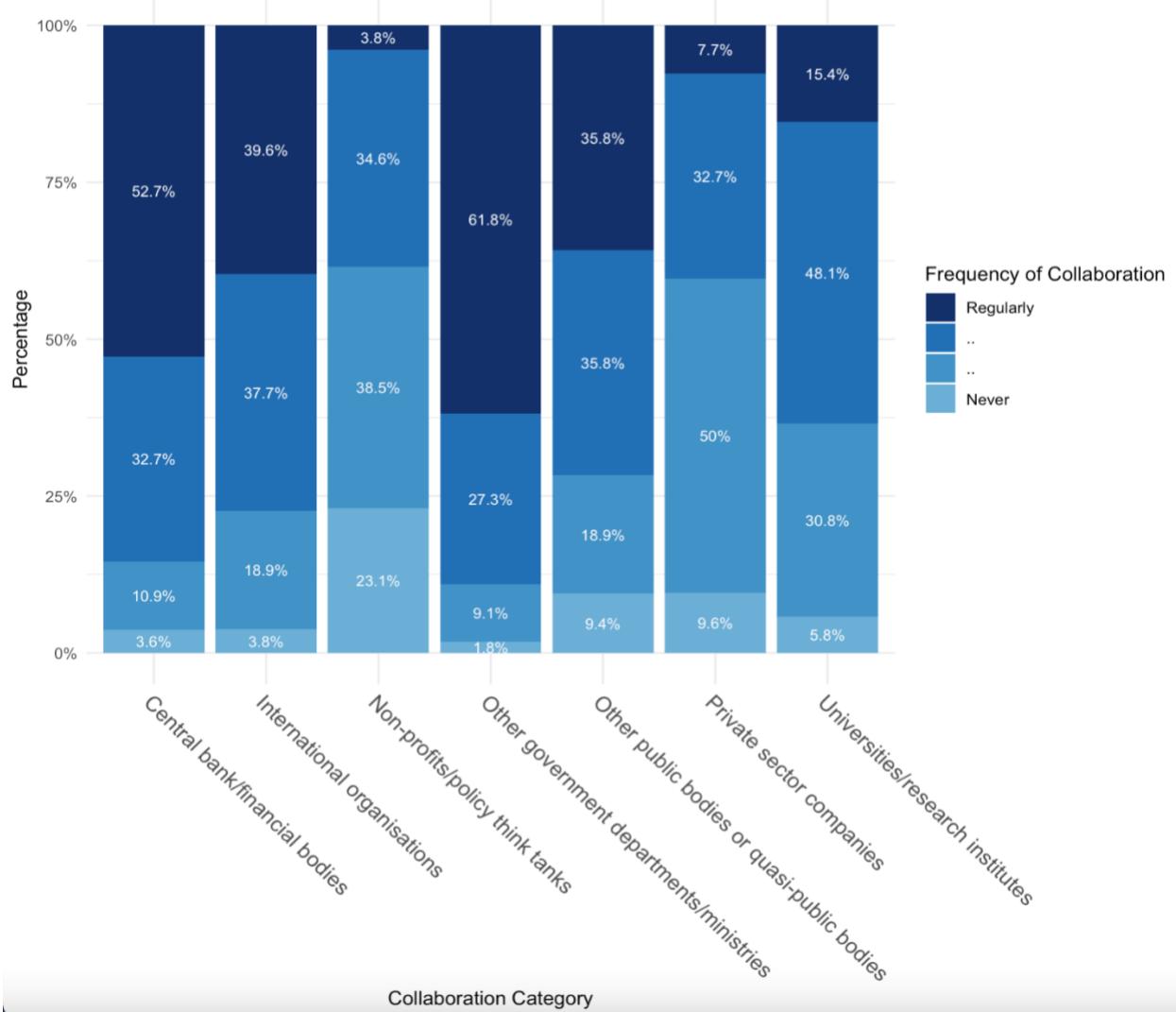
General macroeconomic modelling and analytical tools

Setting the specifics of climate policy aside, most MoFs use a range of *general economic modelling and analytical tools* to support overarching decision-making in relation to economic, fiscal, and financial policy. These tools are typically focused on core indicators of interest, with the majority of MoFs using general equilibrium models and other standard economic models, many of which are spreadsheet based. Macroeconomic forecasting and budget projections are the most commonly used **analytical functions** within MoFs, with roughly 85% of respondents utilizing these functions. Policy appraisal methods are used by 66%, while financial sector design is less commonly applied (utilized by only 46% of respondents). When it comes to **data usage**, aggregate macroeconomic data is the most frequently used data type by MoFs, relied on by 94% of respondents, followed closely by government-owned micro-data (73%) and survey data (63%). Physical climate risk and carbon emissions data are the least used category.

Less than half of MoFs surveyed use advanced economic models for analysis of policy options or forecasting. Features like unemployment, expectations, and heterogeneous agents are common across most ministries. More complex features such as financial frictions and endogenous technological change, are included by only a minority, indicating varied levels of sophistication in economic modelling across countries. Similarly, there are significant differences in model complexity and scope, with the number of equations and sectors ranging widely. Some models are highly detailed, with up to 10,000 equations, while others are more streamlined. However, integrating climate considerations into these advanced models is still work in progress for MoFs. While advanced models are frequently used in general economic policy analysis and forecasting, only 39% of countries report using them for climate-related policy analysis.

There is significant divergence in the extent to which MoFs collaborate and interact within government, nationally and internationally on economic analysis (see Figure S7). We find that MoFs most often collaborate ‘regularly’ with other government departments and ministries (62%), central banks and related financial bodies (53%), as well as international organizations (40%). They collaborate less frequently with universities and research institutes, with only 15% reporting to collaborate regularly with these entities, followed by private sector companies (8%), and non-profit organizations / policy think tanks (4%). We find the most variation for collaboration with other public bodies or quasi-public bodies, meaning that while some MoFs are collaborating frequently with these institutions, others do not.

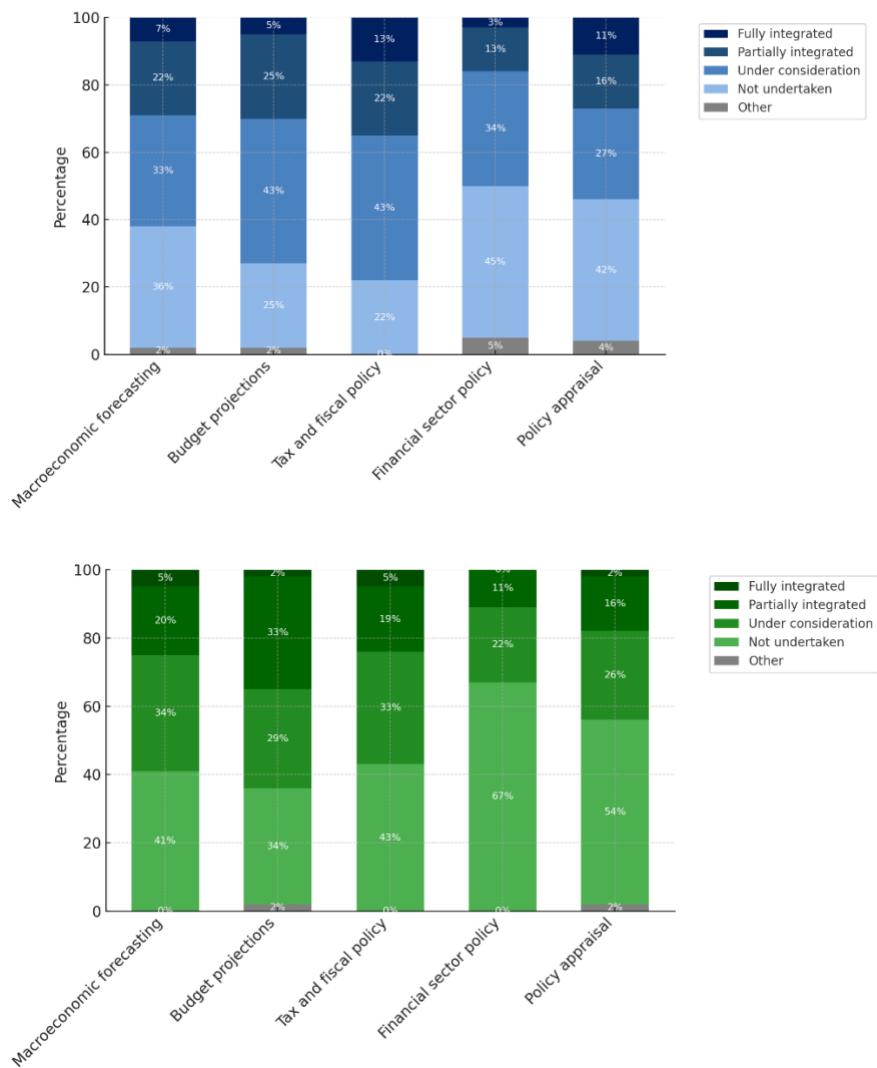
Figure S8: Does the MoF collaborate with external parties as part of its economic analysis and modelling?



Climate-related macroeconomic modelling and analytical tools

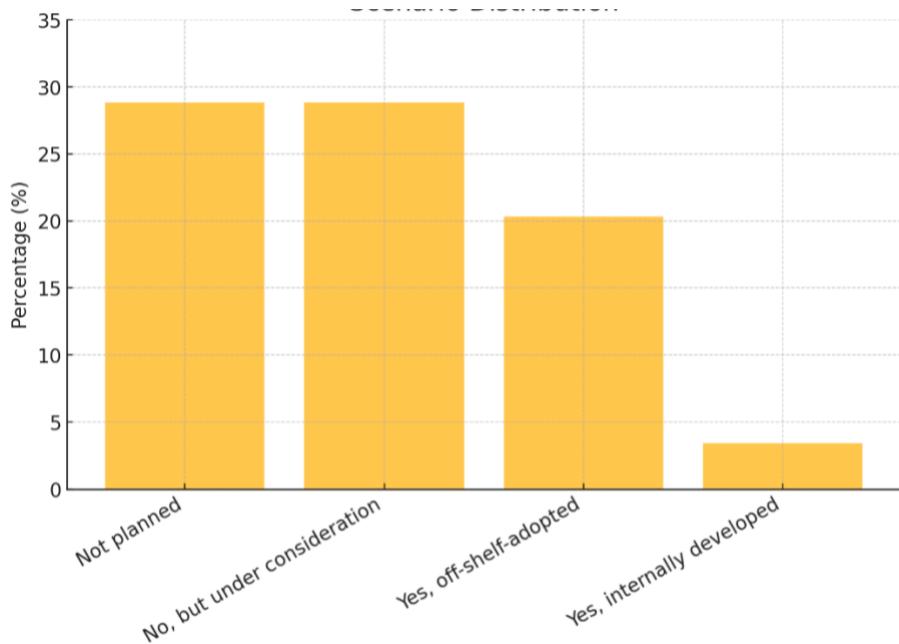
In terms of the use of analytical tools to address climate-related issues, MoFs in both advanced and emerging economies have made limited progress in integrating physical climate change and transition considerations into their core analytical functions (see Figure S9). Overall, around 81% of countries have yet to integrate, or consider the integration, of **physical climate impacts** in any key analytical function (i.e. policy appraisal, financial sector policy, tax and fiscal policy, budget protections and macroeconomic forecasting). Most progress has been made on budget projections, where 35% of countries report full or partial integration. Somewhat more progress has been made with regards to integrating **transition** considerations: A slightly smaller share of MoFs, 71%, are yet to integrate, or consider the integration of, transition consideration into any of the functions surveyed. Most progress has been made in tax and fiscal policy, where 34% report full or partial integration. No significant differences between AEs and EMDEs were observed.

Figure S9: Level of integration of physical climate considerations (top) and transition considerations (bottom) into MoF core analytical functions



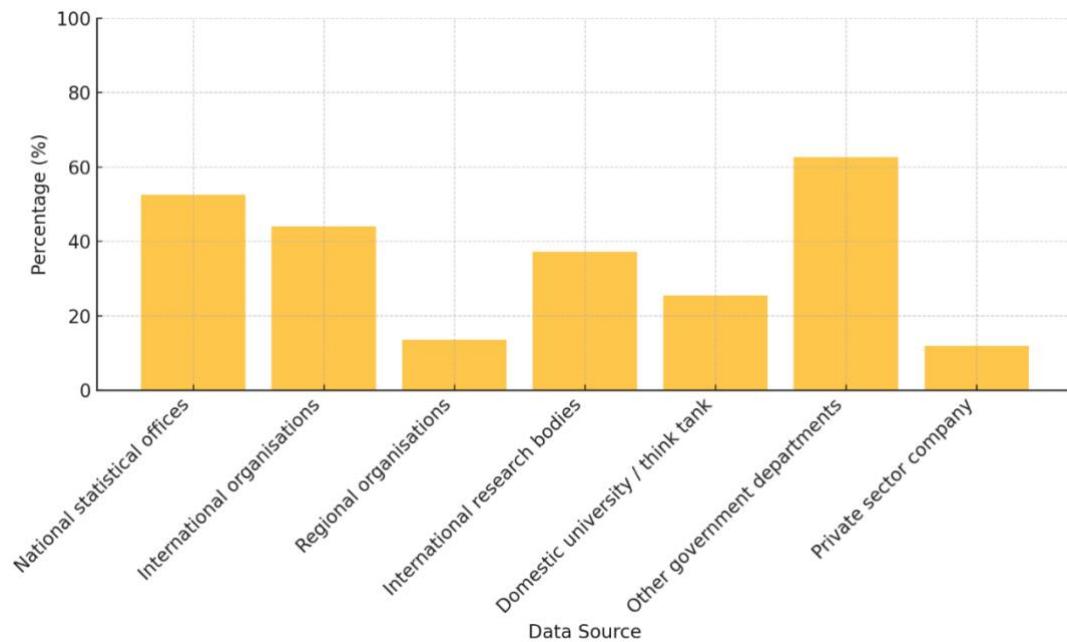
Climate-related scenarios of global warming and decarbonization are not yet widely used for economic policy analysis in MoFs. Around 71% of MoFs have not yet integrated physical climate pathways (global warming scenarios). Of those that have done so, almost all rely on off-the-shelf scenarios (see Figure S10). The share of MoFs that have not yet incorporated transition pathways into their policy analyses is slightly lower, at 62%. Of those who do, a small majority use off-the-shelf climate policy scenarios as opposed to internally developed ones.

Figure S10: Is the MoF using climate-related scenarios of global warming (physical climate pathways) to inform economic policy analyses?



MoFs primarily rely on domestic sources for climate-related data, with most respondents obtaining data from other government departments (78%) and national statistical offices (67%). International organizations (56%) and research bodies (47%) also serve as significant sources, but regional bodies (17%) and private sector companies are used far less frequently (5%). MoFs often combine multiple data providers to inform their climate analyses (see Figure S11). When asked to elaborate on the key data challenges they face, Ministries brought up a range of challenges, particularly around data harmonization, data granularity, data gaps, data frequency, data accessibility and data systemization.

Figure S11: Where does the MoF get granular climate-related data from?



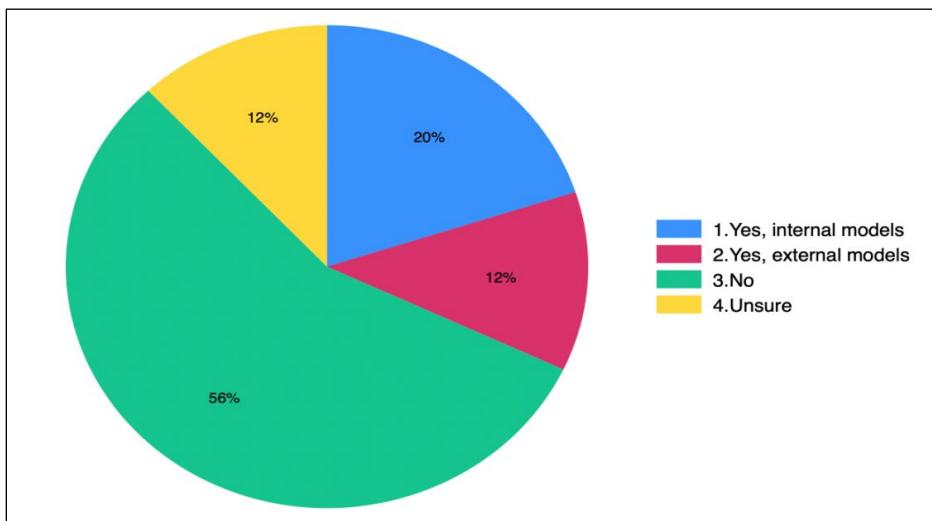
The majority of MoFs do not use dedicated climate-economy models, with around 56% of respondents reporting not using any specialized models for mitigation or adaptation (see Figure S12).

Moreover, most MoFs do not integrate specific climate-related dynamics like tipping points or compound risks into their analytical exercises, with only around 14% incorporating tipping points and 16% including compounding risks (see Box S3 for definitions). Trade effects like carbon-border adjustments (26%) and wider spillover impacts (24%) are slightly more frequently considered. A significant trend is the uncertainty around the inclusion of such dynamics, with an average of around 29% of respondents unsure about whether these elements are factored into their analyses, indicating potential gaps in knowledge or clarity around climate model features in many MoFs. Advanced economies are more likely than emerging economies to incorporate complex risks, such as compounding economic and climate events, and are slightly more likely to integrate trade effects. Other dynamics, such as tipping points and broader non-economic impacts, do not feature in many models by either AEs or EMDEs.

Box S3: Definitions of key concepts

- **Climate-economy models:** Climate-economy models, or climate-enhanced macroeconomic models, are a range of modelling tools utilized to conduct economic analysis of climate change and climate policy to guide policymaking and decision-making processes for climate change adaptation and mitigation from an economic perspective. Purposes include estimating the economic impacts of climate change at global, regional and sectoral levels in the long- and short-term, estimating the economic impacts of climate change mitigation and adaptation strategies, and monetizing projected damages of an additional ton of carbon emitted at specific points in time (the social cost of carbon), among others. Models typically link an economic module with environmental modules, either within one modelling framework or via soft links. Potential outputs of such models can include the estimated effects of climate change and climate policy on macroeconomic indicators such as GDP and inflation, as well as the sectoral make-up and associated structural transformation of economies. (The forthcoming *[technical overview paper]* provides an overview of climate-economy and other models and tools).
- **Tipping Points:** Tipping points are critical thresholds within systems, where exceeding these limits triggers significant and often irreversible changes in the system's state. These thresholds mark moments when climate change impacts accelerate or become self-reinforcing, leading to cascading and intensifying effects. Examples include the release of methane from thawing permafrost or the die-off of rainforests, resulting in a loss of essential carbon storage.
- **Compound Risks:** Compound risks are the interaction of multiple climate-related hazards that occur simultaneously or sequentially, amplifying the combined impact and pressure on physical and social vulnerabilities and complicating responses from governments, communities and institutions that are designed to address singular events.
- **Trade Effects:** Trade effects refer to the economic impacts of climate change risks and climate-related policies on international trade flows. These include, for example, the direct effects of physical risks on critical trade infrastructure and the influence of carbon border adjustment mechanisms on competitiveness.
- **Spillover Impacts:** Spillover effects are the indirect socioeconomic or environmental effects of climate-relevant policies that extend beyond the targeted sector, region, or country. These can include positive impacts, such as technology diffusion, or negative impacts such as carbon leakage.

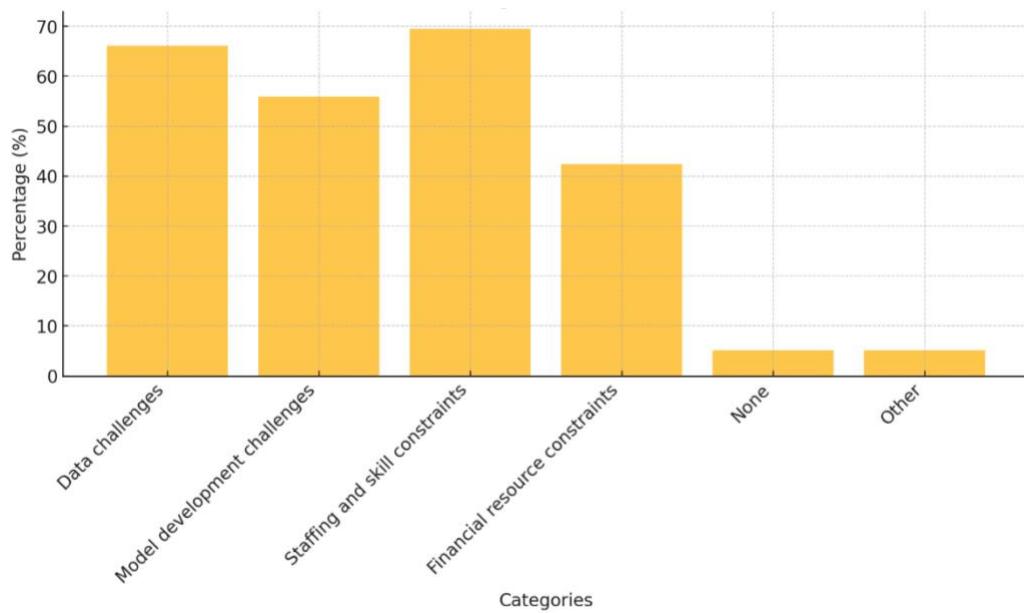
Figure S12: Does the MoF have dedicated climate-economy models of mitigation or adaptation policies?



5. Climate-related analytical capabilities

When it comes to integrating climate into economic analysis and modelling approaches, Finance Ministries experience a number of challenges (see Figure S13). Across both AEs and EMDEs, staffing and skill constraints are the most frequent challenges reported (82%), closely followed by data challenges (78%) and model development challenges (66%). Somewhat fewer MoFs (50%) experience financial resource constraints, while around 43% of Finance Ministries face all four of these challenges, with only a few reporting facing no challenges at all, indicating that most ministries, both in advanced and emerging economies, struggle with multiple obstacles in the integration of climate-related considerations into their analytical approaches.

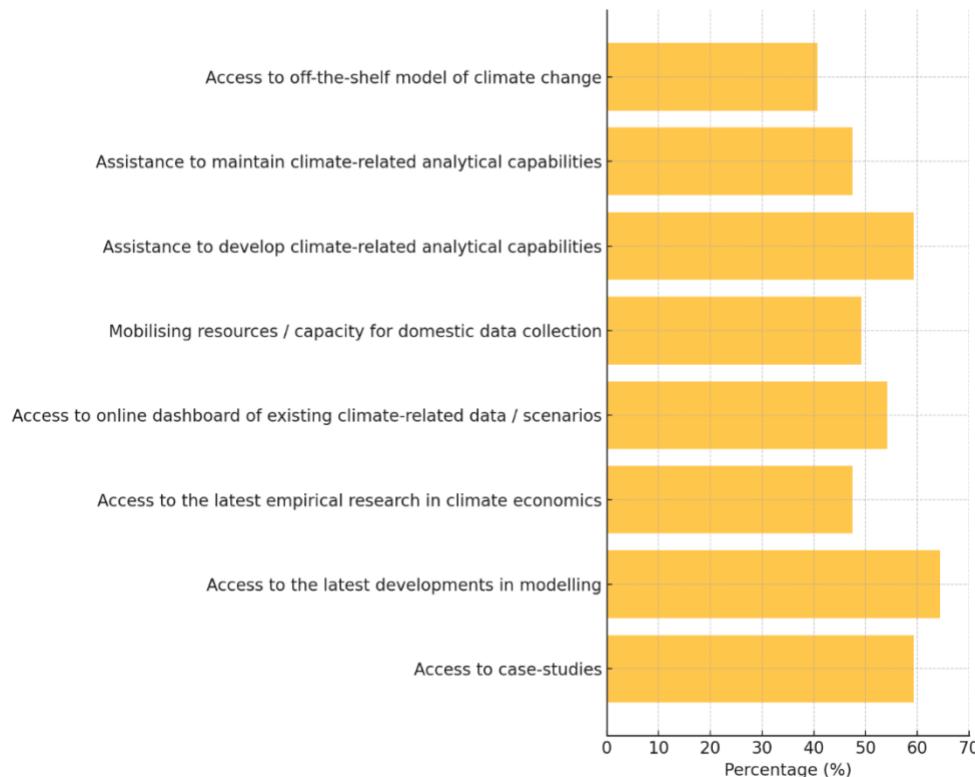
Figure S13: Does the MoF face significant barriers to incorporating climate-related issues into economic analysis and modelling approaches?



Most MoFs have some systems in place to ensure climate-related analysis reaches decision-makers, with approximately 43% of Ministries highlighting that they had a clear or very clear governance mechanisms in place, while around 39% rated their governance as moderately clear. However, about 18% rated their systems as limited or ineffective. AEs generally reported having stronger governance for climate-related economic analysis in place compared to EMDEs.

To build and enhance their climate-related capabilities, MoFs prioritized access to the latest climate-economy modelling developments (78%), followed by technical assistance for in-house capacity building (71%) and case studies from other countries (71%). Many also highlighted the need for access to climate data and resources for domestic data collection, for instance through a dedicated online dashboard. Additionally, support in maintaining in-house capabilities and empirical research access were frequently mentioned, alongside the desire for off-the-shelf macroeconomic climate models (see Figure S14). No notable differences were found between advanced and emerging economies.

Figure S14: Support needs for enhancing climate related economic analysis



Ministries of Finance identified several ways the Coalition of Finance Ministers could support the strengthening of their climate-related analytical capabilities, including technical assistance, access to resources, collaboration, information exchange in direct targeted efforts to build a community of practice that fosters the development of best practices and common approaches. AEs highlighted the needs for platforms for collaboration, feedback, exchange, and standard-setting, while EMDEs focused on technical support, access to data and tools, and training on modelling, developing tools, and integrating climate into policymaking. EMDEs also highlighted the need for collaboration with institutional partners, developed member finance institutions, and MDBs through expert exchanges, best practices, and guides (e.g. on integrating climate concepts into finance ministries' planning). Both AEs and EMDEs stressed the need for the Coalition to support the elevation of finance ministries' roles in climate action, particularly among leadership, with EMDEs also highlighting the need to elevate climate awareness across departments.

The in-depth interviews conducted provided some further insights into the capability challenges Ministries of Finance face. In particular:

- Some Finance Ministries pointed out that when using external models, unclear communication of structural model designs and uncertainties can lead to misunderstood analyses and misuse of results.
- Strong governance, coordination, and external collaboration are critical for MoFs to effectively integrate climate considerations into policy-making. Dedicated climate functions or hubs within MoFs enhance coordination and enable consistent, informed decisions on cross-cutting climate issues. However, many MoFs face challenges such as limited involvement in early policy design

stages and difficulties in communicating climate model results—including uncertainties—to gain policymaker buy-in. Structured collaboration with statistical offices, line ministries, academia, and NGOs is essential, particularly for smaller countries with fewer in-house resources. While such partnerships provide access to critical data and modelling expertise, they also introduce complexities in aligning methodologies and ensuring unbiased results. Many MoFs report a need for standardized tools that require minimal investment and facilitate comparability across ministries and countries, alongside dedicated interdisciplinary teams within the MoFs and relevant other government agencies.

- **MoFs face substantial methodological and data-related challenges, such as a lack of comprehensive, consistent, and timely data.** However, some Ministries of Finance pointed out that these challenges are not the primary obstacle to enhancing capabilities. Having the governance structures, skills, and staff capable of selecting and applying models across a wide range of policy and analytical priorities, and being able to translate outputs into policy decisions are more relevant factors needed to strengthen climate analytical capabilities within MoFs. High level buy-in and strong political leadership from the Ministry of Finance and the government is needed - but often not a given - to successfully build and maintain climate analytical capabilities.
- **Collaboration between MoFs and external organizations needs strengthening to support effective model co-development and increase MoF ownership.** While bespoke models provide tailored relevance and flexibility, most MoFs lack the resources to develop these models fully in-house. However, MoFs receiving technical support from international organizations highlight that they would benefit from more active involvement in model development. This would enable them to adapt and refine models over time to ensure they can provide suitable answers for addressing their country's unique policy questions and circumstances.

6. Conclusion

The survey and accompanying interviews have highlighted that MoF demonstrate increasing awareness of climate-related risks and opportunities, and are increasingly acting on climate change. They have revealed both global trends in MoF response and the great variability in actions MoFs are taking around the world. However, significant challenges remain in integrating climate considerations into their analytical and decision-making frameworks. Addressing these gaps will require significant investments by Ministries of Finance into specialized tools, and in strengthening their analytical capabilities, governance structures and internal and external collaboration.

The findings also emphasize the important role the international community can play in supporting the strengthening of the domestic analytical capabilities necessary to navigate the complexities of climate policy. Key priorities include access to the latest climate-economy modelling developments and technical assistance for in-house capacity building. Finance Ministries in EMDCs particularly underscore the need for the international community to pay due attention to support which builds sustainable capacity and builds the skills and capabilities of staff within Ministries to design and operate their own tools.

Further guidance on how Ministries of Finance can strengthen their analytical capabilities for analysis and modelling to drive climate action, and what the international community can do to support them, will be provided in a complementary paper. Despite the challenges, many MoFs are already making significant strides in enhancing their analytical capabilities. These Ministries are creating a growing repository of valuable examples and insights, offering lessons for the global MoF community and the organizations that support them. In-depth examples of the experience and knowledge of this growing community are available in the Compendium of Practice and the thematic reports that complement this survey.

Appendix 1: Technical report - Survey

Table of contents

1. Introduction.....	31
2. Assessment of climate-related risks and opportunities	35
2.1. Physical climate risks	35
2.2. National transition risks.....	40
2.3 Global transition risks	41
2.4. Economic opportunities	47
3. Priorities for climate policy design and implementation	54
3.1. Economic prioritization	54
3.2. Climate policy decision-making criteria	55
3.3. Climate policy implementation	56
3.4. Key policy and analytical questions	57
4. Evaluations of climate-related investments and expenditures	63
4.1. Adaptation investments and expenditures	63
4.2. Decarbonization investments and expenditures	64
4.3. Diversification expenditure.....	65
4.4. Sources of revenue	66
4.5. Source of funding	67
5. Existing analytical tools and approaches	69
General analytics.....	69
5.1. Economic modelling.....	69
5.2. Data usage and challenges.....	70
5.3. Collaboration.....	72
5.4. Analytical software.....	73
5.5. Advanced models.....	74
Climate analytics	75
5.6. Integration of climate-related considerations into modelling	75
5.7. Climate and transition scenarios	77
5.8. Climate and transition data usage	79
5.9. Climate scenario dynamics	80
5.10. Climate and transition models.....	81
5.11. Governance and analytics	82

6. Climate-related analytical capabilities.....	84
6.1. Main barriers.....	84
6.2. Capability support.....	85

1. Introduction

Active leadership from Ministries of Finance (MoF) is crucial for advancing ambitious climate action. Without MoFs at the helm, countries will struggle to meet their climate goals and achieve sustainable, low-carbon, climate-resilient development. Their role in coordinating economic, fiscal and financial policies places them at the forefront of efforts to respond to climate challenges.

In 2019, governments from 26 countries joined forces to launch the Coalition of Finance Ministers for Climate Action (henceforth “the Coalition”), a program which recognizes the challenges posed by climate change, the unique capacity of the world’s finance ministers to address them, and the ways in which these efforts could be strengthened through collective engagement. Since its launch, MoFs from over 90 countries have signed on to the ‘Helsinki Principles’, a set of six principles that promote national climate action, especially through fiscal policy and the use of public finance.

One of the core mandates of the Coalition is to offer support to MoFs around the world in the implementation of the Helsinki Principles. The Helsinki Principle 4 encourages MoFs to take “*climate change into account in macroeconomic policy, fiscal planning, budgeting, public investment management, and procurement practices*”. To effectively support MoFs in this regard, it is imperative to gain a deeper understanding of how MoFs are currently thinking about climate risks and opportunities and how these are being integrated into their analytical and decision-making frameworks.

The climate-related questions MoFs face today are often intricately linked to their core responsibilities. These include evaluating investment needs for green and resilient transitions and assessing the economic impacts of climate risks. Developing the tools and strengthening the analytical capacity to address these types of questions within the Ministry of Finance can be key levers for countries to respond more effectively to the challenges of climate change at the pace and scale required.

Objectives

The objective of this exercise was twofold:

- i) Gain a deeper understanding of how MoFs are currently thinking about climate-related risks and opportunities, and how these are being integrated into their analytical and decision-making frameworks;
- ii) Identify potential technical gaps and implementation challenges, and highlight areas that would most benefit from increased support.

With these objectives in mind, a comprehensive survey was designed and distributed to MoFs to gather detailed insights into their approaches to assessing climate-related risks and opportunities. The survey sought to capture a broad range of data, including current analytical frameworks, decision-making processes, and the extent to which climate considerations are embedded within these frameworks. Additionally, it aimed to identify specific technical gaps and implementation challenges that MoFs encounter in integrating assessments of climate risks and opportunities into fiscal and economic policies. The results from this survey aim to inform targeted strategies for capacity building, provide tailored support where needed, and foster improved practices across institutions.

Overview

A detailed questionnaire was developed by researchers at the Grantham Research Institute on Climate Change and the Environment, following extensive consultations with subject-matter experts from academic institutions, policy think tanks, international organizations, and representatives from various MoFs. After undergoing multiple iterations and testing with a small number of MoFs, the finalized survey comprised 120 questions. 10 were open-ended to allow for in-depth qualitative responses,

although most quantitative questions also included space for supplementary qualitative input.

The survey was distributed to all Coalition members by the co-leads of Helsinki Workstream 4, represented by the United States (US) Treasury and the Danish Ministry of Finance, as well as observers, and some non-members. To facilitate participation, the survey questions were provided in two formats: a digital version hosted on the Qualtrics Survey Platform and a Microsoft Word document attached to an email and shared electronically. In parallel, support was solicited from international organizations who form part of the Technical Advisory Group and wider partner network for the program, including the World Bank, African Development Bank, Inter-American Development Bank, and Asian Development Bank, among others, in outreach efforts to MoFs. The initial invitation was subsequently followed by multiple formal and informal follow-up inquiries, primarily conducted via email.

Respondents

Submissions from a total of 59 countries were evaluated, representing over one-third of MoFs worldwide. Of these, 27 were Advanced Economies (AEs), and 32 were Emerging Markets and Developing Economies (EMDE) (see Figure 1.2). To provide more granular insights, for any qualitative analysis of responses, the latter group is further split into Emerging Market Economies (EMEs, 23 countries) and Low-Income Developing Countries (LIDCs, 9 countries).

All in all, 63% of all AEs responded to the survey and 21% of EMDEs.

Figure 1.1: Respondents by IMF Country Groupings

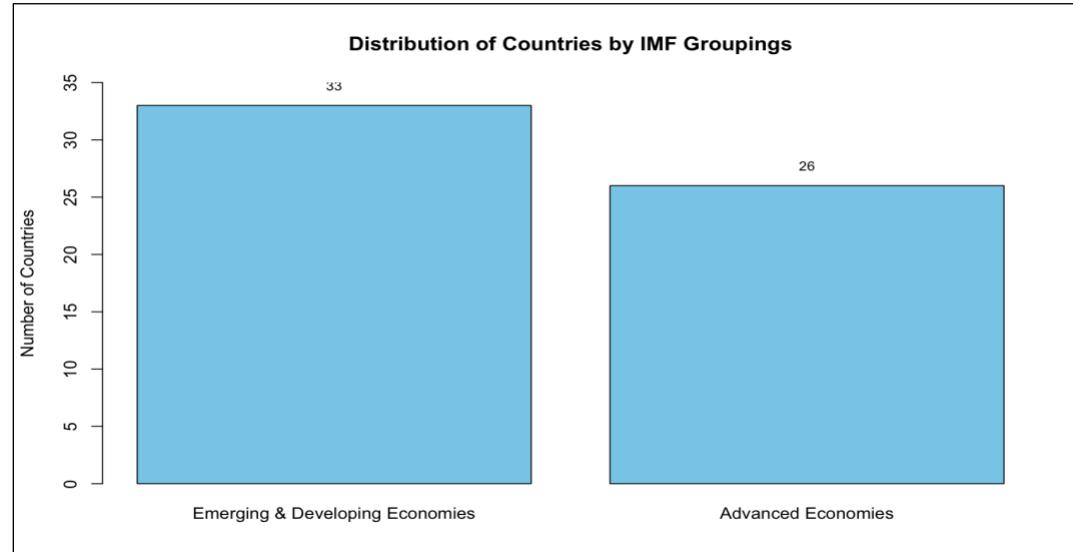


Table 1.1 presents the geographical distribution of survey respondents. All regions (as per the World Bank's Regional Groups) are represented, although regional participation is strongest in the Europe and Central Asia region, where 40% of all countries participated (although exclusively from Europe), and weakest in Middle East & North Africa, where 20% of countries participated. The regional imbalances also reflect current Coalition membership patterns (over 90% of responses came from Coalition members). Survey respondents represent 33% of global GDP, and 20% of global emissions (see Table 1.2).

Table 1.1: Regional representation of respondents

World Bank Regional Groups	Percentage of countries within region that responded to survey	Number of countries that responded to the survey
East Asia & Pacific	24%	9
Europe & Central Asia ⁶	40%	23
Latin America & Caribbean	26%	11
Middle East & North Africa	19%	4
North America	33%	1
South Asia	25%	2
Sub-Saharan Africa	19%	9

Table 1.2: Survey and Interview respondents share of global GDP, emissions and population.

	Share of global Gross Domestic Product	Share of global Emissions	Share of global Population
Survey Respondents	33.2%	19.9%	25.7%
Interview Respondents	27.6%	16.6%	6.8%
Total	60.8%	36.5%	32.5%

Notably, completing the survey involved input from multiple individuals within each MoF, with an average of six contributors per MoF. Informally, some MoFs reported to the research team that the survey process prompted engaging discussions within the ministry, fostering dialogue across departments that do not typically interact on a regular basis.

Structure of this report

The remainder of this document is structured as follows:

- The **second section** presents data on MoFs' assessments of **climate-related risks**, including physical climate risks, as well as national and global transition risks and **opportunities** associated with climate action.
- The **third section** addresses climate-related **policy priorities**, focusing on key decision-making criteria, the current status of various policy considerations, and their level of **implementation**.
- The **fourth section** reviews the evaluation of **climate-related investments** for adaptation, decarbonization, and diversification costs, as well as projected **expenditure needs** and potential new sources of fundraising.
- The **fifth section** is divided into two segments: (a) **general analytics** and (b) **climate analytics**. The first segment explores practices related to general economic modelling, covering model types, data and software usage, and collaboration. It also includes an overview of advanced economic models, with a detailed examination of key features such as equations, sectoral focus, and regional coverage, as well as some underlying structural assumptions. The second segment focuses on climate-specific analytics, examining the integration of climate-related considerations into economic models, the use of various climate and transition scenarios, scenario-specific dynamics and climate-related data.
- The **final section**, reviews core climate-related capabilities within MoFs and outlines the key

⁶ This does not include any countries from Central Asia

challenges they face in integrating climate considerations into their priorities, analytics, and broader practices. This section concludes with a brief reflection on the Coalition's role in supporting MoF's efforts to address these challenges and strengthen capabilities.

2. Assessment of climate-related risks and opportunities

This section of the report looks at Ministries of Finance's assessments of physical climate risks, as well as national and global transition risks and the opportunities associated with climate action. More specifically, the section looks at how ministries perceive each of these risk categories affecting various core macroeconomic indicators, including GDP, inflation, employment, real interest rates, revenue, expenditure, and trade competitiveness. Respondents were also asked to qualitatively share specific risk drivers that they are particularly worried about across each category, and what they consider to be the most important positive economic impacts or opportunities from climate action.

2.1. Physical climate risks

Ministries of Finance are particularly concerned about the potential impacts of physical climate change on GDP, government finances (revenues and expenditures), and, to a lesser extent, inflation, employment, and competitiveness. Concerns about real interest rates, credit ratings, and the value of state-owned enterprises were relatively lower, with many ministries expressing minimal concern in these areas. The variation in responses across different macroeconomic variables underscores a widespread acknowledgment of climate change risks, though the perceived severity of these risks differs notably by variable.

Emerging and developing economies exhibit a higher average level of concern regarding the macroeconomic implications of physical climate change compared to advanced economies.

When asked to comment on specific physical risk drivers they are particularly worried about, MoFs highlighted several key climate change risk drivers, with physical risks—such as extreme weather events and sea-level rise—being the most frequently cited concerns. Economic risks, particularly budget pressures related to disaster recovery and adaptation funding, also emerge as significant challenges. Additionally, the disproportionate impacts of climate change on vulnerable populations and the specific threats to climate-sensitive sectors like agriculture and tourism frequently recurred throughout responses.

Quantitative Insights

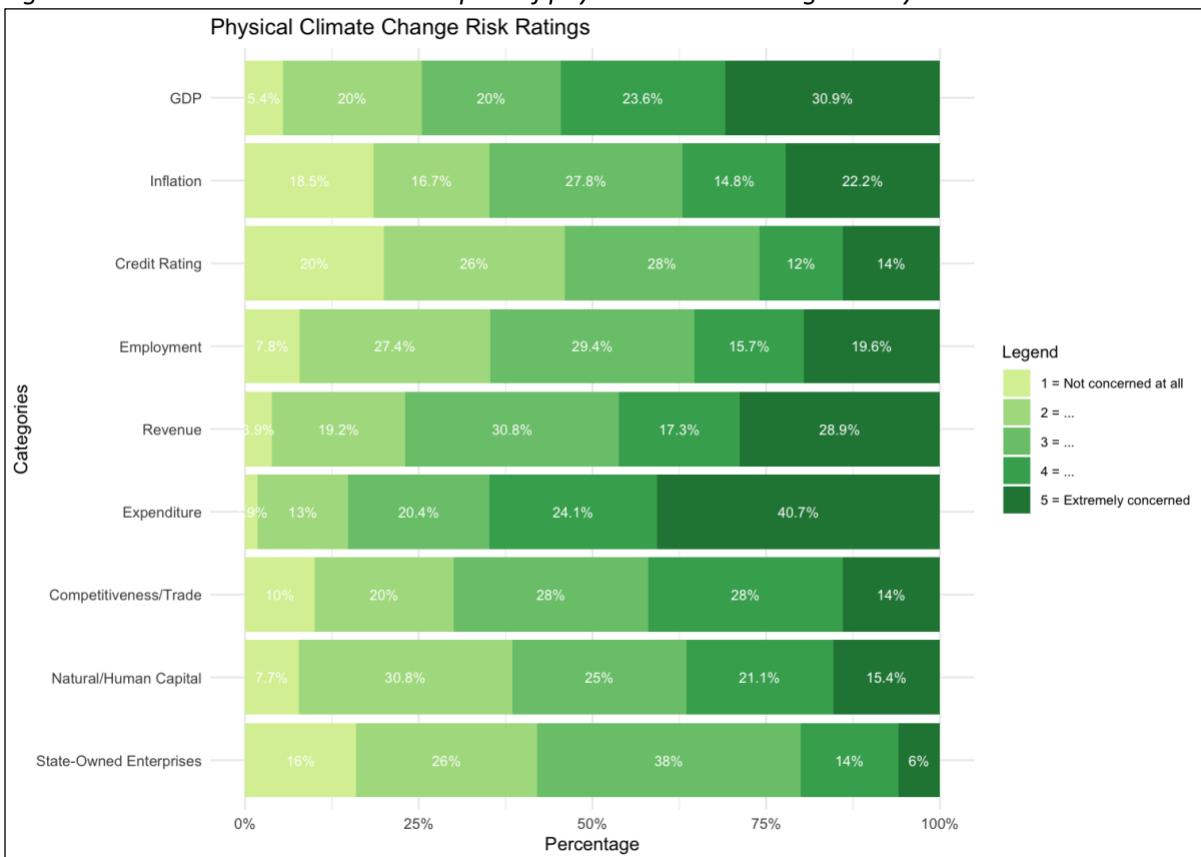
Participants were asked to evaluate their level of concern regarding the effects of physical climate change on a range of macroeconomic indicators.⁷ Ratings were collected on a scale from 1 (not at all concerned) to 5 (extremely concerned). The assessed variables included *GDP, Real interest rates and credit ratings, Employment, Government revenues, Government expenditures, Competitiveness and trade balance, Physical, human, and natural capital*, as well as the *Value of state-owned enterprises*. The number of responses varied across indicators, ranging from 50 to 55 responses per indicator.

Government spending received the highest perceived impact from physical climate change, with a mean rating of 3.8, followed by GDP at 3.6 and government revenue at 3.4⁸ (see Figure 2.1). 65% of MoFs rated the impacts of physical climate risk on government spending at a concern level of 4 or 5, with around 55% doing so for GDP and 46% for government revenue. Conversely, real interest rates and the value of state-owned enterprises were perceived as least impacted, with mean ratings of 2.7 and 2.7, respectively; only about 20% of respondents rated these variables at a concern level of 4 or 5.

⁷ Physical climate change refers to both “acute climate-related events such as heatwaves, storms, wildfires and flash floods, as well as chronic factors (i.e., gradually changing factors) such as average temperature increase, increased droughts and desertification, sea-level rise, coastal erosion, and ocean acidification.”

⁸ All figures in the report are approximate and rounded to the nearest whole number or one decimal place.

Figure 2.1: MoF concerns about the impact of physical climate change on key macroeconomic indicators



Next, an average risk perception score was calculated for each country based on reported ratings across each variable. The aggregate data yielded a mean score of 3.2, with a median of 3.1 and a standard deviation of 1.0. Upon segmenting the sample between EMDEs and AEs, a statistically significant variation emerged, with EMDEs on average more concerned about risks than AEs. Specifically, EMDEs reported a mean score of 3.6 with a standard deviation of 1.0, in contrast to AEs, which had a mean score of 2.7 and a standard deviation of 0.9. (significant at the 1% level.) Table 2.2. displays the average risk perception split into AEs and EMDEs across physical, as well as transition risks.

Table 2.2: Average MoF concerns about the impact of climate change on key macroeconomic indicators on a scale from 1 (not concerned at all) to 5 (extremely concerned)

Type of Risk	AEs		EMDEs	
	Mean	Standard Deviation	Mean	Standard Deviation
Physical risks	2.7	0.9	3.6	1.0
National transition risk	3.6	1.0	3.3	1.0
Global transition risks	3.0	1.0	3.4	0.9

[breakdown across individual risks to be added]

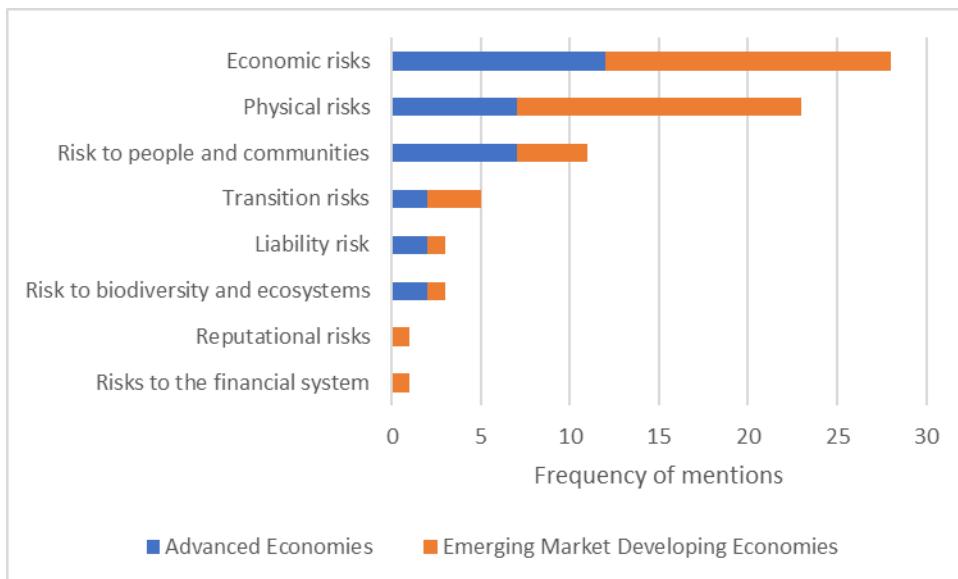
Qualitative Insights

Respondents were asked to comment on specific risk drivers that are particularly worried about in an open-ended question. Overall, 39 countries responded to this question with the key themes that emerged from their responses presented in Figure 2.2.

These key themes were established through a process data familiarization which facilitated the emergence of key themes and subthemes which were then coded and processed in NVivo. More details on this process can be found in the methodology section (Supplementary Material 1).

The following sections will delve into the most prominent of these risks, providing a detailed breakdown of the specific risks within each risk category as identified by MoFs. Transition risks raised by MoFs in response to this question will be explored in sections 2.2 and 2.3.

Figure 2.2: The prevalence of various themes reported by MoFs when asked to name specific physical climate change risk drivers of particular concern

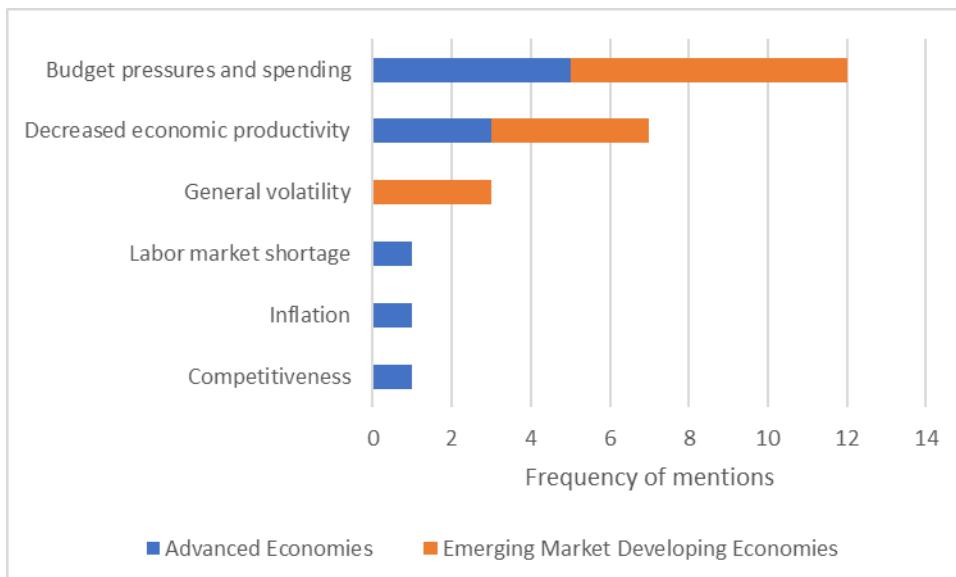


Economic risks

Budgetary Pressures and Spending was reported as the leading economic risk across MoFs of all development stages. This includes managing the fiscal pressures on public finances related to recovery from climate-related disasters and funding the green transition (including adaptation measures for AE and EMDEs), concerns regarding the impact of debt accumulation related to mitigation and adaptation finance on long-term financial stability, and damage compensation. While concerns on recovery costs from extreme and volatile weather events prevailed across all economies, debt sustainability concerns were particularly pronounced in EMDEs as these economies face simultaneous challenges of rising costs and constrained fiscal space due to reductions in available public budget due to declining tax revenues and royalties.

Decreased Economic Productivity emerged as the second most reported economic risk, with MoFs highlighting disruptions to businesses and labor. Both AEs and EMDEs, particularly LIDCs, expressed concern over the agricultural sector, citing declining output, with LIDCs additionally highlighting risks such as reduced labor productivity, loss of workdays, and damage to both produced and non-produced capital.

Figure 2.3: The prevalence of various economic risks reported by MoFs when asked to provide specific climate change risk drivers of particular concern



Physical risks

Physical Risks was the second most reported risk category among MoFs across all development stages. Within this category, ministries reported the impact of increasingly extreme and volatile weather events (floods, droughts, hurricanes and cyclones, mudslides, wildfires) and slow-onset effects (sea-level rise, salinity intrusion, river and coastal erosion) on key industries (agriculture, tourism), infrastructure (including energy infrastructure), public health, and productivity.

Risk to people and communities

Risks to people and communities were spread across the following subthemes: *Public Health* (n=2), *Displacement* (n=2), *Private Expenditures* (n=2), *Healthcare and Insurance Gap* (n=1), *Just Transition* (n=1), *Provision of Essential Services* (n=1), and *Volatile Costs* (n=1). Across this specific risk driver, ministries were primarily concerned about volatile energy prices, meeting energy needs, inflation of electricity prices, and the effects this will have on household expenditures and economic stability generally. Additionally, one ministry expressed deep concern over the disproportional effects of climate change on vulnerable populations (e.g. low-income and marginalized groups) through job losses, displacement and health impacts.

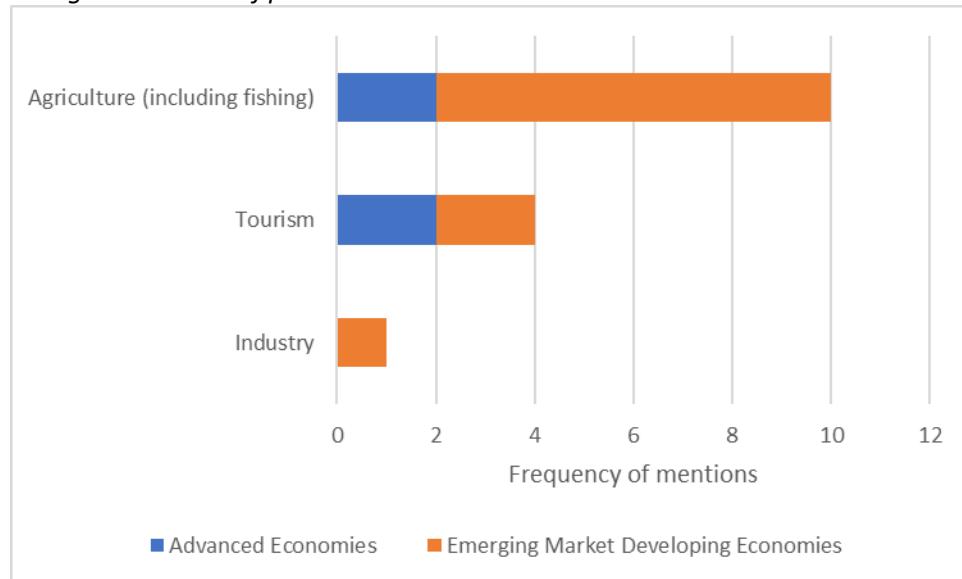
Other risks

Two AEs and one EMDE expressed biodiversity-related concerns, with the AEs focusing on the risks that biodiversity and ecosystem loss pose to communities, businesses, and the economy—particularly through the loss of essential ecosystem services—while the EMDE highlighted concerns about wildlife survival and its impact on the tourism sector. Two AEs and one EMDE expressed liability-related concerns, with all three focusing on the risks that physical damages inflicted by climate change will play on government spending through compensation payments and litigation. One EMDE highlighted concerns about the broader impacts of private sector borrowing on financial system stability, while one LIDC underscored the potential reputational risks and erosion of trust from investors, consumers, and constituents in both governments and businesses if effective climate action is not undertaken.

Sectoral risks

Occasionally, ministries provided further detail on specific sectors towards which their concerns about climate change risks were targeted (see Figure 2.4). Agricultural concerns emphasized the impact on agricultural yields, the impact of biodiversity loss on agriculture, and in-sector labor productivity in the face of heat waves, while concerns about tourism highlighted physical risks related to species decline, biodiversity loss and habitat destruction while. One ministry mentioned concern regarding limiting of industrial emissions related to the European Union's Industrial Emissions Directive (IED).

Figure 2.4: The prevalence of various sectors reported by MoFs when asked to provide specific climate change risk drivers of particular concern



2.2. National transition risks

Ministries of Finance are most concerned about the impacts of the domestic transition on government spending, revenues, GDP, and competitiveness, while concerns about credit ratings, SOEs, and capital is notably lower. EMDEs face heightened concerns, while AEs display relatively lower levels of concern.

Quantitative Insights

Respondents were asked to rate their concerns about the risks posed by the domestic transition to a low-carbon economy on various macroeconomic variables.⁹ Ratings were collected on a scale from 1 (not at all concerned) to 5 (extremely concerned). The assessed variables included *GDP*, *Real interest rates and credit ratings*, *Employment*, *Government revenues*, *Government expenditures*, *Competitiveness and trade balance*, *Physical, human, and natural capital*, as well as the *Value of state-owned enterprises*. The number of responses varied across indicators, ranging from 48 to 57 responses.

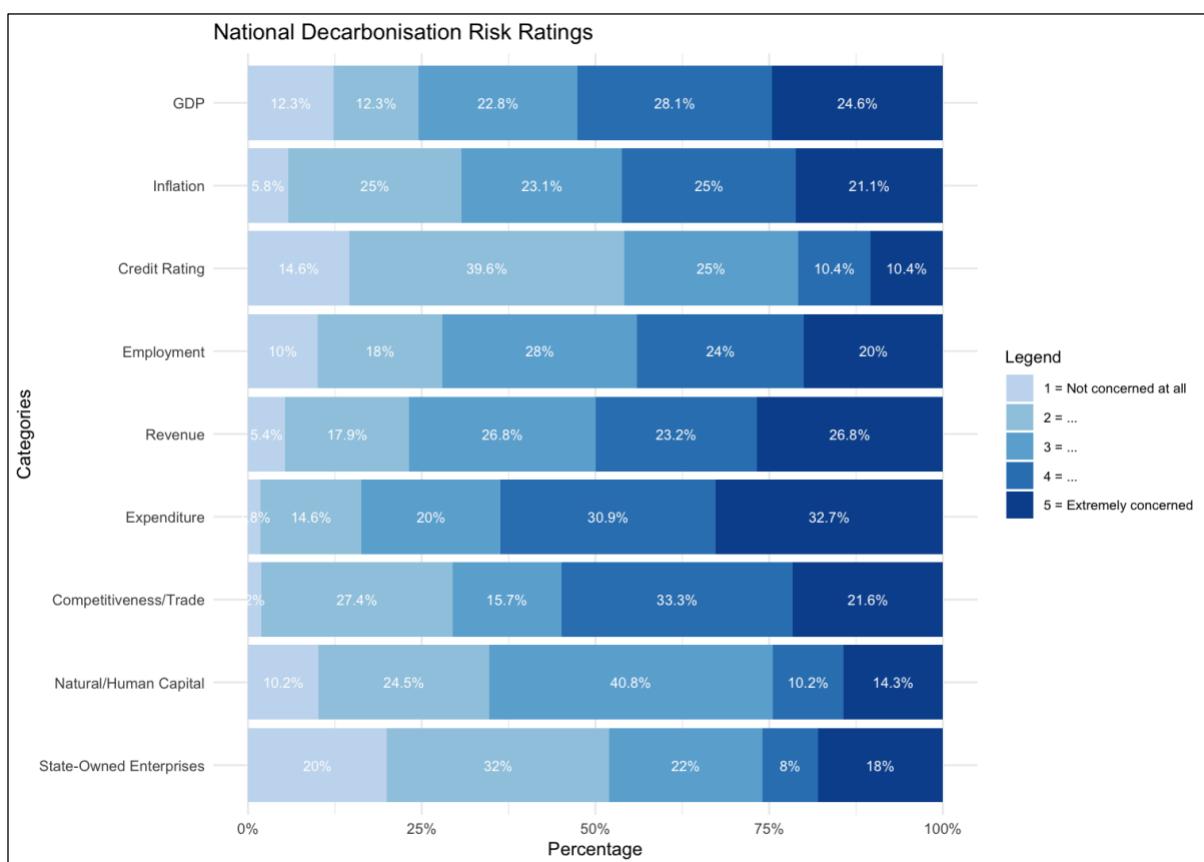
Government spending was perceived as the most impacted variable, with a mean rating of 3.8, and 64% of respondents rating its impact at a concern level of 4 or 5. Government revenues followed closely with

⁹ Defined as “a nationally driven transition to a low-carbon economy. For instance, electrification of transport might impact taxation from fuel taxation without measures to identify alternatives or the transition might impact jobs in certain sectors.”

a mean rating of 3.5, with 50% of respondents marking it as a high concern (4 or 5). Concerns about GDP also ranked prominently, receiving a mean rating of 3.4, with 53% of respondents rating it as a high concern. Competitiveness and trade balance showed a similar level of concern, with a mean rating of 3.45, and 55% of respondents indicating a high level of concern.

Credit ratings and interest rates were seen as less affected by the domestic transition, with a mean rating of 2.6, and 21% of respondents indicating a high level of concern. Similarly, physical, human, and natural capital had a mean rating of 2.9, with only 24% of respondents rating it as a high concern. Lastly, the value of state-owned enterprises (SOEs) received one of the lowest ratings, with a mean of 2.7, and 26% of respondents expressing a high level of concern.

Figure 2.5: MoF concerns about the impact of national decarbonization risks on key macroeconomic indicators



The average decarbonization risk was computed as an ordinal variable and analyzed, with 57 observations, yielding a mean of 3.1, a mode of 3, and a median of 3.3. The standard deviation was 1.0, with a range from 1 to 5, indicating that, while there is some variation in responses, most ministries perceived moderate levels of risk from the domestic decarbonization transition.

EMDEs reported a higher mean risk perception (3.3) compared to AEs (3.0), significant at the 10% level, suggesting that EMDEs may perceive domestic decarbonization to pose a greater risk relative to AEs. Additionally, the standard deviation for EMDEs (1.0) was slightly higher than that for AEs (0.9), implying greater variability in responses among EMDEs (see Table 2.2)

2.3 Global transition risks

Ministries of Finance are most concerned about the impacts of the global transition to a low-carbon

economy on competitiveness, GDP, and government finances (both expenditure and revenue), while concerns regarding real interest rates, credit ratings, and state-owned enterprises are comparatively lower.

This pattern suggests a widespread recognition of the risks associated with the global climate transition; however, the perceived severity of these risks varies considerably depending on the specific macroeconomic variable and the economy's development status. The heterogeneity in responses between EMDEs and AEs highlights how emerging economies might be more sensitive to the risks posed by the global transition.

Within the qualitative contributions, finance ministries identified a variety of transition risks, with a notable focus on financial risks, government revenues, and economic impacts. Advanced economies report a broader range of concerns, while emerging market economies and low-income developing economies express fewer risks overall, but high levels of concern regarding carbon pricing mechanisms and their potential impact on exports trade, domestic industries for exposed sectors, and government revenues. This concern reflects the general sentiment expressed by ministries regarding global climate actions, particularly the impact on increased costs and decreased competitiveness. High levels of concern were also demonstrated for tax revenues, especially regarding EMDEs which experience a higher level of exposure of tax-revenue generating industries to carbon emissions.

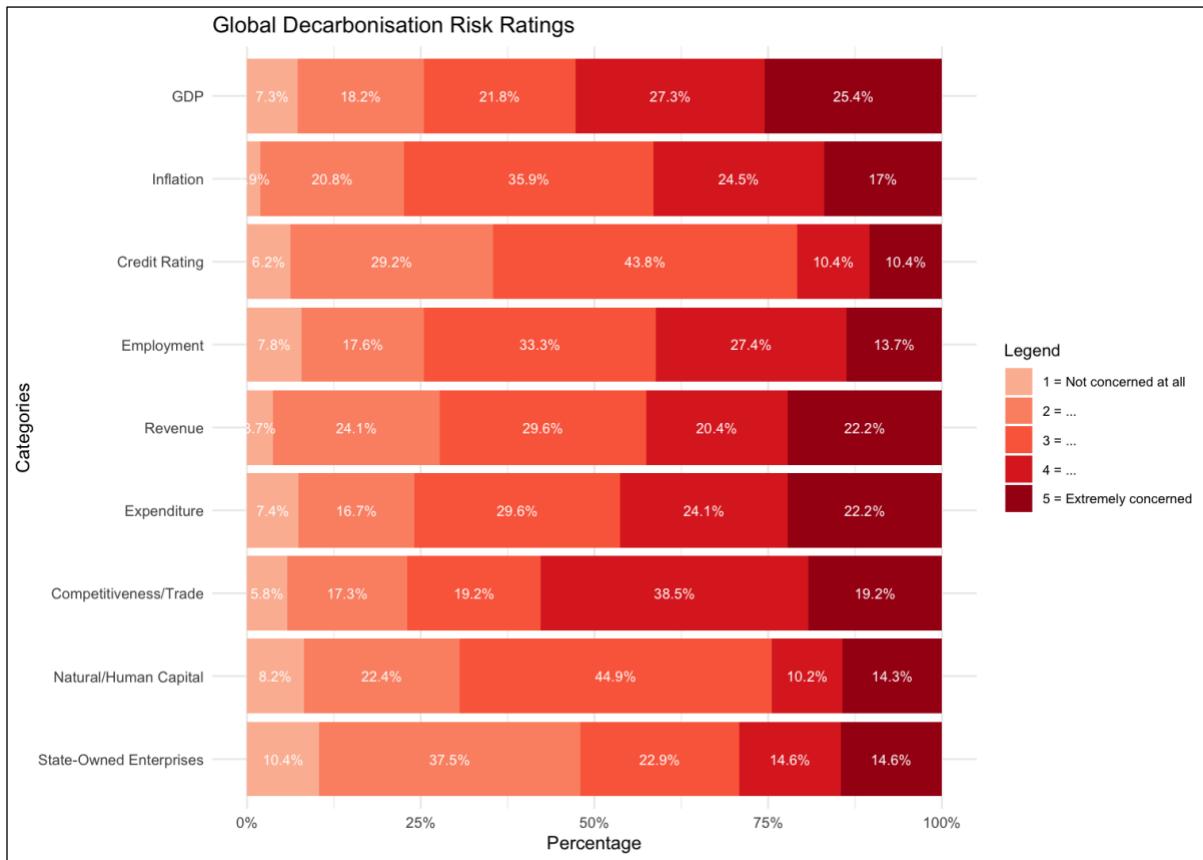
Quantitative Insights

Respondents were asked to rate their concerns about the risks posed by the global transition to a low-carbon economy on various macroeconomic variables.¹⁰ Ratings were collected on a scale from 1 (not at all concerned) to 5 (extremely concerned). The assessed variables included *GDP*, *Real interest rates and credit ratings*, *Employment*, *Government revenues*, *Government expenditures*, *Competitiveness and trade balance*, *Physical, human, and natural capital*, as well as the *Value of state-owned enterprises* (refer to Appendix I, section "Transition Impacts"). The number of responses varied across indicators, ranging from 48 to 55 responses.

Competitiveness and trade balance were perceived as the most impacted by the global transition to net zero, with a mean rating of 3.5 and 57% of respondents rating its impact at a concern level of 4 or 5. GDP followed closely, with a mean rating of 3.5. 52% of respondents indicating a high level of concern (4 or 5). Government expenditure and revenue were also notable concerns, with mean ratings of 3.34 and 3.3, respectively; 46% rated expenditure and 42% rated revenue at a high concern level. Inflation showed a mean rating of 3.3, reflecting moderate concern, while employment followed with a mean rating of 3.2. By contrast, real interest rates were perceived to be less at risk from the global transition, with a mean rating of 2.9 and only 20.8% of respondents rating it as a high concern (i.e. 4 or 5). Similarly, the value of SOEs was one of the least concerning variables, with a mean rating of 2.9.

Figure 2.6: MoF concerns about the impact of global transition risks on key macroeconomic indicators

¹⁰ Defined as "the impacts of the transition refer to potential macroeconomic implications resulting from a global transition to a low-carbon economy, including from the reduction in global fossil fuel demand driven by climate policies, among other factors, across the world or the potential impact of other countries climate policies on competitiveness of existing exports."



To gain further insights, an average risk perception score was computed for each country based on reported ratings across all variables. This average transition risk, structured as an ordinal variable with 57 observations, resulted in a mean of 3.2, a median of 3.1, and a standard deviation of 13.

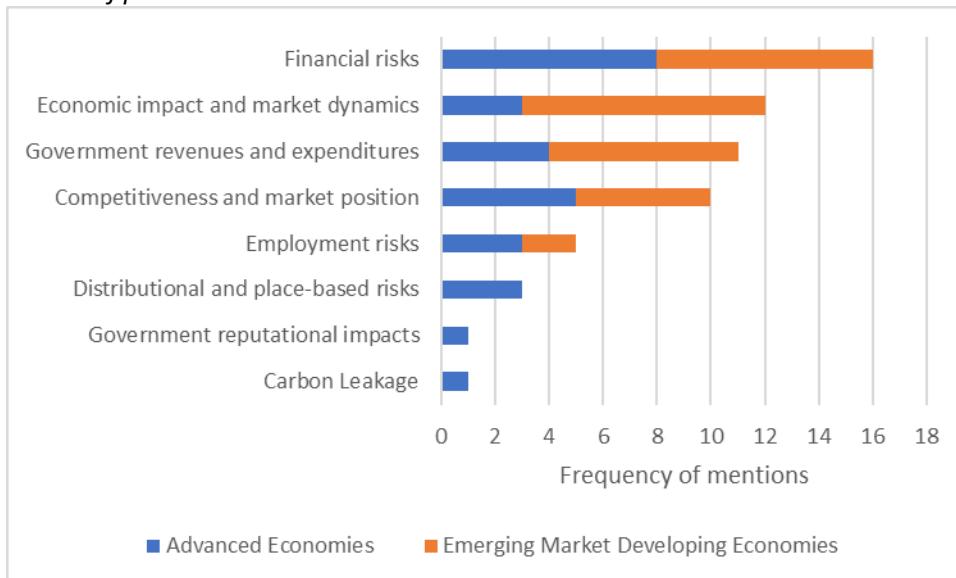
A notable difference in risk perception emerged between economies of differing development status: EMDEs reported a higher mean perception of 3.42, with a standard deviation of 0.9, while AEs had a lower mean of 2.9 and a standard deviation of 1. This difference was statistically significant at the 1% level suggesting that EMDEs expressed significantly higher concern about the potential macroeconomic impacts of the global transition to net zero than AEs (see Table 2.2)

Qualitative Insights

Respondents were asked in an open-ended question to comment on transition risk drivers of particular concern. Overall, 30 countries responded to this question (see Figure 2.7). EMDEs listed fewer transition risk categories than AEs, indicating a narrower range of concerns about policy changes driven by climate change. However, this narrower range of concern does not imply a lower level of concern within the categories where EMDEs are represented.

Where sufficient information on transition risk drivers was provided by MoFs, responses were further categorized to enhance understanding of how transition risk concerns manifested across various mechanisms, sectors, and scales (domestic or global). These contextualizing categories will be examined before exploring the risk categories visualized in Figure 2.7.

Figure 2.7: The prevalence of various themes reported by MoFs when asked about specific transition risk drivers of particular concern

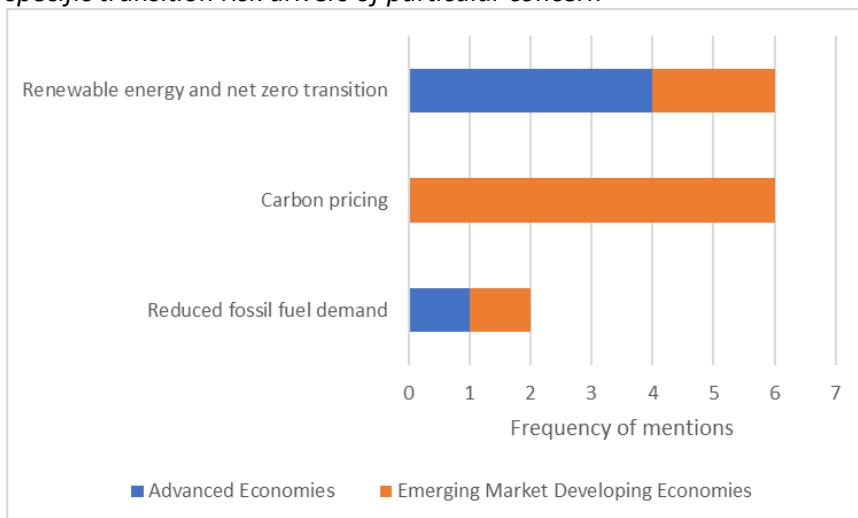


Mechanisms, sectors and scale

Transition risk drivers, where adequately detailed by MoFs, were categorized based on the mechanisms through which they manifest. The identified transition risk mechanisms included: *Carbon Pricing* (n=6), *Renewable Energy and Net Zero Transition* (n=6), and *Reduced Fossil Fuel Demand* (n=2).

Focusing on *Carbon Pricing*, this transition risk includes two subcategories: *CBAM* (n=3) and *Carbon Pricing and Taxes* (n=3). Notably, this category is exclusively represented by contributions from LIDCs (n=4) and EMEs (n=2). Concerns included the increased costs of exports to the EU (e.g. garments and textiles) and the impact on revenues in sectors reliant on exports to carbon-regulated markets. This mechanism is linked to industrial competitiveness and government revenues from exports, with resultant macroeconomic impacts on employment and fiscal stability. These responses indicate significant pressure on ministries in EMDEs within the sample to respond and adapt to carbon border adjustment mechanisms.

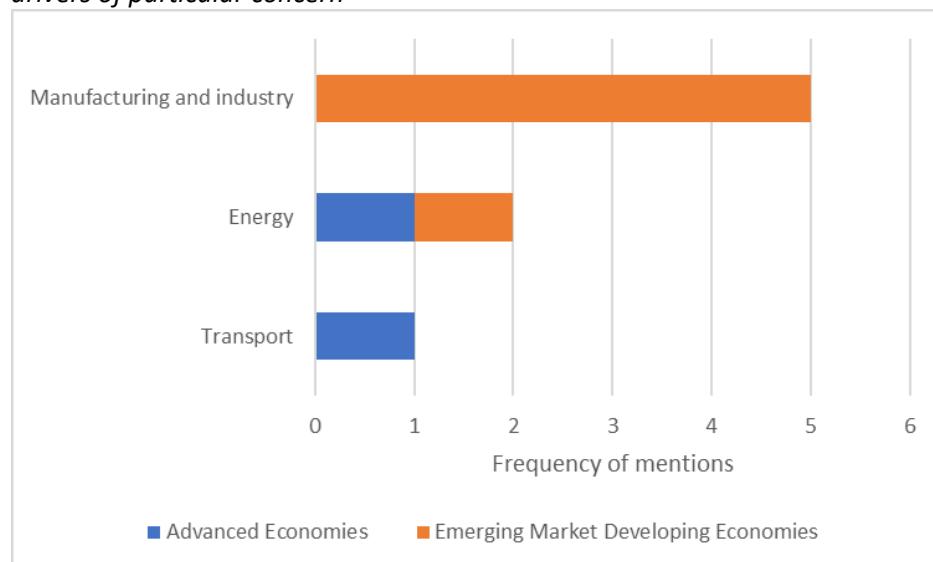
Figure 2.8: The prevalence of various transition risk mechanisms reported by MoFs when asked about specific transition risk drivers of particular concern



Looking at sector-specific transition risks, manufacturing and industry-related sectoral concerns, particularly emissions-exposed/intensive industries, were most frequently reported (although, AEs were absent from this category). These concerns included reduced competitiveness of domestic industries, industrial backsliding and re-industrialization, and increased production costs relating to international standards.

Among energy-related concerns, one AE highlighted challenges in aligning dispatchable energy supply with renewable energy production, as well as the potential financial burdens on enterprises and households due to the volatility of renewable energy outputs. Similarly, one LIDC emphasized the costs businesses face in adapting to international standards within the energy sector. In the transport sector, an AE raised concern on phasing out fossil fuels for transportation.

Figure 2: The prevalence of various sectors reported by MoFs when asked about specific transition risk drivers of particular concern



Transition risks reported by ministries were spread across global ($n=8$) and domestic scales ($n=7$). Global concerns pertained to how the global transition will place additional costs on domestic industries, affecting exports of fossil fuels or high-emissions products and investment flows. Domestic concerns identified pertain to the economic impact of transitioning away from fossil fuels and the impact of the transition on energy matrix and intermittency. One AE noted that their greater control over domestic transitions has led to comparatively heightened concerns about the global transition.

Looking at sectoral breakdown, manufacturing and industry-related transition risks largely pertained to the impact of the global transition on domestic economies. Conversely, transport and energy concerns related more to the domestic transition and were therefore more dominated by AEs navigating risks related to national decarbonization (see the transition risk mechanism *Renewable Energy & Net Zero Transition* in Figure 2.9).

Financial Transition Risks

Turning to the individual transition risks, financial risks emerged as the most frequently reported category. Risks reported by MoFs in this category includes *Investment Financing* ($n=6$), *Exposed Institutions* ($n=3$), *Stranded Assets* ($n=2$), *Uncertainty* ($n=2$), *Crowding-out Non-green Investments* ($n=1$),

Financial Instability (n=1) and Foreign Currency Impacts (n=1).

Financial risks reported by AEs related to investment financing, particularly regarding potential reputation losses that could adversely affect their investment strategies and international negotiation positions. Additionally, AEs reported uncertainty surrounding frictions in labor and capital markets, which may hinder the mobilization of private finance for climate-related initiatives. In contrast, LIDC economies grapple with increased borrowing costs and the high cost of green capital, making it challenging for them to secure the necessary financing for sustainable projects.

AEs and LIDCs highlighted vulnerabilities in financial systems connected to fossil fuel industries, whether directly through national efforts or indirectly through global efforts. One AE additionally noted risks to institutions invested in other carbon-intensive sectors, such as industries linked to nitrogen deposition.

On the issue of uncertainty, one AE expressed a lack of clarity on investment needs, which complicates planning and decision-making processes. One LIDC reported that rapid changes in tax or economic policies create significant uncertainty that generates risks for businesses and investors. LIDCs specifically highlighted the risk of stranded assets as a consequence of the global transition to greener economies. Given significant budgetary restraints and reliance on limited investment financing, the obsolescence of previous investments could lead to substantial financial losses with greater developmental significance.

EMEs did not report any financial risks related to the transition.

Economic transition risks

Risks reported in this category included: Economic Performance (n=6), Trade and Investment (n=4), General Macroeconomic Concerns (n=1), and Re-industrialization (n=1).

MoFs across all development stages expressed equal levels of concern over economic performance (e.g. indicators such as GDP, inflation, price volatility and reduced consumption), with countries in all development stages reporting concern about inflation, including increased prices of food and energy due to carbon taxes or power plant retrofitting. One AE additionally reported the desire to understand how the transition will impact consumption, and one EME expressed anxiety about a period of economic depression that may accompany the net zero transition.

On the other hand, trade and investment, which includes disrupted trade flows, foreign and national investment, and supply chain disruption, was only reported by EMDEs. This manifested through concerns over geopolitical conflicts disrupting global supply chains and international trade and the impact of international climate policies will affect trade and investment.

Government revenues

Government revenue-related concerns raised by MoFs include: *Tax Revenues (n=6)*, *Funding (n=3)*, *Public Debt (n=1)* and *Revenues from Government-Owned Companies (n=1)*.

AEs reported concern over changing tax revenue bases, particularly with the loss of excise duties on fossil fuels as the electrification of the vehicle fleet accelerates. EMEs accounted for half of all mentions of tax revenues-related concerns. Two reported that government income derived from oil extraction plays a crucial role in the overall state budget—for one country accounting for 33% of the budget and representing 29% of total exports. However, another country stated they are exploring new avenues to bolster tax revenues and develop green budgeting through the development of green industries in green hydrogen, mining in copper and lithium to support battery industries, and investing in renewable energy. The LIDC that reported a tax revenue concern highlighted the detrimental impact that global carbon taxes could have on domestic public revenues.

Funding emerged as the second most reported concern, with two EMDEs highlighting the need for increased spending and the budget impacts of investment projects generally, while one AE emphasized challenges in financing energy transition infrastructure.

Competitiveness and market position

Regarding competitiveness, AEs reported the risk of losing competitiveness generally, while EMDEs reported the risk of losing competitiveness in the context of carbon pricing mechanisms (i.e. carbon taxes and CBAM). Within EMDEs, more LIDCs expressed concern about competitiveness generally (n=2) than EMEs (n=1). One EME mentioned unrealized natural resource rents (and the opportunity cost of foregone revenues) as a key transition risk. While AEs and EMEs reported taking advantage of transition opportunities as a key transition concern, LIDCs did not report this concern.

Employment risks

The most prominent employment-related risk raised by MoFs was *Employment Distribution and Labor Market Transformation* (n=3). In this category, one AE reported a high level of concern about the distribution of future employment opportunities across sectors, communities and workers—particularly for sectors and regions most exposed to domestic and global decarbonization. Another expressed concern about the limited information surrounding labor market frictions. One EME raised concern about labor market transformations related to the energy transition and potential re-industrialization.

The other risks raised by MoFs in this category were policy and legal risk related to carbon taxes and their impact on employment (n=1) and the impact on job opportunities generally (n=1).

Other transition risks

The remaining transition risks were only raised by AEs. Distributional and place-based risks included distributional impacts across income groups, regions, occupations, and industries, the difficulties of estimating the place-based impacts, and the impact of the net-zero transition on inequality and wealth distribution. One MoF emphasized that if governments lower their climate ambitions or fail to take adequate action to meet climate goals, the resulting reputational damage could negatively impact investments and weaken their positions in international negotiations. One MoF noted that uncertainties in the pace and impact of climate policies, and difficulties in modelling the impact of these policies, result in difficulties understanding the risk of (particularly EU) policies on carbon leakage.

2.4. Economic opportunities

MoFs differ in their approach towards the evaluation of economic policies aimed at creating green opportunities. Some ministries actively lead in evaluating the economic impacts of such policies, while others primarily support assessments led by other government departments. Certain ministries consider identifying relevant green policies without conducting formal assessments, and a smaller group does not prioritize these evaluations at all. No notable differences were found between EMDEs and AEs, suggesting a broadly similar approach to green economic assessments across these groups.

MoFs display a strong eagerness to leverage both current and potential comparative advantages, particularly those that can be strengthened through proactive climate action. Additionally, energy independence, insulation from geopolitical volatility, and protection from price instability and foreign influence are paramount priorities across ministries in all development stages. Advanced economies frequently cited opportunities related to intellectual property, diversification, and green technology,

while low-income developing countries generally reported a narrower range of potential benefits. Furthermore, for low-income developing countries, key opportunities were largely concentrated in avoided physical risks, investment, and job creation, with fewer mentions in advanced areas. This suggests limited perceived opportunities from climate action for low-income developing countries, highlighting the significant challenges they face in accessing the full range of climate-related benefits. This disadvantage is further emphasized given that countries who reported comparative advantage saw it as an essential prerequisite for unlocking additional benefits of climate action, such as job creation, business growth, and strengthened public finances through the transition to low-carbon technologies.

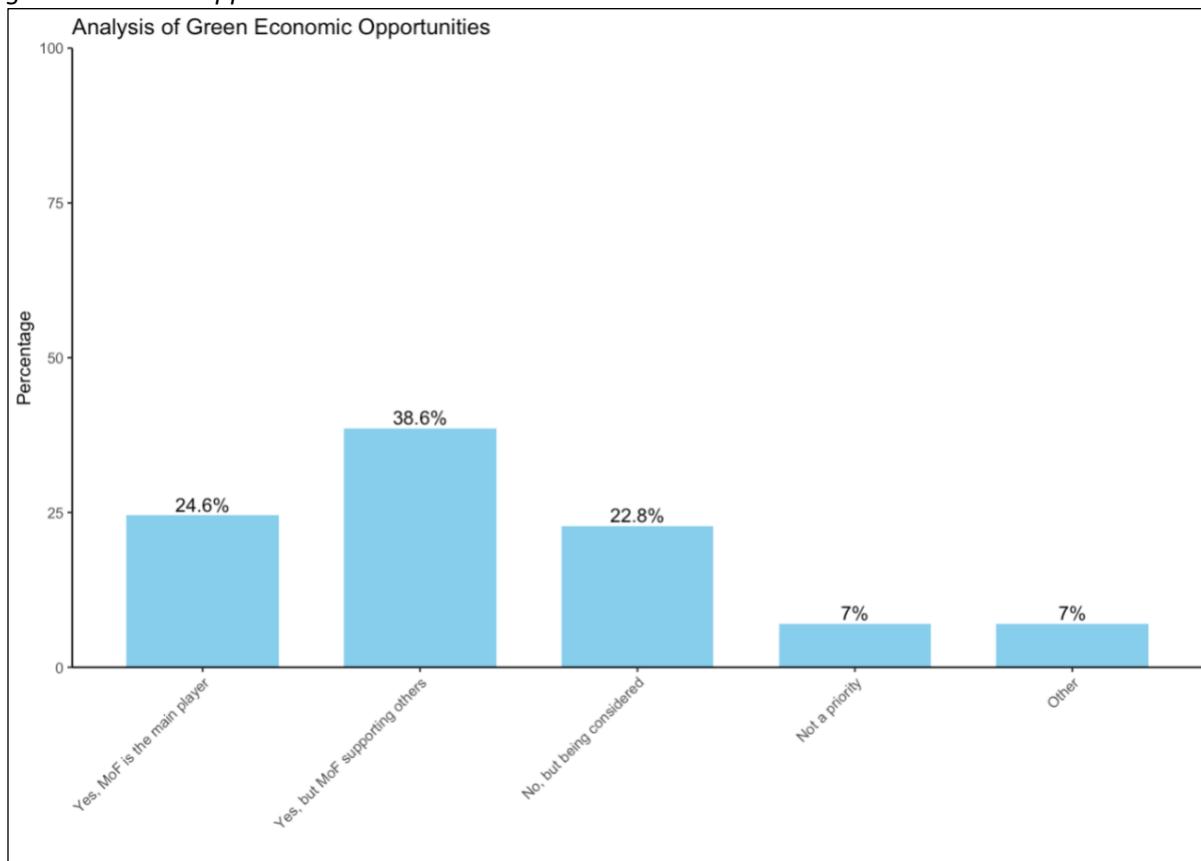
Quantitative Insights

Respondents were asked if their respective MoF undertakes economic analyses to assess the impacts of policies aimed at creating green economic opportunities, including potential economic benefits of green policies on key indicators like GDP, trade flows, competitiveness, employment, and productivity. Respondents could one of the five options: *Yes, the Ministry plays a leading role in designing and assessing these impacts; Yes, but the Ministry mainly supports other government departments in this assessment; No, but some consideration is given to identifying relevant policies; No, this assessment is not a priority for the Ministry, and Other*. A total of 57 responses were recorded.

25% of respondents indicated that their ministry plays a leading role in designing and considering the impacts of green economic policies. The majority, 39%, reported that the ministry supports other government departments in this area. 23% stated that, although their ministry does not conduct a formal analysis, some consideration is given to identifying relevant policies (see Figure 2.10)

Further analysis indicated no statistically significant differences between the two groups. This finding suggests that both EMDEs and AEs have a similar distribution in terms of their ministries' engagement with assessing green economic opportunities, whether as a leading role, a supportive function, or exploratory consideration.

Figure 2.10: Do MoFs undertake economic analyses to assess the impacts of policies aimed at creating green economic opportunities?



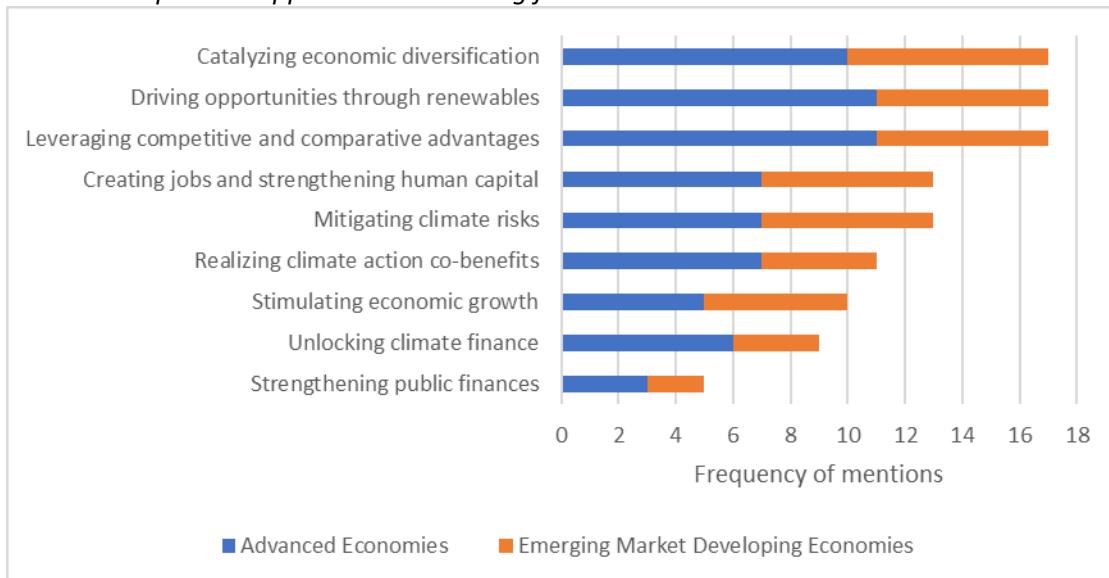
Qualitative Insights

Respondents were asked to identify what they consider to be the most important positive economic impacts or opportunities from climate action.¹¹ 38 MoFs responded to this question, with the most frequently reported climate action opportunities being Leveraging Competitive and Comparative Advantage, Catalyzing Economic Diversification, Driving Opportunities through Renewables, Mitigating Climate Risks and Unlocking Climate Finance (see Figure 2.11).¹²

¹¹ In this context, climate action referred to “policy efforts undertaken to address climate change by both limiting its impacts and adapting to them. This encompasses policies and initiatives focused on adaptation, mitigation, and economic diversification, all aimed at reducing both physical climate risks and emissions.”

¹² Countries were additionally asked to specify the expected time horizons—short-term (1-2 years), medium-term (2-5 years), or long-term (5-25 years)—over which these benefits might accrue. However, countries generally did not respond to this element of the question, and it was therefore excluded from the analysis.

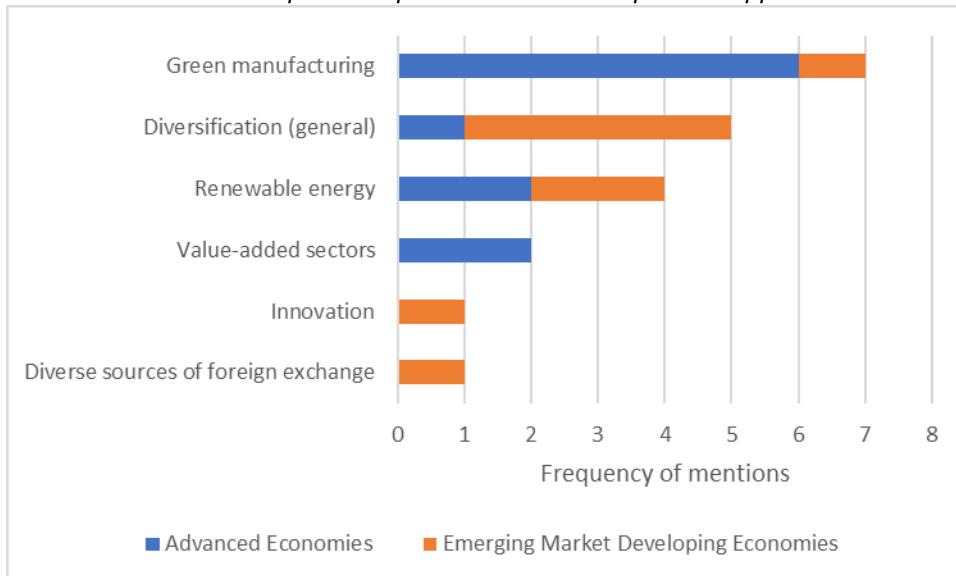
Figure 2.113: The prevalence of various themes reported by MoFs when asked about potential positive economic impacts or opportunities resulting from climate action



Catalyzing economic diversification

Opportunities relating to catalyzing economic diversification were frequently reported, with MoFs highlighting how supportive climate policies can incentivize domestic innovation in green technologies, which can enhance green supply chains and manufacturing capabilities. Specific opportunities in this category are *Green Manufacturing* (n=7), *Diversification (General)* (n=5), *Renewable Energy* (n=4), *Value-Added Sectors* (n=2), *Diverse sources of foreign exchange* (n=1), and *Innovation* (n=1).

Figure 2.12: The prevalence of various themes relating to catalyzing economic diversification reported by MoFs when asked about potential positive economic impacts or opportunities resulting from climate action



AE responses frequently centered discussions around green manufacturing capacity, emphasizing several key areas for development, including scaling up negative emission industries and enhancing manufacturing capabilities within clean energy supply chains, particularly regarding critical minerals. Additionally, there is a strong focus on the production of green steel as well as the emergence of new economic sectors arising from the green transition, such as batteries and hydrogen technologies.

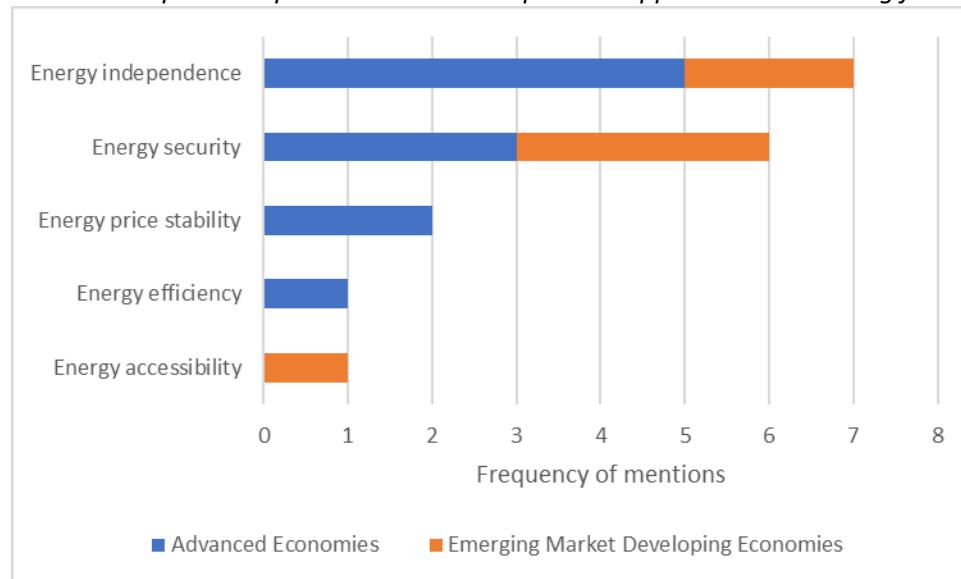
EMEs most frequently reported opportunities through diversification of the industrial sector, exports basket, and economic activities generally. One LIDC reported an opportunity in diversification of the local energy supply chain through renewables.

Driving opportunities through renewables

Respondents reported on many opportunities derived from supporting the transition to renewable energies (See Figure 2.13). The importance of reducing foreign dependence on fossil fuels and thereby improving energy security was highlighted by ministries across all categories, making energy independence and energy security the most frequently reported opportunities associated with renewable energy. This highlights the paramount and universal importance of autonomy and reduced exposure to geopolitical risks among MoFs globally.

AEs were represented across all reported opportunities in this category, excluding energy accessibility through decentralized solar deployment which was reported only by one LIDC. Only AEs reported energy price stability from renewables deployment and energy efficiency as potential opportunities.

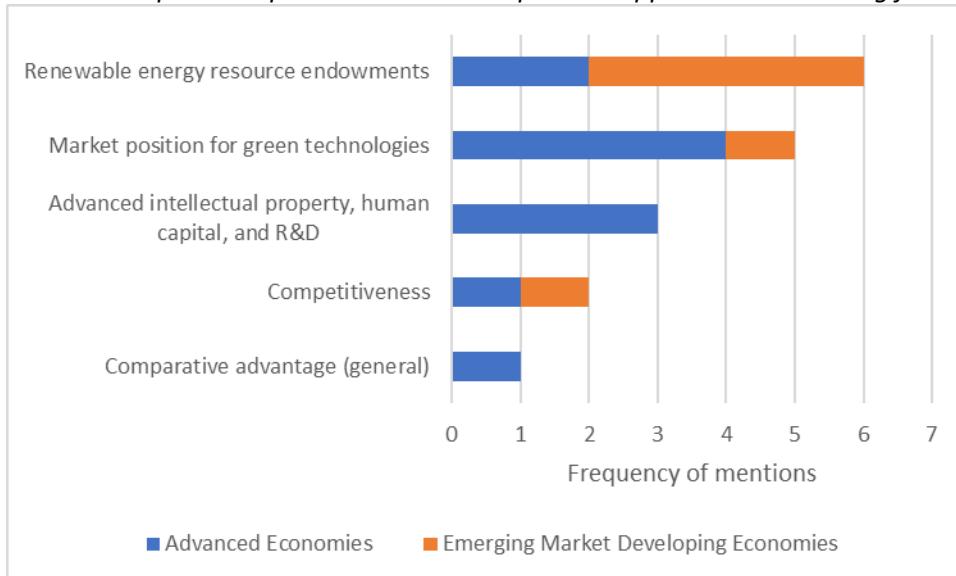
Figure 2.13: The prevalence of various themes relating to renewable energy reported by MoFs when asked about potential positive economic impacts or opportunities resulting from climate action



Leveraging comparative and competitive advantage

Taking a closer look at each opportunity, starting with leveraging comparative and competitive advantage, country responses that fell under this opportunity category referenced the exploitation of existing competitive and comparative advantages or explicitly discussed gaining an advantage from an exports-oriented perspective (see Figure 2.14).

Figure 2.14: The prevalence of various themes related to comparative advantage reported by MoFs when asked about potential positive economic impacts or opportunities resulting from climate action



AEs dominated this category, reporting the desire to seize long-term competitive advantages, exports boosts, economic growth, and position as a global leader in green industries that can come with being an early and decisive player in climate action. These countries link this to their advantageous market position, human capital, research and development capacity, and advanced intellectual properties. EMDEs, particularly EMEs ($n=4$), more frequently reported opportunities around taking advantage of renewable energy resource endowments, however they are still overshadowed by AEs within this category.

Only one LIDC reported an opportunity in this category, mentioning how countries and companies that take the lead in clean technologies, electric vehicles and energy storage can become global leaders, boosting growth and exports in the medium to long-term.

Creating jobs and strengthening human capital

Three employment opportunities that were addressed by MoFs included *Job Creation* ($n=8$), *Human Capital Development* ($n=2$), and *Labor Productivity* ($n=1$). Regarding employment, ministries acknowledged that investment in green sectors (i.e. renewables, green manufacturing, and critical minerals) can potentially generate employment over the short, medium, and long-term. Two AEs highlighted that transition, for example just transition policies, would result re-skilling and up-skilling of the workforce would result in human capital accumulation. One EME noted potential improvements to labor productivity.

Mitigating climate risks

Rather than opportunities, many ministries reported the absence of risk as a key opportunity derived from climate action. Particularly, countries noted that climate action would be accompanied by *Avoided Physical Risks* ($n=10$), *Avoided Financial Risks* ($n=3$), *Avoided Economic & Employment Risks* ($n=2$), *Avoided Health Risks* ($n=1$).

Realizing climate action co-benefits

Co-benefits reported by MoFs from climate action included *Air Quality & Public Health* (n=4), *Protecting Biodiversity* (n=3), *Ecosystem Services* (n=1), and *Food Security* (n=1). The most frequently reported co-benefits were reduced environmental health hazards and improved public health and wellbeing outcomes related to air quality improvements. This is followed by the protection of biodiversity and natural resources. While AEs reported potential co-benefits across all four opportunities in this category—compared to EMDEs reporting on only two opportunities—responses were largely standardized within each theme, regardless of development stage.

Unlocking climate finance

Many ministries reported on the financial opportunities that could be unlocked through climate finance, highlighting *Foreign Investment* (n=5), *Investment (General)* (n=5), and *Financial Sector Stimulation* (n=1).

Foreign investment was largely populated by EMDEs (n=4). EMEs listed potential opportunities from global climate access through increased access to and crowding-in of green foreign direct investment, including sustainable financing and green technologies. LIDCs reported that policy emphasis on renewable energy can boost private investment, with green finance initiatives—such as green bonds and responsible investments—increasingly attracting capital for businesses adopting sustainable practices. One AE additionally reported that climate action can attract and enable investment in their domestic renewable energy transition, particularly in rural areas.

AEs also highlighted additional financial opportunity in investing in domestic innovation and manufacturing capabilities in clean energy supply chains, including critical minerals, green steel and hydrogen, to strengthen economic resilience and security, create new jobs. One LIDC also listed potential opportunity, instead highlighting construction and resource management sectors. One EME emphasized that capitalizing on these opportunities would necessitate ensuring certainty for investors.

Strengthening public finances

Five countries (three AEs and two EMEs) reported strengthening public finances as a potential opportunity from climate action, highlighting fiscal opportunities that can be accumulated through climate action. This entailed increased public revenue from an increase in renewable energy production or comparative advantage in low-carbon technologies, and enhanced capacity to invest in sustainable development projects.

3. Priorities for climate policy design and implementation

This section specifically looks at Ministries of Finance's climate-related policy priorities, focusing on key decision-making criteria, the current status of various policy considerations, and their level of implementation.

3.1. Economic prioritization

Ministries of Finance see climate action as an important economic consideration, but often view their role as supporting climate initiatives led by other departments rather than leading these efforts directly. While a portion of MoFs consider climate action central to their mandate, most focus on facilitation rather than primary responsibility.

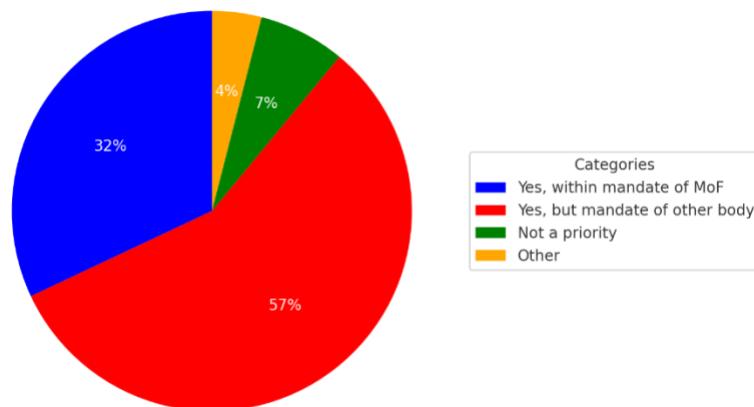
Additionally, qualitative responses highlight that, even when direct climate strategy is led by other departments, MoFs often play a critical role by integrating climate goals into public finance, prioritizing sustainable growth, and supporting cost-effective carbon management.

Quantitative Insights

Respondents were asked whether their ministry's views climate action as a core economic issue and central to its mandate or if it is primarily regarded as the responsibility of other government departments. Four response options were provided, with respondents allowed to select only one: (1) *Yes, climate action is seen as a key economic priority and central to the Ministry's mandate*; (2) *Yes, climate action is an important economic consideration, but the Ministry mainly focuses on helping accelerate action by other departments*; (3) *No, climate action is mainly the mandate and responsibility of other government departments*; and (4) *Other*. A total of 56 responses were recorded.

32% of respondents indicated that their MoF views climate action as a key economic priority central to its mandate. The majority, 57%, selected the option stating that climate action is an important economic consideration, but the ministry primarily focuses on supporting and accelerating actions by other departments. A smaller proportion, 7%, reported that climate action is seen as mainly the responsibility of other government departments (see Figure 3.1). There was no statistically significant differences between AEs and EMDEs, suggesting suggests that both groups share similar views regarding the MoF's role in climate action.

Figure 3.1: Do MoFs consider climate action a core economic issue?



Qualitative Insights

Some MoF further provided more nuanced qualitative responses, highlighting that while climate action strategy itself is mainly the responsibility of other government departments, the impact of public finance and financial markets are considered core economic issues through varying governmental channels and initiatives. In several cases, climate action is explicitly integrated into the MoF's core objectives, either through strategic plans prioritizing sustainable economic growth or through support of national climate goals with a focus on cost efficiency and carbon management.

3.2. Climate policy decision-making criteria

Fiscal sustainability is the top priority for policymakers when designing climate-related policies, with a strong emphasis on the long-term financial impact of such measures. Economic growth and efficiency also rank highly, followed by concerns about international competitiveness and distributional impacts. Legal obligations related to international agreements, such as the UNFCCC and Paris Agreement, are generally seen as less critical, with fewer respondents rating them as highly important.

While there is broad alignment between emerging and advanced economies in prioritizing fiscal sustainability and economic growth, EMDEs show a slight trend towards valuing economic growth more than AEs, while AEs may place slightly more weight on legal obligations. Overall, the findings suggest that fiscal and economic factors are central to policy design in climate-related initiatives across different economic contexts.

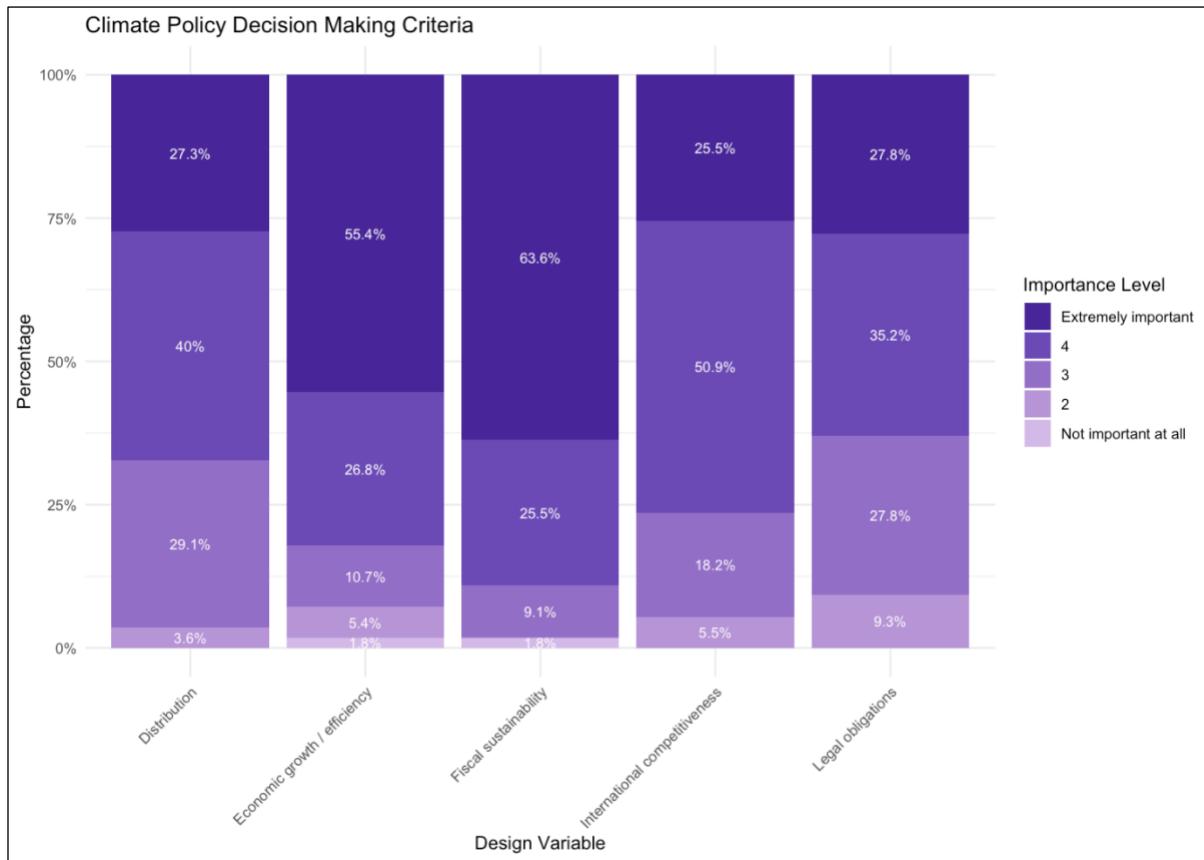
Respondents were asked to rate the importance of several key policy considerations when designing climate-related policies within their MoF. The response scale ranged from 1 (not important at all) to 5 (extremely important), and options were provided for variables such as *Economic growth and efficiency*, *International competitiveness*, *Distributional and employment impacts*, *Fiscal sustainability and affordability*, and *Legal obligations*. The number of responses ranged between 54 and 56 per criterion.

Fiscal sustainability was the most highly rated policy criterion, with a mean rating of 4.5. 89% of respondents rated fiscal sustainability as 4 or 5 on the importance scale, indicating that ministries place a strong emphasis on the long-term fiscal impacts of climate-related policies. This was followed by economic growth and efficiency, which received a mean rating of 4.3, with 82% of respondents rating it as a 4 or 5. Meanwhile, international competitiveness and distributional and employment impacts were also rated highly, with mean ratings of 4.0 and 3.9, respectively. About 76% of respondents rated international competitiveness as 4 or 5, while 67% did so for distributional impacts (see Figure 3.2)

Legal obligations, by contrast, including those related to international agreements like the UNFCCC or the Paris Agreement, were rated lower in comparison, with a mean rating of 3.8. Only 63% of respondents rated this criterion as 4 or 5, suggesting that legal commitments are less of a priority for some ministries when designing climate-related policies, compared to economic and fiscal considerations.

Overall, there were no statistically significant differences in how EMDEs and AEs prioritized these criteria, except for a near-significant difference in the focus on economic growth and efficiency, where EMDEs appear to be more concerned.

Figure 4: How do MoF rate the importance of key policy considerations when designing climate-related policies?



3.3. Climate policy implementation

Ministries of Finance are actively implementing, or involved in the implementation, of climate policies in a range of different areas. More than half of MoFs are engaged in shaping national climate strategies, using taxes and pricing mechanisms, and providing green fiscal subsidies. They are less active in areas like strengthening the resilience of public finances, green budgeting, and integrating climate into financial systems, with significant portions of respondents indicating these are either under consideration or not being pursued.

In most areas, the level of engagement is similar between AEs and EMDEs. Only when it comes to green fiscal subsidies, resilience of public finances, and integration of climate considerations into central banks and financial supervision, implementation in AEs tends to be more advanced, while EMDEs are more likely to be at the early stages of implementation

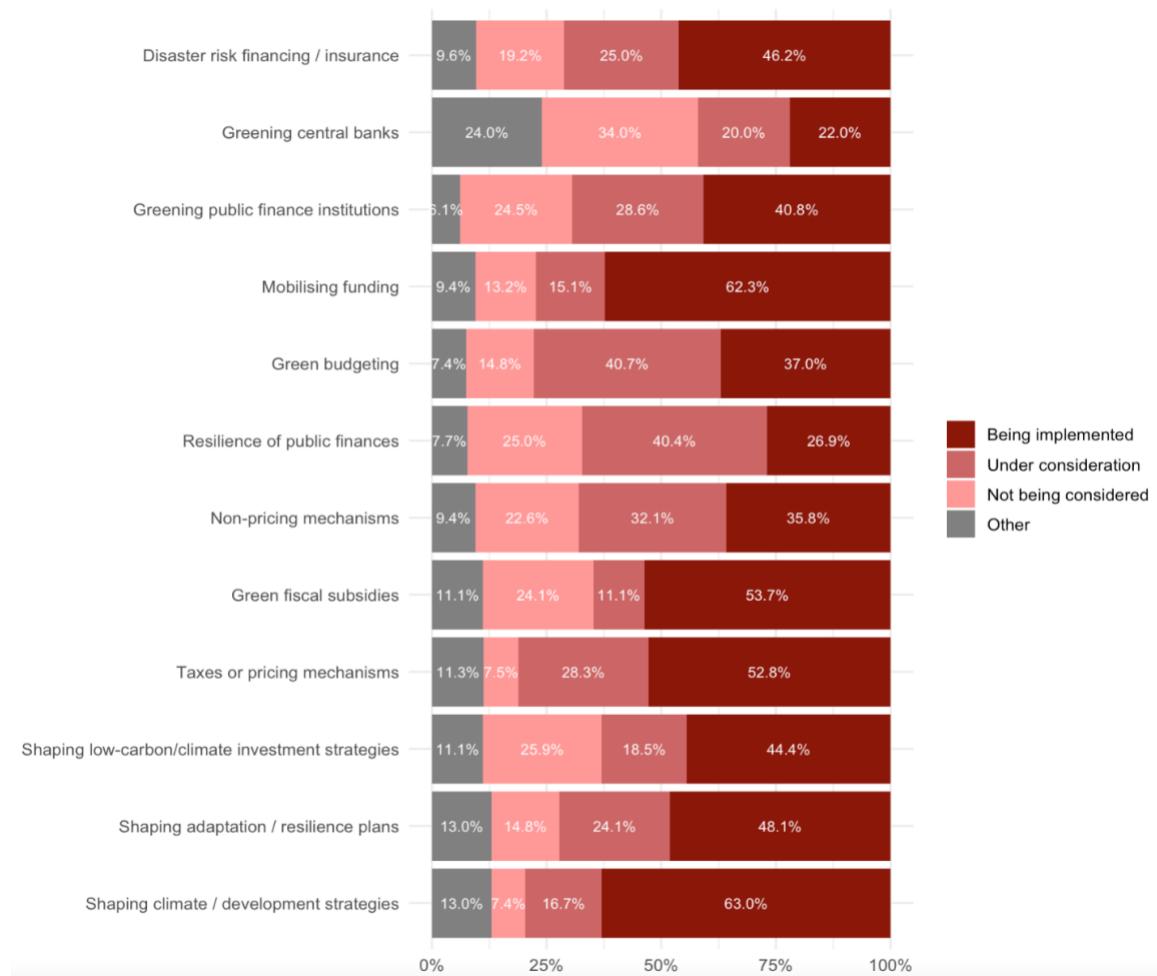
Respondents were asked to rate the level of engagement of their MoF in various key climate policy areas. Options included, with respondents allowed to only select one: *Currently not being considered by the Ministry of Finance*, with the option to provide a qualitative explanation; *Currently under consideration*; *Currently being implemented*, and *Other*. They were also encouraged to *provide a brief explanation of the reason for the selection where appropriate*.

The results suggest that Ministries of Finance are actively implementing, or involved in the implementation, of climate policies in a range of different areas, with substantial differences between individual policies (see Figure 3.3). More than half of MoFs are engaged in shaping national climate strategies (63%), providing green fiscal subsidies (54%), using taxes and pricing mechanisms to change market incentives (53%), and providing green fiscal subsidies. Strengthening the resilience of public

finances for a net zero economy (40%), implementing *non-pricing mechanisms to change market incentives* (32%), and embedding green budgeting in national budget processes (41%) are policies that are under consideration in many Ministries. Over a quarter of Ministries are not (yet) considering action on greening central banks (34%), shaping low-carbon, climate-resilient investment strategies (26%) and resilience of public finances for a net-zero economy (25%).

Significant differences exist between EMDEs and AEs with regards to green fiscal subsidies, resilience of public finances, and integration of climate considerations into central banks and financial supervision. In these specific policy areas, AEs tend to be more advanced in implementing these measures, while EMDEs are more likely to be at the early stages of consideration or not considering these areas at all. For other climate policy priorities, no significant differences were found between the two groups.

Figure 3.3: Implementation status of climate-related policies in Ministries of Finance



3.4. Key policy and analytical questions

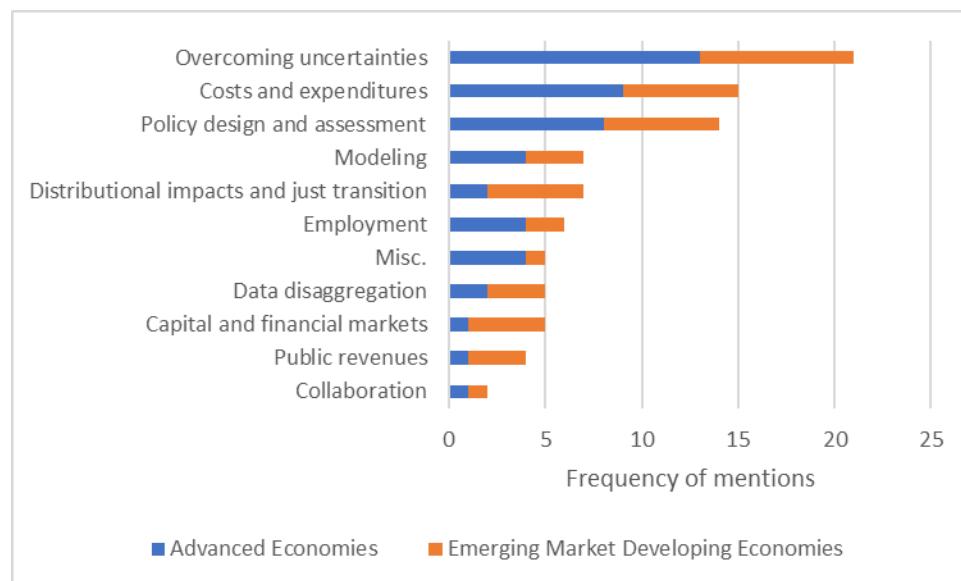
MoFs reported grappling with a range of urgent climate-related policy questions, spanning several critical areas including overcoming uncertainties, costs and expenditures, policy design and

assessment, and data disaggregation. These questions are often invoked key policy instruments, namely tax policies and carbon pricing. Across responses, low-income countries prioritized immediate adaptation needs while emerging and advanced economies balanced adaptation and mitigation in their agendas. For many countries, costs associated with adaptation and mitigation, as well as physical climate change risks, remain opaque, hindering capacity to undertake cost-benefit analysis for climate action to select the best policies or justify budgetary expenditures. Additionally, MoF's desire to seize comparative advantages is offset by a lack of knowledge of how to do so and missing information across the key areas covered here, ultimately hindering the ability of these ministries to take the decisive action needed to achieve climate and climate-related strategic goals.

Qualitative Insights

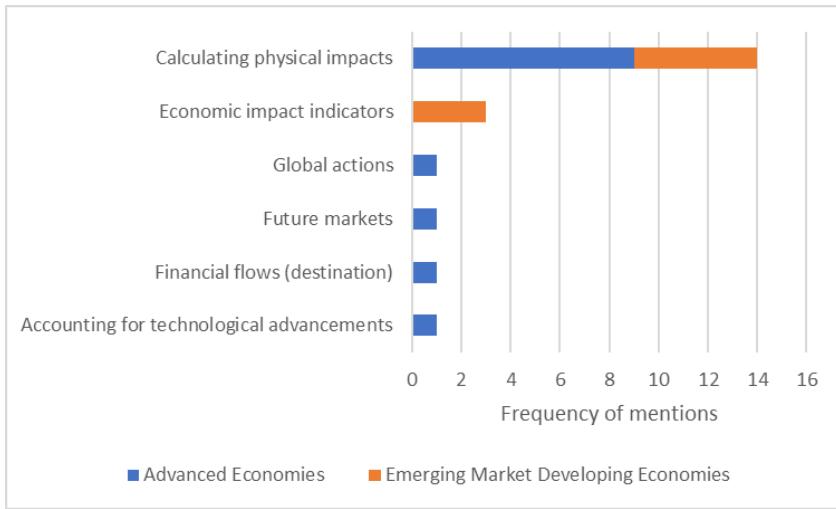
Countries were asked about the most pressing climate-related policy and analytical questions that their MoFs currently lack sufficient information to address. The response format was open-ended, encouraging countries to provide detailed qualitative insights. 28 MoFs provided responses to this prompt, presenting a wide range of climate-related questions, most of which fell into the following categories: Overcoming Uncertainties, Costs Expenditures and Policy Design & Assessment. These categories first be explored in detail, before being followed by a comprehensive meta-analysis of the specific policy tools associated with them.

Figure 5: The prevalence of various themes reported by MoFs when asked to identify the key issues that they have insufficient information to address



Questions on overcoming uncertainties

Figure 3.5: The prevalence of various themes relating to overcoming uncertainties reported by MoFs when asked to identify the key issues that they have insufficient information to address

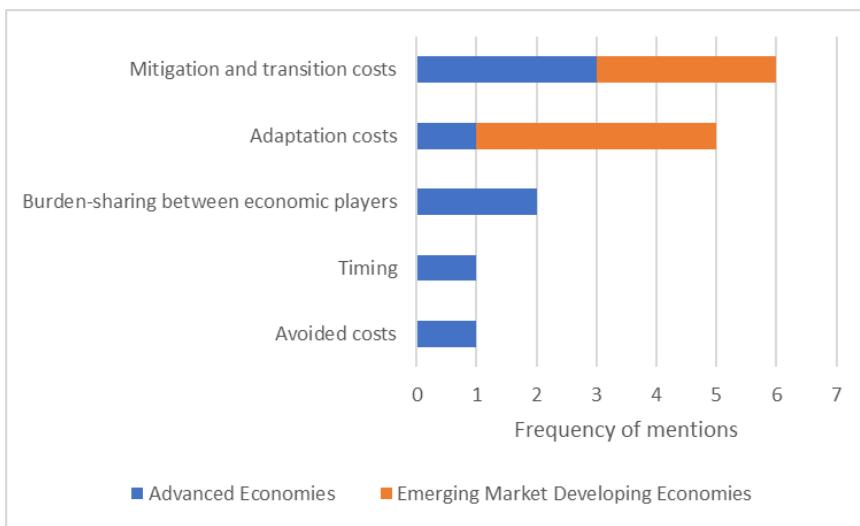


The uncertainties that emerged throughout MoF responses are linked to insufficient data on climate risks and actions, emissions, and adaptation costs, which make it difficult to assess the financial impact of climate policies, plan for risks, and prioritize investments. AEs demonstrated more diversified uncertainties within this category, however, ministries across all development stages were united around the need to overcome uncertainties in calculating physical impacts, particularly in the context of quantifying financial risks and undertaking cost benefit analysis for adaptation projects to select the most effective measures or justify budget expenditures.

Questions on costs and expenditures

Questions posed by MoFs related to costs and expenditures fell into the following categories: *Mitigation & Transition Costs* (n=6), *Adaptation Costs* (n=5), *Burden-sharing* (n=2), *Avoided Costs* (n=1) and *Front or Back-Loaded Timing of Expenditures* (n=1).

Figure 3.6: The prevalence of various themes relating to costs and expenditures reported by MoFs when asked to identify the key issues that they have insufficient information to address

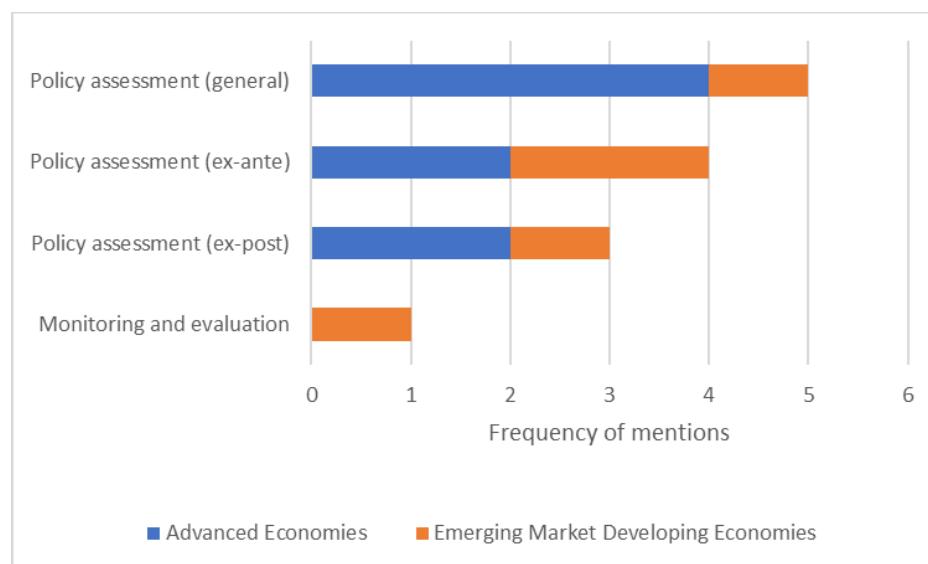


Questions on mitigation and transition costs were the most frequent within this category. AEs expressed uncertainty around the costs of sectoral abatement technologies and overall energy transition investment needs, as well as uncertainty on the best methods of decreasing the cost of capital for clean energy projects in EMDEs and scale up the mobilization of private capital. EMEs expressed uncertainty regarding the costs of implementing carbon pricing measures and the precise costs in the short- and long-term of various climate change mitigation strategies. LIDCs reported uncertainty regarding how to fund climate mitigation projects.

Turning to adaptation costs, while one AE highlighted a lack of clarity in quantifying these expenditures, EMDEs expressed greater uncertainty overall in this category. EMEs commented on the lack of disclosure of adaptation costs compared to mitigation costs and how the lack of data on cost estimates for adaptation measures hinders effective planning and resource allocation for climate resilience. Additionally, one EME emphasized the importance of understanding the precise short- and long-term costs and benefits of various adaptation strategies. LIDCs, which demonstrated slightly higher concern over adaptation costs than mitigation costs, inquired as to the costs of public- and private-level infrastructure for adaptation, as well as how these costs would be financed.

Questions on policy design and assessment

Figure 3.7: The prevalence of various themes relating to policy design and assessment reported by MoFs when asked to identify the key issues that they have insufficient information to address



AEs exhibited a greater, and more granular interest in questions regarding policy design and assessment. Countries reported the need for policy assessment to improve design and effectiveness, the need for or improvement of *ex-ante* projections for economic impacts, a better understanding of the effects of decarbonization policies (particularly of emissions-intensive industries), and the effects of adaptation policies (particularly quantifying avoided physical risks).

One EME posed a question on identifying the most effective metrics and indicators for monitoring progress in climate action and its economic impacts, emphasizing the importance of enabling timely policy adjustments, policy rollbacks, or more informed future policymaking based on observed outcomes.

Questions on modeling

Only AEs and EMEs reported questions related to modeling. AEs raised questions related to applying the economic impacts of climate change and adaptation (n=1), theory and applied techniques for modeling discrete choice behavior (n=1) and modeling macroeconomic impacts where labor reallocation frictions exist (n=1). EMEs raised questions related to integrated assessment models (n=2), particularly how integrated assessment models can better capture interactions between climate policies, economic growth, and social outcomes, as well as questions on tax elasticity in the mining sector (n=1) and advanced modeling techniques for more accurate predicting the economic impacts of climate policies (n=1).

Questions on distributional impacts and just transition

In this category, countries most frequently raised questions related to coordinating a just transition (n=6). Regarding mitigation policies generally, one AE raised a question on the effects of different policies (including taxes and regulation) on income distribution, particularly related to the macro view. One EME identified questions on impacts across different socioeconomic groups and the measures needed to ensure a just transition. Two EMDEs asked about the mechanisms which would ensure costs of the low-carbon economy transition do not fall disproportionately on vulnerable populations and regarding the estimation of social impacts of the energy transition.

Within the coordinating a just transition category, two countries addressed carbon pricing specifically, including one AE asking how to estimate carbon pricing impacts on citizens through distributional analysis and steps for countering adverse impacts, and one EME questioning how to minimize disproportionate impacts on vulnerable populations. One EME raised a question regarding climate policy more generally, relating to sourcing disaggregated data for investigating social impacts and designing inclusive policies to protect vulnerable groups through modeling.

Questions on data disaggregation

Regarding data disaggregation, MoFs highlighted three primary dimensions of disaggregation that are currently insufficient for modeling and policy needs: *Regional Disaggregation* (n=3), *Sectoral Disaggregation* (n=2) and *Demographic Disaggregation* (n=1).

One AE reported that existing approaches for generating cost estimates are largely top-down and economy-wide, that, given the sectoral focus of many exercises, does “not provide a sufficiently robust basis on which to inform [the] government of the value for money proposition of an individual climate measure or of prioritizing climate action measures in any particular sector relative to another.” Another AE reported the need to understand local physical climate change impacts to permit more detailed and cost-effective adaptation planning.

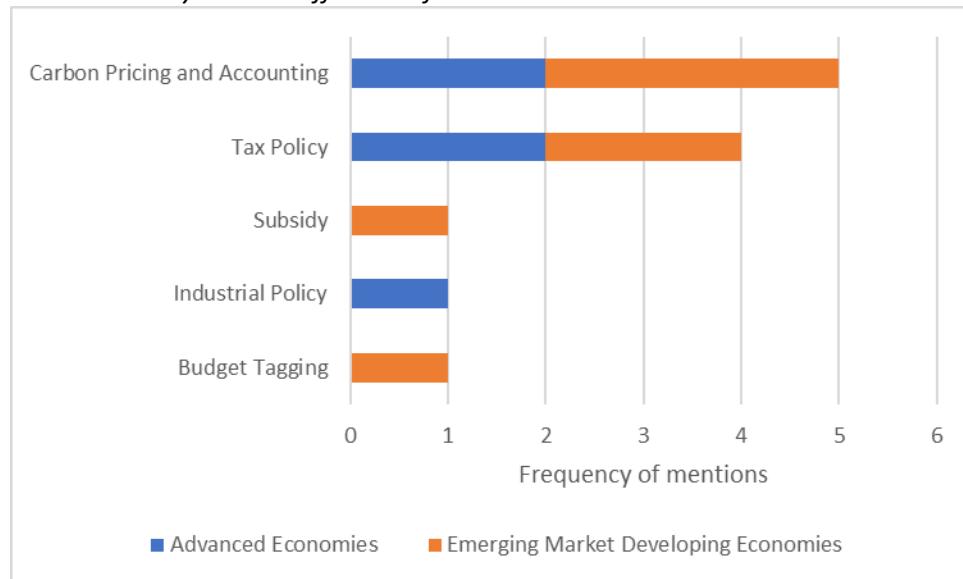
EMDEs expressed the need for “socio-economic data disaggregated by income, gender, region, and other factors”, to understand how climate policies affect different population groups, potentially exacerbate existing inequalities, to design inclusive policies that protect vulnerable groups. Additionally, they expressed the need to understand localized long-term climate projects and how different sectors will be affected by climate change and climate policies. Overall EMEs responses were most prevalent within this theme, while LIDCs did not provide any responses

Questions on policy instruments

Since policy instruments were mentioned in questions throughout key categories, this section examines

MoFs' responses to identify and highlight the most frequently mentioned policy instruments across all questions.

Figure 3.8: The prevalence of various policy instruments reported by MoFs when asked to identify the key issues that they have insufficient information to address



Carbon pricing and accounting and tax policy were the most frequently mentioned policy instruments across all MoFs. AEs were most likely to mention carbon pricing and accounting and tax policy over other policy types, while emerging market economies prioritized carbon pricing and accounting, followed by budget tagging. For LIDCs, tax policy was the most frequently mentioned policy instrument across responses.

Within carbon pricing, AEs were concerned about the acceptability of carbon pricing as an instrument among households, particularly concerning socio-economic impacts and disproportional burdens on low-income populations. EMEs were concerned about the kinds of financial infrastructure needed to support carbon markets, as well as costs of and strategies for implementation, while LIDCs posed questions regarding how carbon credit implementation will affect the economy.

On tax policy, one AE approached tax incentives from the perspective of assessing the labor needs of the job market and another questioned the impact mitigation-related tax policies will have on public revenues/expenditures, employment, growth, and income distribution. LIDCs were concerned about the socio-economic impact of domestic and international fossil fuel taxes.

4. Evaluations of climate-related investments and expenditures

This section reviews the status of climate-related analytical exercises, including cost assumptions, and expenditure forecasts, with specific attention to adaptation, decarbonization, and diversification costs, as well as projected expenditure needs and potential new sources of fundraising.

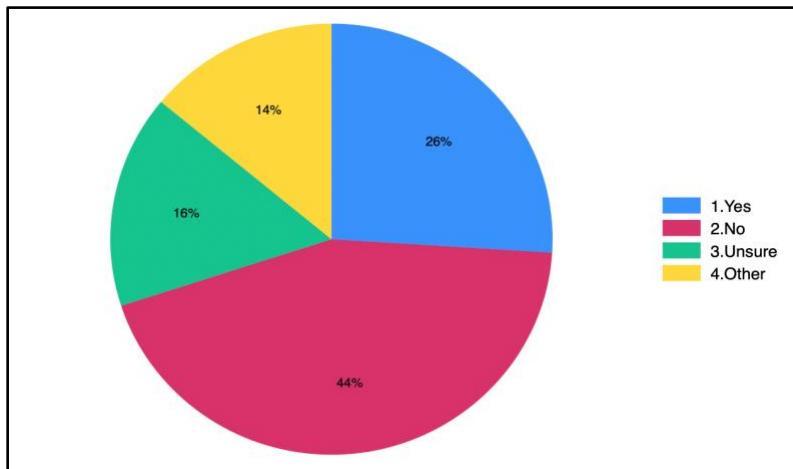
4.1. Adaptation investments and expenditures

A notable portion of MoFs have yet to conduct analyses estimating public expenditure and financing needs for climate adaptation and resilience, with nearly half of respondents indicating no such analyses had been performed. Around a quarter of respondents reported that such assessments had been undertaken, while others were either unsure or cited alternative responses. No statistically significant differences were observed in responses between AEs and EMDEs.

Respondents were asked whether their Ministry had yet conducted any analysis to estimate public expenditure and financing needs for adaptation and resilience to climate change. Four response categories were provided: *Yes*, *No*, *Unsure*, and *Other*. A total of 50 responses were received for this question.

44% of respondents reported that their MoF had not conducted such analyses, while 26% indicated that their MoF had done so. An additional 16% of respondents were unsure (see Figure 4.1). Further analysis was conducted to examine potential differences between EMDEs and AEs, but no significant heterogeneity was observed between these groups.

Figure 4.1: Has the MoF conducted any analysis to estimate public expenditure and financing needs for adaptation/resilience?



4.2. Decarbonization investments and expenditures

Nearly half of MoFs have conducted economy-wide decarbonization cost estimates, but many are still early in this process, especially for sector-specific costs. Power generation and transportation had the highest reported rates of assessment, while buildings, industry/manufacturing, and agriculture lag behind.

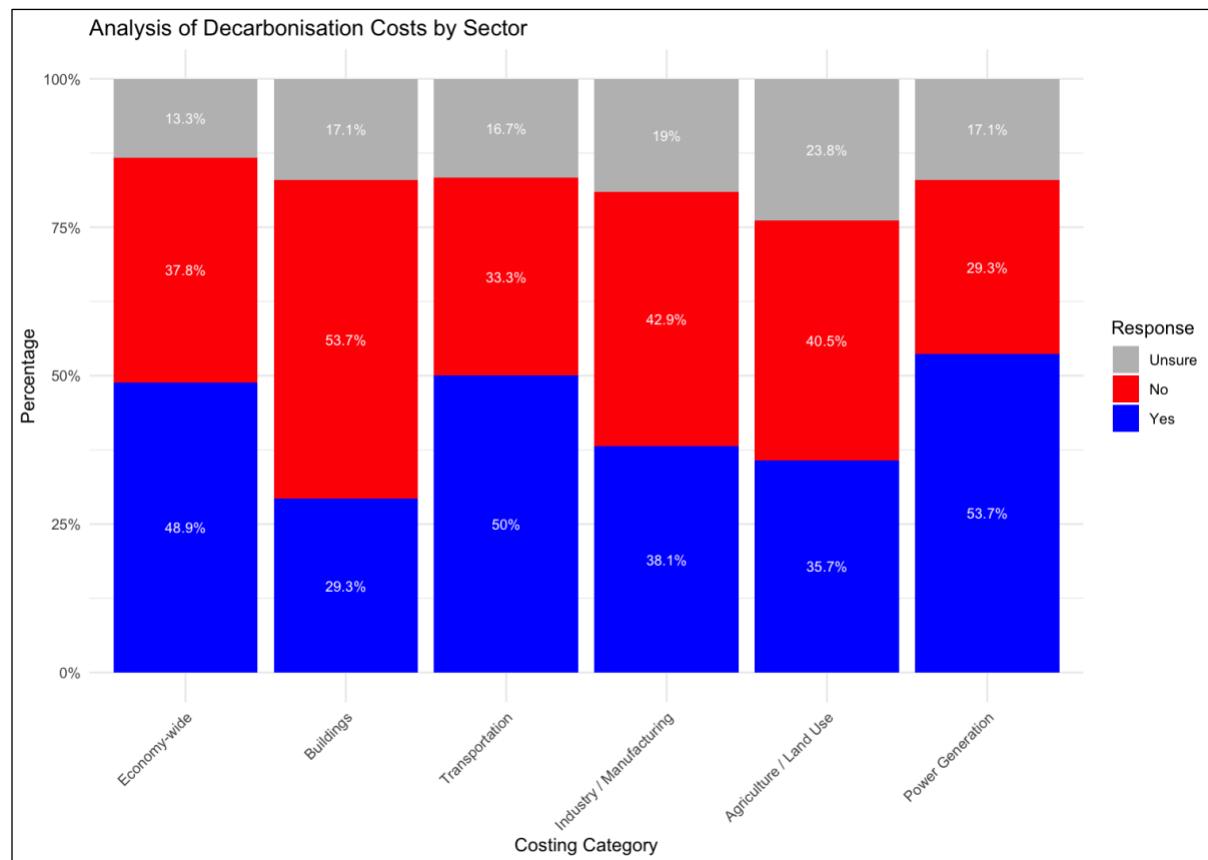
AEs are somewhat more likely to estimate costs in the buildings sector, but otherwise, both AEs and EMDEs show similar engagement levels in assessing decarbonization costs.

Respondents were asked whether their MoF had estimated public expenditure costs and financing needs associated with policies for decarbonization. This question allowed multiple answers across several categories, including *Economy-wide estimates*, as well as detailed estimates for specific sectors such as *Buildings*, *Transportation*, *Industry/Manufacturing*, *Agriculture/Land Use*, and *Power Generation*. Respondents could also select *Unsure* for any of the options. Response rates varied between 41 and 45 respondents.

49% of MoF reported they had conducted economy-wide estimates for decarbonization. However, 38% responded with No, and 13% were unsure, indicating that for a significant number of countries, the financial implications of decarbonization are either unquantified or in the early stages of analysis. Power generation is the sector where most (54%) of respondents indicated they had conducted analysis, followed by Transportation (50%). Rates were slightly lower for industry/manufacturing (38%), agriculture and land use (35%) and buildings (29%).

Further analysis was carried out to check for differences across the two development levels. There was a near-significant difference (at 1% level), with AEs more likely to have conducted detailed estimates for buildings (near-significant at 1% level). For the economy-wide, transportation, industry/manufacturing, agriculture/land use, and power generation sectors, there were no statistically significant differences between EMDEs and AEs.

Figure 4.2: Share of MoF that have produced estimates of public expenditure costs and financing needs associated with policies for decarbonization for key sectors



4.3. Diversification expenditure

Around a third of MoFs have estimated the financing needs for transitioning key sectors away from fossil fuels, while approximately the same proportion of countries is yet to do so. A big proportion of respondents also reported being uncertain about whether such estimates had been conducted.

Respondents were asked whether their MoF had estimated the financing needs or support required for transitioning key sectors away from fossil fuels.¹³ The responses were categorized into four groups: Yes, No, Unsure, and Other. A total of 49 responses were received for this question.

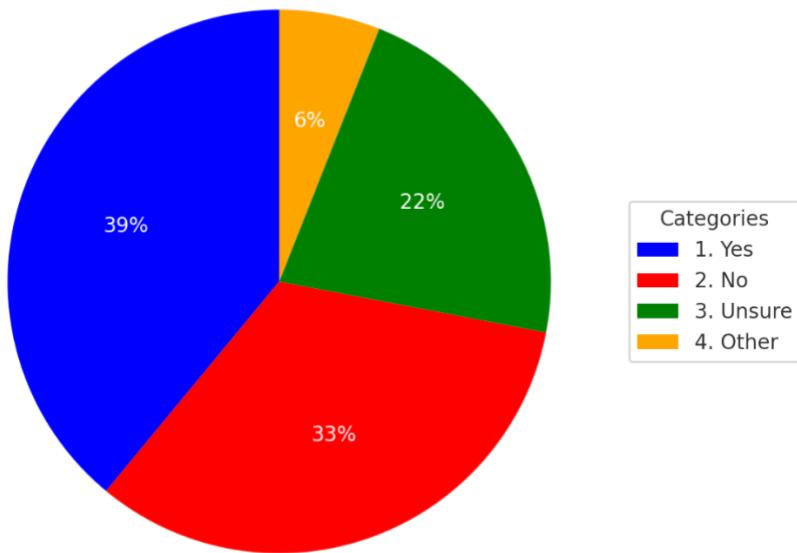
39% of respondents indicated that their ministry had not yet conducted such estimates. On the other hand, 33% of respondents reported that they had conducted the estimates. Meanwhile, 22% of respondents expressed uncertainty, selecting the Unsure option, which suggests that some ministries may be unaware of whether these financing needs have been assessed.

When comparing the responses across AEs and EMDEs, there were some minor but statistically insignificant differences observed. Among EMDEs, 42% responded No, and for AEs, 35%. This suggests that both AEs and EMDEs are progressing at a similar pace in terms of estimating the financing needs for diversifying away from fossil fuels, with many countries either still in the process of developing these

¹³ Diversification expenditure is defined as “expenditure costs and financing needs could include direct costs, subsidies, or compensation for fossil-fuel industries or infrastructure, such as support for re-skilling of labor force in areas dependent on fossil fuels, retrofitting or repurposing existing infrastructure, etc.”

estimates or having not yet begun.

Figure 4.3: Has the MoF conducted any analysis to estimate the financing needs or support required for transitioning key sectors away from fossil fuels?



4.4. Sources of revenue

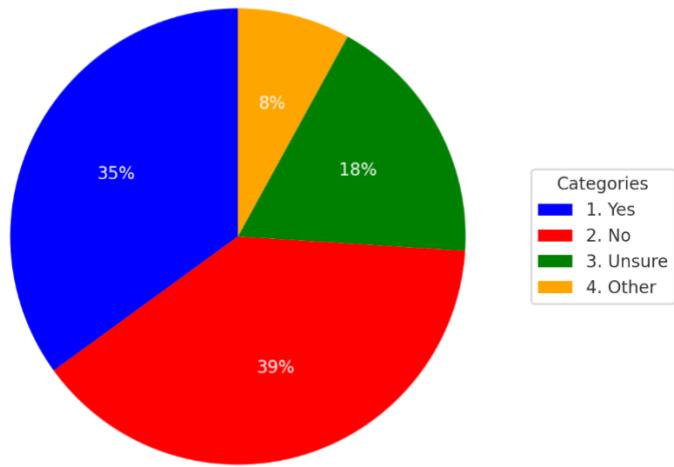
A varied level of engagement was observed among MoFs regarding leadership in identifying and designing new revenue measures for a low-carbon economy. While some ministries are actively pursuing these assessments, others have yet to undertake such efforts, with a portion uncertain about their involvement. No significant difference in engagement was found between advanced and emerging economies.

Respondents were queried on whether their MoF had taken the lead in analytical efforts to identify and design new revenue-raising measures tailored for a low-carbon economy. Response options included *Yes*, *No*, *Unsure*, and *Other*, with participants instructed to select the option that best reflected their ministry's activities.

The results reveal a diverse range of involvement across ministries regarding their leadership in analytical efforts to devise new revenue measures for a low-carbon economy. Specifically, 39% of respondents indicated *Yes*, suggesting that their ministry had actively engaged in exploring new revenue options. Conversely, 33% of respondents reported *No*, indicating their ministries had not yet pursued such initiatives. A notable portion, 22%, selected *Unsure*, reflecting either uncertainty or a lack of clarity about whether such analytical work had been undertaken.

There was no statistically significant difference between AEs and EMDEs regarding their engagement in analytical work on new revenue measures for a low-carbon economy.

Figure 4.4: Has the MoF led analytical work to identify and design new measures for raising revenue in a low-carbon economy?



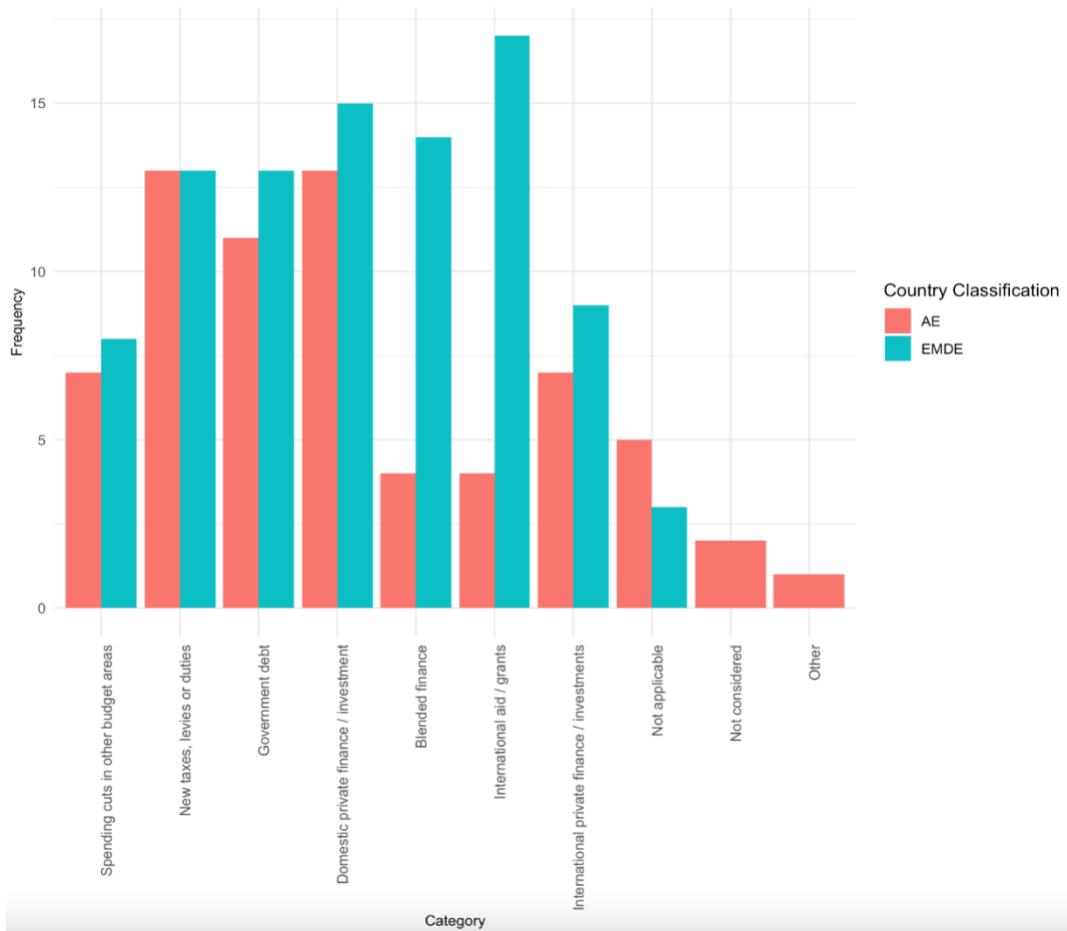
4.5. Source of funding

Finance Ministries are exploring a wide range of funding sources to cover climate-related fiscal needs, with a strong focus on Mobilizing domestic private finance and new taxes. Government debt instruments, particularly green bonds, international aid or grants, and blended finance were also frequently cited as significant funding avenues. Additionally, some ministries are considering spending cuts in other areas and international private finance to support the climate-related expenditures. Only a few ministries indicated that they have not yet considered specific funding options or that this issue is not currently relevant to their planning.

Respondents were asked to identify the sources of funding from which their MoF assumes the majority of the fiscal costs related to climate adaptation, the transition to net-zero, and diversification could be mobilized. The options included a variety of potential funding mechanisms such as *Spending cuts in other budget areas*, *New taxes*, *Government debt*, *Domestic and international private finance*, *Blended finance*, *International aid / grants* and *International private finance / investment* among others. For this particular question, multiple answers were allowed, in order to reflect the diverse strategies ministries may consider for financing these initiatives, including the option to choose *Not considered*, *Other*, or *Not applicable*".

The responses indicate that ministries are considering a diverse array of funding sources to address climate-related financial needs (see Figure 4.5). The most frequently selected source was domestic private finance/investment, reflecting strong interest in leveraging local private sector capital, closely followed by new taxes, levies, or duties as a primary funding source, and government debt instruments, such as green bonds, as a major financing avenue.

Figure 4.5: From which sources of funding does the MoF assume the majority of the fiscal costs related to climate adaptation, transition to net-zero, and diversification can be mobilized from?



5. Existing analytical tools and approaches

This section is divided into two segments; (a) general analytics and (b) climate analytics. The first segment looks at the patterns of practices associated with general economic modelling, including the types of modelling, data usage, software usage, collaboration with other entities, as well as an overview of advanced economic models with a granular inspection of some key features including equations, sectors, regions, and assumptions. The second segment focuses more specifically on climate-related analytics, including integration of climate-related considerations into economic models, use of various climate and transition scenarios, key dynamics within respective scenarios, climate-related data, and internal coordination of modelling results.

General analytics

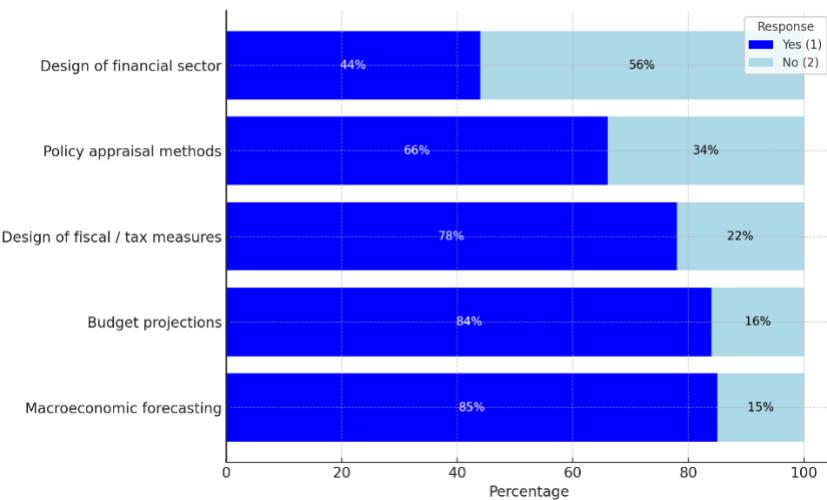
5.1. Economic modelling

Ministries of Finance widely use economic analysis and modelling across key functions, with macroeconomic forecasting and budget projections being the most common. In contrast, the design of financial sector measures and policy appraisal methods saw less frequent use. Most respondents provided details on the types of models used, their developers, and typical analysis time horizons, reflecting the breadth of tools employed for economic planning and policy design across ministries.

Respondents were asked to share details about the type of economic analysis and modelling currently being used in their respective MoF across for key analytical functions, including *Macroeconomic forecasting*, *Budget projections*, *Design of fiscal and tax measures*, *Quantitative policy and programme appraisal*, and *Design of financial sector measures*. Respondents were given the option to report the name and type of the model used for the specific analytical function, the name of the entity that developed the model, and the typical time horizon considered for the analysis. Where respondents provided information, this was interpreted as “Yes”.

Macroeconomic forecasting was the most commonly used analytical function, with 85% of respondents reporting it, while budget projections stood at 84% at a close second, albeit with a smaller sample size (44). (see Figure 5.1)

Figure 5.1: Share of MoFs reporting use of using models across key analytical functions



5.2. Data usage and challenges

MoFs reported varied frequency in data usage for economic analysis, with aggregate macroeconomic data and government-owned micro-data being the most frequently utilized, reflecting regular use by a majority of respondents. Survey data also sees moderate usage, while physical climate risk and carbon emissions data are the least utilized, next to proprietary market data. There are no notable differences between advanced and emerging economies, indicating similar data reliance patterns across both groups. Key data-related challenges that arose in MoF responses related to data harmonization, data granularity, data gaps, data frequency, data accessibility and data systemization.

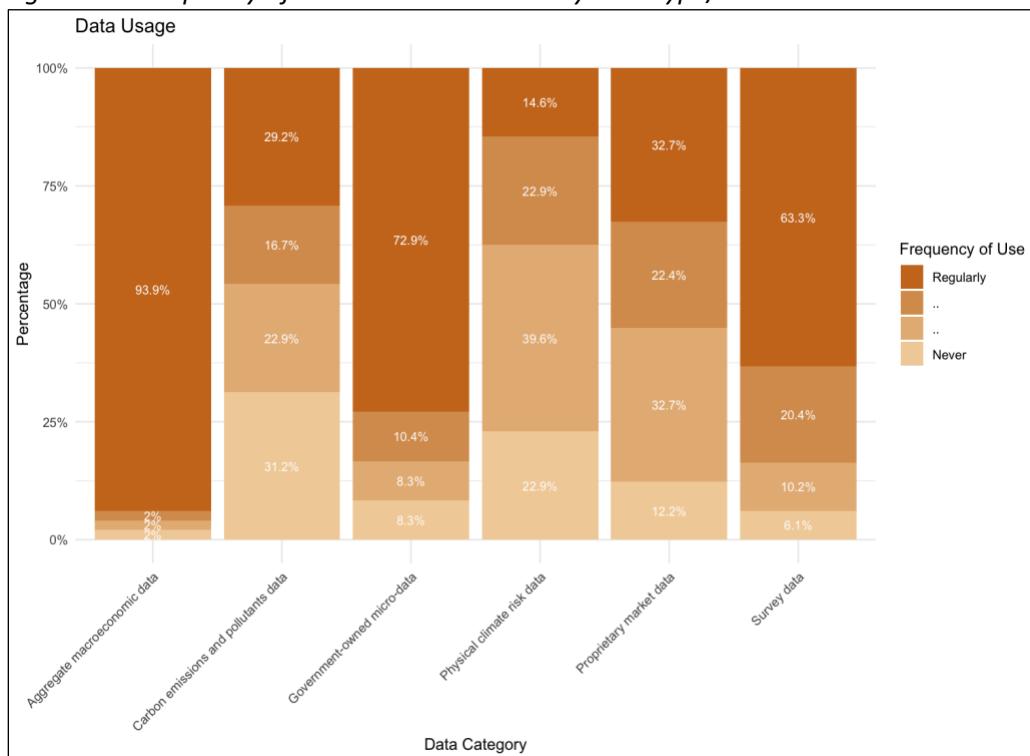
Quantitative Insights

Respondents were asked about the types of data and its frequency by MoF as part of its economic analysis. Available options included *Government-owned micro-data*, *Survey data*, *Aggregate macroeconomic data*, *Proprietary market data*, *Physical climate risk data*, *Carbon emissions and air pollutants data*, and *Other*. For each category, excluding ‘other’, respondents could report a number on an ordinal scale from 1-4, with 1 indicating “never” and 4 indicating “regularly”. The response rate was relatively uniform across all categories, with 49 responses for half of the categories, and 48 responses for the other categories, and only 1 observation for “other”.

Aggregate macroeconomic data had the highest use frequency with 94% of respondents reporting regular use, with government owned micro-data at a close second with 73% reporting regular use, followed by survey data at 63 (see Figure 5.2).

The average data use score was computed for each country using their reported number across each variable. The mean score obtained from the average dataset was 3.06, with a median of 3.17 and a standard deviation of 0.65. No significant distinction was observed between AEs and EMDEs.

Figure 5.2: Frequency of data use within MoFs by data type/source



Qualitative Insights

Respondents were asked to provide open-ended insights on the most pressing climate-related data challenges they face. 28 countries responded to this question, including 14 AEs and 14 EMDEs (8 EMEs and 6 LIDCs), shedding light on both missing datasets needed to produce calculations and missing calculations needed to produce effective policies.

Key data-related challenges that arose in MoF responses related to data harmonization, data granularity, data gaps, data frequency, data accessibility and data systemization.

Key data challenges for AEs were data gaps, data granularity and disaggregation, and data harmonization. Data gaps revolved around the parameterization of abatement possibilities, physical and economic climate risks, national emissions inventories, carbon intensity metrics of the embodied carbon emissions of foreign products, private investment data, AFOLU data (particularly related to land-use change), and ex-post analysis of subsidy impacts. Data granularity and disaggregation challenges related primarily to regional geographic disaggregation, followed by sectoral disaggregation (particularly AFOLU). Data harmonization related to carbon pricing data, green investment reporting, and ex-post analysis of subsidies. These data gaps are barring coherent data frameworks and dataset linking, including federal and regional datasets, and the analysis of the cost-effectiveness of climate action efforts.

Other data challenges raised by AEs included the frequency of data, including on carbon intensity metrics of foreign products, and data accessibility relating to differing access procedures and difficulties acquiring stakeholder approval and accessing disaggregated data on energy prices and consumption and climate investments by households and industries. One respondent stated the desire to link with the European Commission's Green Budgeting framework and OECD Paris Collaborative Green Budgeting framework to aid green budgeting.

For EMEs, a key data-related challenge that arose was data gaps relating to short-term projections of climate impacts, historical and real-time data, impacts of climate change physical risks on infrastructure, geophysical location of companies, industrial and residential water consumption, and firm-level energy consumption. Other key concerns were data granularity related to sectoral and particularly geographic data concerning high-resolution, localized climate data, and data inaccessibility. EMEs additionally expressed challenges related to data frequency of national-level data, systematized adaptation data, and harmonization of data across sources. General topics that arose included climate budgeting to monitor and identify the effects of climate change and the creation of a subnational/regional input-output matrix.

Key data-related challenges expressed by LIDCs included geographic and temporal data granularity, data frequency, data harmonization across sources, and data insufficiency generally. One country reported a financial inability to compile necessary data. These data challenges related to climate finance, emissions data (general, sectoral, and project), and the costs of abatement.

5.3. Collaboration

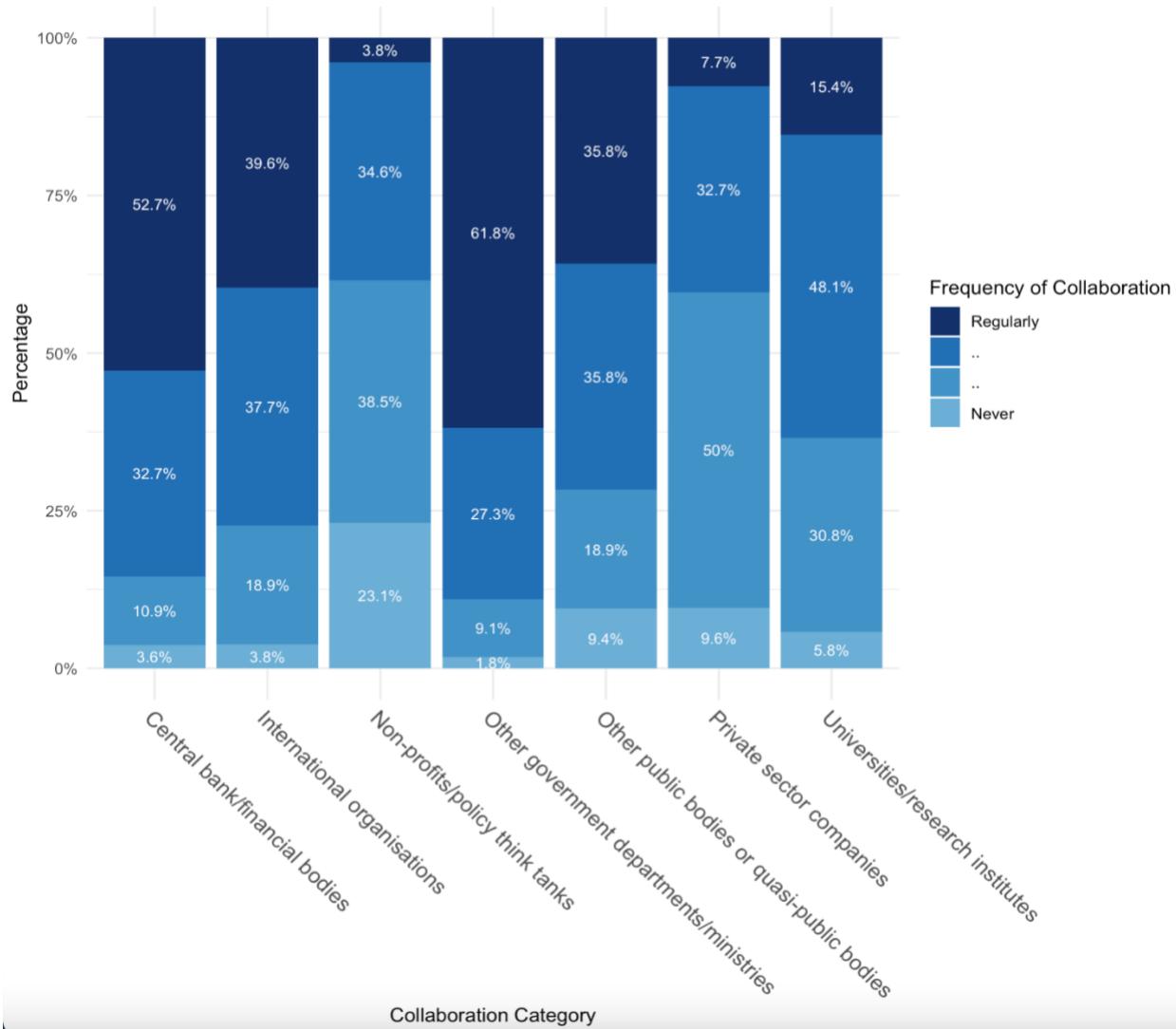
MoFs reported varied collaboration frequency for policy analysis and economic modelling, with the highest rate of collaboration associated with other government departments, central banks, and international organizations. In contrast, collaboration with non-profit organizations, private sector companies, and universities is less frequent, suggesting limited engagement with external non-governmental and academic entities. Collaboration with other public bodies displayed the most variation among responses, while collaboration with government departments was the most consistent. An average collaboration score across countries revealed no significant differences between advanced and emerging economies.

Respondents were asked about collaboration of MoF as part of its economic analysis and modelling of policy options? Available options included *Other government departments / ministries*, *Other public bodies or quasi-public bodies*, *Central bank and related financial bodies*, *Private sector companies*, *Non-profit organizations*, *Universities and other research institutions*, and *International Organizations*, and *Other*. For each entity, excluding Other, respondents could report a number on an ordinal scale from 1-4, with 1 indicating “never” and 4 indicating “regularly”. The response rate was relatively uniform across all categories, with range between 55 and 52 responses for each question, and only 5 observations for “other”.

Highest reported rates of collaboration were other government departments / ministries, with 62% reporting regular consultations, followed by central bank and related financial bodies at 53%, and international organizations at 40% (see Figure 5.3).

Next, the average data consultation score was computed for each country using their reported number across each entity. The mean score obtained from the average dataset was 2.9, with a median of 3 and a standard deviation of 0.56. The average sample split between EMDEs and AEs and further analyzed, but no meaningful or significant distinction was observed across the two groups of countries.

Figure 5.3: Does the MoF collaborate with external parties as part of its economic analysis and modelling?

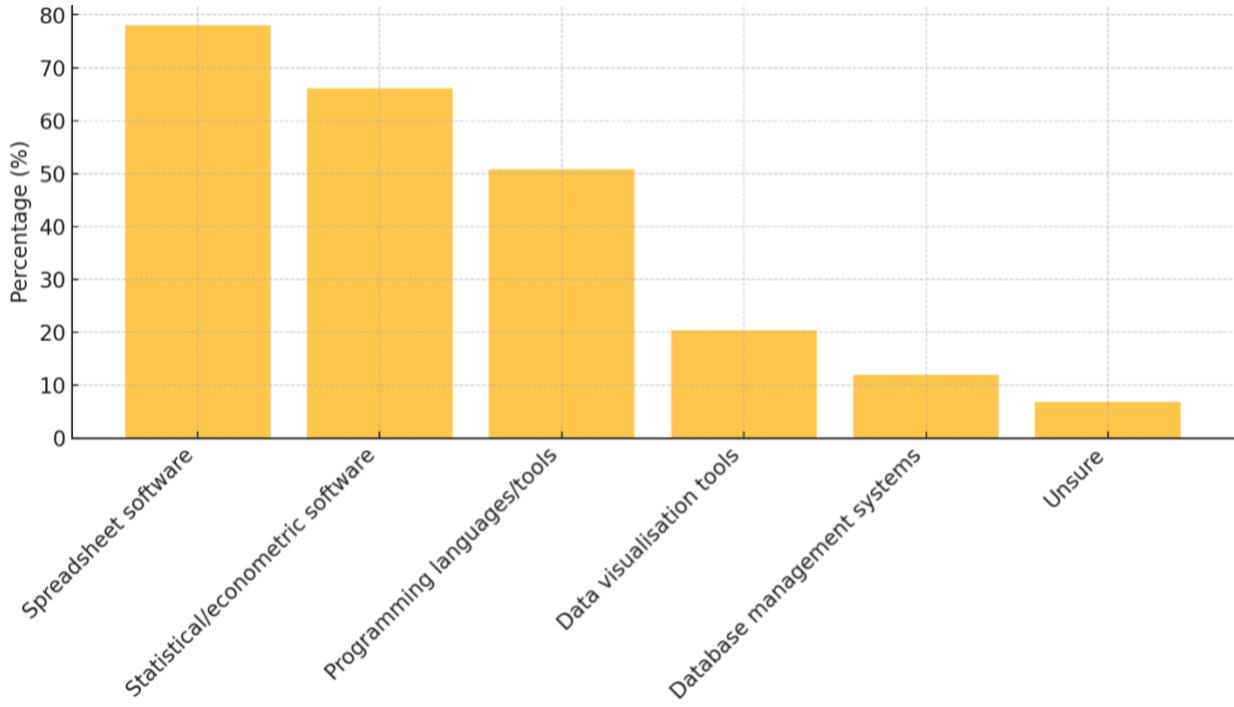


5.4. Analytical software

Respondents were asked about the types of software used by their MoF for economic analysis. Spreadsheet software was the most commonly used, followed by statistical/econometric software, and programming tools. Data visualization tools and database management systems were selected less frequently, reflecting a preference for standard analytical tools over more specialised alternatives.

Respondents were asked about the types of software used by their respective MoF as part of general economic analysis of policy options. Respondents could select multiple options from a list which included *Spreadsheet software*, *Statistical and econometric software*, *Programming languages and tools*, *Data visualization & business intelligence tools*, *Database management systems*. Respondents could also select *None* and *Unsure*. Overall, 50 countries responded to the question and results are reported in the table 3, and visualized in Figure below. Overall, only 4 countries selected the unsure option, and no country selected the none option.

Figure 5.4: Use of software for economic analysis in MoFs



5.5. Advanced models

Ministries of Finance employ a variety of economic models for economic policy analysis, showing significant diversity in sophistication and complexity. While many models address elements such as unemployment and economic expectations, features like financial frictions and endogenous technological change are less common. Despite the range of applications, only a minority of ministries have adapted these models for climate-related economic analysis.

Respondents were asked about the most advanced model currently being used in the MoF for economic analysis of policy options and / or forecasting. They were given the option to share the name of the model, link to a document capturing key details, highlight what entity developed the model and how it is being operated. Respondents were also asked to share the details about the approximate number of equations, sectors and regions in their model and to indicate whether their model includes any of the following features, including *Heterogenous agents*, *Financial frictions*, *Endogenous technological change*, *Unemployment*, and *Expectations*. Finally, respondents were asked whether the said model has ever been used to conduct climate-related economic policy analysis.

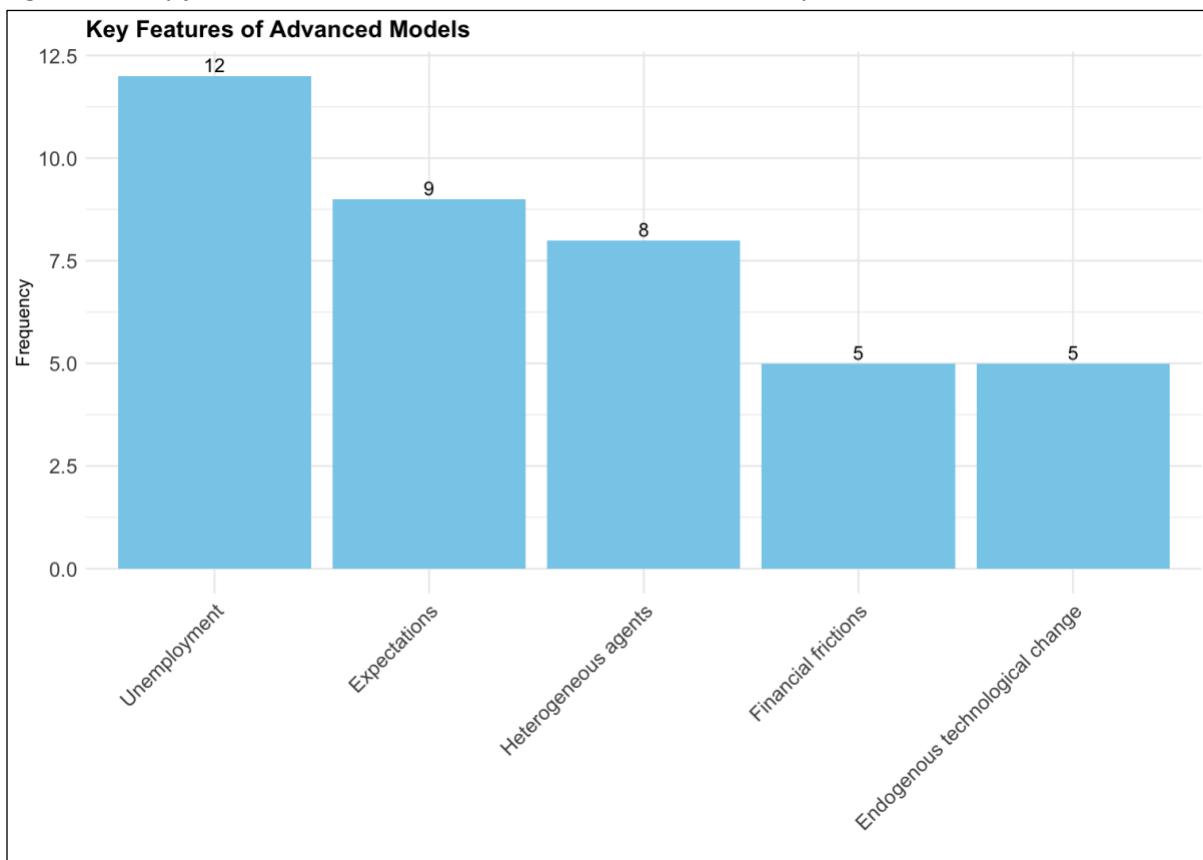
Overall, 29 countries responded to the questions in this section, with 24 sharing the name of their model, 2 indicating that model is still under development and 1 indicating there is no model available (see qualitative results below). 15 countries replied to the question about key model features, with the majority reporting that their model includes features such as unemployment (80%), expectations (60%), and heterogenous agents (53%), while only a minority reported including features such as financial frictions and endogenous technological change (33%) (see Figure 5.5).

9 countries reported the total number of equations in their most advanced model, with a mean of 1764, and a median of 256 equations, indicating a high degree of heterogeneity. One country stood as an outlier, reporting 10,000 equations, while the rest range between 14 and 1800. The same number of countries responded to the question about regions in their most advanced model, with a median of 1

and a range of 1-8. Moreover, 14 countries reported the number of sectors in their most advanced model, with a mean of 32, a median of 8, and a range of 1-186.

39% of countries reported that the model is used to conduct climate-related economic policy analysis, while 61% reported that it is not.

Figure 5.5: Key features contained in most advanced models used by MoF



Climate analytics

5.6. Integration of climate-related considerations into modelling

The integration of physical climate change and transition considerations into MoFs' economic analysis remains limited, with most countries still in early stages. Physical climate considerations are least integrated in financial sector policy design and quantitative policy appraisal, while macroeconomic forecasting and tax/fiscal policy show modest progress, albeit with only a small portion of countries achieving full integration. Transition considerations show slightly more progress, particularly within tax and fiscal policy, but a majority of countries have yet to incorporate these considerations into their analytical frameworks. Average integration scores for both physical and transition aspects reveal that integration levels remain low across both advanced and emerging economies.

Respondents were asked about integration of physical climate change as well as transition considerations into various analytical functions, including "macro-economic forecasting", "budget projections", "design of tax and fiscal policy", "design of financial sector policy", and "quantitative policy and program appraisal". For each category, respondents could report a number on an ordinal scale from 1-4, with 1 indicating *Not undertaken*; 2 indicating *Currently under consideration*, 3 indicating *Partially*

integrated in model, and 4 indicating *Fully integrated in model*. Each selection also presented an optional textbox, allowing respondents to share examples and links to any relevant documents. Response rates ranged from 46 to 37 ministries.

On the integration of physical climate considerations, highest rates of integration were reported for macroeconomic forecasting and design of tax/fiscal policy, with 5% of countries reporting fully integrating physical considerations into these functions. Although, when looking at the partial and full integration together, most progress is observed in budget projections, at 35%. Meanwhile, on average 81% of countries¹⁴ have neither considered nor integrated physical climate considerations into any of the analytical functions, with the lowest progress seen for design of financial sector policy at 89% and quantitative policy/program appraisal at 81% (see Figure 5.6).

The average integration score was computed for each country using their reported results across each function. The median score obtained from the average dataset was 1.8, with a standard deviation of 0.7. No meaningful or significant distinction was observed between AEs and EMDEs.

On the integration of transition considerations, highest rates of integration were reported for tax/fiscal policy, with 13% of countries reporting having fully integrated transition considerations into this function. Once partial integration was also included in the calculations, design of tax/fiscal policy continued to be the function where most integration progress made at 34%. Meanwhile, on average, 71% of countries have neither considered nor have yet integrated transition considerations into any of the analytical functions, with the lowest progress seen for design of financial sector policy at 79% and macroeconomic forecasting at 70% (see Figure 5.7).

The average integration score was computed for each country using their reported results across each function. The median score obtained from the average dataset was 2, with a standard deviation of 0.9. Again, no significant distinction was observed between EMDEs and AEs.

¹⁴ Computed as an average of the percentage share of the “not undertaken” and “under consideration” option combined.

Figure 5.6: Level of integration of physical climate considerations into MoF core analytical functions

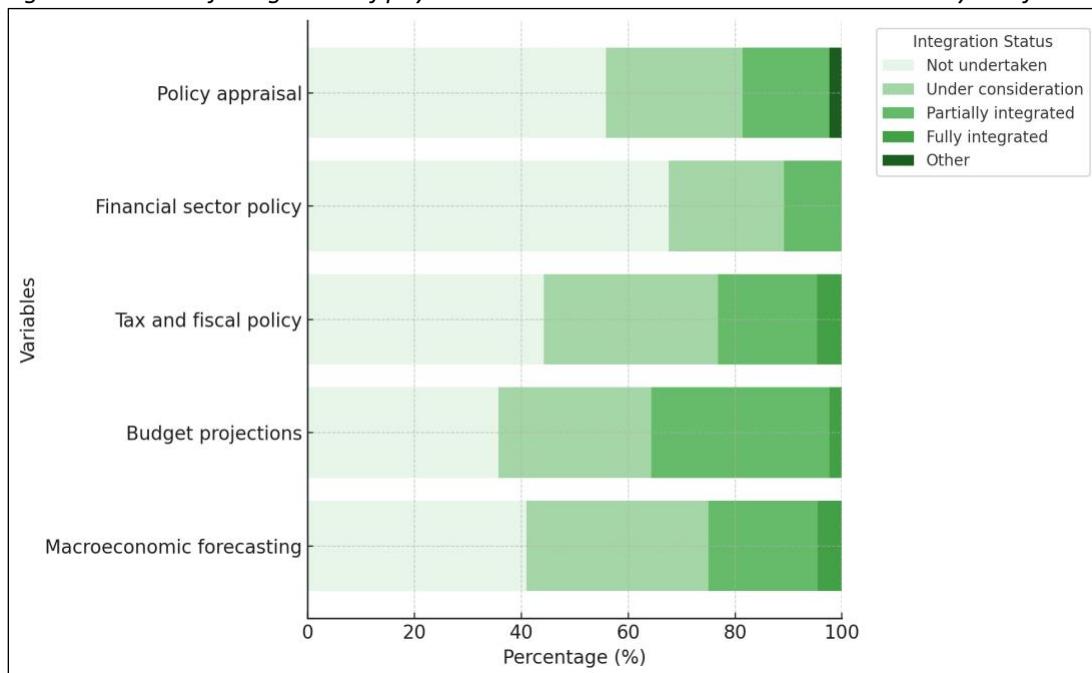
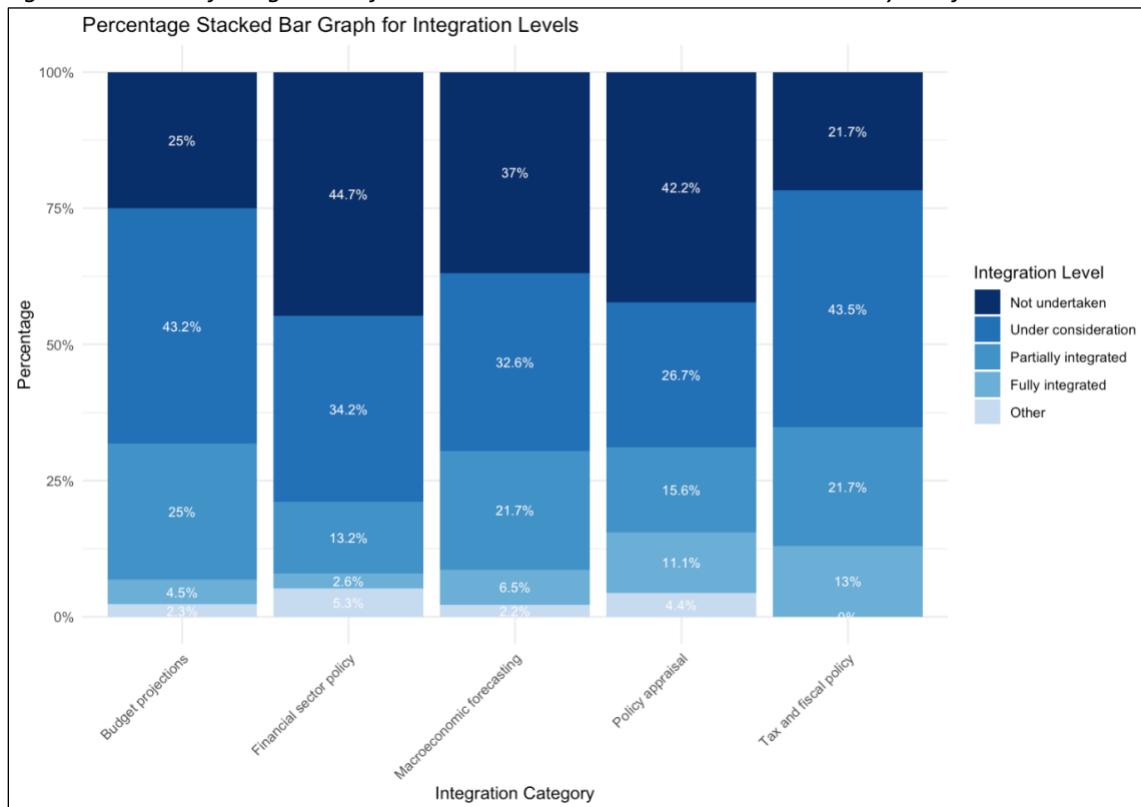


Figure 5.7: Level of integration of transition considerations into MoF core analytical functions



5.7. Climate and transition scenarios

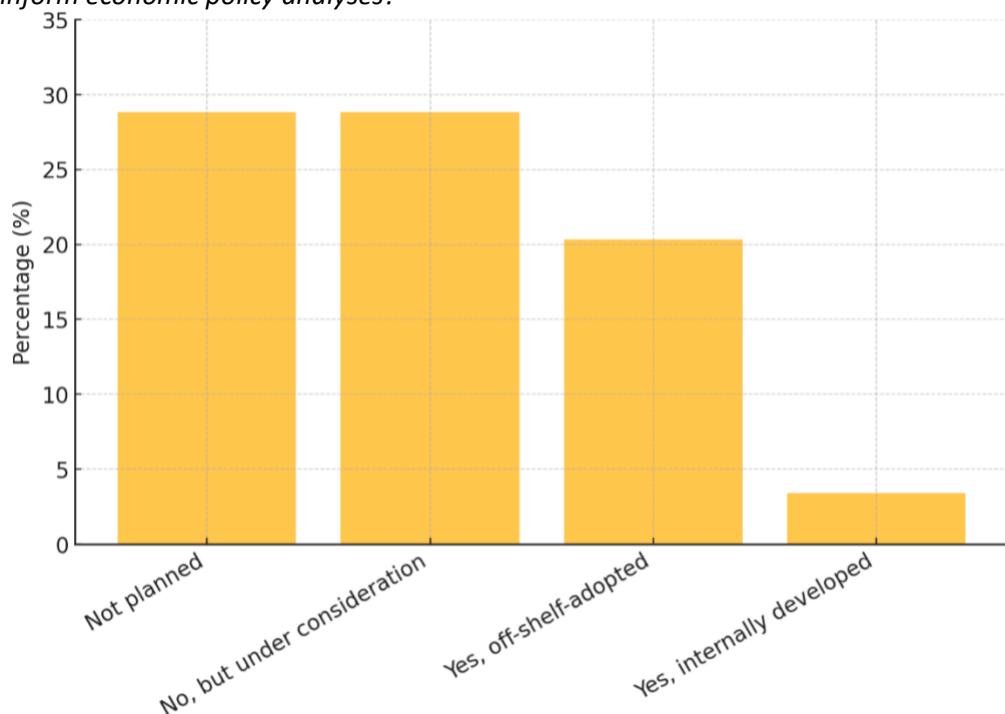
Most Ministries of Finance have yet to integrate climate-related scenarios into their economic analyses, with a notable preference for using off-the-shelf climate scenarios over internally developed

ones when they do. Specifically, for physical climate pathways, a majority of countries have not adopted any scenario-based analysis, while those that have typically rely on established external models rather than custom scenarios. For transition-related scenarios, slightly more countries have started to incorporate them, showing a particular preference for climate policy pathways over sector-specific or technological cost models. Only minor differences were found between advanced and emerging economies in the adoption of both physical and transition scenarios, suggesting a generally limited but similar uptake across country types.

Respondents were asked whether their respective ministry is using climate-related scenarios of global warming (physical climate pathways) to inform economic policy analyses. Respondents could choose multiple options among the possible options presented, including *Not planned*, *No, but currently under consideration*, *Yes, using those adapted from off-the-shelf physical climate scenarios based on GHG emission pathways*, and *Yes, using internally developed physical climate scenarios*. No respondents selected more than 1 choice despite having the option to do so, with overall 48 countries responding to the question.

71% of countries have not yet used climate-related scenarios of global warming. Meanwhile out of those that have utilized these scenarios, the overwhelming majority have used off-the shelf scenarios (86%), compared to internally developed ones (14%). Additional analysis revealed a marginal difference in reported results between EMDEs and AEs, but only significant at the 10% level.

Figure 5.8: Is the MoF using climate-related scenarios of global warming (physical climate pathways) to inform economic policy analyses?

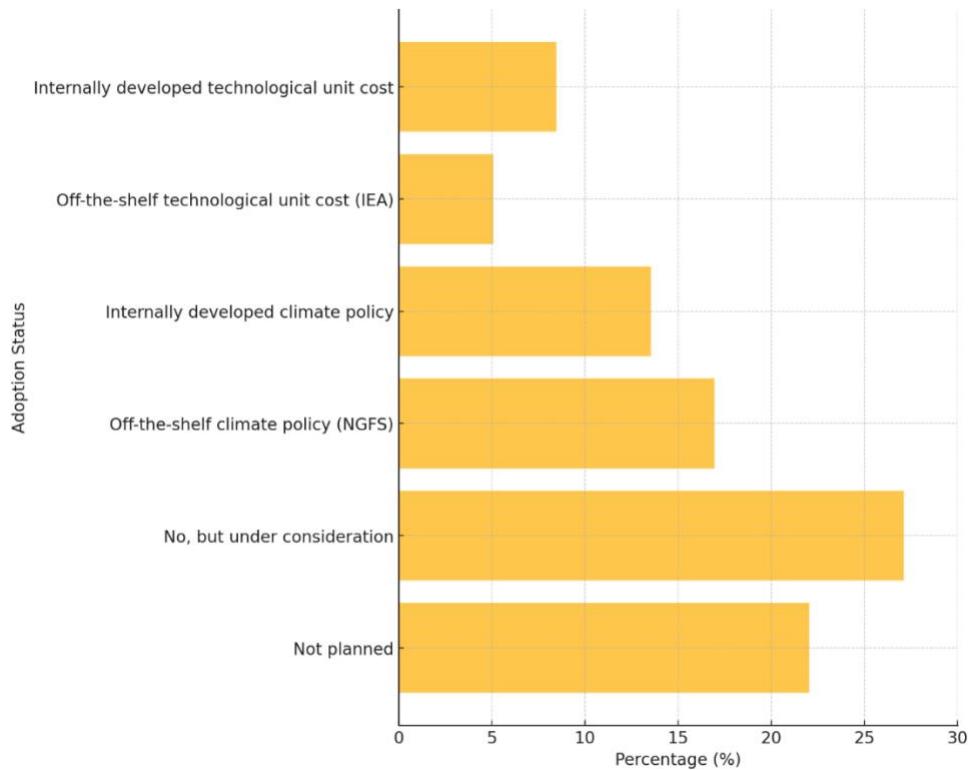


Next respondents were asked whether their respective ministry uses climate-related transition scenarios (including baseline emissions and climate policy scenarios) to inform economic policy analyses. Respondents could choose multiple options among the possible options presented, which included *Not planned*, *No, but currently under consideration*, *Yes, using those adapted from off-the-shelf climate*

policy / transition pathways, and Yes, using those adapted from off-the-shelf technological unit cost or sector-specific decarbonization scenarios, Yes, using internally developed technological unit cost or sector-specific decarbonization scenarios. Overall, 47 countries responded to this question, but unlike the pattern observed in previous section, at least 4 respondents selected multiple options for this question.

62% of countries that responded to the question have not yet used transition-related scenarios. Meanwhile out of those that have utilized these scenarios, off-the-shelf ones were the most utilized (10 respondents), followed by internally developed climate scenarios (8 respondents). When compared to off-the-shelf (3 respondents) and internally developed technological unit cost scenarios (5 respondents), there was a clear preference shown for climate policy scenarios over technological unit cost scenarios. Additional analysis revealed no meaningful and significant differences between EMDEs and AEs.

Figure 5.9: Source and adoption status of climate-related transition scenarios in MoFs



5.8. Climate and transition data usage

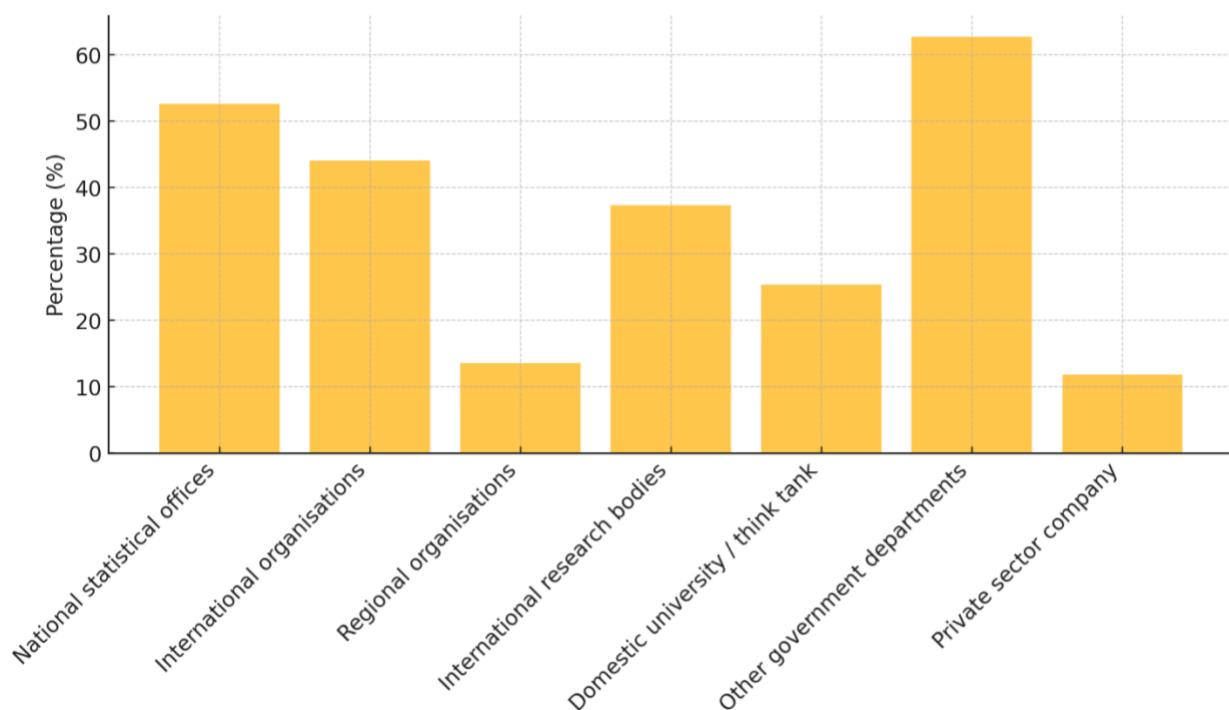
Ministries of Finance reported using multiple sources for climate-related data, with each country selecting an average of 2.4 options. Most commonly, data was obtained from other government departments and national statistical offices, followed by international organizations and research bodies. Fewer ministries relied on regional bodies and private sector companies, indicating a lesser role for these sources. No significant differences were observed between advanced and emerging economies in their choice of data sources, reflecting a consistent approach across both groups.

Respondents were asked whether their respective MoF obtain their empirical climate-related data from

(e.g., carbon emissions data, spatially specific vulnerability to floods or droughts, damage functions, etc.) Options specified include, *National statistical offices*, *International bodies* such as the World Bank or IMF, *Regional bodies* such as regional development banks, *International research bodies and community*, such as the Intergovernmental Panel on Climate Change, *Domestic university or non-profit institution*, *Other government departments or other public bodies* such as the Ministry of Environment, and *Private sector company* such as climate consultancy firms. Multiple options could be selected from the list. Overall, 46 countries responded to this question, with average number of options selected by each country standing at 2.4, indicating that multiple data sources are being used by countries.

Climate-related data was mainly obtained from other government departments (36 respondents), and national statistical offices (31 respondents), followed by international organizations (26 respondents), and international research organizations (22). Lowest observations were seen for regional bodies (8 respondents) and private sector companies (7 respondents). Additional analysis revealed no significant differences between EMDEs and AEs.

Figure 5.10: Sources of climate-related data used in MoFs



5.9. Climate scenario dynamics

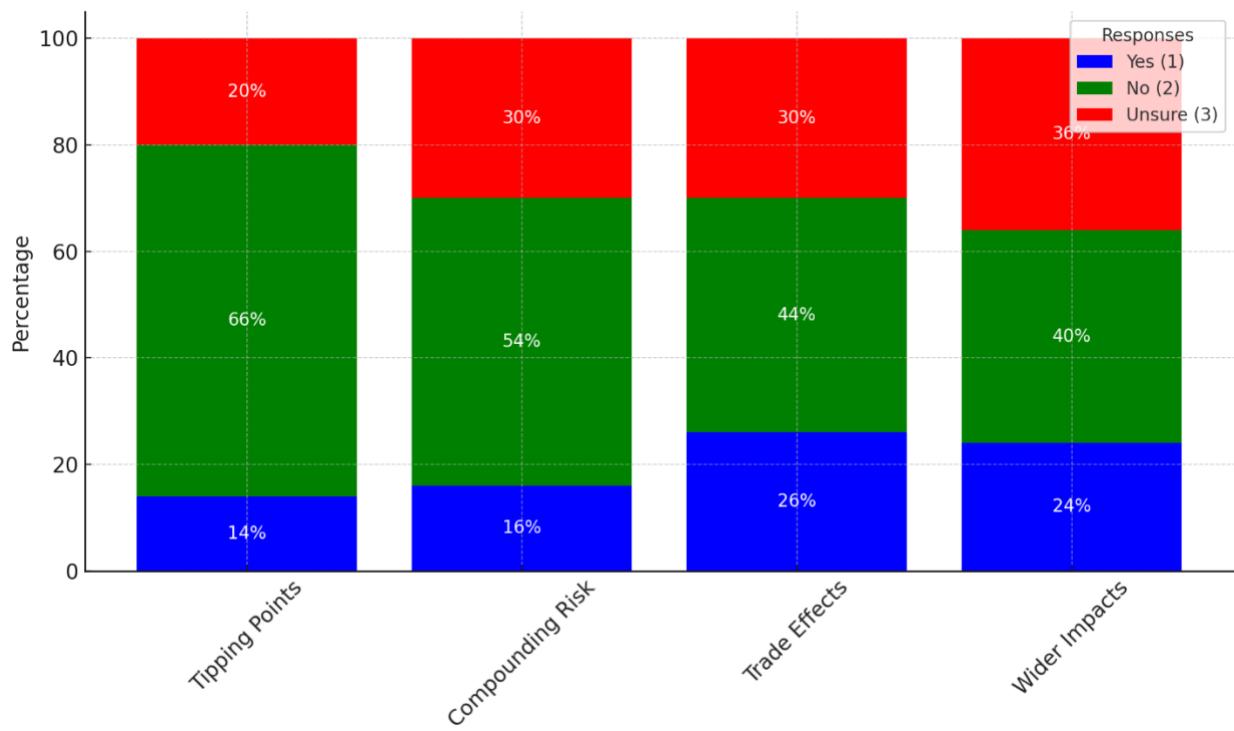
Tipping points and compounding are the climate scenario dynamics least likely to be integrated into climate-related analytical exercises, with 66% of Ministries of Finance reporting that they had not integrated tipping points and 55% that they had not integrated compounding risks. The integration of trade effects is slightly more common. However, a large percentage of countries reported being unsure about the inclusion of these specific features in their analytical exercises.

Respondents were asked to report whether their respective MoF has integrated specific dynamics in any of its climate-related analytical exercises. These include physical *Climate tipping points*, *Compounding risks*, such as economic recessions coupled with acute physical climate event, *Trade effects*, such as the impact of carbon-border adjustment mechanisms on trade, *Wider non-economic impacts and spillover*

effects, and *Other*. Respondents were asked to select one of three options for each category – excluding “other” – between *Yes*, *No*, and *Unsure*. The number of responses ranged between 42-44 respondents across all categories.

Tipping points and compounding risks were least likely to be integrated into climate-related analytical exercises, with 66% of MoF answering no to tipping points and 55% to compounding risks. The feature most considered included were trade effects at 26% and wider impacts at 24%. However, a noticeable trend was the percentage of countries that reported being unsure about the inclusion of these specific features in their analytical exercises, where on average 29% of respondents reported being unsure.¹⁵

Figure 5.11: Status of integration of key dynamics into climate-related analytical exercises used in MoFs



5.10. Climate and transition models

The majority of MoFs do not currently utilize dedicated climate-economy models for assessing mitigation or adaptation policies, with most relying instead on general economic models. A small proportion have implemented internal or external climate-specific models, though uncertainty remains for some ministries about the presence of such tools.

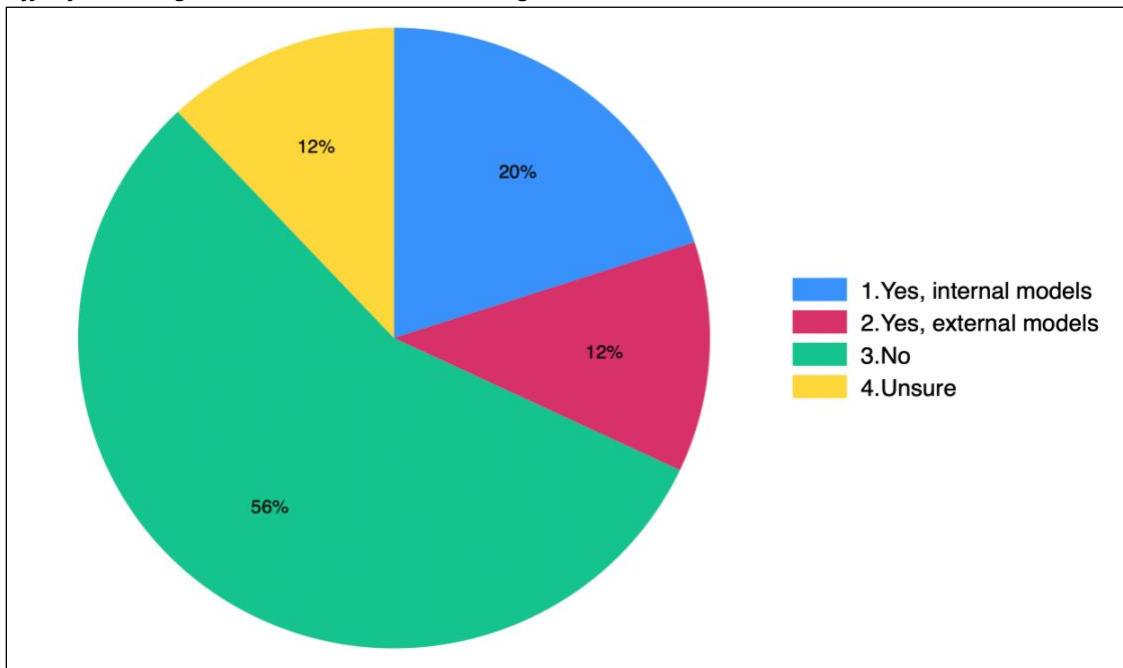
Respondents were asked whether their respective MoF has dedicated climate-economy models of mitigation or adaptation policies that differ from the general economic models being used. The survey provided four response options: *Yes, internal climate-economy models*; *Yes, external climate-economy models*, *No*, and *Unsure*. Overall, 50 countries responded to this question.

56% of respondents reported not having dedicated climate-economy models. Only 20% of respondents confirmed the use of internal climate-economy models, and an additional 12% reported using external

¹⁵ Computed as the average of the reported percentage point for the unsure category across all 4 variables.

models. The level of uncertainty was also notable, with 12% of respondents stating they were unsure whether such models exist within their ministry (see Figure 5.12). The distribution of responses highlights that while some ministries have begun to integrate dedicated climate-economy models, either internally or externally, they have not been broadly adopted.

Figure 5.12: Does the MoF use dedicated climate-economy models of mitigation or adaptation policies that differ from the general economic models being used?



5.11. Governance and analytics

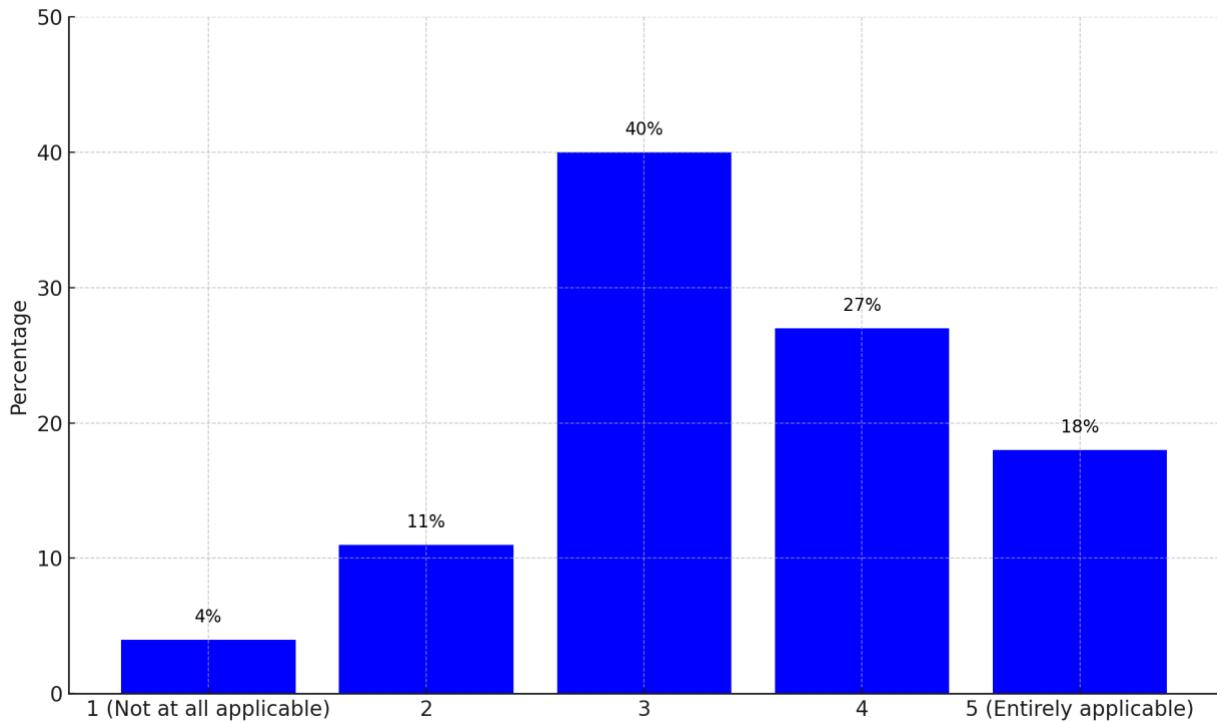
Finance ministries reported moderate effectiveness in governance mechanisms for delivering climate-related analysis to decision-makers, with significant variation across countries. While a substantial portion of respondents rated their structures as moderately effective, fewer ministries reported highly effective governance. Advanced economies generally had stronger governance mechanisms in place, with a higher average score than emerging economies, suggesting that AEs were more likely to have established senior-level responsibilities and dedicated frameworks for integrating climate insights into decision-making.

In this question, respondents were asked to rate the effectiveness of their ministry's governance mechanisms in ensuring that climate-related analysis reaches decision makers in a timely manner. The rating scale ranged from 1 (not at all applicable) to 5 (entirely applicable), with 1 indicating no clear governance structures, and 5 indicating highly effective mechanisms such as senior-level responsibilities or dedicated frameworks for climate analysis. Overall, 44 countries responded.

The mean score of 3.4 reflects a moderate level of governance effectiveness across all ministries, with some variability indicated by a standard deviation of 1.1. The results reveal a broad distribution of responses regarding governance effectiveness within MoFs (see Figure 5.13). Ministries in AEs have a higher mean score (3.8) compared to those in EMDEs (3.0), indicating that advanced economies

generally have more effective governance mechanisms in place for climate-related analysis

Figure 5.13: “The Ministry has clear mechanisms (e.g., senior-level responsibilities or other governance structures) to ensure climate-related analysis reaches respective decision makers in a timely manner”



6. Climate-related analytical capabilities

This section reviews core climate-related capabilities within MoFs and outlines the key challenges they face in integrating climate considerations into their priorities, analytics, and broader practices. It concludes with a brief reflection on the Coalition's role in supporting MoF's efforts to address these challenges and build capacity in climate-focused areas.

6.1. Main barriers

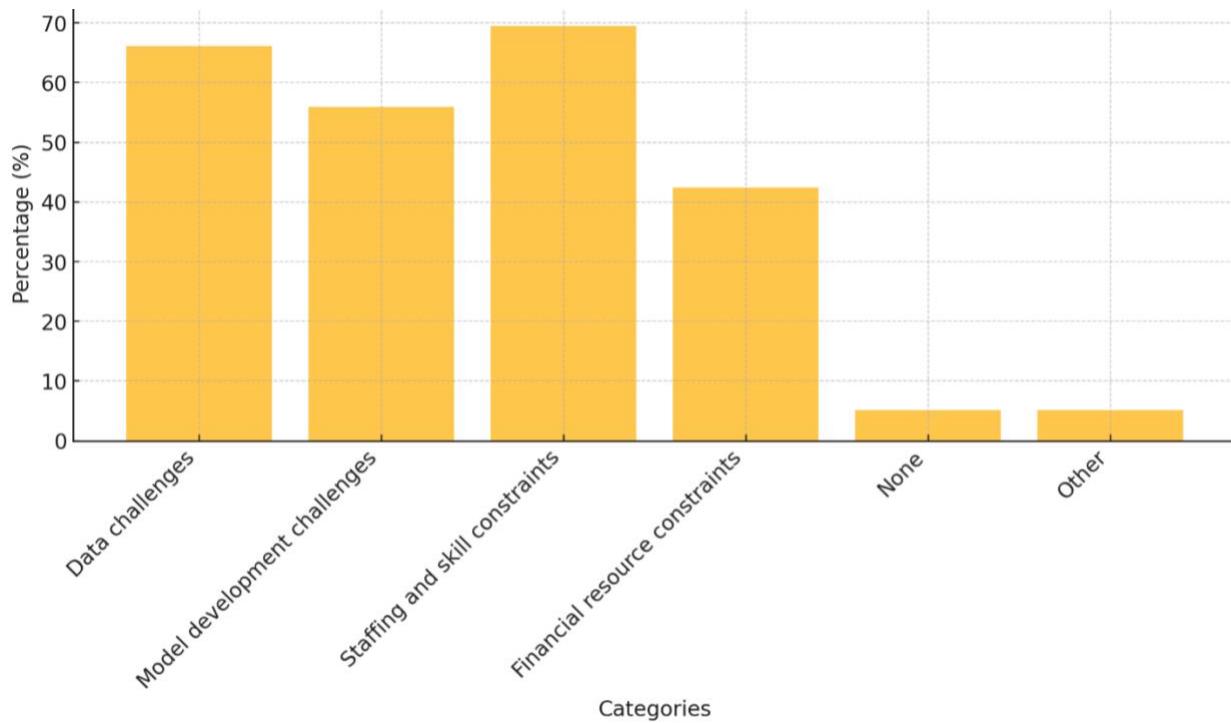
Substantial barriers were reported with respect to integrating climate-related issues into economic analysis within MoFs, with staffing and skill constraints, as well as data challenges, being the most commonly reported obstacles. Many ministries also face difficulties in model development and financial limitations, indicating that resource constraints broadly hinder progress in climate integration. Only a few respondents reported no significant barriers, suggesting that most finance ministries encounter multiple challenges in advancing climate-focused economic analysis. Notably, these barriers appeared consistent across both advanced and emerging economies, showing no significant differences in challenges faced by each group.

Respondents were asked to identify significant barriers to incorporating climate-related issues into their economic analysis and modelling approaches. They were allowed to select multiple barriers from the following options: *Data challenges; Model development challenges; Staffing and skill constraints, Financial resource constraints; No, and Other.*

A total of 50 countries responded to this question, and the responses indicate that data challenges and staffing and skill constraints are the most prevalent barriers, selected by 78% and 82% of respondents, respectively. Additionally, model development challenges were highlighted by 66% of countries, while financial resource constraints were identified by 50% of respondents.

Only a small proportion of respondents (3) indicated that they do not face significant barriers in integrating climate considerations into economic analysis. This suggests that the vast majority of respondents encounter at least one substantial barrier, if not multiple, when attempting to incorporate climate-related issues into their analytical frameworks. No significant differences were observed between AEs and EMDEs.

Figure 6.1: Barriers associated with integration of climate-related considerations into economic analysis



6.2. Capability support

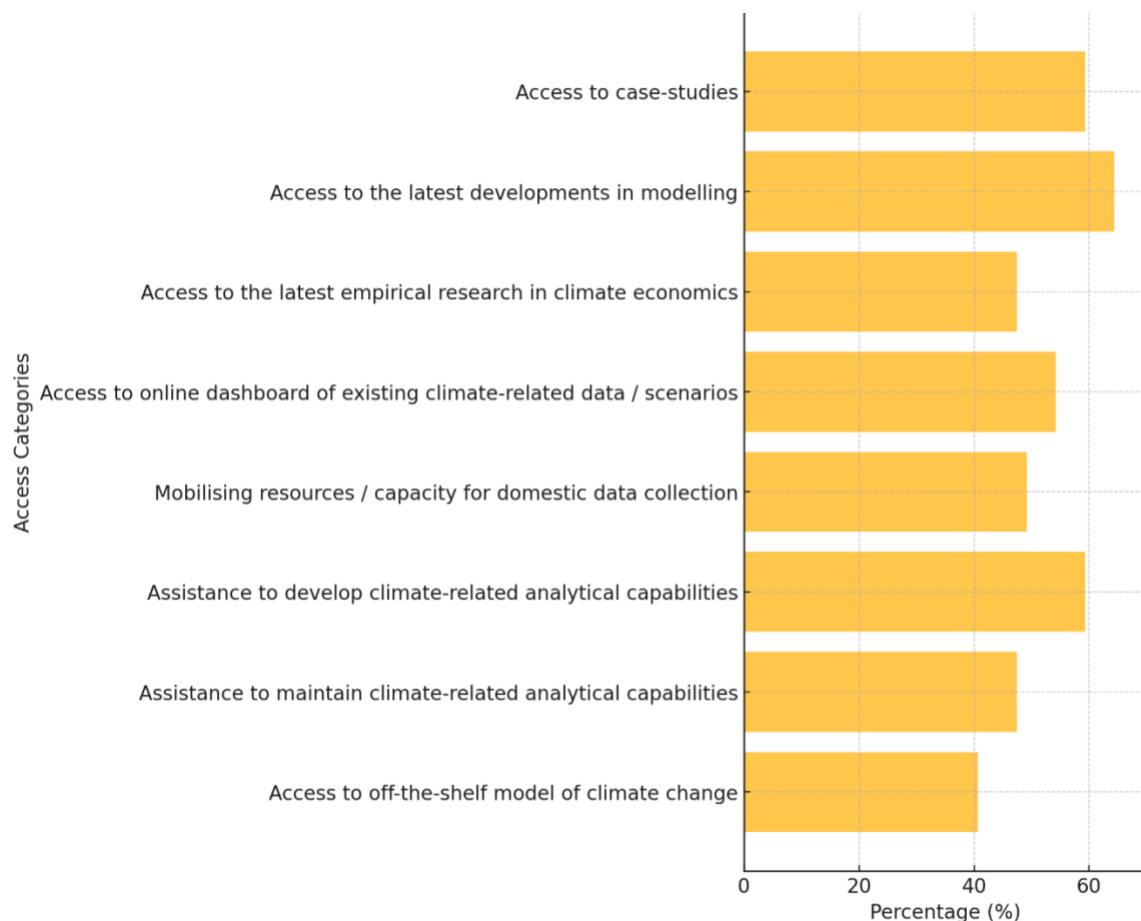
Finance Ministries highlighted a strong need for various forms of support to boost their climate-related analytical capabilities, with top priorities including access to the latest climate-economy modelling developments, technical assistance for building in-house expertise, and case studies from other countries. Many ministries reported seeking resources like online dashboards for climate data, enhanced domestic data collection capacity, and access to empirical research in climate economics. Some respondents further expressed interest in ready-made macroeconomic climate models to aid their analytics. These needs were broadly consistent across both advanced and emerging economies. Ministries of Finance also shared a variety of ways through which the Coalition of Finance Ministers could help them to enhance their climate-related analytical capabilities. This includes facilitating technical assistance around models, analytical skills and methodologies, knowledge sharing to highlight best practices, experiences and case studies, collaboration with institutional partners, the academic community, MDBs and other members, and access to resources like datasets and tools.

Quantitative Insights:

Respondents were asked to identify the types of support that would enable their Ministry of Finance to enhance its climate-related analytical capabilities. Multiple options were provided, allowing respondents to select all relevant types of support. The options included: *Access to case studies from other countries; Access to the latest developments in climate-economy modelling; Access to the latest empirical research in climate economics; Access to an online dashboard of climate-related data and scenarios; Resources and capacity for domestic data collection, Technical assistance for developing in-house climate-related analytical capabilities; Technical assistance for maintaining in-house capabilities; Access to an off-the-shelf macroeconomic model of climate change, and Other*, with space to specify additional types of support (see appendix I section titled “Support for enhancing capabilities”).

Out of the 49 countries that responded to this question, 78% cited access to the latest developments in climate-economy modelling as a priority, followed closely by technical assistance to develop in-house climate-related analytical capabilities (71%) and access to case studies from other countries (also 71%). Additionally, 65% of respondents indicated the need for access to an online dashboard of climate-related data and scenarios, while 59% emphasized the importance of Mobilizing resources and capacity for domestic data collection. Other frequently selected forms of support included access to empirical research in climate economics (57%) and assistance to maintain in-house analytical capabilities (57%). Finally, 49% of respondents indicated the need for access to an off-the-shelf macroeconomic model of climate change. No meaningful distinctions were observed between AEs and EMDEs.

Figure 6.2: Support requirements by MoFs to enhance their climate-related analytical capabilities



Qualitative Insights:

Respondents were asked to provide open-ended insights into how the Coalition of Finance Ministers for Climate Action can best support their ministry in enhancing climate-related analytic capabilities. 35 countries responded to this question, composed of 13 AEs and 22 EMDEs (15 EMEs and 7 LIDCs), highlighting the following key themes: technical and methodological assistance ($n=11$), access to resources ($n=9$), collaboration ($n=7$), information exchange platform ($n=7$), champion the role of finance ministries ($n=6$), direct assistance ($n=6$) and community of practice ($n=2$).

Technical and methodological assistance

Themes reported under this category related to the need for training on various subjects. EMDEs dominated in this category, with EMEs reporting the need for training on developing economic climate

models and in-house analytical tools ($n=5$), modelling methods ($n=2$), policy evaluation ($n=2$), maintaining in-house analytical tools ($n=1$) and understanding the public finance implications of a low-carbon transition related to energy-focused state-owned enterprises ($n=1$). LIDCs reported the need for training on integrating climate into economic policies ($n=1$) and workshops and seminars to gain skills and analytical know-how regarding technical skills related to climate risk analysis ($n=1$). One AE reported the need for basic training courses for MoF staff on the basic notions of modelling delivered through seminars and workshops.

Access to resources

This category covers specific requests from MoFs for tools and data and was made up, with the exception of one AE, entirely of EMDEs. EMEs ($n=3$) and one LIDC reported the need for data accessibility, with EMEs requesting specific geographic information such as production chains, flood maps and wildfire maps, and the LIDC requesting GHG emissions data. Relating to tools, the AE requested access to off-the-shelf models that are externally maintained and quickly utilized, EMEs ($n=2$) requested macroeconomic models for climate change, and LIDCs ($n=3$) requested models and climate risk management tools.

Collaboration

This category captures various opportunities for enhanced collaboration. Responses across this category were diverse, with most opportunities for collaboration identified receiving one mention. AEs reported the desire for opportunities for feedback, particularly relating to the social accounting matrix, exchange mechanisms for collaborative work on models and utilizing standard scenarios (particularly for countries in the EU), as well as working collaboratively to better package modelling results for policymakers. EMEs reported the desire to connect with institutional partners or developed member countries and the exchange of experts ($n=2$). One LIDC expressed interest in collaboration opportunities with international financial institutions, multilateral development banks, and other organizations.

Information exchange platform

This category reflects the opportunity to establish channels for information exchange, particularly through sharing case studies—both successful and unsuccessful—as well as examples where climate-economy models have effectively supported policy development, as reported by one AE and two EMEs. The sharing of best practices was reported by one AE, one EME, and two LIDCs, and the development of guides, particularly on how to incorporate climate change concepts into the planning of Finance Ministers across various areas (economic planning, tax aspects, green financing, among others) was reported by one EME.

Champion the role of finance ministries in climate policy

This category consisted of responses from AEs and EMEs, with countries across both development stages reporting on the need for elevated awareness among MoF leadership of the importance of the net-zero transition and climate issues generally in budget, macroeconomic projects and other central areas ($n=2$) and, reciprocally, highlighting the importance of finance ministries in climate policy ($n=2$). EMEs additionally reported the need to demonstrate the importance of climate issues on economic variables ($n=1$) and engage directors from other departments to understand the relevance of climate within their areas ($n=1$).

Direct assistance

EMDEs further cited opportunities where direct assistance was needed. For EMEs this entailed financial assistance (n=2), retooling assistance and integrating models into analysis; for LIDCs this entailed policy development assistance and capacity assessment to inform where assistance from the Coalition of Finance Ministers would be needed.

Community of practice

AEs highlighted the value of a community of practice specifically, emphasizing the need for a strong network between MoF analysts and the wider research community for the development of common approaches and frameworks and the creation of synergies on cost-effective approaches (e.g. to estimate country-specific elasticities factoring-in data requirements and best available econometric approaches).

Appendix 2: Technical report – Interviews

Table of contents

1.	<i>Introduction</i>	90
2.	<i>Policy and analytical priorities</i>	91
3.	<i>Climate economic modelling and analysis</i>	93
3.1.	Analytical needs differ across MoFs	93
3.2.	Responsive policymaking requires adaptable tools.....	93
3.3.	Model use can have unintended consequences.....	94
4.	<i>Data and methodological challenges</i>	95
4.1.	Data-related challenges	95
4.2.	Methodological and model design challenges	96
5.	<i>Capabilities</i>	98
5.1.	Governance and leadership	98
5.2.	Collaboration and coordination.....	100
5.3.	Skills and expertise.....	100
5.4.	External support and technical assistance.....	101

1. Introduction

This technical report discusses the in-depth findings from semi-structured interviews with 15 Ministries of Finance (see Table 1) on the state of climate mainstreaming into their work, the most pressing policy and analytical questions they face, and the key challenges they experience around modelling and analytical tools.

The interviews were conducted to inform and complement the Global Survey of Finance Ministries (see technical appendix I). Given the limited sample size, the interview findings are not representative.

However, they provide additional insights into dynamics and complexities that the survey was unable to fully cover. This includes issues such as how Ministries of Finance use tools to influence policy decision, the roles of institutional politics, capacity constraints and dynamics of external collaboration.

Table 1: List of Ministries of Finance (or Government Bodies) that participated in the interviews

US	Sierra Leone	Austria	Italy
Canada	Uganda	European Commission	Ecuador
Australia	Slovakia	Morocco	Mexico
Finland	Brazil	Switzerland	

The 15 Ministries were selected based on a range of factors including geographic diversity, income level, institutional capacity, and experience in climate policy, as well as their availability and interest in the initiative. All are members of the Coalition of Finance Ministries for Climate Action. Individuals interviewed were typically representatives from the relevant modelling and policy teams, accompanied by representatives from relevant policy units.

The semi-structured interviews addressed four main areas that were identified by the research team in coordination with the Steering Committee and were informed by engagements with other MoFs between January and March 2024. A sample questionnaire can be found in Supplementary Material V. The four main areas were:

- **Policy and Analytical Priorities:** Interviewees were asked to elaborate on current climate policy issues that require robust analysis, as well as the Ministry's top priorities in climate policy.
- **Climate Economic Modelling and Analysis:** Interviews were asked to discuss the various economic and climate modelling tools used in the Ministry, with a particular focus on modelling needs, including internal technical capacity and collaboration.
- **Challenges around Data, Model Design and Methodologies for MoFs:** Interviewees were asked about the analytical barriers they face, and challenges around data and model design.
- **Analytical Capabilities and Capacity:** Interviewees were asked about governance processes, skills, technical assistance, decision-making structures for live policies, and opportunities to enhance analytical capabilities.

Interviews were held between March and July 2024, and analysis took place between July and September 2024. For the analysis, responses were condensed into categories through an inductive process. Results were fully anonymized as part of the process. The interpretation of findings was validated through internal workshops and discussions with the wider project team. The validation process further consisted of verifying the qualitative interpretation of interviews with specialists and experts on the issues in question.

The remainder of this annex is structured along the four themes discussed above, starting with policy and analytical priorities, followed by climate economic modelling and analysis, challenges and barriers, and wider analytical capabilities.

2. Policy and analytical priorities

In order to navigate climate change, Ministries of Finance are grappling with a range of policy and analytical priorities. Particularly common priorities were the identification of appropriate climate policies and plans, the identification and management of risks associated with climate change, the design of effective fiscal policies to drive climate action and resilience, the management of domestic equity and distributional aspects, and the impact on budget and medium-long-term debt, assessments of the impact on revenue and identification of alternative revenue raising measures. Some finance ministries also listed enabling green finance, financing adaptation and the green and resilient transition and ensuring fiscal resilience as policy and analytical priorities.

Interviewees were asked about the current climate policy priorities their Ministry is facing, and the analysis required to successfully navigate them. The following policy and analytical priorities were identified in the interviews, listed in order of frequency:

- **Identification of climate policies.** Many of the MoFs interviewed recognize they need to play an ever-greater role in shaping national climate and development strategies, dedicated plans for adaptation and resilience, and low-carbon investment strategies to enhance economic competitiveness. Priorities include:
 - identifying appropriate climate policies and public investments to catalyze low-carbon economic growth, ensure competitiveness and stimulate critical markets, exploring synergies and trade-offs with other development objectives,
 - identifying adaptation measures and determining the benefits of resilient infrastructure,
 - conducting ex-post assessments of economic impacts,
 - analyzing the effects of mitigation and adaptation strategies on GDP, employment, inflation, fiscal conditions, and other economic and social benefits.
- **Identification of risks.** Many of the MoFs interviewed recognize they need to identify and manage the risks associated with both climate change and green transitions. MoFs highlighted the need to better understand future increases in chronic physical climate change and acute physical risk hazards and the likely economic impacts from global transition dynamics. Priorities include:
 - assessing how climate change and the increased intensity of disasters could affect infrastructure, ecosystems, and communities,
 - estimating the potential costs of climate change,
 - analyzing the risks to global trade from international regulation, disruptions in supply chains and market instability in order to be able to prepare for and mitigate adverse effects on the national economy.
- **Fiscal policy design and effectiveness.** Many MoFs raised the relevance of fiscal policies, including pricing, subsidy reform and non-pricing policies to strengthen public finances for long-term sustainability and climate resilience. Priorities include:
 - Assessing the effectiveness and optimal design of various policies,
 - determining how to recycle tax revenues,
 - determining how to achieve a balance between incentives and regulations, supported by clear guidelines, periodic evaluations, and flexibility to adjust based on outcomes and evolving needs.
- **Domestic equity and distributional aspects.** Most MoFs recognize the need to place a great emphasis on the equitable considerations of green and resilient transitions, and the distributional aspects associated with the management of climate risks and opportunities. Priorities include:

- assessing the consequences of climate change on different groups,
 - determining how to ensure a just transition,
 - estimating public spending requirements to compensate affected communities and sectors,
 - evaluating the impact of climate policy on income inequality and the force.
- **Impact on budget and medium-long-term debt management.** Most MoFs highlighted the need to embed transition-related considerations into the national budget processes and to evaluate the fiscal implications of climate change on debt sustainability. Priorities include:
 - determining how these considerations can be represented in the assumptions underpinning budget forecasts, macro-fiscal forecasts, and expenditure plans,
 - costing NDCs and NAPs and the increasing damages to economic activity from extreme weather events.
- **Tax, impact on revenue and identifying alternative revenue raising measures.** Most MoFs are considering the expected changes in revenue generation arising from the transition or climate change. Priorities include:
 - the assessment of the impact of phasing out fossil fuel subsidies on the national budget,
 - the effects of reduced productivity on output and changes to fiscal revenues.
- **Enabling green finance.** Some MoFs identified the need to design incentives to mobilize financial flows towards green investments for adaptation and mitigation. Priority questions include:
 - how to develop a green finance taxonomy to categorize investments,
 - how to analyze the impact and effectiveness of various financial instruments, such as green bonds,
 - how to conduct economic and broader analyses of impact on publicly backed investment banks.
- **Financing adaptation and the green and resilient transition.** Some MoFs raised the need to assess the feasibility of re-allocating public finances to support green and resilient transitions. Priorities included:
 - how to create instruments like disaster risk financing, insurance, and sovereign or municipal green bonds to financial mitigation and adaptation efforts,
 - how to diversify public finances and government-linked portfolios,
 - how to analyze the effectiveness and impact of financing strategies.
- **Ensuring financial resilience.** Some MoFs highlighted the need to ensure the resilience of the financial system to climate change and the net zero transition, as this is often considered the realm of central banks. Priority questions mentioned were:
 - how to bolster the resilience of banking systems against shocks through prudential rules,
 - how to identify assess and mitigate systemic risk in the financial sector,
 - how climate change is impacting the sovereign's ability to access international capital markets,
 - how investor expectations changing vis a vis the green transition.

3. Climate economic modelling and analysis

Ministries of Finance are increasingly aware of the pressing need to address climate action, yet many face significant limitations in their capabilities to perform climate economic modelling and analysis. The findings are based on interview questions that asked MoFs to elaborate on specific live policies that are currently underway, with a focus on the type of analysis that is being used to inform policy design (*i.e., how well MoFs can model those priorities, what challenges are encountered and how such analyses are being undertaken*).

Many MoFs are in the early stages of establishing climate-related analysis. They are faced with inadequate tools, limited data access, and broader analytical resource constraints, all of which may hinder effective climate policy decisions. To close this gap, MoFs require adaptable models that can respond to diverse policy demands and shifting political landscapes, and tools that enable rapid policy insights on both mitigation and adaptation strategies. Strengthening these analytical capabilities hinges on close collaboration with external stakeholders, including international organizations and academia, and improvements in data accessibility, model transparency, and standardized methodologies. With better-resourced tools, enhanced internal capacity, and established best practices from other cross-cutting policy areas, MoFs can move beyond climate awareness to effectively integrate climate considerations into their core economic functions, setting a strong foundation for resilient, data-driven climate policy.

3.1. Analytical needs differ across MoFs

Finance Ministries show significant variation in modelling needs and approaches, depending on their stage of climate policy implementation, prioritization, and internal capabilities. Ministries with advanced capabilities and strong climate ambitions require sophisticated tools for detailed policy design and evaluation, including sub-sectoral analysis, models that account for impacts by income group and other socio-demographics, and tools for ex-post policy evaluation and cost-benefit analysis. These MoFs also rely on granular climate hazard models with geospatial components, robust models for tracking technological trends, and detailed assessments of adaptation and resilience investment needs. MoFs with less developed capabilities often prioritize robust estimates for the identification of trends and changes in macro-critical indicators to inform government strategy and mapping of broader risk and opportunities but are not (yet) using these estimates to inform the specific design or implementation of policy.

Some MoFs emphasized the need to first understand current expenditures related to climate change and the green transition before moving to forward-looking modelling. Tools like green budget tagging, already used by some MoFs, serve as a foundational step for building analytical capabilities and an empirical base. This approach helps identify vulnerabilities, assess the impact of public spending on carbon lock-in (e.g., fossil fuel subsidies), and track progress toward national climate targets, supporting more strategic climate-related financial planning.

3.2. Responsive policymaking requires adaptable tools

Most MoFs emphasized the importance of flexible analytical tools that can adapt to evolving policy priorities and shifting political landscapes. MoFs expressed a need for (some) control over model

calibration and design, enabling them to tailor models to various tasks. For example, a model should be able to assess pricing instruments, such as carbon taxation, if that becomes a national priority, but also adapt to evaluate non-pricing measures, like subsidies or regulatory actions, if the political climate shifts. Thus, analytical tools must be designed with adaptability in mind to support and inform policy and decision-making effectively, even under conditions of uncertainty. Some MoFs therefore find value in developing bespoke models tailored to their specific domestic needs, rather than relying on legacy models with generalized assumptions. However, this flexibility is not always present: Particularly in EMDEs, many ministries rely on external (typically global) models, that do not always provide suitable answers for addressing their country's unique policy questions and circumstances. For these countries, there is a need for tools to align more closely with immediate policy priorities.

Most MoFs identified a critical need for analytical tools and models capable of delivering rapid outputs in response to impromptu requests from Ministries and government bodies. Effective analytical frameworks should support swift policy advice, but many existing models lack this capability. Consequently, MoFs prioritize tools that emphasize efficiency over complexity, allowing them to provide timely insights for policy decisions whenever needed.

3.3. Model use can have unintended consequences

Some MoFs have highlighted that the dominance of a few model types and outdated assumptions could underestimate mitigation and adaptation opportunities. Many MoFs rely on a narrow set of models that were not specifically designed to address climate issues and structural transformations. This lack of diversity in models presents a risk of systematically undervaluing mitigation benefits and overemphasizing negative impacts. In the broader field of economics, equilibrium models may be insufficiently equipped to capture the benefits of structural transformation, which limits their usefulness in climate-related decision-making.

Some Finance Ministries have pointed out that when using external models, it is important to understand the model design, underlying assumptions, and uncertainty of model results. There is a risk that model outputs may be misinterpreted or misused if the sensitivity of results to underlying assumptions and uncertainties is not clearly communicated. MoFs may rely heavily on external models, but without clear communication of design principles, results may be misused, leading to policy decisions based on incomplete or misunderstood analyses. Clear processes within MoFs between analytical teams and policy makers are needed to ensure transparent communication of analytical results.

4. Data and methodological challenges

MoFs face substantial data-related challenges, such as a lack of comprehensive, consistent, and timely data. Even when such data exists, it is often not accessible. However, the primary challenge lies in data quality rather than availability, as much of the data is unreliable, outdated, or biased (such as self-reported industry emissions data) and lacks the latest insights on critical indicators. These barriers are especially pronounced in ministries with limited resources. Furthermore, MoFs noted a critical need for micro-level data with geographical and sector-specific detail to enhance their analyses.

While methodological challenges exist, they are generally seen as secondary to these more immediate data concerns. Some MoFs have highlighted challenges in applying and developing analytical tools effectively, particularly in adapting models to local contexts and understanding complex decision factors like consumer behavior and investment needs. Overall, MoFs emphasized the need for a clearer understanding and communication of the structural differences among various models and analytical frameworks, as these are based on different economic theories and assumptions. Awareness of these foundational design features is essential for the effective use and interpretation of model results.

4.1. Data-related challenges

Ministries of Finance identified the following data-related challenges:

- **Data quality:** Many MoFs report challenges with data quality rather than availability. They lack reliable, unbiased, and up-to-date data, with issues such as outdated figures on forest cover, livestock, population, and trade that have multi-year time lags. There is also a shortage of granular, disaggregated data at sectoral and geographical levels, limiting the precision of climate and economic analysis.
- **Data awareness and accessibility:** Some MoFs are unaware of existing data resources and struggle to access essential climate data—such as scenario pathways, technology forecasts, energy projections, emission data, and hazard maps—due to limited internal resources. Access to innovative data, like emissions intensity for carbon border adjustment mechanisms, is particularly challenging in cases where public registries or international guidance are unavailable.
- **Capacity to analyze data:** Beyond data access, many MoFs lack the internal capacity to harmonize, integrate, and analyze data effectively. Much of the data requires additional work to make it consistent with analytical frameworks, which can overwhelm available resources.
- **Dependence on external data sources:** Many MoFs rely heavily on external sources, like damage functions and hazard data, to assess climate risks and the value of resilient infrastructure. However, these data sources are often insufficiently granular and lack the flexibility MoFs need for localized analyses. Transparency on methodology and data points is sometimes also limited, contributing to the risk of misuse and misinterpretation.

4.2. Methodological and model design challenges

Ministries of Finance identified the following methodological and model design challenges:

- **Model adaptability and calibration to local context:** MoFs engaged in policy design require detailed sub-sectoral analyses, models that differentiate impacts by income group, cost-benefit analysis, granular climate hazard models with geospatial data, and tools that capture local versus global impacts. Most of these require complex methodologies that are not necessarily accessible to MoFs, hindering the integration of climate considerations into standard models. External models often rely on broad assumptions that may not align with specific country needs, particularly for countries with high climate vulnerabilities or unique economic structures. Many external models are too complex and rigid, making recalibration to local contexts difficult and potentially leading to underestimation of local impacts or tail risks.
- **Understanding model design and structural assumptions:** Some MoFs emphasized the need to understand the underlying assumptions and structural setups of different model types. For instance, equilibrium models (such as CGE models) often have assumptions imbedded that determine the effectiveness of public investment. The choice of model structure can influence policy insights, making it critical for MoFs to understand these underlying design principles to avoid misinterpretation.
- **Lack of consistency and transparency:** Different ministries may use varying models and methodologies, making cross-comparisons challenging and potentially limiting MoFs' ability to consistently assess and challenge policy proposals. This is further aggravated by a lack of transparency in the calibration and setup of various analytical tools used across departments (see also next section).
- **Modelling specific policy needs and impacts:** There are many layers of complexity surrounding climate modelling and analysis that need to be better understood by MoF. Specific examples that MoFs highlighted include, but are not limited to:
 - **Quantifying investment needs for the green and resilient transition:** High-level estimates around investment needs for mitigation and adaptation are no longer sufficiently useful for MoFs that are designing specific policies. More granular information and analysis needs to be undertaken to support effective policy design. Those estimates are largely unavailable and are highly sensitive to country-specific factors and policy ambition.
 - **Modelling discrete consumer decisions:** Many climate-related consumer choices (e.g., adopting electric vehicles or heat pumps) are discrete and may not be easily captured by models that assume continuous or rational behavior. Demand elasticities and consumer behavior parameters in models often fail to account for these non-linearities, which can distort results for policy effectiveness analyses (e.g., subsidy impacts on EV adoption).
 - **Newer climate policies (e.g., carbon border adjustment mechanisms)** require highly specific information, such as emissions intensity by product or sector, which may not be easily accessible or publicly available, nor do transmission channels in standard models exist to capture those dynamics.
 - **Some MoFs are reliant on the integration of social accounting matrixes (SAM) into their computable general equilibrium models.** Embedding sustainable and environmental considerations into SAMs is therefore critical to enhance and revamp the ability of CGE models to perform climate-related analysis.

Quote: “*The complexities are enormous in terms of trying to see what type of adaptation investment you need, how much of that, that type of investment you need, how much of an insurance do you want to buy against climate hazards, what sort of warming scenarios do you have to prepare yourself for?*”

However, while most Ministries of Finance agree that these challenges exist in the development of climate analytical tools, they are not the primary obstacle to enhancing capabilities. Having the right political buy-in, governance structures, the skills, and staff to apply those models across a wide range of policy and analytical priorities and being able to translate outputs into policy decisions (all discussed in the next section) are more relevant factors needed to strengthen climate analytical capabilities within MoFs.

5. Capabilities

High level buy-in and strong political leadership from the Ministry of Finance and the government is needed - but often not a given - to successfully build and maintain climate analytical capabilities.

Depending on the size of the country, the potential impact of a policy and how advanced modelling capabilities are, climate modelling is used to inform different stages of the policy cycle and the ministry's core functions - from defining long term priorities to fine-tuning policy options. Outside of defined processes, finding appropriate outlets to share analysis with policy makers in a format that is useful to them is essential to influence decision-making.

All climate modelers interviewed interact with stakeholders outside of the Ministry, in particular line ministries and government agencies, international organizations, academia, NGO and industry. In most cases this collaboration is required to compensate for and/or enhance limited expertise and to ensure access to required models and data. Small countries and those with fewer analytical capabilities are particularly reliant on external collaborations, particularly with IMF and World Bank.

All Ministries interviewed lack - to different extents - the skills and expertise to do the modelling and analysis they would like to do to answer pressing policy questions. External support is helpful but can also add more challenges for resource constraint MoFs, as work done by consultants or TA providers is time-intensive, requires a high-level of expertise and may not always be suited to domestic needs.

5.1. Governance and leadership

Strong leadership, governance mechanisms and institutional setups are essential for strengthening analytical capabilities. Political certainty and climate targets that are enshrined in law or institutionalized in long-term ministerial strategies help to make the internal case for building out analytical capabilities in a more sustained way and enables the required buy-in from highest officials. By contrast, changing government commitments and varying support for climate work within MoFs undermine the continuous build-out of capabilities. For example, one MoFs reported that staff employed to focused on climate analytics, were continuously pulled into other work when priorities shifted.

Some MoFs highlighted how the executive branch of the government can play an important coordination function to guide strategic analytical work and interaction across ministries. Such a centralized coordination function by governments is however rarely in place and requires a clearly formulated climate strategy.

Two archetypes of internal governance can be found in interviewed ministries: (i) full integration and (ii) dedicated climate hubs. For the former, MoFs are following a systemic approach that integrates climate considerations across all relevant units. Benefits of this approach highlighted by MoFs include that climate features in a cross-cutting matter and is assessed in relation to other priorities, such as energy security, price stability, competitiveness, economic growth, and debt sustainability. For the latter, MoFs have set up climate hubs with centralized capabilities that are also acting as coordination point for other work within MoFs.

Some MoFs have pointed out the importance of effective coordination across different units within the MoF. The coordination of different teams working across core functions of Ministries (e.g., economic strategy, fiscal policy, budget management) is key to exchange information, avoid duplication of efforts and coherence across efforts. A centralized climate hub can serve such a function and can also serve as one focal point to communicate and coordinate externally. This is of particular importance when climate modelling is undertaken across other line ministries (e.g., Ministry of Environment) and input from MoFs needs to be coordinated.

MoF climate modelling and analysis is used at different points of the policy cycle in different Ministries. It can be used to:

- challenge policies and proposals by other ministries
- inform strategic multi-year priorities
- fine tune policies that have already been decided
- conduct policy evaluation
- inform annual revenue and expenditure forecasts
- provide evidence about the impact of policies that have already been decided to policy-makers and the wider public.

The majority of MoFs are performing an important challenge function through their analysis and modelling. They coordinate, inform and assess activities or policy proposed by other line Ministries that may have a more direct responsibility for climate action. For MoFs it is critical to uphold a high-level of coordination and communication to those line ministries. Most MoFs highlighted that for important policy priorities an early engagement is key to ensure successful outcomes. However, MoFs are often note directly involved in the early policy design and drafting stage, which is especially true for smaller regulations and policy packages. In addition, some MoFs face challenges around comparing results across a wide range of different analytical tools used across governments. Different line ministries may use a wide range of different analytical approaches to assess policy proposals. A lack of inter-agency consistency and transparency around the design and calibration of those analytical tools makes it difficult for MoFs to challenge proposals.

Some MoFs highlighted the importance of analytical work in assisting with strategic formulation of long-term planning and help to identify risks and opportunities to assist policy makers in their strategic focus. An effective governance structure and process on how analytical works feeds into decision making discussions is crucial to raise the awareness around critical climate priorities. Detailed evidence can serve to convince stakeholders across government of policy choices.

In the majority of MoFs, policy and analytical units are involved in mainstreaming climate action beyond MoF core functions. This includes involvement in international and national organizations and committees, board roles of funding bodies, overseeing industry collaboration and engagement. Sharing robust analysis and thought leadership can be an effective avenue engage in peer-to-peer exchange and to inform decision making and climate leadership across a wide spectrum of influence.

Having an outlet to publish analytical work is important to ensure it reaches decision-makers. Most analytical evidence that is prepared by MoFs is communicated to senior leadership or decision makers through strategic documents, larger reports or for bespoke briefings on certain policy proposals put forward by other line ministries. Some Ministries highlight that to ensure buy in, these reports need to ‘speak’ to policy makers and cover the data, variables and scenarios they are interested in. However, communicating the uncertainty of modelling results (and modelling results in general) to decision-makers is a key challenge for modelers.

5.2. Collaboration and coordination

There is a significant divergence in the extent to which MoFs collaborate and interact with other line Ministries, across government and internationally on climate-related analysis. Most MoFs do however see collaboration across multiple areas as a critical means for enhancing analytical capabilities. Particularly important opportunities include:

- Collaborations with statistical offices and other non-government agencies are important, as many models rely on external scenarios and assumptions that are provided by those institutions. Strong collaboration with those providers is therefore key to ensure consistency.
- Topical engagement with experts from other line ministries is important when MoFs are tasked with analyzing the impact of specific regulation or policies that sit outside of the expertise of Ministries of Finance.
- Exchanging information and best practices, both bilaterally and multilaterally, with other countries that have similar priorities and where previous relations exists is an important mechanism for most MoFs (e.g., benchmarking or peer-to-peer learning from other MoFs that have already implemented a policy).
- Setting up joint committees or other forms of collaboration with the financial and insurance industry can be useful to understand market sentiment and collect valuable data (e.g., historical loss data on insurance claims, counterparty financial exposure of banks and asset owners to critical industries)
- Establishing of stakeholder engagement with industry, scientific councils, academia, and NGOs is critical to provide answers to how industry and certain sectors are affected by the transition.
- Collaboration with universities is important as they can provide unbiased data and a range of technical support.

The majority of MoFs have highlighted the need for knowledge exchange with partner institutions and other countries to build out the required capabilities. Enhanced knowledge exchange within and across governments raises awareness and consciousness around climate impacts, facilitates the circulation of relevant information and may enhance the ability of governments and ministries to formulate their needs in a more quantitative way to help support and identify suitable policy designs.

While all MoFs rely to some extent on external models, some MoFs have a greater reliance on partnerships and collaborations with external stakeholders. Smaller countries tend to collaborate more with external institutions (e.g., academia, research institutions).

Close interaction with businesses, academia and NGOs that understand real world challenges is important to consider early in the model design. Some Ministries highlight the benefits of consulting with and drawing in stakeholders to support in analytical tasks (e.g., techno-economic modelling for industries). However, some MoFs highlighted that such engagement can take up significant resources.

5.3. Skills and expertise

The majority of MoFs currently have significant gaps in the skills and expertise needed to develop and apply models to answer the most pressing policy and analytical questions they face. This makes it difficult for MoFs to appropriately integrate climate considerations into their core functions. The lack of skills and expertise leads to an absence of analytical tools and models, which may prevent effective decision-making. In some cases, this is a result of the fact that for most MoFs climate considerations are

not yet fully integrated in their standard macroeconomic toolkit, but rather quantitatively or qualitatively assessed complementarily, using a suite of different approaches and tools with varying levels of sophistication.

We have identified two broad capability stages across MoFs: (i) Ministries with advanced capabilities are requiring more granular analytical tools and models that support the design of specific policies and regulation, often with a very detailed sector- or spatial focus, as well as detailed policy evaluation; (ii) MoFs with less developed capabilities and resources require simple but robust estimates for the identification of trends and changes in macro-critical indicators to inform government strategy and mapping of broader risk and opportunities. Those MoFs are not yet in a stage to inform the specific design or implementation of policy. Analytical requirements, policy priorities, challenges and responsibilities vary substantially across those two groups.

Some MoFs are currently transitioning from qualitatively assessing fiscal risk stemming from climate change and the impact of climate policy to more quantitative exercises. Such a process is described by a more thorough integration of climate considerations into general economic modelling and macroeconomic frameworks.

Another challenge when building out modelling capabilities highlighted by MoFs is that modelers and policy makers, but also economists and energy specialists or engineers speak very different languages. MoFs point out that communication and interdisciplinarity need to be improved. There is great value in community building when it comes to combining and integrating diverse approaches to shed light on complex topics from multiple angles. For minimal useful decision-making, MoFs reported the need for a small team of people dedicated to (i) modelling the impacts of policies on emission pathways; and (ii) modelling the impact of policies on key economic variables.

One MoF emphasized the need for improved software capable of handling larger and more complex models, along with greater open-source transparency to enhance knowledge sharing and comparability. Upgraded software tools would better support the increasing complexity of climate models, while open-source access would promote collaborative learning and allow MoFs to benchmark and refine their models more effectively across institutions.

Some MoFs have highlighted that MoFs can draw valuable lessons from their experience with integrating other cross-cutting issues, such as demographic change and aging populations, into their modelling frameworks. The insights gained in building political buy-in and developing robust analytical infrastructure for these issues offer a foundation for addressing climate challenges. For instance, demographic shifts are similar to climate issues in that they are long-term, marked by high uncertainty, and have wide-reaching effects across the entire economy and all core MoF functions. Leveraging this experience can inform effective strategies for integrating climate considerations into economic and policy planning

5.4. External support and technical assistance

Some MoFs are either receiving or are due to receive technical assistance from international organizations, with the IMF and World Bank playing the most critical roles. There is broad consensus around interviewed MoFs that such technical assistance is highly important for knowledge transfer. One Ministry highlighted how simple tools and models provide a critical starting point to either feed into existing model infrastructure or provide useful learning exercises for staff with lower modelling capabilities across the Ministry. Some MoFs in developing countries mentioned the need for both: (i)

capacity in the theoretical approaches of capturing climate change in different frameworks; and (ii) building out capacity in terms of “hands-on” modelling.

External support is helpful but can also be challenging as work done by consultants or TA providers is time-intensive, requires a high-level of expertise and may not always be suited to domestic needs.

Additionally, MoFs mentioned concerns that model owners may have their own agenda and highlighted that control over model design may be limited. They have highlighted the importance of being more closely involved in model development and have more ownership on adjusting models moving forward.

Some MoFs find that collaboration with external organizations needs strengthening to support effective model co-development and increase MoF ownership. While bespoke models provide tailored relevance and flexibility, some MoFs lack the resources to develop these models in-house. Relying on external model maintenance can be advantageous for these MoFs but requires close coordination with model providers throughout the co-development process to ensure relevance. Some MoFs receiving technical support from international organizations argue they would benefit from being more actively involved in model development to enable them to adapt and refine the models over time. Others argue they would rather receive enhanced support to strengthen internal capacities to build customized, in-house models that directly address their specific requirements.

Supplementary material

I. Survey methodology

The majority of survey submissions were received between May and August 2024. As of October 2024, a total of 188 submissions had been recorded, including seven that were completed manually and submitted via email in a Microsoft Word document. The remaining submissions were made through the online Qualtrics platform. Among the 181 submissions on Qualtrics, most were incomplete or entirely blank. Additionally, several countries submitted responses more than once, with at least 11 countries falling into this category. In cases of duplicate submissions, only the most recent entry was considered, unless a significant discrepancy in completeness was observed between the two versions (i.e., where the later version contained substantially fewer responses). However, no such discrepancies were found; in each instance of dual submission, the latter version consistently included more inputs. After cleaning the data, 60 individual and complete submissions remained. However, one submission was omitted from the analysis due to it being submitted much later than the deadline.

The quantitative survey data was cleaned using Microsoft Excel and R, with the majority of data analysis conducted primarily in STATA, and in some cases, within R. Data on the regional, income, and development status of each respondent was sourced from the World Bank and IMF databases. The analysis predominantly followed a descriptive approach; however, various regression analyses were also employed to examine specific patterns and to assess the robustness of preliminary findings. Qualitative data was processed primarily using NVivo, then exported to Excel for further graphic visualization in STATA. Open-ended responses underwent thorough coding and evaluation based on an analytical framework tailored to each question (see Appendix III for further details). Most graphics were generated in STATA; however, where specific visual features were not supported, charts were recreated in GPT4o, which offers greater flexibility for complex graphic generation under time constraints.

Responses provided in languages other than English were machine translated to facilitate their inclusion in the thematic analysis. Once the responses were translated, each response was thoroughly reviewed and its contents condensed to highlight the core ideas, concerns, or insights conveyed by the respondents. This summarization step facilitated a more efficient analysis by distilling detailed responses into concise summaries without losing key information. From here, key themes that emerged from recurring concepts across multiple responses were organized, and key trends summarized. Thematic categorization allowed effectively identifying prevalent concerns or opportunities raised by the respondents.

For four out of seven standalone open-ended qualitative questions, a more advanced methodology was applied to explore their responses with greater depth and granularity. These questions were selected based on the frequency, length, and depth of responses. The same data familiarization process was applied from the other questions to identify and compile key patterns, themes, and insights and provide a deep understanding of the contents before proceeding to subsequent analysis. From there, data-driven codes were inductively applied to encapsulate themes and subthemes. To organize these codes systematically, code trees, drawn from existing climate economics frameworks were drawn to ensure the structure was aligned with broader discussions on risks, costs, capacities, fiscal concerns, and opportunities ongoing in the field. These themes were refined and adjusted as necessary to capture patterns that emerged during the immersion stages to comprehensively capture ministry concerns in a manner that contributes to existing policy discussions.

Finally, the raw data was input into NVivo and coded according to the established trees. Additional classification was applied to the data based on the IMF country classifications of respondents, to categorize countries into advanced, and emerging, and developing economies, which allowed for a more nuanced analysis of how risks, opportunities, and priorities are perceived across various development contexts. Utilizing this software, particularly through generating queries based on respondent attributes, allowed for greater organization and visualization of relationships in the data.

II. Survey - List of countries

Table 2: List of countries that participated in the survey

<i>Andorra</i>	<i>Dominican Republic</i>	<i>Republic of Korea</i>	<i>Serbia</i>
<i>Argentina</i>	<i>Ecuador*</i>	<i>Latvia</i>	<i>Seychelles</i>
<i>Australia*</i>	<i>Egypt</i>	<i>Lithuania</i>	<i>Sierra Leone*</i>
<i>Austria*</i>	<i>Estonia</i>	<i>Luxembourg</i>	<i>Singapore</i>
<i>Bahamas</i>	<i>Eswatini</i>	<i>Malaysia</i>	<i>Slovakia*</i>
<i>Bahrain</i>	<i>Finland*</i>	<i>Marshall Islands</i>	<i>Spain</i>
<i>Bangladesh</i>	<i>France</i>	<i>Mexico*</i>	<i>Switzerland*</i>
<i>Belgium</i>	<i>Germany</i>	<i>Mozambique</i>	<i>Uganda*</i>
<i>Bhutan</i>	<i>Greece</i>	<i>Namibia</i>	<i>Uruguay</i>
<i>Cambodia</i>	<i>Guinea</i>	<i>Netherlands</i>	
<i>Canada*</i>	<i>Hungary</i>	<i>Nigeria</i>	<i>Interviews only</i>
<i>Cabo Verde</i>	<i>Iceland</i>	<i>Norway</i>	<i>Brazil</i>
<i>Chile</i>	<i>Indonesia</i>	<i>Palestine</i>	<i>European Commission</i>
<i>Colombia</i>	<i>Ireland</i>	<i>Paraguay</i>	<i>Morocco</i>
<i>Cyprus</i>	<i>Italy*</i>	<i>Peru</i>	<i>United States</i>
<i>Denmark</i>	<i>Jamaica</i>	<i>Philippines</i>	
<i>Djibouti</i>	<i>Japan</i>	<i>Portugal</i>	

*Countries that also participated in in-depth interviews

III. Survey questions

Dear Respondent,

We invite you and your Ministry to participate in an important survey being conducted by the Coalition of Finance Ministers for Climate Action (CFMCA) led by the cochairs of Helsinki Principle 4, that seeks to gather insights into the key climate policy priorities being considered by Ministries of Finance globally and how climate considerations are currently integrated within economic analysis and modelling approaches and capabilities. The results of this survey will appear on an anonymised basis in a flagship report of the CFMCA for COP29. Current observer members or non-members of the Coalition of Finance Ministers are equally encouraged to participate.

Please review the key information and conditions of use before starting the survey:

- **Survey Objective:** The purpose of this survey is to gather information regarding the current status of climate-related economic policy and analytics within Ministries of Finance around the world. More specifically, the survey aims to collect data on potential concerns, priorities, and challenges within Ministries of Finance, with respect to both climate-related economic policies and the analytics used to support decision-making. It is important to clarify that the objective of the survey is NOT to evaluate or benchmark individual countries' progress; rather, it is **intended to serve as a stocktake, which can be used to identify gaps and areas where Ministries of Finance might require additional support**. The insights gathered will be crucial in developing tailored recommendations and mechanisms.
- **Time Commitment:** Your time is highly valued, and as such, we have designed this survey to require only **approximately 30 minutes to complete**. Further time is likely to be needed for fuller responses in some of the optional sections, which we would especially welcome. Your participation during this brief period will significantly contribute to our global understanding of climate-related economic policy and analysis.
- **Survey Responses:** We recognize that you may not have immediate access to all the detailed data or official positions required by this survey. **Some sections may also require you to seek inputs from other parts of the Ministry.** Therefore, the on-line survey has the ability for you to save and return to later through the web platform (the survey can be returned to via your web browser automatically; no additional action required). **Some Ministries may prefer or need to use the word version to seek inputs from other parts of the Ministry or for sign-off purposes.** You can then either enter the details on the on-line version or submit to us using the word version. In addition, we recognize that **some of the questions may not be relevant, in which case we provide options for skipping those sections.** Please view this as a preliminary exercise to define the background understanding of climate-related economic policies and analysis.
- **Sign Offs:** We highly encourage that the survey be **reviewed and signed-off by at least one senior individual working on domestic economic policy and one senior individual working on analytics** (both should have some knowledge of the Ministry's overall economic policy and analytical / modelling capabilities and its nexus with climate issues). The web function allows you to download in PDF the survey to share with officials for approvals if needed.
- **Data and Privacy:** We assure you that the confidentiality of your responses is of utmost importance. Therefore, access to the raw data collected through this survey will be strictly limited to the HP4 Co-Chairs, Coalition Secretariat, and the project team working under the auspices of Grantham Research Institute, London School of Economics and Political Science (LSE). While **individual country-level information will remain strictly confidential and not publicly disclosed**, aggregated data will be analyzed and included in publicly available reports and journal articles to foster a global dialogue on enhancing climate-related economic policy and analysis. All data collection, storage and ethics will be conducted under the official guidelines of the LSE.

We appreciate your willingness to contribute to this crucial survey effort. Your input is essential for shaping effective and inclusive climate policies and financial strategies by Ministries of Finance.

GENERAL INFORMATION ON RESPONDENTS

Contact Person 1
<p>Full Name <u>Instruction:</u> State the full name of the individual filling out this form in the text box [Short answer text box]</p>
<p>Title/Position <u>Instruction:</u> State the official title and position of the individual filling out this form in the text box (e.g., Director of Research, Fiscal Affairs Unit) [Short answer text box]</p>
<p>Department/Ministry <u>Instruction:</u> State the full official name of the government ministry/department the individual filling this form is employed by in the text box below (e.g., Department of Finance and Economy). If the official name of the government ministry/department is in a language other than English, please translate it into English. [Short answer text box]</p>
<p>Contact Information <u>Instruction:</u> State the official email of the individual filling out this form [Short answer text box] [Short answer text box] - repeat email address</p>
Contact Person 2
<p>Full Name <u>Instruction:</u> State the full name of the individual filling out this form in the textbox [Short answer text box]</p>
<p>Title/Position <u>Instruction:</u> State the official title and position of the individual filling out this form in the text box (e.g., Director of Research, Fiscal Affairs Unit) [Short answer text box]</p>
<p>Department/Ministry <u>Instruction:</u> State the full official name of the government ministry/department the individual filling this form is employed by in the text box below (e.g., Department of Finance and Economy). If the official name of the government ministry/department is in a language other than English, please translate it into English. [Short answer text box]</p>
<p>Contact Information <u>Instruction:</u> State the official email of the individual filling out this form [Short answer text box] [Short answer text box] - repeat email address</p>
Country Information
<p>Country [Dropdown menu] - single choice</p>
Other Information
<p>Individuals Consulted How many individuals from the Ministry of Finance - including the person/s filling out this form - were consulted in filling out this survey? <u>Instruction:</u> Please state the total number in the box below. [Number box]</p>

YOUR MINISTRY – BASIC INFORMATION

All Employees

How many full-time staff members are employed by the Ministry of Finance?

Instruction: Please write down a number in the textbox below. If you are unsure, please provide an approximate.
[Enter number]

General Analytical Capability

How many Ministry of Finance staff members work specifically on economic analysis and modelling in general as a significant portion of their job?

Definition: In this context, "economic analysis and modelling" refers to the use of a wide range of macroeconomic and microeconomic methods (including quantitative modelling approaches) to evaluate policy options to optimise economic impacts. This process involves detailed evaluations of economic data, forecasting future economic conditions, analysis of fiscal policies, and analysis of the budget to support budget planning and economic stability. Additionally, it covers quantitative and other frameworks for policy evaluation and decision-making, such as cost-benefit analysis, cost-effectiveness analysis, among others (e.g., Risk-Opportunity Analysis). Please note that this question refers to staff members that either have a qualification and / or work experience related to quantitative economic analysis.

Instruction: Please select one option and then enter the number of people working on this agenda as a significant portion of their job (defined as greater than 50% of their time). If you are unsure of the exact numbers, please provide an approximation.

- [Multiple options] - 1 choice plus number
 - [actual number or approximation]
 - Not sure
 - Other e.g., specify number of staff with small % of their role dedicated to this area [explanation]

Climate-related Analytical Capability

Does the Ministry of Finance have climate-related economic analysis and modelling capacity and if so, how many staff members have this as significant portion of their job in each core functional area of the Ministry?

Definition: In this context, the question is referring to individuals within the Ministry of Finance whose main role is economic modelling and /or other forms of economic analysis of climate policies (see definition above).

Instruction: Please select one option and then enter the number of people working on this agenda as a significant portion of their job (defined as greater than 50% of their time) in each key functional area. If you are unsure of the exact numbers, please provide an approximation or simply specify the core functional area the majority of staff are located in 'other'.

- [Multiple options] - Choice plus number or approximation
 - Yes – Climate related quantitative modelling capability [specify numbers in each key functional area of macro-forecasting, budget, tax policy, financial policy]
 - Yes - Other climate-related economic analysis capability [specify numbers in each key functional area of macro-forecasting, budget, tax policy, financial policy]
 - No
 - Not sure
 - Other e.g., specify number of staff with small % of their role dedicated to this area

Collaboration on Analysis with Other Ministries and Parties Outside Government

Does the Ministry of Finance directly partner with the following external parties as part of its economic analysis and modelling of policy options?

Definition: "Economic analysis of policy options," same as above.

Instruction: Please indicate with a number from 1 to 4 how frequently the Ministry of Finance collaborates with each of the following groups on economic analysis of policy options including for climate specific policy analysis and / or more broadly. Please note that in this case, 1 means "never" and 4 means "regularly."

- Other government departments / ministries
 - [1-4] single choice
 - 1 = Never

- 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Other public bodies or quasi-public bodies
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Central bank and related financial bodies (e.g. financial supervisory authorities)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Private sector companies (e.g. private sector consultants)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Non-profit organizations (e.g. policy think tank)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Universities and other research institutions
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- International organizations (e.g. development banks)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Other [text]

CLIMATE AS AN ECONOMIC ISSUE

Climate as an Overall Economic Issue

Does your Ministry of Finance see climate action as a core economic issue and central to its mandate or is this seen primarily as the responsibility of other government departments / ministries?

Instruction: Please choose one of the following options that apply.

[Single choice]

- Yes, climate action is seen a key economic priority and central to mandate of the Ministry
- Yes, climate action is an important economic consideration with support, but the Ministry mainly focused on helping accelerate action by other government departments
- No, climate action is mainly the mandate and responsibility of other government departments
- Other [short text]

Physical Climate Impacts

How significant are Ministry of Finance concerns about the impacts of physical climate change on your economy's key macroeconomic variables?

Instruction: Please rate each of the following answers with a number from 1 to 5. Please note that for this question, 1 means “not concerned at all” and 5 means “extremely concerned”.

Definition: Please note that physical climate change refers to both acute climate-related events such as heatwaves, storms, wildfires and flash floods, as well as chronic factors (i.e., gradually changing factors) such as average temperature increase, increased droughts and desertification, sea-level rise, coastal erosion, and ocean acidification.

[Rating of each option] 1-5

- GDP [1-5] single choice
- Inflation [1-5] single choice
- Real Interest Rates and Credit Ratings [1-5] single choice
- Employment [1-5] single choice
- Government revenues [1-5] single choice
- Government spending [1-5] single choice
- Competitiveness and trade balance [1-5] single choice
- Physical, human, and natural capital [1-5] single choice
- Value of Publicly Owned Enterprises [1-5] single choice
- Other [short text]

Are there specific climate change risk drivers or channels that the Ministry of Finance is particularly worried about? Please provide some details.

[Optional text box]

Transition Impacts

How significant are Ministry of Finance concerns about the potential risks posed from the overall global transition to net zero on your economy’s macroeconomic variables?

Instruction: Please rate each of the key variables with a number from 1 to 5. Please note that for this question, 1 means “not concerned at all” and 5 means “extremely concerned”.

Definition: In the context of this survey, the impacts of the transition refer to potential macroeconomic implications resulting from a global transition to a low-carbon economy, including from the reduction in global fossil fuel demand driven by climate policies, among another factors, across the world or the potential impact of other countries climate policies on competitiveness of existing exports.

[Rating of each option] 1-5

- GDP [1-5] single choice
- Inflation [1-5] single choice
- Real Interest Rates and Credit Ratings [1-5] single choice
- Employment [1-5] single choice
- Government revenues [1-5] single choice
- Government spending [1-5] single choice
- Competitiveness and trade balance [1-5] single choice
- Physical, human, and natural capital [1-5] single choice
- Value of Publicly Owned Enterprises [1-5] single choice
- Other [short text]

How significant are Ministry of Finance concerns about the potential risks posed from your domestic transition to a low-carbon economy on your economy’s macroeconomic variables?

Instruction: As above.

Definition: In the context of this survey, the impacts of the transition refer to potential macroeconomic implications resulting from the nationally driven transition to a low-carbon economy. For instance, electrification of transport might impact taxation from fuel taxation without measures to identify alternatives or the transition might impact jobs in certain sectors.

[Rating of each option] 1-5

- GDP [1-5] single choice
- Inflation [1-5] single choice
- Real Interest Rates [1-5] single choice

- Employment [1-5] single choice
- Government revenues [1-5] single choice
- Government spending [1-5] single choice
- Competitiveness and trade balance [1-5] single choice
- Physical, human, and natural capital [1-5] single choice
- Value of Publicly Owned Enterprises [1-5] single choice
- Other [short text]

Are there specific global and national transition risk drivers or channels that the Ministry of Finance is particularly worried about? Please provide some details.

[Optional text box]

Assessing Economic Impacts

Does the Ministry of Finance undertake economic analysis to assess the impacts of policies aimed at creating green economic opportunities?

Definitions: In this context, the question is referring to the potential economic opportunities that might materialise for the overall macroeconomy or in key sectors from the impact of policies aimed at creating green economic opportunities on key economic indicators such as GDP, trade flows, competitiveness, employment, and productivity.

Please select the option that applies.

[Single choice]

- Yes, the Ministry plays a leading role in designing and considering the impacts of policies aimed at creating green economic opportunities
- Yes, but the Ministry mainly supports other government departments to consider the impacts of policies aimed at creating green economic opportunities
- No, but some consideration is being given to identifying policies aimed at creating green economic opportunities
- No, assessing the impacts of policies aimed at creating green economic opportunities is not a priority for the Ministry
- Other [short text]

What does your Ministry consider to be the most important positive potential economic impacts or opportunities from climate action, and over what time horizons might these accrue? Please provide some details.

Definition: In this context, "climate action" refers to policy efforts undertaken to address climate change by both limiting its impacts and adapting to them. This encompasses policies and initiatives focused on adaptation, mitigation, and economic diversification, all aimed at reducing both physical climate risks and emissions.

Instruction: Please list a small number of the potential positive economic impacts or opportunities identified by decision-makers and over what time horizons you expect the benefits to accrue. Please note that short-term refers to 1-2 years, medium-term refers to 2-5 years, and long-term refers to 5-25 years.

[Optional text box]

CLIMATE-RELATED POLICY PRIORITIES

Policy Criteria

What are the most important impacts to consider when designing climate-related policies within the Ministry of Finance?

Instruction: Please rate each of the key variables with a number from 1 to 5. Please note that for this question, 1 means "not important at all" and 5 means "extremely important".

- Economic growth and efficiency (e.g., impacts on GDP and productivity) [0-5]
- International competitiveness (e.g., impacts on exports in key sectors) [0-5]
- Distributional and employment impacts (e.g., the distributional impacts of policies and risks across households, income groups, and sectors) [0-5]

- Fiscal sustainability / affordability (e.g., overall public capital expenditure / operating expenditure costs, sustainability of current spending, tax and other policies in the long run) [0-5]
- Legal obligations (e.g., UNFCCC submissions or Paris Agreement or domestic legal) [0-5]
- Other [short text]

Climate Policy Priorities and Actions

Is the Ministry of Finance engaging in climate action in the following key policy areas?

Instruction: Please select the option that applies.

OPTIONAL: Please provide a brief explanation of the reason for the selection (e.g., if not being considered, it may be because the policy area is not within the Ministry's jurisdiction; or due to equity considerations; fiscal constraints; public opinion considerations; technical gaps)

- Shaping national climate and development strategies (e.g., formulation of Nationally Determined Contributions, green growth strategies, low-carbon industrial and innovation strategies etc.)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Shaping dedicated national plans for adaptation and / or resilience (e.g., formulation of National Adaptation Plans)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Shaping low-carbon, climate resilient investment strategies (e.g., systematically assessing climate-related investment needs, developing investment programmes and building specific project pipelines)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]

- Taxes or pricing mechanisms to change market incentives (e.g., through carbon pricing or taxation or phasing out fossil fuel subsidies)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Green fiscal subsidies to catalyse new low carbon sectors and innovation (e.g., through grants for purchasing EVs, subsidies for Research and Development (R&D))
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Non-pricing mechanisms to change market incentives (e.g., energy market reforms, regulations for end dates on phase out of fossil fuels)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Building resilience of public finances for a net-zero economy (e.g., by identifying new revenue streams as alternatives to taxing fossil-fuel consumption or rents from the production of fossil fuels)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]

- Embedding green budgeting in national budget processes (e.g., systematically assessing and aligning fiscal policies with environmental goals, integrating climate considerations into public investment planning and cost-benefit analyses, introducing green public procurement practices)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Mobilizing funding to finance the transition (e.g., issuing sovereign or municipal green bonds, building a greener financial sector and capital markets, accessing and building voluntary carbon markets or international climate finance)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Integrating climate considerations into mandates and investment practices of publicly backed financial institutions (e.g., national development and/or investment banks, export credit agencies, sovereign wealth funds, state-owned enterprises)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Integrating climate considerations into the mandates of the Central Bank and system for financial supervision
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area

- B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]
- Providing disaster risk financing and insurance (e.g., disaster relief funds, credit for reconstruction, government-supported property insurance, compensation and relief for agricultural producers, disaster-linked social protection)
 - [0-4] single choice
 - 1 – Currently not being considered by the Ministry of Finance [Explain why]
 - 2 – Currently under consideration (*please choose sub-option A or B*)
 - A: The Ministry of Finance is considering supporting other government departments in this area
 - B: The Ministry of Finance is considering leading these efforts across the government in this area
 - 3 – Currently being implemented (*please choose sub-option A or B*)
 - A: The Ministry of Finance is currently supporting other government departments in this area
 - B: The Ministry of Finance is leading these efforts across the government in this area
 - 4 - Other [Text]

Key Policy and Analytical Questions

What are some of the most pressing climate-related policy and related analytical questions that the Ministry of Finance currently has insufficient information to answer?

Instruction: In the textbox, please identify and elaborate on the most pressing climate-related policy questions the Ministry of Finance currently has insufficient information to answer. Please provide details for up to five policy and analytical questions, making sure to include specific details about the context, implications, and any aspects or parameters that need to be addressed. Furthermore, please ensure to explain what key information is missing for each question.

[Text box]

ECONOMIC ANALYSIS & MODELLING APPROACHES

General Economic Models and Tools

General Economic Analysis and Modelling

Instruction: Note completing this section may require coordination across divisions (and related agencies) such as macroeconomic policy, tax, and budget offices.

What type of economic analysis and modelling approaches does the Ministry of Finance use for general economic policy analysis across the following key functional areas:

- **Macroeconomic forecasting** (The method of making predictions about future aspects of the economy, such as growth, inflation, and unemployment rates, based on historical data and using various econometric and statistical techniques to project future trends.)
 - *Name of model /tool, type of model (e.g., macro-econometric (New Keynesian), DSGE, vector auto-regression, other etc.) the name of the entity that developed the model, typical time horizon considered*
 - *None*
- **Detailed budget projections** (method for projecting revenues and expenditure over a set period)
 - *Name of model/tool, type of model (e.g., DSGE, budget model, other etc.), the name of the entity that developed the model, typical time horizon considered*
 - *None*
- **Design of tax and fiscal policy measures** (method for assessing taxation system, options, and revenues)
 - *Name of model/tool, type of model (e.g., microsimulation, input-output, CGE, agent-based model, other etc.), the name of the entity that developed the model, typical time horizon considered*
 - *None*
- **Quantitative policy and programme appraisal methods** (measuring the costs and benefits of specific economic policies or programmes on key metrics of interest, such as employment, distributional impacts and macroeconomic indicators, such as GDP)

- Name of model/tool, type of model (e.g., DSGE, CGE, etc. , the name of the entity that developed the model, typical time horizon considered)
 - None
- **Design of financial sector policy measures** (method for assessing stability and functioning of the financial system including the functioning of monetary policy and commercial banking sector)
 - Name of model/tool, type of model (e.g., DSGE, CGE, financial sector model, agent based model, other etc.), the name of the entity that developed the model, typical time horizon considered

Modelling Software

What type of software does the Ministry of Finance use as part of its general economic analysis of policy options?***

Definition: "Economic analysis of policy options," as defined above

[Multiple options] - multiple answers possible

- Spreadsheet software (e.g., Excel, Google Sheets)
- Statistical and econometric software (e.g., Stata, EViews)
- Programming languages and tools (e.g., R, Python, MatLab)
- Data visualization & business intelligence tools (e.g., Tableau, Power BI)
- Database management systems (e.g., Oracle SQL)
- Unsure
- None

Data

What types of data does the Ministry of Finance use for its general economic analysis of policy options?

Definition: "Economic analysis of policy options," as defined above

Instruction: Please indicate with a number from 1 to 4 how frequently the Ministry of Finance draws on each of the following groups of data. Please note that in this case, 1 means "never" and 4 means "regularly."

- Government-owned micro-data (e.g., individual tax returns, PAYE data)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Survey data (e.g., Household income and budget surveys)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Aggregate macroeconomic data (e.g., from National Accounts or revenue collection)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Proprietary market data (e.g., from banks, credit-card companies)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Physical climate risk data (e.g., historic loss assessments from environment agency)
 - [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Carbon emissions and air pollutants data

- [1-4] single choice
 - 1 = Never
 - 2 = Rarely
 - 3 = Occasionally
 - 4 = Regularly
- Other [text]

Advanced Modelling Capability

If known, what is the most sophisticated model currently being used in the Ministry of Finance for general economic analysis of policy options and / or forecasting?

Instruction: please specify the most sophisticated economic model currently being used by the Ministry of Finance for economic analysis of policy options and / or general economic analysis and forecasting. Please note this is not only in the context of climate change but any economic policy.

- Model name (Optional)
 - [Text]
- Link to model document (Optional)
 - [Link]
- Model development and operation (Optional)
 - Developed internally and operated internally
 - Developed externally but operated internally
 - [Optional text: Name of entity that developed model]
 - Developed externally and operated externally
 - [Optional text: Name of entity that developed model]
- Approximate number of equations in the model (Optional)
 - [Number]
- Approximate number of sectors in the model (Optional)
 - [Number]
- Approximate number of regions in the model (Optional)
 - [Number]
- Which of these features does the model include (Optional)
 - [multiple options] - multiple choices
 - Heterogenous agents
 - Financial frictions
 - Endogenous technological change
 - Unemployment
 - Expectations
- Has this model ever been used to conduct climate-related economic policy analysis?
 - Yes
 - Optional details [text box]
 - No
 - Unsure

Integration of Climate into General Economic Models and Tools

Integration of Climate into General Economic Analysis and Modelling Tools

Has the Ministry of Finance integrated climate mitigation and / or decarbonization considerations...

Instruction: Please select the option that applies.

- ... into macro-economic forecasting of the economy
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document

- ... into detailed budget projections (including tax and spending plans)
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document
- ... into design of tax and fiscal policy options
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document
- ... into design of financial sector policy options
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document
- ... into quantitative policy and programme appraisal methods
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document

Integration of Climate into General Economic Analysis and Modelling Tools

Has the Ministry of Finance integrated physical climate risk and /or adaptation measures...

Instruction: Please select the option that applies.

- ... into macro-economic forecasting of the economy
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document
- ... into detailed budget projections (including tax and spending plans)
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document
- ... into design of tax and fiscal policy options

- [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document
- ... into design of financial sector policy options
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document
- ... into quantitative policy and programme appraisal methods
 - [0-4] single choice
 - 1 - Not undertaken
 - 2 - Currently under consideration
 - 3 - Partially integrated in model
 - 4 - Fully integrated in model
 - [Optional textbox] - include example and link to the document

Use of climate damage scenarios

Is the Ministry of Finance using climate-related scenarios of global warming (physical climate pathways) to inform general economic policy analyses? (e.g., considering impact of changes in labor productivity due to climate risks such as heat stress on economic growth projections)

[multiple choice] - multiple answers

- Not planned
- No, but currently under consideration
- Yes, using those adapted from off-the-shelf physical climate scenarios based on GHG emission pathways (e.g., Intergovernmental Panel on Climate Change (IPCC))
- Yes, using internally developed physical climate scenarios

Use of climate transition scenarios

Is the Ministry of Finance using climate-related decarbonization scenarios (including baseline emissions and climate policy scenarios) to inform general economic policy analyses? (e.g., considering impact of climate policies on economic growth projections)

[multiple choice] - multiple answers

- Not planned
- No, but currently under consideration
- Yes, using those adapted from off-the-shelf climate policy / transition pathways (e.g., Network for Greening the Financial System (NGFS))
- Yes, using internally developed climate policy / transition pathways
- Yes, using those adapted from off-the-shelf technological unit cost or sector-specific decarbonization scenarios (e.g., International Energy Agency (IEA))
- Yes, using internally developed technological unit cost or sector-specific decarbonization scenarios (e.g., derived through energy modelling)

Climate and Transition Dynamics

Has the Ministry of Finance considered the following dynamics in any of its climate-related analytical exercises?

[multiple options] - multiple answers

- Climate tipping points (e.g., non-linear relationships between temperature increase and GDP impacts) [Yes / No / Unsure]
- Compounding risks (e.g., multiple risk drivers materialising at the same time, such as an economic recession coupled with acute physical climate risk event) [Yes / No / Unsure]
- Trade effects (e.g., impact of carbon-border adjustment mechanisms on international trade relations) [Yes / No / Unsure]
- Wider non-economic impacts and spill over effects (e.g., co-benefits on health and living quality)
- [Other]

Specific Climate-Economy Models and Tools

Specific Climate-related Models

Does your Ministry have dedicated climate-economy models of mitigation or adaptation policies which differ from the general economic models being used above?

- [0-4] Multiple choice
 - 1 – Yes, internal climate-economy models
 - [OPTIONAL: Please specify type and name of model, as well as for which policy area or analytical question this model is being used]
 - 2 – Yes, external climate-economy models
 - [OPTIONAL: Please specify type and name of model, as well as for which policy area or analytical question this is used]
 - 3 - No
 - 4 - Unsure

Climate related data

Where does your Ministry of Finance get granular climate-related data from (e.g., carbon emissions data, spatially specific vulnerability to floods or droughts, damage functions, etc.)

[Please select all options that apply – Multiple choice]

- National statistical offices
- International bodies (IMF, WB, OECD)
- Regional bodies (Regional Development Banks)
- International research bodies and community (e.g., IPCC)
- Domestic university or non-profit institution (e.g., non-government climate think tank)
- Other government departments or other public bodies (e.g., Ministry of Environment)
- Private sector company (e.g., a climate consultancy firm)

What are some of the most pressing climate-related data challenges you face?

Instruction: In the textbox, please identify and elaborate on the most pressing climate-related data challenges you face in terms of the data itself or access to the data.

[Text box]

Financing Climate Action and Economic Analysis

Domestic Adaptation Expenditure Needs

Has the Ministry of Finance conducted any analysis to estimate public expenditure and financing needs for adaptation/resilience?

- Yes
- No

- Unsure
- Other [text box]

Domestic Decarbonization Expenditure Needs

Has the Ministry of Finance estimated public expenditure costs and financing needs associated with policies for decarbonization?

[multiple options] - multiple answers

- Economy-wide estimates [Yes/No / Unsure]
- Buildings – detailed estimates [Yes/No / Unsure]
- Transportation – detailed estimates [Yes/No / Unsure]
- Industry / Manufacturing – detailed estimates [Yes/No / Unsure]
- Agriculture / Land Use – detailed estimates [Yes/No / Unsure]
- Power Generation – detailed estimates [Yes/No / Unsure]
- Other, please specify [Text]

Costs of Diversifying Away from Fossil Fuels

Has the Ministry of Finance estimated financing needs or support that might be needed for transitioning key sectors away from fossil fuels?

Definition: Expenditure costs and financing needs could include direct costs, subsidies, or compensation for fossil-fuel industries or infrastructure, such as support for re-skilling of labor force in areas dependent on fossil fuels, retrofitting or repurposing existing infrastructure, etc.)

Instruction: Please select any of the options below that are applicable.

- Yes
 - please specify the sectors considered [text box]
- No
- Unsure
- Other [text box]

Sources of Funding for Additional Expenditure

From which sources of funding does the Ministry of Finance assume the majority of the fiscal costs related to climate adaptation, transition to net-zero, and diversification can be Mobilized from?

[multiple options] - multiple answers

- Spending cuts in other budget areas
- New taxes, levies or duties
- Government debt (e.g., green bonds)
- Domestic private finance / investment
- Blended finance
- International aid / grants
- International private finance / investments
- Not considered
- Other, please describe [text box] - e.g., generally available fiscal space]
- Not applicable

Has the Ministry of Finance led analytical work to identify and design new measures for raising revenue in a low-carbon economy?

- Yes
- No
- Unsure
- Other [text box]

OVERCOMING BARRIERS AND ENHANCING ANALYTICAL CAPABILITIES

Barriers

Are there significant barriers to incorporating climate-related issues in your economic analysis and modelling approaches?

[multiple options] - multiple answers

- Yes, data challenges
- Yes, model development challenges
- Yes, staffing and skill constraints
- Yes, financial resource constraints
- No
- Other [Please specify]

Governance***

Please indicate with a number from 1 to 5 the extent to which the following statement applies to your Ministry:
“The Ministry has clear mechanisms (e.g., senior-level responsibilities or other governance structures) to ensure climate-related analysis reaches respective decision makers in a timely manner”

Please note that in this case, 1 means “not at all applicable” and 5 means “entirely applicable.”

- Scale [1-5]

Please describe [Free text box]

Support for enhancing capabilities

What type of additional support would enable the Ministry of Finance to enhance its climate-related analytical capabilities?

Instructions: Please select all the options that apply.

- Having access to case-studies from other countries
- Having access to the latest and most relevant developments in climate-economy modelling
- Having access to the latest and most relevant empirical research in climate economics
- Having access to an online dashboard of existing climate-related data and scenarios
- Mobilizing resources and capacity for domestic data collection
- Technical assistance to develop in-house climate-related analytical capabilities
- Technical assistance to maintain in-house climate-related analytical capabilities
- Having access to a robust off-the-shelf macroeconomic model of climate change
- Other [explain]

Coalition of Finance Ministers

How can the Coalition of Finance Ministers for Climate Action best provide support to your Ministry of Finance in enhancing its climate-related analytical capabilities?

[Text box]

Concrete examples

Do you have examples and / or case studies where analysis has influenced a climate policy or associated learning experiences that you may want to share?

[Optional Text box]

IV. Additional qualitative survey results

Tables 3-7 organize the qualitative responses to two add-on and three standalone survey questions, providing further detail on the integration of climate adaptation and mitigation considerations into various policy areas (Tables 3-4) and greater detail on models employed by MoFs and the policy areas they cover (Tables 5-7).

Table 3: Has the Ministry of Finance integrated climate mitigation / decarbonization considerations into the following analytical areas?

Macroeconomic Forecasting	Budget Projections	Design of tax and fiscal policy options	Design of financial sector policy options	Quantitative policy and program appraisal methods
<p>Six MoFs provided additional detail.</p> <p>Two MoFs elaborated that they have not integrated climate mitigation/ decarbonization into macroeconomic forecasting due to either government transition or macroeconomic forecasting falling under the jurisdiction of other agencies.</p> <p>One MoF indicated periodic baseline revisions to a climate-economy model.</p> <p>Other MoFs indicated integration of climate mitigation/decarbonization through exogenous variables, green investment projections in the investment model, and periodic baseline revisions to a climate-economy model.</p>	<p>Two MoFs provided additional detail on how climate mitigation and decarbonization have been integrated into budget projections.</p> <p>One MoF reported periodic baseline revisions to climate-economy model, as well as through a green budgeting review.</p> <p>The other MoFs reported medium- and long-term energy product consumption (produced by other ministries responsible for the energy transition) are being integrated into revenue forecasts for excise duties.</p>	<p>Three MoFs provided additional detail, sharing that climate mitigation and decarbonization has been integrated into design of tax and fiscal policy options through exogenous variables, long-term strategic budget projections, and the application of a climate-economic model for analysis of green tax reforms in agriculture.</p>	<p>Four MoFs provided additional detail, with two specifying that the design of financial sector policy options does not fall under MoF's jurisdiction, one indicating government transition, and one indicating that fiscal channels are under development for their climate-economy model to ensure better alignment with observed public finance outturns.</p>	<p>Six MoFs provided additional detail.</p> <p>These responses indicate that climate mitigation and decarbonization has been integrated into quantitative policy and program appraisal methods through tax reform, a green and sustainable MoF framework, and the application of a climate-economic model for agricultural policy analysis (including but not limited to taxes, subsidies, and standards).</p> <p>One MoF reported that this was not planned for their climate-economy model program, and another MoF indicated they were unsure.</p>

Table 4: Has the Ministry of Finance integrated physical climate risk and /or adaptation measures in the following analytical areas?

Category	Macroeconomic Forecasting	Design of tax and fiscal policy options	Design of financial sector policy options	Quantitative policy and program appraisal methods
Summary	<p>Three countries provided additional information. One country reported that physical climate risk and /or adaptation measures are being integrated into macroeconomic forecasting through assessment of short-term economic impact of major natural disasters (e.g., wildfires, extreme weather) in monitoring of GDP and GDP inflation (1- and 2-quarters ahead).</p> <p>One stated that macroeconomic forecasting does not fall under MoF jurisdiction, and another revealed ongoing consideration of a separate climate-economy model realigned to medium-term macro fiscal outlook</p>	<p>Two countries provided additional information. One country reported that integration physical climate risk and /or adaptation measures into design of tax and fiscal policy options is done for long-term strategic budget projection. Another country shared that the integration of physical climate risk and adaptation costs into fiscal projections is more straightforward than integration with the macroeconomic model.</p>	<p>Two countries provided additional information, both stating that integration of physical climate risk and /or adaptation measures into the design of financial sector policy options falls under the jurisdiction of the central bank, though one mentioned the possibility of future consideration in modelling work.</p>	<p>Two countries provided additional information, with one stating they are not sure, and another stating that their climate-economic model lacks sufficient disaggregation within its fiscal channels to conduct granular policy program appraisals.</p>

Table 5: Does your ministry have any internal climate-economy models? For which policy area or analytical question this model is being used?

Model Name	Type	Policy Area/Analytical Question/Additional Notes
<i>Treasury Industry Model (TIM)</i>	<i>Forward-looking, multi-sector dynamic equilibrium model</i>	<i>Australian macroeconomy</i>
<i>Model of Industrial and Resources Abatement (MIRA)</i>	<i>Partial Equilibrium techno-economic model</i>	<i>Least cost abatement for large industrial emitters (part of the Safeguard Mechanism)</i>

<i>Electricity Market Model</i>	<i>Partial equilibrium techno-economic model</i>	<i>Analysis of capacity expansion and detailed dispatch for Australia's key electricity grids (shared with other department)</i>
<i>FIN-GLOBAL variant</i>	<i>Multi-sector multi-region CGE model that incorporates combustion and process emissions</i>	<i>Modelling economic impacts of mitigation policies (does not consider climate-related feedbacks).</i>
<i>GEMMES, ENCORE</i>	<i>[No information provided]</i>	<i>[No information provided]</i>
<i>GreenREFORM</i>	<i>Dynamic CGE model</i>	<i>Policy assessment for climate measures in agriculture</i>
<i>ThreeME</i>	<i>Multisector, new-Keynesian CGE model</i>	<i>Assess the macroeconomic impact of sectoral mitigation policies (particularly in housing and automobile sectors)</i>
<i>SNOW</i>	<i>[No information provided]</i>	<i>[No information provided]</i>
<i>N/A</i>	<i>Budget-impact model</i>	<i>Long-term fiscal implication of net-zero emissions, building on the energy system models and economic (CGE) implications of the green transition from the Energy Perspectives 2050+.</i>
<i>UGAMOD, REEA</i>	<i>[No information provided]</i>	<i>[No information provided]</i>

Table 6: Does your Ministry have dedicated external climate-economy models? For which policy area or analytical question this is used?

<i>Model Name</i>	<i>Type</i>	<i>Policy Area/Analytical Question/Additional Notes</i>
<i>Global Trade and Environment Model (GTEM)</i>	<i>Dynamic global CGE</i>	<i>Address total, sectoral, spatial, and temporal efficiency of resource allocation</i>
<i>G-Cubed</i>	<i>Intertemporal General Equilibrium Model of the world economy</i>	<i>Based on explicit intertemporal optimization by the agents (consumers and firms) in each economy, Time and dynamics are of fundamental</i>

		<i>importance to the G-Cubed model.</i>
N/A	<i>Dynamic macroeconomic CGE model based on GreenREFORM, with bottom-up technology data) emission abatement technology curves developed by DREAM)</i>	<i>Model the macroeconomic costs of the net-zero transition to fulfil NECP requirements. Coupled with a micro-simulation model that can capture the impact of energy and climate policies on specific socio-economic groups (distributive impact).</i>
TIMES-BE (open source)	[No information provided]	<i>Energy model that seeks cost-efficient solutions based on technical or economic preconditions (e.g. energy supply security or carbon neutrality by 2050).</i>
N/A	<i>Dynamic Input-Output Model + Energy Systems model</i>	<i>Developed and run by the Cyprus Institute</i>
CPAT	[No information provided]	[No information provided]
GEM-E3-SK	[No information provided]	[No information provided]
ESRI-I3E	<i>Intertemporal CGE climate model (and other external climate-economy models)</i>	<i>Developed under a Joint Research Program.</i>
OSEM (currently rolling out)	[No information provided]	[No information provided]
GreenREFORM (near future)	CGE	[No information provided]

Table 7: What is the most computationally sophisticated model currently being used in the Ministry of Finance for general economic analysis of policy options and / or forecasting?

Model/Type	Development/Operation
Treasury Industry Model	[No information provided]
Excel	[No information provided]
FPP (Financial Programming and Policies)	Developed externally (IMF), operated internally
HANK	[No information provided]
IAE	Developed internally, operated internally

XMAS	Developed externally (Central Bank), operated internally
Finex, Coffee, GEMMES	Developed externally (technical assistance), operated internally
Excel	<i>[No information provided]</i>
<u>MAKRO</u>	Developed externally (DREAM), operated internally
CGE	<i>[No information provided]</i>
EUROMOD	<i>[No information provided]</i>
Mesange	Developed internally, operated internally
Oxford Global Economic Model	<i>[No information provided]</i>
ITEM	<i>[No information provided]</i>
General and partial equilibrium models	<i>[No information provided]</i>
MMM	<i>[No information provided]</i>
ThreeME	Developed externally, operated internally
SNOW	<i>[No information provided]</i>
Financial Programing Policy	<i>[No information provided]</i>
SLIMM (Sierra Leon Integrated Macro Model)	<i>[No information provided]</i>
Dynamic CGE	<i>[No information provided]</i>
DSGE + time series approaches	<i>[No information provided]</i>
Macro-structural models (business cycle and public finance implications)	<i>[No information provided]</i>
IMEM	<i>[No information provided]</i>
Maco-econometric (New Keynesian) and vector-auto regression	Developed internally, operated internally
KOOMA	<i>[No information provided]</i>
Open Source Empirical Macro (OSEM) à beta stage of implementation	<i>[No information provided]</i>

V. Interview structure

The below structure served as a reference point for the semi-structured interviews. Based on individual conversations, the interviewers deviated from the below guidance. Interviews were transcribed and fully anonymized.

General:

- Can you please briefly describe your current role and responsibilities within the Ministry?
 - Policy Side
 - Analytical and Modelling Side
- Can you elaborate on roughly how many people in your Ministry work on economic analysis and modelling in general and how many people within this work on climate-specific analysis and modelling?

Part A: Policy and analytical priorities

- From the perspective of the Ministry of Finance, what are the most pressing policy questions that you need good analytical answers to? Please can you elaborate on the related analytical questions?
- Can you name and elaborate on a quite specific live policy that is currently underway? And the type of analysis you are using or need to address this?

Part B: Climate-Economy Modelling and Barriers

- Taking into consideration the policy and analytical priorities mentioned earlier, can you elaborate on how well you can cover these issues with existing modelling or related tools? Please provide some specific example and technical detail.
 - *Potential follow up questions: Which model types are you using in general across key core functions and to what extent are climate considerations integrated? (macroeconomic forecasting, policy evaluation, budgeting, and costing)? Do you rely on any other climate-specific external models / analytics? How do your bespoke climate models relate to your general economic models and analytic toolbox? What is the level of integration?*

Part C: Capabilities

- How does the analytical work feed into the decision-making process, how effective is it, and who is involved? What are the main challenges and barriers to analysis being used to inform decision-making?
- If time, in more general terms, could you elaborate on:
 - Whether there is senior leadership and clear governance structures overseeing analytical capability
 - The level of and importance of collaboration with other line Ministries and / or outside actors
 - The types of skills they have or might need in future
- What do you think would be the most helpful support that you need to advance capabilities? What would make the single biggest difference to your capabilities?

Wrap Up

- Is there something we haven't asked you about that you'd like to mention?
- Would you like to flag an important initiative or new work that you plan to undertake?

VI. Interview information consent

Revamping Economic Analysis and Modelling for Climate Leadership by Ministries of Finance

Information Sheet and Consent Form (6th May 2024)

We invite you to participate in a short interview via Microsoft Teams. Participation in this research is completely voluntary. We are interested in your personal views and experiences, whether positive or negative.

1. What is the research about?

The Grantham Research Institute (GRI) at the London School of Economics and Political Science (LSE) is undertaking a research project, sponsored by the Bezos Earth Fund, to write a report for the workstream HP4 of the Coalition of Finance Ministries for Climate Action, co-chaired by the United States Department of the Treasury and the Danish Ministry of Finance. The initiative aims to address how to integrate climate into the macro-economic analysis and models of Ministries of Finances (MoFs). Hence, a major new effort was launched to support Ministries of Finance in developing economic analysis and modelling capacity that can match their needs. This will include both work within the Coalition of Finance Ministers as well as activities aimed at building a larger community of practice with leading researchers, modelling experts, and institutions that can help advance this agenda.

We are now conducting semi-structured interviews with Ministry of Finance officials. These interviews will allow us to analyse where MoFs currently stand, what models and analytics are being used and what the most pressing technical and policy challenges are. The core team on the project includes Nick Godfrey (n.godfrey@lse.ac.uk), Distinguished Policy Fellow and Senior Advisor, and Dr. Moritz Baer (m.baer1@lse.ac.uk), Visiting Fellow at GRI. Please feel free to contact any of us by email should you require further information.

2. What will my involvement be?

As a team member of your respective countries' Ministry of Finance, you will be asked to take part in a 60 minute interview via Microsoft Teams. If you do decide to take part, we will ask you a series of policy-related and analytical questions to better understand the status of mainstreaming climate (mitigation, adaptation and resilience aspects) in your Ministries analysis and modelling. Your view will not be cited directly with any level of attribution and we would appreciate an open expression of your opinion rather than a discussion of the public position your organization may have on this issue. It is your choice whether or not to participate.

We will ask for your permission to record the conversation at the start of the interview. If any questions during the interview make you feel uncomfortable, you do not have to answer them. Note, even if you do decide to take part, you are free to withdraw within 14 days of the interview without giving a reason by emailing either Nick Godfrey or Moritz Baer. If you withdraw from the study, we will not retain the information you have given thus far, unless you are happy for us to do so.

3. Will my data be kept confidential, anonymous, and how will information provided be used?

All information you provide will be kept anonymous and will be securely stored. All digital files, transcripts and summaries will be given codes and stored separately from any names or other direct identification of participants. Short quotes from your interview may be used in resulting outputs. However, neither your name, nor the name of your institution or company will be mentioned or associated in any way with your answers without the explicit prior consent of you. The results of the study will be published in a coalition of

Finance Ministry report under the workstream HP4, supported by the Grantham Research Institute at the London School of Economics. The results may further be used or inform subsequent academic research and/or policy journals.

4. Data Protection Privacy Notice and Complaints

This study has undergone ethics review in accordance with the LSE Research Ethics Policy and Procedure. The LSE Research Privacy Policy can be found [here](#).

If you have any questions, please contact any member of the core research team. If you have any concerns or complaints regarding the conduct of this research, please contact the LSE Research Governance Manager via research.ethics@lse.ac.uk.

If you are happy to take part in this study based on the conditions set out in this information sheet, please confirm your consent via email reply to m.baer1@lse.ac.uk and n.godfrey@lse.ac.uk in advance of the interview.