HP 4 CORE SERIES

A GLOBAL SURVEY OF MINISTRIES OF FINANCE

The pressing policy questions Ministries of Finance face in driving green and resilient transitions and their use of analytical tools to address them

JUNE 2025

A report of the Coalition of Finance Ministers for Climate Action Helsinki Principle 4 initiative: Economic Analysis for Green and Resilient Transitions

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 (CFMCA). 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 modeling tools for Ministries of Finance (MoFs) and equip them to assess the economic impacts of climate risks, mitigation efforts, and adaptation strategies.

This report is based on a survey of 59 MoFs, with submissions received between May and October 2024 (26 from Ministries in advanced economies and 33 from emerging markets and developing economies). Recognizing the urgent need for these Ministries to access tools capable of addressing today's critical climate policy challenges, it aims to provide insights that are tailored to diverse contexts and adaptable to the timescales in which decision-makers operate. As the first global survey of its kind, it offers a systematic exploration of the key climate policy issues facing MoFs and examines the extent to which they possess the necessary tools to tackle them. The survey is complemented and informed by in-depth interviews with 15 MoFs carried out between March and July 2024.

A series of complementary reports and online resources are published alongside or are under development, including an online Compendium of Practice and Summary Report, which provide an overview of modeling and analytical tools available to MoFs, 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 inform the wider initiative and other outputs that aim to provide support to the MoF ecosystem. This research complements other efforts, including a 2023 baseline survey for Latin America and the Caribbean published by the Inter-American Development Bank, which provides an overview of the state of fiscal policy for climate action.

About this report

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Disclaimer

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Contents

Key messages

The first comprehensive survey of Ministries of Finance (MoFs), complete with supplementary interviews, sheds light on how these Ministries around the world 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 substantial proportion have not yet undertaken analysis of the economic, fiscal, and financial impacts of the policies required to drive forward a green and resilient transition. There is a notable gap between the demand for and the availability and use of suitable economic modeling and analytical tools to inform climate action. This poses a substantial barrier to MoFs' ability to advance the transition at the pace and scale required. Overcoming these limitations necessitates 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.

Responses to the survey were received from 59 MoFs between May and October 2024; 26 were from advanced economies (AEs) and 33 were from emerging markets and developing economies (EMDEs). Key findings include[1]:

1. **There is broad recognition among MoFs of the physical and transition risks of climate change, reflecting keen awareness of its potential impacts and the economic opportunities of 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, government finances (revenues and expenditures) and, to a lesser extent, inflation, employment, and competitiveness. They also voice significant concerns about **transition risks** (the risks posed by the transition to a low-carbon economy). EMDEs are more concerned than AEs about both physical and transition risks.
- MoFs see a wide range of **economic opportunities** emerging from proactive climate action, although MoFs from AEs perceive a greater degree of emerging economic opportunity than EMDEs. The key opportunities identified include economic diversification, opportunities related to the expansion of renewables, and competitive and comparative advantages. Low-income countries (LICs) generally reported a narrower range of potential benefits.

2. **MoFs are increasingly acting on climate change, but responses vary by country and development status**.

- While almost all MoFs surveyed consider climate action an important economic issue, only around one-third see it as central to their **core mandate**. Most deem it the responsibility of other departments to drive climate action and see the MoF as playing 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 somewhat more advanced in AEs than in EMDEs in most policy areas, including taxation or pricing mechanisms, mobilizing funding, and strengthening the resilience of public finances.
- Fiscal sustainability, followed by economic growth and efficiency, are the top priorities for policymakers in MoFs when designing climate-related policies.

[1] Response rates vary per question. Percentages for each question are calculated based on the number of countries that responded to each variable. More information on response rates for each question can be found in Part 2.

3. **Most MoFs are in the early stages of establishing the climate-related analysis needed to inform the transition to a low-carbon and climate-resilient economy**.

- Most MoFs have not quantified the **investments and public expenditure needed** for a green and resilient transition. Only 26% 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 tailored to supporting a low-carbon economy.
- Few MoFs have yet fully 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 saying they do not use any specialized models for mitigation or adaptation, although a greater share of AEs than EMDEs have done so.

4. **Ministries are facing many barriers and challenges to scaling up analytical tools and capabilities for climate action**.

- More than four in five MoFs report **staffing and skills constraints** when it comes to climate–economy analytics. Two-thirds are facing model development challenges, while half of MoFs are experiencing financial constraints on their ability to invest in improving their analytical capabilities.
- MoFs also **lack access to the analytical tools** they need to answer their policy questions. They tend to rely on a small number of model types, while many rely heavily on external models. Some MoFs noted that unclear communication on the structural design and uncertainties of external models could result in the misinterpretation of analysis and the improper application of results.
- MoFs often face **data and information gaps**, with 78% of MoFs highlighting data challenges when using analytical tools for climate action. MoFs also cite a lack of sufficient information to address several pressing climate-related policy and analytical questions, including in relation to quantifying the costs of mitigation and adaptation at sufficiently detailed and disaggregated levels and timescales.

5. **There are robust options for addressing the gaps between MoF demand and the supply of robust analytical tools and capabilities**.

- MoFs highlighted a need for various forms of **support to boost their climate-related analytical capabilities**. This includes better access to the latest climate–economy modeling 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 the need for better knowledge- and experience-sharing of analytical best practice, especially among MoFs that face similar challenges.
- MoFs have varying **climate–economy modeling 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 the mapping of broader risks and opportunities.
- MoFs at 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, which are (or can be) tailored to their national circumstances.

- Many MoFs are clear on the types of **external collaboration** 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. This, along with improved model transparency, would enable them to adapt and refine models over time to ensure they can provide suitable answers to the unique policy questions they face. Furthermore, efforts to standardize data sources and methodologies across government departments could facilitate better cross-comparisons and help MoFs review and challenge policy proposals more effectively.

6. **Despite the challenges, many MoFs are making progress on 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 accompanies this survey.[2] Guidance on how MoFs can strengthen their analytical capabilities for analysis and modeling to drive climate action, and what the international community can do to support them, will be provided in a complementary paper.[3]

[2] The full Compendium is an online resource available at www.greenandresilienteconomics.org. A report summarizing all the contributions is also available on that website.

[3] 'How Ministries of Finance Can Build Capabilities for Economic Analysis and Modeling to Drive Green and Resilient Transitions: Taking stock of challenges, strategies and lessons learned'.

1. Introduction

Green and resilient transitions demand sweeping structural transformations in all sectors of the economy, from energy and transportation to industry and agriculture, and at 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 in driving the economic transformation necessary to address the climate crisis. Yet, many MoFs are not progressing at the pace required to confront the scale of the challenge. Understanding the barriers preventing MoFs from mainstreaming climate action and identifying the tools needed to overcome these challenges will be crucial in helping them to accelerate climate action.

One of the core mandates of the Coalition of Finance Ministers for Climate Action is to offer support to MoFs around the world in implementing the 'Helsinki Principles'. Helsinki Principle 4 encourages MoFs to take "climate change into account in macroeconomic policy, fiscal planning, budgeting, public investment management, and procurement practices" (CFMCA, 2019).[4] To support MoFs effectively in this regard, it is imperative to gain a deeper understanding of how these ministries are currently approaching climate risks and opportunities and integrating them into their analytical and decision-making frameworks.

Under the Helsinki Principle 4 initiative 'Economic Analysis for Green and Resilient Transitions', a survey was carried out that represents the first systematic attempt to explore how MoFs around the world are approaching the transition to a low-carbon and climate-resilient economy. This report analyzes the results of that survey, from responses received between May and October 2024, and the dominant views from accompanying interviews carried out between March and July 2024. The purpose of this exercise was to shed light on the steps MoFs are taking to integrate climate-related considerations into their economic analysis and modeling approaches, along with the efforts they are making to answer their most pressing climate policy questions and the challenges they experience.

Objectives and audience

There were two objectives to this exercise:

1. To 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
2. To identify potential technical gaps and implementation challenges, and highlight areas that would most benefit from greater support.

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

[4] Coalition of Finance Ministers for Climate Action [CFMCA] (2019) Helsinki Principles. Web page. https://www.financeministersforclimate.org/helsinki-principles

Survey

To this end, the survey[5] asked questions on five themes:

1. **Assessment of climate-related risks**, including physical climate risks, as well as national and global transition risks, and **opportunities** associated with climate action
2. **Priorities for climate policy design**, focusing on key decision-making criteria, the current status of various policy considerations, and their level of **implementation**
3. **Evaluation of climate-related investments** for adaptation, decarbonization, and diversification costs, as well as projected **expenditure** needs, and potential new sources of fundraising
4. **Existing analytical tools and approaches**, divided into two segments: (a) general analytics, including practices related to general economic modeling, 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
5. **Climate-related analytical capabilities** and the key challenges they face in integrating climate considerations into their priorities, analytics, and broader practices, and the role of the Coalition of Finance Ministers for Climate Action in supporting MoF efforts to address these challenges and strengthen capabilities.

Fifty-nine Ministries of Finance completed the survey (see Table 1), of which 26 were from advanced economies (AEs) and 33 from emerging markets and developing economies (EMDEs), as classified by the International Monetary Fund (IMF). To glean more granular insights for the qualitative analysis of responses, the latter group was split into emerging market economies (EMEs) and low-income countries (LICs).[6]

In all, 63% of all AEs and 21% of EMDEs responded to the survey. All regions (per the World Bank's regional groups) were represented, although regional participation was strongest in the Europe and Central Asia region, where 40% of countries participated (albeit only from Europe). Involvement was weakest in the Middle East and North Africa, where 20% of countries participated. The regional imbalances also reflect current Coalition membership patterns (more than 90% of responses came from Coalition members). Survey respondents account for 33% of global GDP, and 20% of global emissions.

Analysis was conducted for each question to determine potential differences between AEs and EMDEs. Relevant and interesting differences are reported throughout the report, although scope remains to further investigate differences between the two country groupings. For questions that consist of several sub-questions, only countries that responded to all sub-questions have been included in the analysis for that question. Note that across different questions, sample size and composition may vary. The number of respondents for each question is indicated on the individual charts. More details on the methodology can be found in Appendix 1.

Interviews

The survey was complemented by semi-structured interviews[7] with 15 MoFs on the state of climate mainstreaming in their work, their most pressing policy and analytical questions, and their key challenges with regard to modeling and analytical tools. Because of the limited sample size, the interviews and resulting findings are not representative.[8]

[5] The full set of survey questions is available in a separate annex.
[6] This distinction was not made for quantitative analysis, to avoid reducing the statistical power of the analysis. The split into EMEs and LICs is based on the IMF's April 2023 Fiscal Monitor, which divides EMDEs into emerging market economies and low income developing countries (here referred to as 'low-income countries').
[7] An outline of the interview structure along with information on interview consents are available in a separate annex.
[8] 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 or East Asia subregions.

However, they do provide additional insights into certain dynamics and complexities that the survey could not cover fully. These include issues such as how MoFs use tools to influence policy decisions, the role of institutional politics, capacity constraints, and the dynamics of external collaboration.

Table 1. List of countries participating in the survey and interviews

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

*Countries that participated in interviews as well as the survey

Structure of the report

This report discusses key findings from both exercises—the survey and interviews. Below, in Box 1, we provide a short discussion of the high-level findings from the interviews, which sets the context for the survey. A comprehensive overview of the survey findings, complete with graphs and figures, is then provided in **Part 1**, divided up by each of the five aforementioned themes in turn. In this section, the survey findings are occasionally complemented by further insights from the interviews, where they are relevant and bring additional perspective.

The full results from the survey and findings from the interviews, with analysis in greater depth, and further details on their methodologies, are provided in **Parts 2** (survey) and **3** (interviews).

The **Appendix** contains the full survey methodology and additional qualitative results. The survey questions and interview structure plus information on interview consent are provided in two separate **annexes**.

Box 1. Integrating climate considerations into economic analysis and modeling—insights from interviews

Ministries of Finance are increasingly aware of the pressing need to take climate action, yet many face significant limitations on their ability to perform the climate–economic modeling and analysis they need to tackle these challenges. Fifteen in-depth interviews were conducted with Ministries to inform the HP4 initiative on Economic Analysis for Green and Resilient Transitions, including the survey summarized in this report. The key trends revealed by the interviews influenced the design of the survey and are summarized here.

Notably, 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 are currently holding back MoF climate–economy modeling and analysis. These include a lack of specialized analytical tools and models that are sufficiently tailored 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 a lack of comprehensive, consistent, and timely data, as well as access to such data where it exists.

To plug this gap, MoFs require adaptable analytical tools and models that can respond to diverse policy demands and shifting political landscapes, and enable rapid policy insights into both mitigation and adaptation strategies. Strengthening these analytical capabilities hinges on close collaboration with external stakeholders, including international organizations and academia, along with 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 show that MoFs can move beyond climate awareness to effectively integrating climate considerations into their core economic functions, laying a strong foundation for resilient, data-driven climate policy.

At the same time, the interviews suggest that MoFs have varying climate–economy modeling and analysis needs, depending on their stage of climate policy implementation and internal resources available. Analytical requirements, policy priorities, challenges, and responsibilities vary substantially from Ministry to Ministry. Those with advanced capabilities may require more granular analytical tools and models that support the design of specific policies and regulation, often with a very detailed sectoral or spatial focus, and detailed policy evaluation. MoFs with less developed capabilities and resources often first need simple but robust estimates to help identify trends and changes in macro-critical indicators, to inform government strategy and the mapping of broader risks and opportunities.

The interviews suggest that enhanced collaboration, tailored solutions, and strong political leadership are vital if MoFs are to overcome barriers to enhancing their analytical capability and integrating climate considerations into their core operations. They show that building stronger partnerships with international organizations, academia, and other external stakeholders is critical to addressing analytical gaps and fostering the long-term sustainability of analytical capability. Co-development can help to ensure that models 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, to translate analytical outputs into actionable policies, it is essential to achieve strong political buy-in, establish dedicated governance structures for good analytics, and equip interdisciplinary teams with the necessary skills.

PART 1. Summary of findings from the survey and interviews

1.1. Assessment of climate-related risks and opportunities

The survey results show widespread acknowledgment among Ministries of Finance of physical climate and transition risks, indicating high levels of awareness of climate change and its consequences. However, the level of concern varies. Average levels of concern about all risk categories, be it physical, national, or local transition risks, are highest among EMDEs (see Box 1.1 for risk definitions).

Box 1.1. What are physical climate and transition risks?

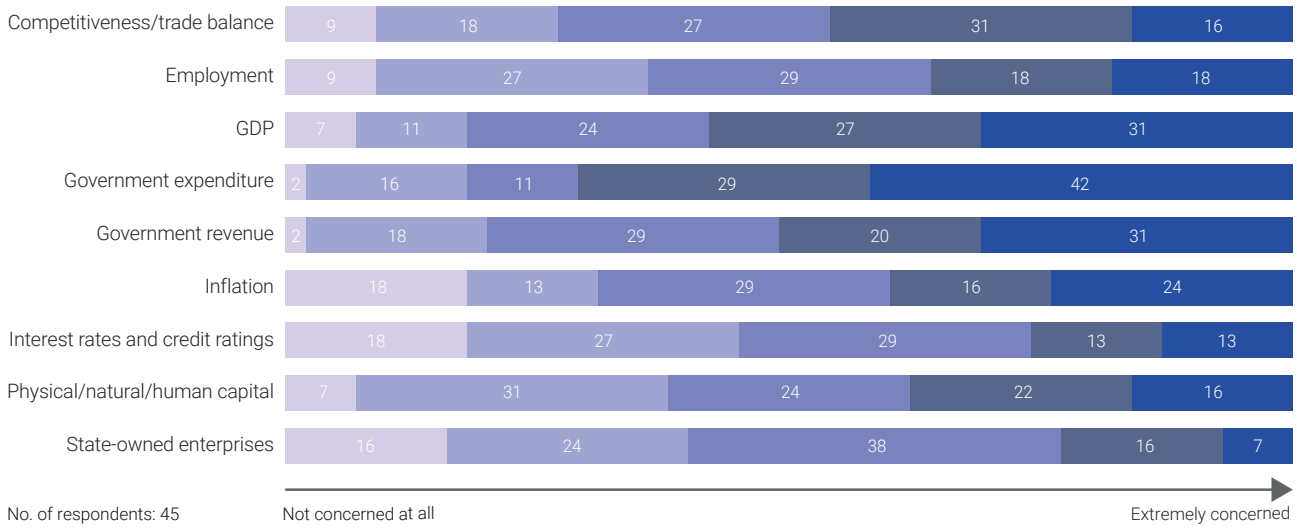
- **Physical climate risks** refer to risks caused by acute climate-related events, such as heatwaves, storms, wildfires, and flash floods, as well as chronic factors (i.e., gradually changing factors), such as average temperature increase, increased droughts and desertification, sea-level rise, coastal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

In terms of physical climate risk, MoFs are particularly concerned about the potential impacts of physical climate change on GDP, government finances (revenue and expenditure) and, to a lesser extent, inflation, employment, and competitiveness. For instance, 71% of respondents rated their level of concern about the impacts of physical climate risks on government spending at 4 or 5 (on a 5-point scale with 5 being 'extremely concerned'), while 58% expressed these levels of concern about GDP.[9] MoFs are less concerned about real interest rates and credit ratings, and the value of state-owned enterprises (see Figure 1.1 overleaf). On average, EMDEs voiced greater concern than AEs about the macroeconomic implications of physical risks. When asked to comment on specific physical risk drivers that particularly worried them, Ministries most frequently mentioned the impact of extreme weather events (e.g., floods or droughts) and slow-onset effects (e.g., sea-level rise, salinity intrusion) on key industries, infrastructure, public health, and productivity.

With regard to national transition risk, MoFs are most concerned about the impacts of the domestic transition on government finances (expenditure and revenue), GDP, and competitiveness. Similarly, MoFs are most worried about the impact of the global transition on competitiveness, GDP, and government finances (both expenditure and revenue), while concerns over real interest rates, credit ratings, and state-owned enterprises (SOEs) are

[9] All figures in the summary are approximate and rounded to the nearest whole number.

Figure 1.1. How concerned are Ministries of Finance about the impact of physical climate change on key macroeconomic indicators? (%)



comparatively lower. As with physical risks, EMDEs are, on average, more concerned than AEs about national and global transition risks (see Table 1.1).

When asked to comment on specific transition risk drivers, EMDEs expressed high levels of concern about the impacts of other countries' carbon pricing (border adjustment) mechanisms and their potential impact on exports, more exposed domestic industries, and government revenues. Countries of all income levels also identified financial risks, government revenues, and economic impacts as other transition risk drivers.

MoFs identified a range of specific opportunities emerging from climate action, particularly in relation to harnessing comparative advantages and increasing competitiveness (see Figure 1.2). EMEs frequently cited opportunities related to the adoption of renewable energy, whereas advanced economies noted opportunities pertaining to green technologies, intellectual property, and research and development (R&D). Of paramount importance to Ministries at all levels of development are the avoidance of physical climate risks, energy independence, insulation from geopolitical volatility, and protection from price instability and foreign influence.

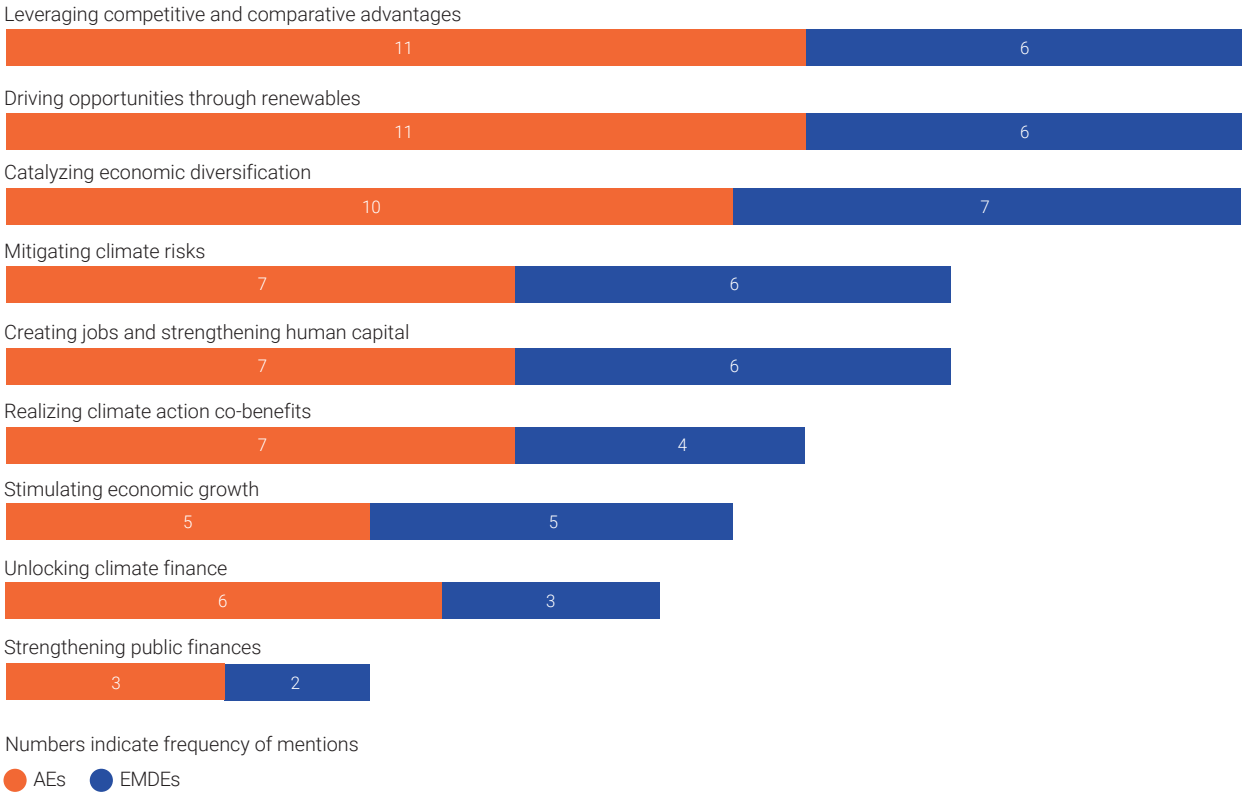
LICs generally listed a narrower range of potential benefits and no opportunities in relation to comparative advantage or competitiveness. For these countries, the key opportunities are the avoidance of physical risks, investment, and job creation.

Table 1.1. Average level of concern among Ministries of Finance about the impact of climate change on key macroeconomic indicators on a scale of 1 (not concerned at all) to 5 (extremely concerned)[10]

Type of risk	AEs	EMDEs
Physical risks	2.8	3.7
National transition risks	3.2	3.5
Global transition risks	3.1	3.4

[10] A detailed breakdown of risk perception on key economic variables is available in Section 2.2 in Part 2.

Figure 1.2. Which potential positive economic impacts or opportunities resulting from climate action do Ministries of Finance mention the most?



Most MoFs are actively assessing the opportunities arising from climate change. Around 25% of Ministries say they are playing a leading role in designing and considering the impacts of green economic policies with a view to creating green economic opportunities, while a further 39% are providing support to other government departments.

1.2. Priorities for climate policy design and implementation

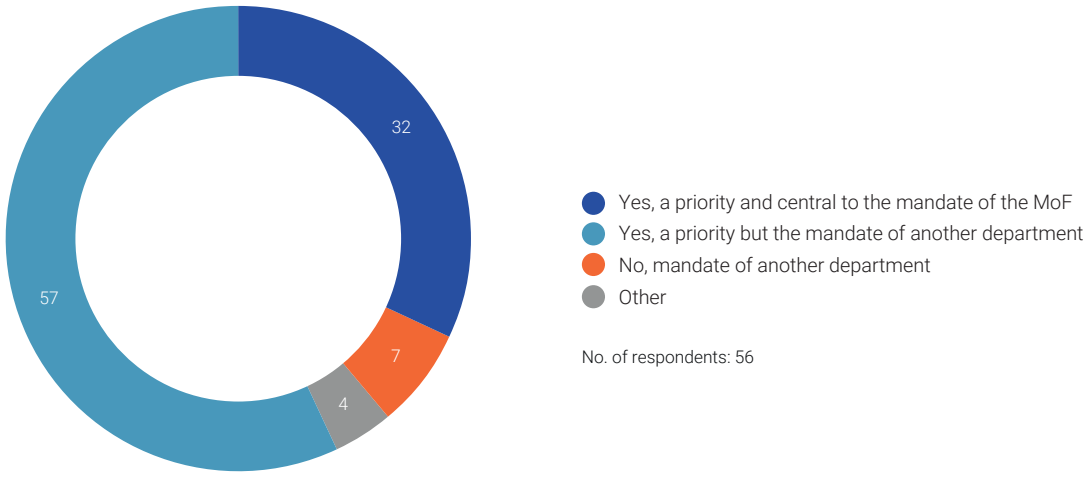
Almost all MoFs (89%) consider climate action an important economic issue. However, only around one-third say it is central to their core mandate, while the majority (57%) consider it to be the mandate of other departments (see Figure 1.3). While both AEs and EMDEs have similar views on climate being a core economic issue, a greater proportion of EMDEs consider it central to the mandate of the MoF (40%, compared with 23% of AEs).

Many MoFs are actively implementing, or involved in implementing, climate policies in a range of different areas (see Figure 1.4). More than half of MoFs are engaged in shaping national climate strategies (65%), mobilizing funding (59%), providing green fiscal subsidies (57%), and using taxes and pricing mechanisms to change market incentives (54%). They are less active in areas such as greening central banks, strengthening the resilience of public finances, greening the budget process and implementing non-pricing mechanisms, with substantial shares of respondents indicating that these actions are either still under consideration or are not being pursued.

Implementation in AEs is somewhat more advanced than in EMDEs. In particular, when it comes to green fiscal subsidies, the resilience of public finance, and green budgeting, EMDEs are more commonly not yet implementing or not considering implementation.

When designing climate-related policies, MoFs pay particular attention to their consequences for fiscal sustainability, and economic growth and efficiency, with more than 80% of respondents rating these considerations at 4 or 5 (on a 5-point scale with 5 being 'extremely concerned'). International competitiveness and distributional impacts

Figure 1.3. Does the Ministry of Finance consider climate action a core economic issue? (%)

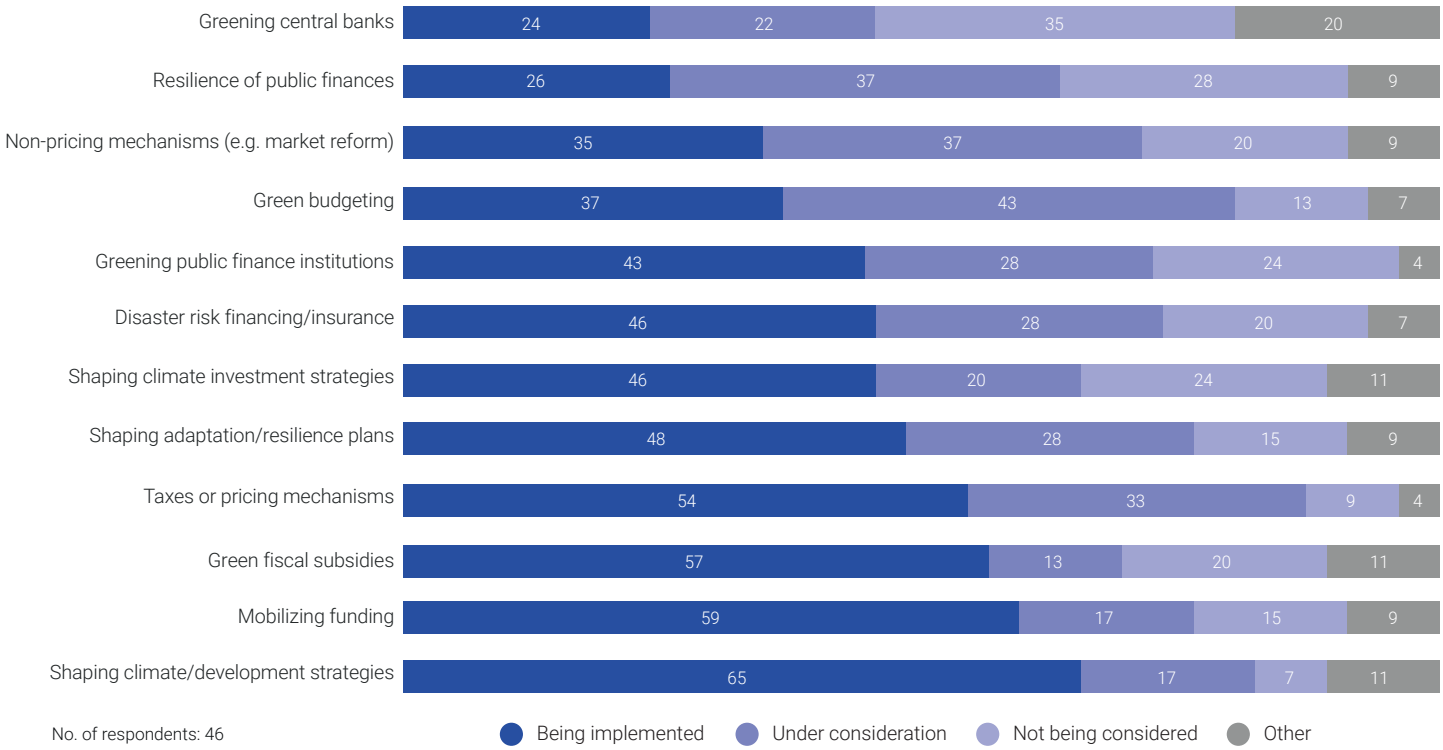


are also considered important. Legal obligations, including those related to international agreements, such as the United Nations Framework Convention on Climate Change (UNFCCC) or the Paris Agreement, are rated somewhat lower in comparison. This suggests that MoFs perceive such commitments to be less relevant than economic and fiscal considerations when designing climate-related policies.

MoFs currently have insufficient information to answer a number of pressing climate-related policy and analytical questions on 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.

Figure 1.4. Which climate-related policies are Ministries of Finance engaging with? (%)



- **Quantifying costs and expenditures**: MoFs face challenges in estimating and planning for mitigation and adaptation costs, particularly when it comes to financing clean energy in EMEs and infrastructure resilience in LICs. Many AEs are also grappling with the unknown costs of sector-specific transitions and adaptation.
- **Improving policy design and assessment**: MoFs, particularly in AEs, are looking to improve policy effectiveness through better ex-ante assessments, ex-post evaluations, and clear metrics for tracking climate policy impacts.

1.3. Evaluation of climate-related investments and expenditures

The financial implications of decarbonization, adaptation and diversification from fossil fuels remain unquantified in many countries. Forty-four percent of MoFs have yet to conduct any analysis to estimate public expenditure and financing needs for adaptation and resilience to climate change, and only 26% say they have done so. Forty-eight percent of MoFs have estimated public expenditure costs and financing needs associated with policies for decarbonization. However, most MoFs have yet to conduct sector-specific analysis, particularly in relation to buildings (28% have completed assessments), and agriculture and land use (35% have completed assessments). Moreover, only 39% have estimated financing needs for economic diversification (i.e., expenditure costs and financing needed to transition key sectors away from fossil fuels, such as compensation for fossil-fuel industries or infrastructure, or for re-skilling the labor force in areas dependent on fossil fuels).

MoFs are considering a diverse array of funding sources to address climate-related financial needs (Figure 1.5). 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.

Most MoFs have not undertaken analytical efforts to identify and design new revenue-raising measures tailored to a low-carbon economy (Figure 1.6). Thirty-five percent of MoFs have done so, while a notable portion, 18%, selected "unsure", reflecting either uncertainty or a lack of clarity about whether such analytical work had been undertaken.

Figure 1.5. From which sources of funding does the Ministry of Finance assume the majority of fiscal costs related to climate adaptation, transition to net zero, and diversification can be mobilized? (%)

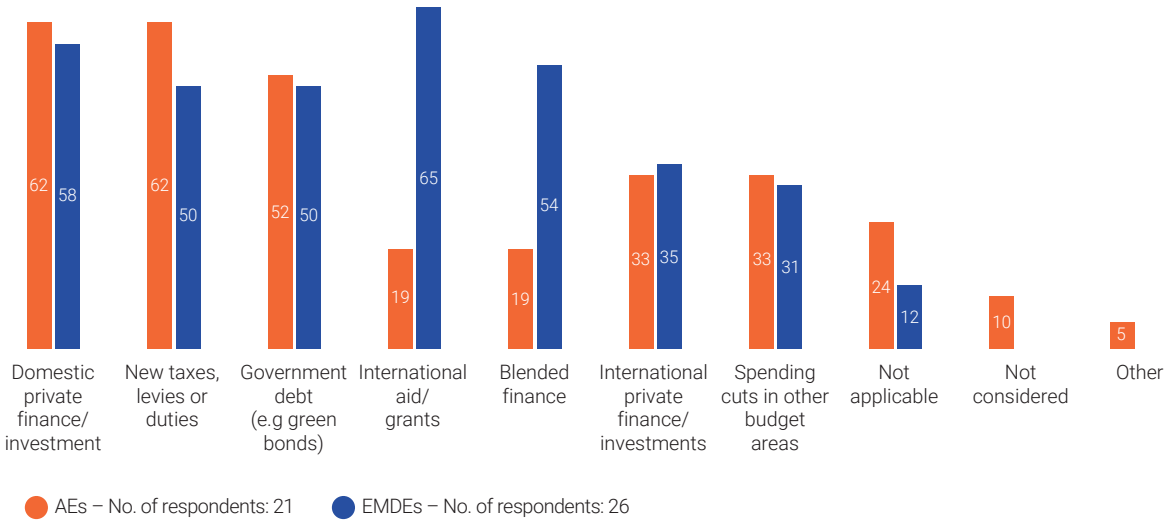
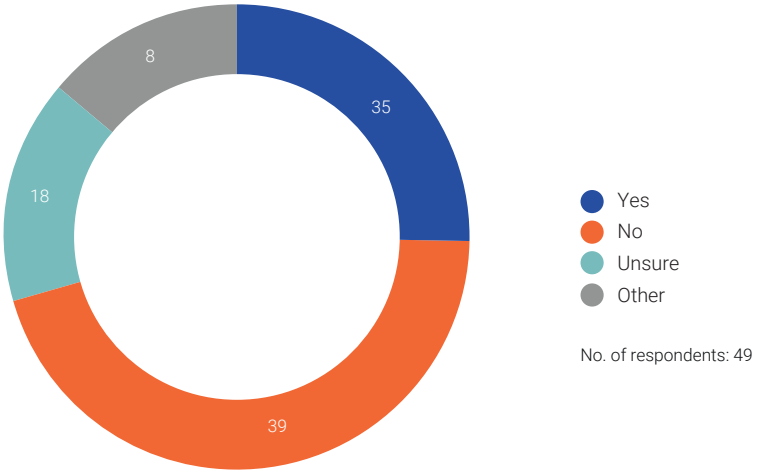


Figure 1.6. Has the Ministry of Finance led analytical work to identify and design new measures for raising revenue in a low-carbon economy? (%)



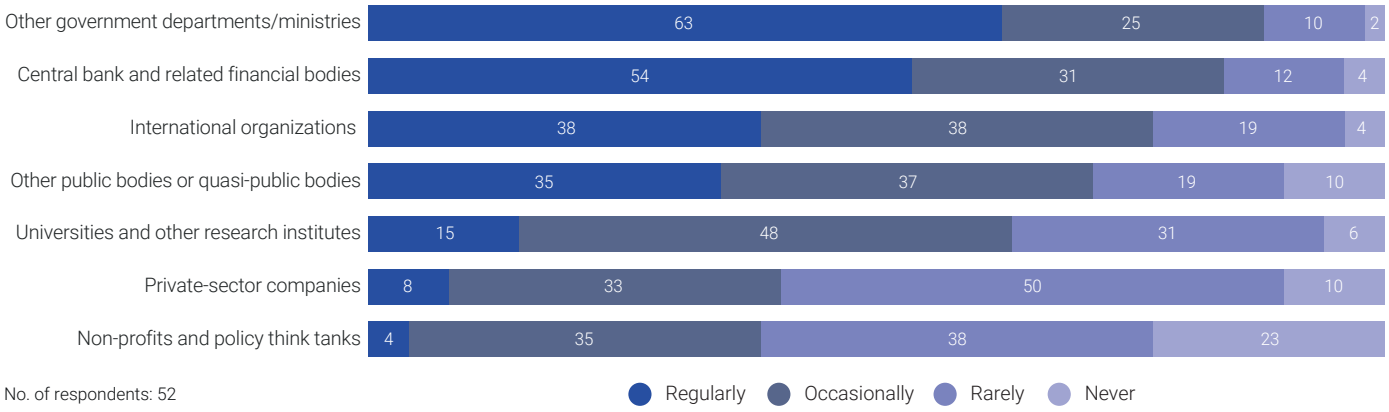
1.4. Existing analytical tools and approaches

General macroeconomic modeling and analytical tools

Setting the specifics of climate policy aside, most MoFs use a range of general economic modeling and analytical tools to support overarching decision-making in relation to economic, fiscal, and financial policy. These tools typically focus 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, with 82% and 79% of respondents, respectively, using these functions. Fifty-eight percent use policy appraisal methods, while financial sector design is less common (used by only 45% of MoFs). When it comes to data usage, aggregate macroeconomic data is the most frequently used type of data (94% of respondents), closely followed by government-owned micro-data (73%) and survey data (62%). Physical climate risk and carbon emissions data is the least used category. Fifteen MoFs provided more information on the most sophisticated model currently used for general economic analysis or forecasting. Among those models, features such as unemployment, expectations, and heterogeneous agents are common, although only a minority include more complex features, such as financial frictions and endogenous technological change, indicating varying levels of sophistication in economic modeling from country to country.

There is substantial divergence in the extent to which MoFs collaborate and interact on economic analysis, both internally within government and externally with other bodies (Figure 1.7). MoFs most often collaborate "regularly" with other government departments and ministries (63%), central banks and related financial bodies (54%), and international organizations (38%). At the other end of the spectrum, MoFs collaborate the least with private-sector companies (8%) and non-profit organizations/policy think tanks (4%). Collaboration with external parties follows similar patterns in both AEs and EMDEs, although more AEs collaborate 'regularly' with other public bodies and with universities and other research institutes.

Figure 1.7. How regularly does the Ministry of Finance collaborate with external parties as part of its economic analysis and modeling of policy options? (%)



Climate-related macroeconomic modeling and analytical tools

When it comes to using analytical tools to address climate-related issues, MoFs in both advanced and emerging economies have made limited progress on integrating physical climate change and transition considerations into their core analytical functions (Figure 1.8). Most countries have yet to integrate, or consider integrating, **physical climate impacts** into key analytical functions (i.e., policy appraisal, financial sector policy, tax and fiscal policy, budget protections, or macroeconomic forecasting). Most progress has been made on budget projections, where 35% of countries report full or partial integration, while financial sector policy is lagging behind (11% full or partial integration). Somewhat more progress has been made with regard to integrating **decarbonization** considerations: integration is again most advanced on budget projection, as well as tax and fiscal policy, with 29% reporting full or partial integration on both. The integration of decarbonization considerations, and to a lesser extent of physical climate considerations, is somewhat more advanced in AEs than in EMDEs.

Climate-related scenarios for global warming and decarbonization are not yet widely used in MoF economic policy analysis. Around 70% of MoFs have not yet integrated physical climate pathways (global warming scenarios) into their policy analysis. Of those that have, most rely on off-the-shelf scenarios (Figure 1.9). The proportion of MoFs that have not yet incorporated transition pathways into their policy analysis is slightly lower, at 62%. Of those that have, a small majority uses off-the-shelf climate policy scenarios rather than internally developed ones. Uptake of both global warming and decarbonization scenarios is somewhat more advanced in AEs than in EMDEs.

Figure 1.8. To what extent has the Ministry of Finance integrated climate considerations into core analytical functions? (%)

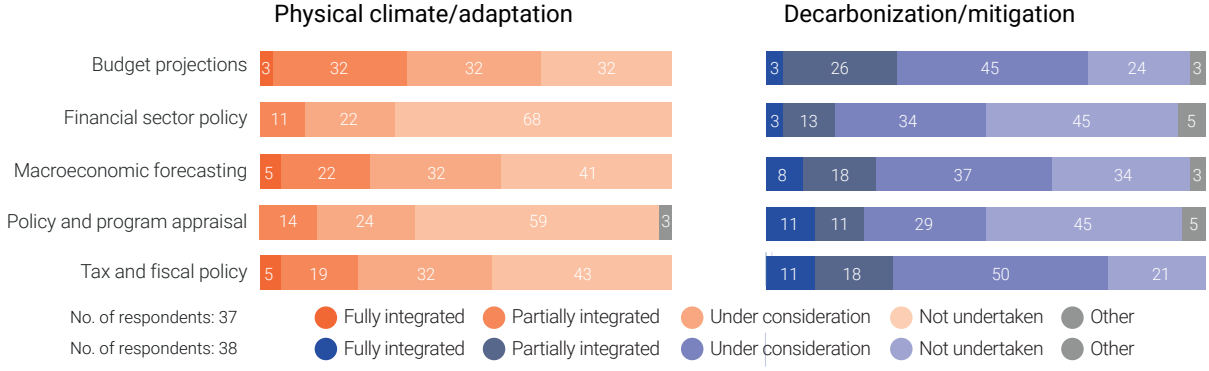
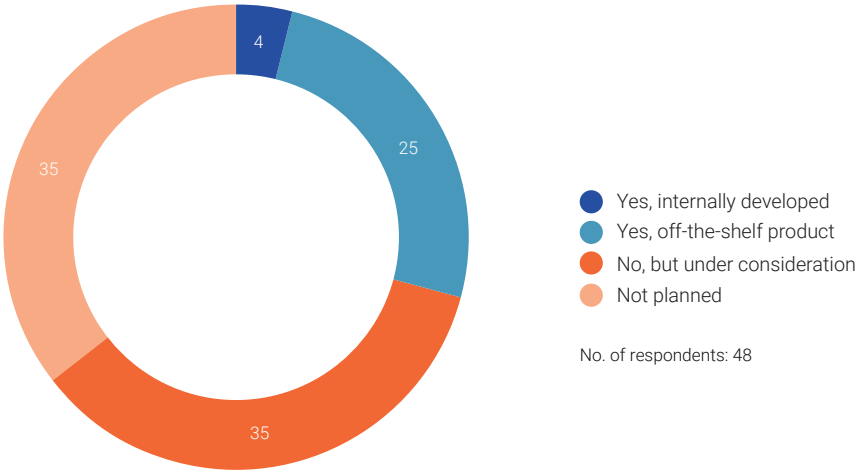


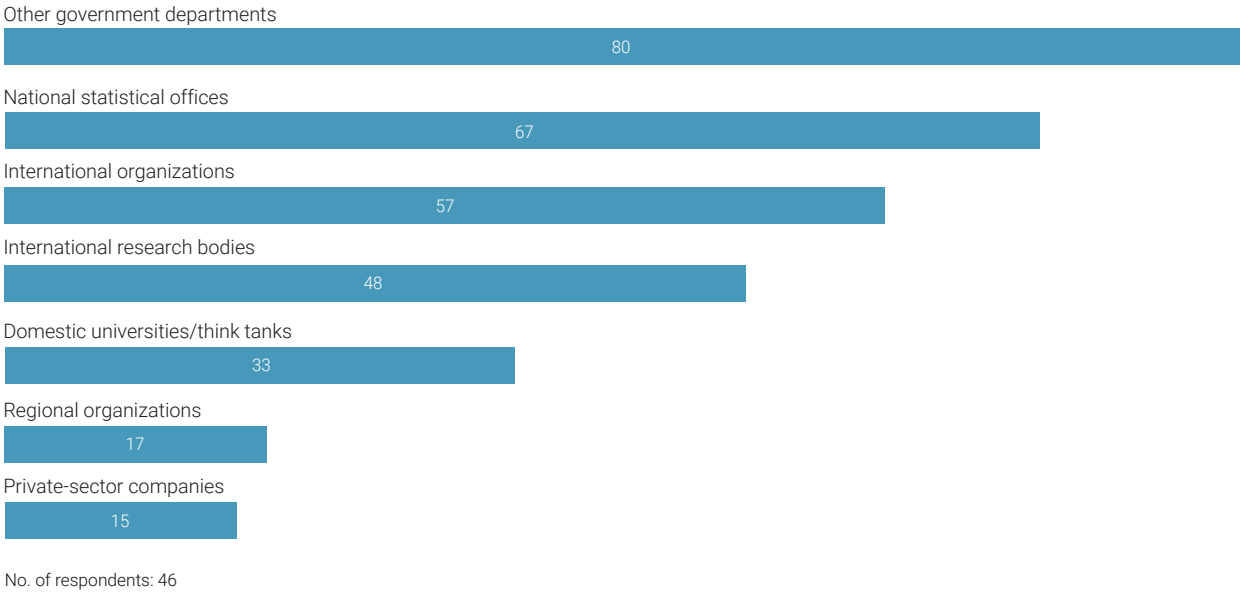
Figure 1.9. Is the Ministry of Finance using climate-related scenarios of global warming (physical climate pathways) to inform general economic policy analysis? (%)



MoFs primarily rely on domestic sources for climate-related data, with most respondents obtaining data from other government departments (80%) and national statistical offices (67%). International organizations (57%) and research bodies (48%) also serve as common sources, but regional bodies (17%) and private-sector companies are used far less frequently (15%). MoFs often combine multiple data providers to inform their climate analyses (Figure 1.10). When asked to elaborate on the key data challenges they face, Ministries cited a range of difficulties, particularly relating to harmonization, granularity, gaps, frequency, accessibility, and systemization.

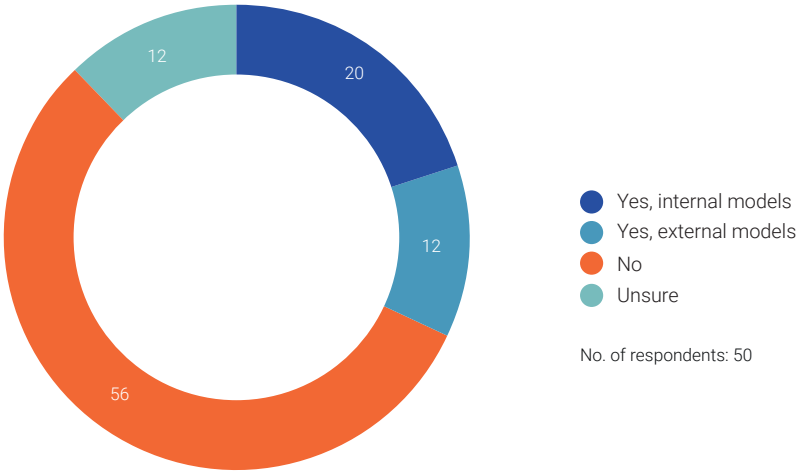
The majority of MoFs do not use dedicated climate–economy models, with around 56% of respondents saying they do not use specialized models for mitigation or adaptation (Figure 1.11). Moreover, most MoFs do not incorporate specific climate-related dynamics, such as tipping points or compound risks, into their analytical exercises (only around 15% incorporate tipping points and 17% include compound risks; see Box 1.2 for definitions). Trade effects such as carbon border adjustments (27%) and wider spillover impacts (24%) are considered slightly more frequently. There is uncertainty surrounding the inclusion of such dynamics, with up to

Figure 1.10. From where does the Ministry of Finance get its granular climate-related data? (%)



29% of respondents unsure as to whether these elements are factored into their analyses, indicating potential gaps in knowledge or clarity on climate modeling features in many MoFs. More AEs have adopted climate-economy models, with 48% having adopted either internal or external models, compared with 16% of EMDEs. AEs also incorporate complex risks, such as compounding economic and climate events and trade effects, more frequently than EMDEs.

Figure 1.11. Does the Ministry of Finance use dedicated climate–economy models of mitigation or adaptation policies that differ from the general economic models being used? (%)

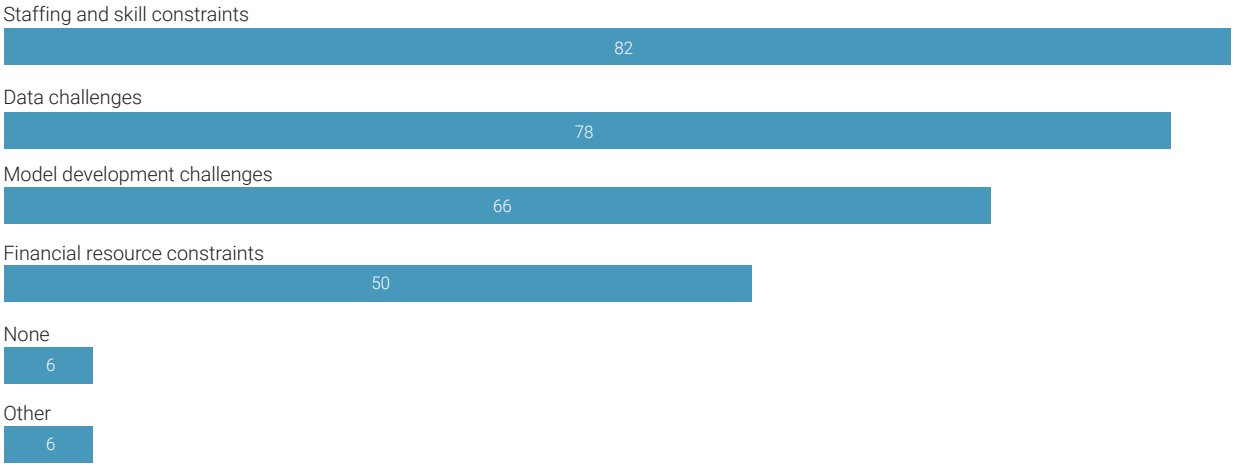


Box 1.2. Definitions of key concepts

- **Climate–economy models** or climate-enhanced macroeconomic models, are tools used to conduct economic analysis of climate change and climate policy, with a view to guiding policymaking and decision-making processes on climate change adaptation and mitigation from an economic perspective. For example, they can be used to estimate the economic impacts of climate change at a global, regional, and sectoral level in the long and short term; estimate the economic impacts of climate change mitigation and adaptation strategies; and monetize the projected damages of an additional ton of carbon emitted at specific points in time (the 'social cost of carbon'). Models typically link an economic module with environmental modules, either within one modeling framework or through soft links. The 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. (A forthcoming paper from the Coalition provides an overview of climate–economy and other models and tools.)[11]
- **Tipping points** are critical thresholds within systems which, if exceeded, trigger significant and often irreversible changes in the state of the system. 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** 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** 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 (CBAMs) on competitiveness.
- **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.

[11] 'Economic Analysis and Modeling Tools to Assist Ministries of Finance in Driving Green and Resilient Transitions: An overview of options and case studies of deployment.'

Figure 1.12. What barriers does the Ministry of Finance face in incorporating climate-related issues into economic analysis and modeling approaches? (%)



No. of respondents: 50

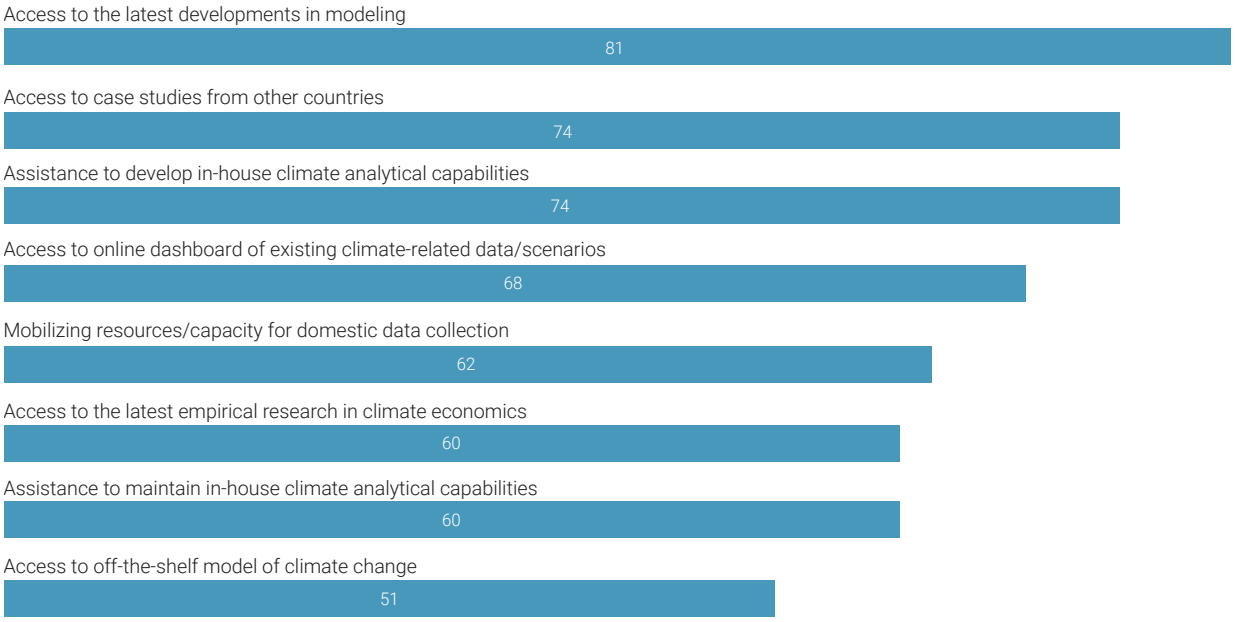
1.5. Climate-related analytical capabilities

When it comes to integrating climate into economic analysis and modeling approaches, MoFs face several challenges (Figure 1.12). MoFs most frequently cite staffing and skills constraints (82%), closely followed by data limitations (78%) and model development challenges (66%). Somewhat fewer MoFs (50%) experience financial resource constraints. Around 43% of MoFs face all four challenges, while only a few say they face no challenges at all. This suggests that Ministries in both AEs and EMDEs struggle with multiple obstacles in the integration of climate-related considerations into their analytical approaches. EMDEs report financial resource constraints (reported by 70% of EMDEs) and data challenges (96%) more frequently than AEs. However, all in all, both AEs and EMDEs struggle with multiple obstacles to integrating climate-related considerations into their analytical approaches.

To build and enhance their climate-related capabilities, MoFs prioritized access to the latest climate–economy modeling developments (81%), followed by technical assistance for in-house capacity-building (74%) and case studies from other countries (74%). Many highlighted the need for access to climate data and resources for domestic data collection, for instance through a dedicated online dashboard. They also frequently mentioned support in maintaining in-house capabilities and empirical research access, alongside a desire for off-the-shelf macroeconomic climate models (Figure 1.13). EMDEs in particular indicated a need for support to i) develop and ii) maintain in-house climate-analytical capabilities (selected by 92% and 80% respectively), access to the latest developments in modeling (84%) and case studies (80%), and to mobilize resources for domestic data collection (76%).

MoFs identified several ways the Coalition could support the strengthening of their climate-related analytical capabilities, including technical assistance, access to resources, collaboration, and 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 need for platforms for collaboration, feedback, exchange, and standard-setting, while EMDEs focused on technical support, access to data and tools, and training on modeling, developing tools, and integrating climate into policymaking. EMDEs also underscored the need for collaboration with institutional partners, financial institutions in AEs, and multilateral development banks (MDBs) through expert exchanges, sharing of best practice, and guides (e.g., on integrating climate concepts into MoF planning). Both AEs and EMDEs stressed the need for the Coalition to support the elevation of MoFs' role in climate action, particularly at a leadership level, with EMDEs also highlighting the need to elevate climate awareness across departments.

Figure 1.13. What types of additional support would enable the Ministry of Finance to enhance its climate-related analytical capabilities? (%)



No. of respondents: 47

The in-depth interviews provide further insights into the capability challenges that MoFs face. In particular:

- **Some MoFs noted that when using external models, unclear communication on structural model designs and uncertainties could lead to misunderstanding of analysis and the misuse of results.**
- **Strong governance, coordination, and external collaboration are critical if MoFs are to effectively integrate climate considerations into policymaking**. 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, and the associated uncertainties, to gain policymaker buy-in. Structured collaboration with statistical offices, line ministries, academia, and non-governmental organizations (NGOs) is essential, particularly for smaller countries with fewer in-house resources. While such partnerships provide access to critical data and modeling expertise, they also introduce complexities in aligning methodologies and ensuring unbiased results. Many MoFs cited a need for standardized tools that require minimal investment and facilitate comparability across ministries and countries, alongside dedicated interdisciplinary teams within the MoF and other relevant government agencies.
- **MoFs face substantial methodological and data-related challenges, such as a lack of comprehensive, consistent, and timely data**. However, some MoFs said these challenges were not the primary obstacle to enhancing capabilities. In their view, it is more important to have the governance structures, skills, and staff capable of selecting and applying models across a wide range of policy and analytical priorities, and of translating outputs into policy decisions. High-level buy-in and strong political leadership within the MoF and the government are also needed to successfully build and maintain climate analytical capabilities, but often are not a given.
- **Collaboration between MoFs and external organizations needs to be strengthened 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 said 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 address their country's unique policy questions and circumstances in a suitable manner.

1.6. Conclusion

Through the survey and the accompanying interviews, MoFs have shown growing awareness of climate-related risks and opportunities, and that they are increasing their action on climate change. Their answers reveal both trends in MoF responses to climate change and a great variability in the actions that these Ministries are taking around the world. However, substantial challenges remain in integrating climate considerations into MoFs' analytical and decision-making frameworks. Addressing these gaps will require them to make significant investments in 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 strengthening domestic analytical capabilities to navigate the complexities of climate policy. Key priorities include access to the latest climate–economy modeling developments and technical assistance for in-house capacity-building. MoFs in EMDEs underscore, in particular, the need for the international community to pay due attention to support that builds sustainable capacity, along with the skills and capabilities of staff within Ministries to design and operate their own tools. Further guidance on how MoFs can strengthen their analytical capabilities for analysis and modeling to drive climate action, and what the international community can do to support them, is provided in a complementary paper.[12]

Despite the challenges, many MoFs are already making significant strides in enhancing these capabilities, creating a growing repository of valuable examples and insights, and 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 thematic reports accompanying this survey.

[12] 'How Ministries of Finance Can Build Capabilities for Economic Analysis and Modeling to Drive Green and Resilient Transitions: Taking stock of challenges, strategies and lessons learned'.

PART 2. Survey findings in depth

Contents

PART 2. Survey findings in depth

2.1. Overview of approach and respondents

Having summarized the survey results in Part 1, this part of the report presents the findings and analysis in fuller detail and depth. In this introductory section, we first expand upon the approach taken and who responded.

The survey of MoFs was designed with two objectives: i) to gain a deeper understanding of how MoFs are currently approaching climate-related risks and opportunities, and how these are being integrated into their analytical and decision-making frameworks; and ii) to identify potential technical gaps and implementation challenges, highlighting areas that would most benefit from greater support.

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. It also 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. It was anticipated that the results could inform targeted strategies for capacity-building, identify where and what kind of tailored support is needed, and help foster better practices across institutions.

Researchers at the Grantham Research Institute on Climate Change and the Environment developed a detailed questionnaire, following extensive consultations with subject-matter experts from academic institutions, policy think tanks, international organizations, and representatives from various MoFs. The final survey comprised 120 questions. Ten were open-ended to elicit in-depth responses, although most questions designed to glean quantitative information also included space for supplementary qualitative input. The survey was distributed to all members of the Coalition of Finance Ministers for Climate Action as well as observers and some non-members.

Different approaches for analysis were chosen for the quantitative and qualitative parts of the survey. Further details on the survey methodology can be found in Appendix 1.

Respondents

A total of 59 individual and complete submissions were received between May and October 2024. This represents over one-third of MoFs worldwide. Of these, 26 were in advanced economies (AEs) and 33 were emerging markets and developing economies (EMDEs) (see Figure 2.1 and Table 2.1). To glean more granular insights for the qualitative analysis of responses, the latter group was split into emerging market economies (EMEs, 24 countries) and low-income countries (LICs, 9 countries).

Figure 2.1. Respondents by IMF country grouping

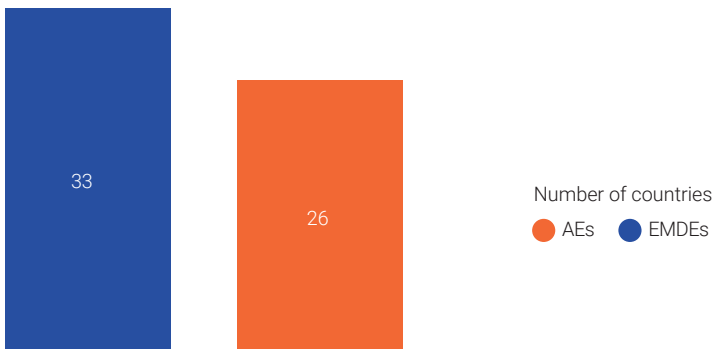


Table 2.1. List of respondents

AEs	EMDEs	
	EMEs	LICs
Andorra	Argentina	Bangladesh
Australia	Bahamas	Bhutan
Austria	Bahrain	Cambodia
Belgium	Cabo Verde	Djibouti
Canada	Chile	Guinea
Cyprus	Colombia	Mozambique
Denmark	Dominican Republic	Nigeria
Estonia	Ecuador	Sierra Leone
Finland	Egypt	Uganda
France	Eswatini	
Germany	Hungary	
Greece	Indonesia	
Iceland	Jamaica	
Ireland	Malaysia	
Italy	Marshall Islands	
Japan	Mexico	
Republic of Korea	Palestine	
Latvia	Namibia	
Lithuania	Paraguay	
Luxembourg	Peru	
The Netherlands	The Philippines	
Norway	Serbia	
Singapore	Seychelles	
Slovakia	Uruguay	
Spain		
Switzerland		

Note: The split into advanced economies, EMEs and LICs is based on the IMF's April 2023 Fiscal Monitor.

Table 2.2 presents the geographical distribution of survey respondents. All regions (per the World Bank's regional groups) were represented, although regional participation was strongest in the Europe and Central Asia region, where 40% of all countries took part (albeit exclusively from Europe). Involvement was weakest in the Middle East and North Africa. The regional imbalances also reflect current Coalition membership patterns (over 90% of responses came from Coalition members). Survey respondents account for 33% of global GDP and 20% of global emissions (see Table 2.3).

Table 2.2. Regional representation of respondents

World Bank regional groups	Percentage of countries in the region that responded to the survey	Number of countries that responded to the survey
East Asia and Pacific	24%	9
Europe and Central Asia[13]	40%	23
Latin America and the Caribbean	26%	11
Middle East and North Africa	19%	4
North America	33%	1
South Asia	25%	2
Sub-Saharan Africa	19%	9

Table 2.3. Survey and interview respondents' share of global GDP, emissions, and population

	Share of global GDP	Share of global emissions	Share of global population
Survey respondents	33%	20%	26%
Interview respondents	28%	17%	7%
Total	61%	37%	33%

Notably, completing the survey involved input from multiple individuals, with an average of six contributors per Ministry. Some MoFs told the research team informally that the survey process had prompted engaging discussions within their Ministry, fostering dialogue across departments that did not typically interact on a regular basis.

Structure of Part 2

The remainder of Part 2 is structured as follows:

- **Section 2.2** presents data on MoF assessments of **climate-related risks**, including physical climate risks, as well as national and global transition risks, and **opportunities** associated with climate action.
- **Section 2.3** addresses climate-related **policy priorities**, focusing on key decision-making criteria, the current status of various policy considerations, and their level of **implementation**.
- **Section 2.4** 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.

[13] This group does not include any countries from Central Asia.

- **Section 2.5** is divided into: (a) **general analytics** and (b) **climate analytics**. Section (a) explores practices related to general economic modeling, 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. Section (b) 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.
- **Section 2.6** 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 efforts to address these challenges and strengthen capabilities.

2.2. Assessment of climate-related risks and opportunities

This section looks at Ministry of Finance assessments of physical climate risks, as well as national and global transition risks, and the opportunities associated with climate action. More specifically, it looks at how MoFs perceive each of these risk categories to affect various core macroeconomic indicators, including GDP, inflation, employment, real interest rates, revenue, expenditure, and trade competitiveness. In each category, respondents were also asked to provide a qualitative response on specific risk drivers that particularly worried them and what they considered to be the most important positive economic impacts or opportunities of climate action.

Physical climate risks

Ministries of Finance were 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 SOEs 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 level of concern differs considerably by variable.

EMDEs, on average, exhibited greater concern than AEs about the macroeconomic implications of physical climate change.

When asked to comment on specific physical risk drivers that particularly worried them, MoFs most frequently cited physical climate change risks, such as extreme weather events and sea-level rise. Economic risks, particularly budgetary pressures related to disaster recovery and adaptation funding, emerged as other significant challenges. The disproportionate impacts of climate change on vulnerable populations and specific threats to climate-sensitive sectors, such as agriculture and tourism, were also frequently recurring issues.

Quantitative insights

Participants were asked to evaluate their level of concern about the effects of physical climate change on a range of macroeconomic indicators.[14] Ratings were collected on a scale of 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*; and *the value of SOEs*. Forty-five MoFs provided information on all nine indicators and were therefore included in the analysis.

[14] Physical climate change effects refer to both acute climate-related events, such as heatwaves, storms, wildfires and flash floods, and chronic, gradually changing factors, such as average temperature increase, increased droughts and desertification, sea-level rise, coastal erosion, and ocean acidification.

Government spending was perceived as suffering the greatest impact from physical climate change, with a mean rating of 3.9, followed by GDP and government revenue, both at 3.6 (see Figure 2.2).[15] Seventy-one percent of MoFs rated the impacts of physical climate risk on government spending at a concern level of 4 or 5 (5 being extremely concerned), with around 58% doing so for GDP, and 51% for government revenue. Conversely, real interest rates and the value of SOEs were perceived as the least impacted. Only about 25% of respondents rated these variables as a level 4 or 5 concern.

Next, an average risk perception score was calculated for each country based on the ratings across each variable. On segmenting the sample between EMDEs and AEs, substantial differences emerged, with EMDEs more concerned about risks than AEs, on average. Specifically, EMDEs reported a mean score of 3.7, in contrast to AEs, which had a mean score of 2.8.

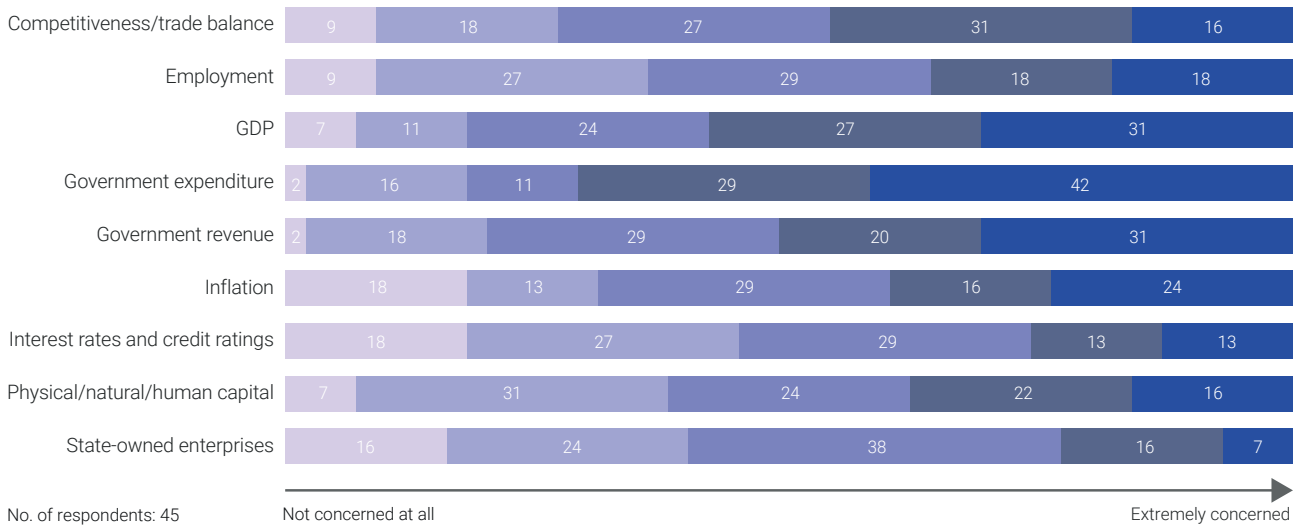
Table 2.4 shows the average risk perception split into AEs and EMDEs across physical, national transition and global transition risks. Figure 2.2b displays differences in perceptions of physical risks across both country groupings.

Table 2.4. Average level of concern among Ministries of Finance about the impact of climate change on key macroeconomic indicators on a scale of 1 (not concerned at all) to 5 (extremely concerned)

Type of risk	AEs		EMDEs	
	Mean	Standard deviation	Mean	Standard deviation
Physical risks	2.8	1.2	3.7	1.2
National transition risks	3.2	1.2	3.5	1.3
Global transition risks	3.1	1.1	3.4	1.2

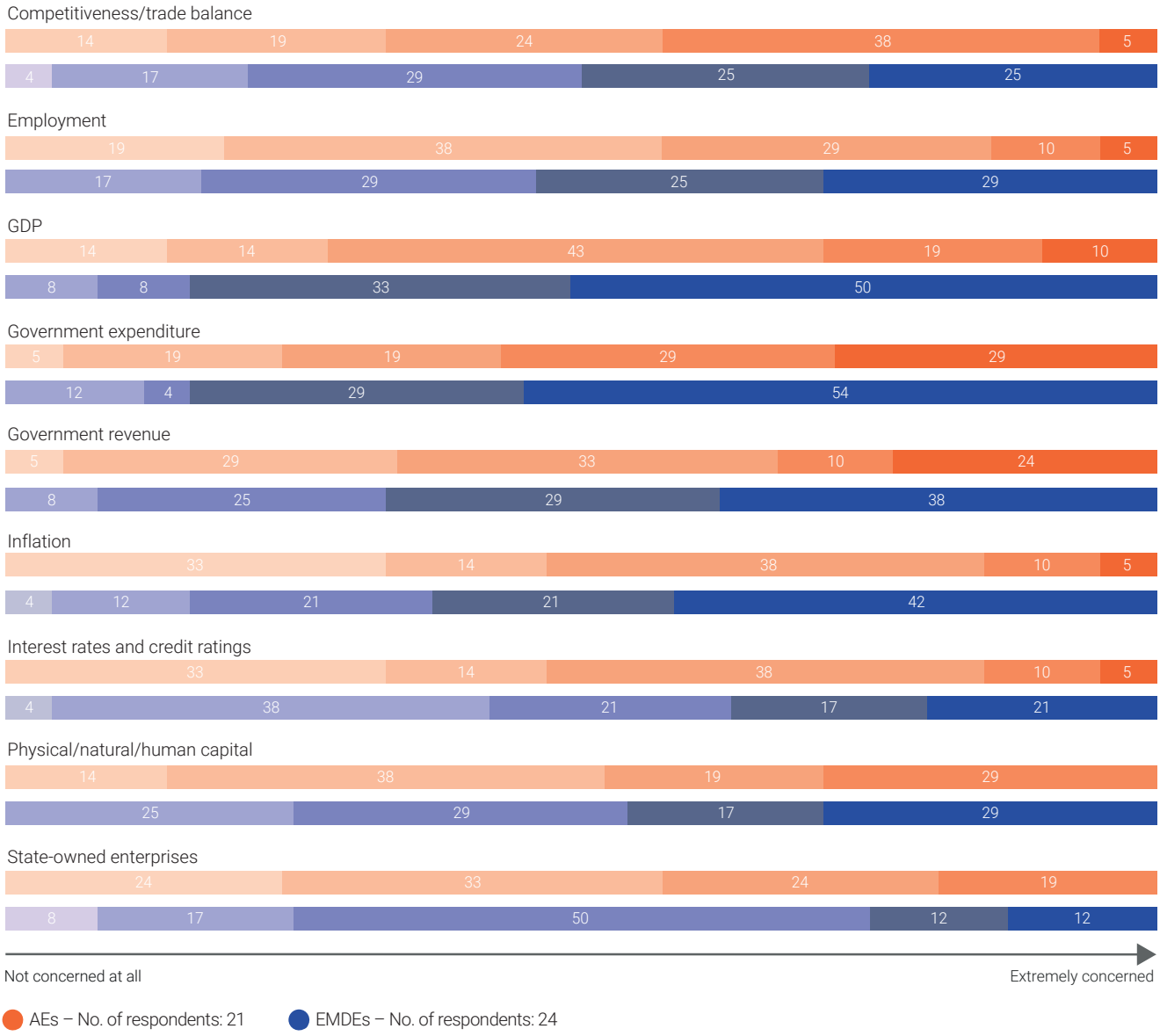
Figure 2.2. How concerned are Ministries of Finance about the impact of physical climate change on key macroeconomic indicators? (%)

a. All Ministries of Finance



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

b. AE and EMDE breakdown



Qualitative insights

In an open-ended question, respondents were asked to comment on risk drivers that particularly worried them. Overall, 39 countries responded to this question, and the key themes that emerged from their responses are presented in Figure 2.3.

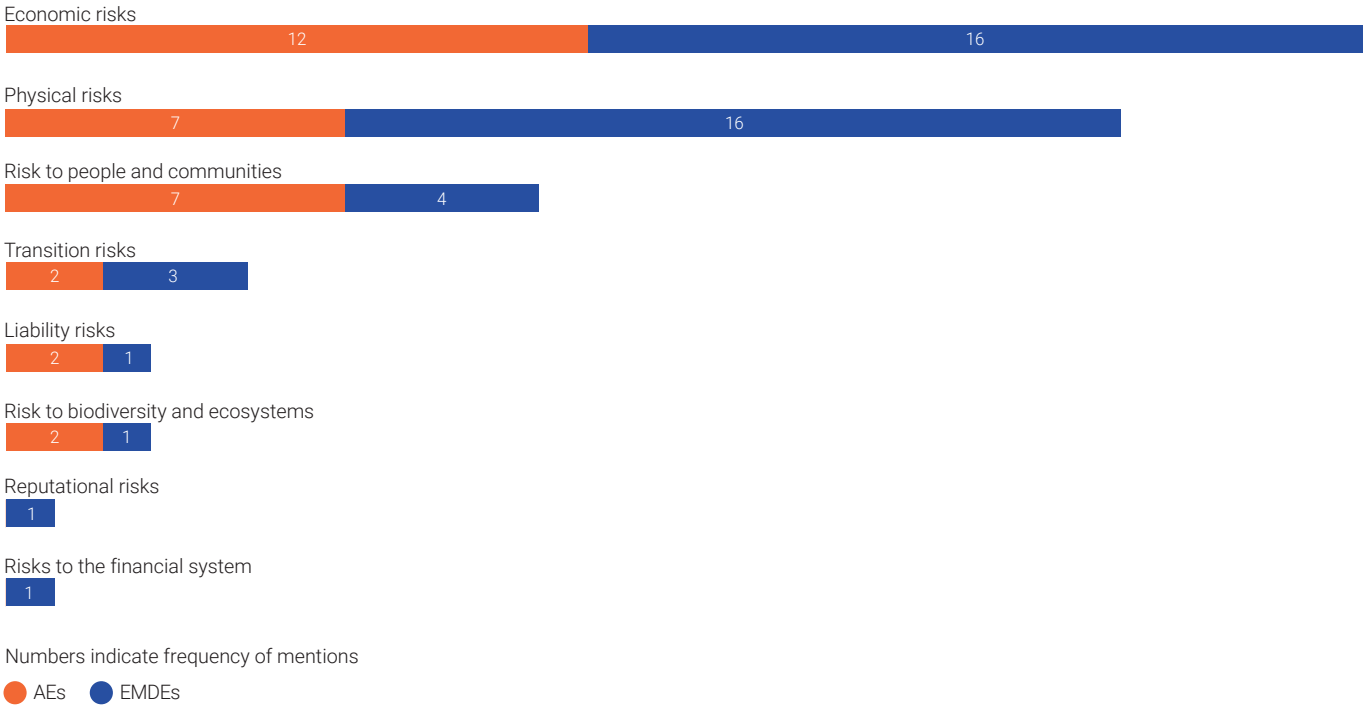
These key themes were established through a process of data familiarization, which facilitated the emergence of key themes and subthemes, which were then coded and processed in NVivo. More details on this process can be found in Appendix 1.

The following sections will explore the most prominent of these risks, providing a detailed breakdown of the specific risks MoFs identified in each risk category. Transition risks raised by MoFs in response to this question are explored in Sections 2.4 and 2.5.

Economic risks

MoFs of all development stages cited *budgetary pressures and spending* as the leading economic risk category. This includes managing fiscal pressures on public finances associated with recovery from climate-related

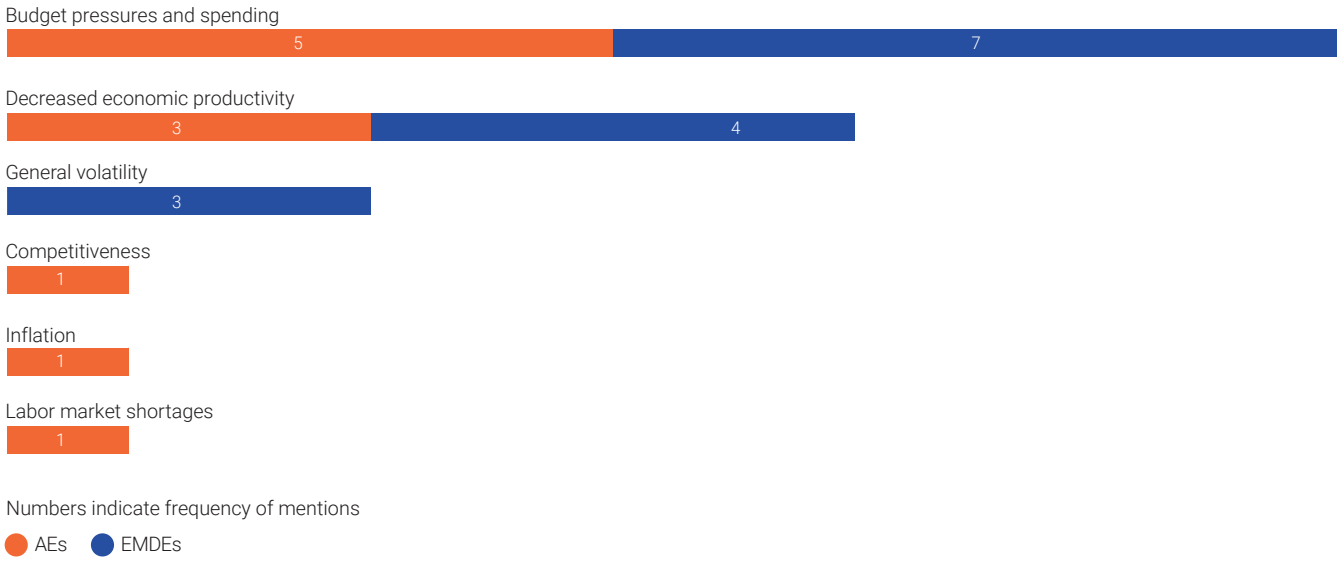
Figure 2.3. Which physical climate change risk drivers do Ministries of Finance mention the most as a concern?



disasters, funding the green transition (including adaptation measures for AEs and EMDEs), concerns about the impact on long-term financial stability of debt accumulation related to mitigation and adaptation finance, and damage compensation. While concerns about recovery costs from extreme and volatile weather events prevailed across all economies, debt sustainability concerns were particularly pronounced in EMDEs, as these economies face the simultaneous challenges of rising costs and constrained fiscal space 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 LICs, expressed concern over the agricultural

Figure 2.4. Which types of economic risk from climate change do Ministries of Finance mention the most as a concern?



sector, citing declining output. LICs also mentioned risks such as reduced labor productivity, loss of workdays, and damage to both produced and non-produced capital.

Physical risks

Physical risks was the second-most reported risk category among MoFs of all development stages. Within this category, Ministries cited the impact of increasingly extreme and volatile weather events (floods, droughts, hurricanes and cyclones, mudslides, and wildfires) and slow-onset effects (sea-level rise, salinity intrusion, and river and coastal erosion) on key industries (agriculture and 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, electricity price inflation, and the effects the latter would have on household expenditures and economic stability generally. In addition, one Ministry expressed deep concern over the disproportional effects of climate change on vulnerable populations (e.g., low-income and marginalized groups) in the form of job losses, displacement, and health impacts.

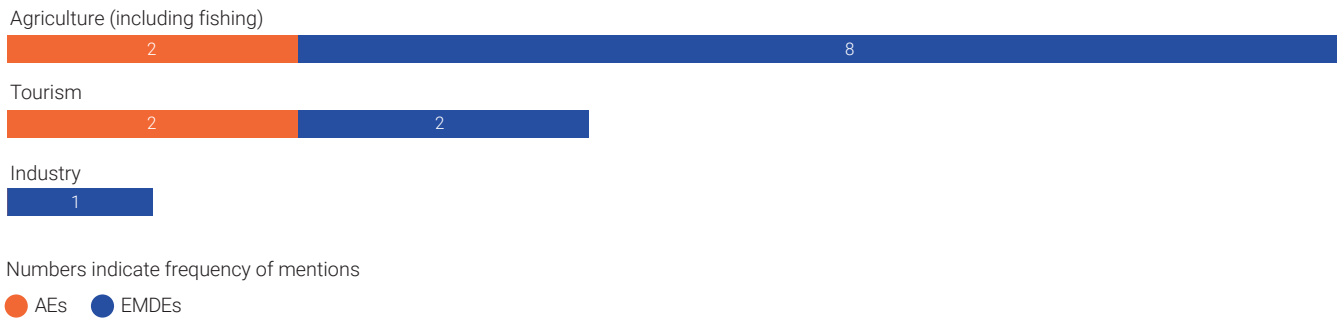
Other risks

Two AEs and one EMDE expressed biodiversity-related concerns. The AEs focused on the risks that biodiversity and ecosystem loss pose to communities, businesses, and the economy, particularly through the loss of essential ecosystem services. 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 would 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 LIC underscored the potential reputational risks and erosion of trust among investors, consumers, and constituents in both governments and businesses if effective climate action is not taken.

Sectoral risks

Occasionally, Ministries provided further detail on specific sectors where climate change risks were causing particular concern (see Figure 2.5). Agricultural concerns centered on 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. One Ministry mentioned concerns about limiting industrial emissions in the context of the European Union's Industrial Emissions Directive.

Figure 2.5. Which sectors do Ministries of Finance mention the most when asked to identify specific climate change risk drivers of particular concern?



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 are notably lower. EMDEs show heightened concern, while AEs display relatively lower levels of concern.

Quantitative insights

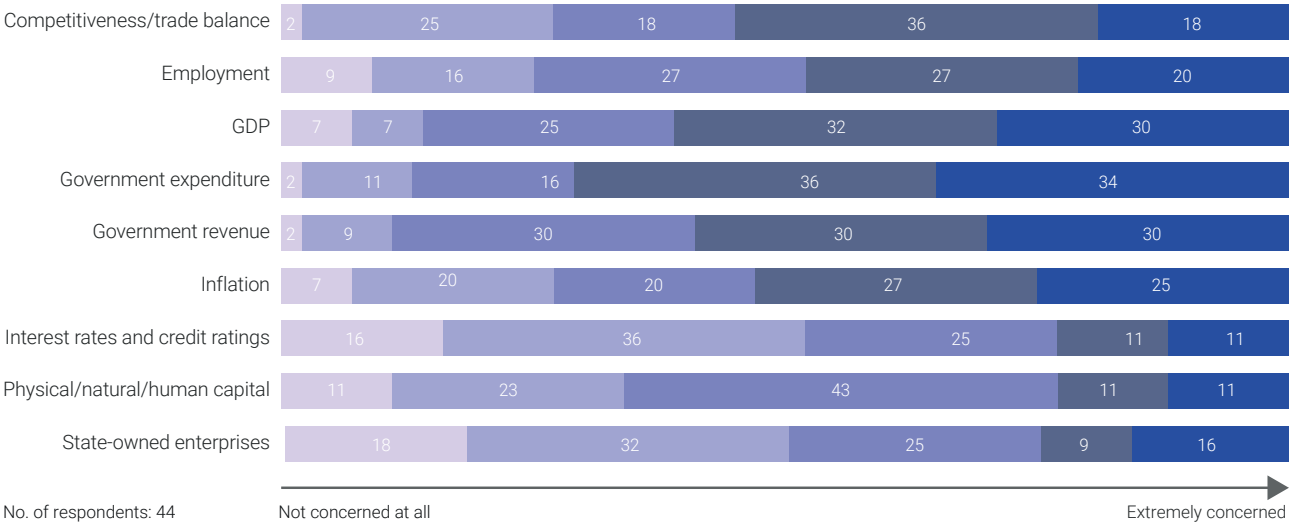
Respondents were asked to rate their concerns about the risks posed by the domestic transition to a low-carbon economy on various macroeconomic variables.[16] Ratings were collected on a scale of 1 (not at all concerned) to 5 (extremely concerned). The assessed variables included: *GDP; real interest rates and credit ratings; employment; government revenues; government expenditures; competitiveness and trade balance; physical, human, and natural capital;* and *the value of SOEs*. Forty-four MoFs provided information on all nine sub-questions and were therefore included in the analysis.

Government expenditure was perceived as the most impacted variable, with a mean rating of 3.9 and 70% of respondents expressing a concern level of 4 or 5 regarding this variable. Concerns about government revenue and GDP were also relatively high, with mean ratings of 3.8 and 3.7, and with 59% and 61% respectively expressing a concern level of 4 or 5 about these variables. The following variables saw lower rates of level 4 or 5 concern: state-owned enterprises (rated at 4 or 5 by 25%), credit ratings and interest rates (23%), and physical, human, and natural capital (23%).

EMDEs reported a higher mean risk perception (3.5) than AEs (3.2) (see Figure 2.6b, and Table 2.4).

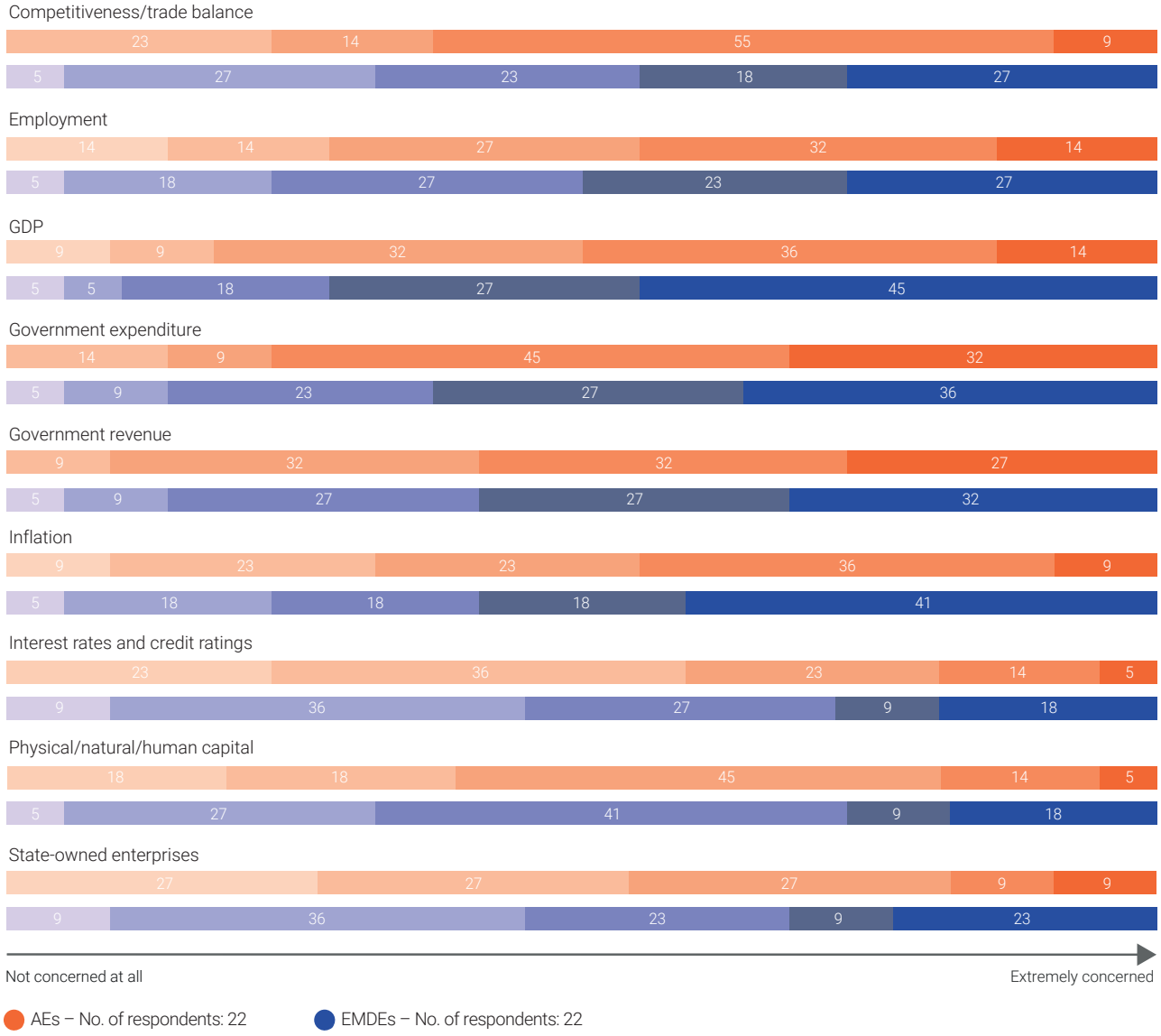
Figure 2.6. How concerned are Ministries of Finance about the impact of national transition risks on key macroeconomic indicators? (%)

a. All Ministries of Finance



[16] Defined as a nationally driven transition to a low-carbon economy. For instance, electrification of transportation might impact taxation without measures to identify alternatives to fuel tax, or the transition might impact jobs in certain sectors.

b. AE and EMDE breakdown



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 about real interest rates, credit ratings, and SOEs are comparatively lower.

However, MoFs' concern varies considerably depending on the 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.

In the qualitative contributions, MoFs identified a variety of transition risks, with a notable focus on financial risks, government revenues, and economic impacts. AEs reported a broader range of concerns, while EMEs and LICs cited fewer risks overall, but greater concern about carbon pricing mechanisms and their potential impact on exports, exposed domestic industries, and government revenues. This concern echoed a general sentiment among Ministries with regard to global climate actions, particularly the potential for increased costs and decreased competitiveness. There were also high levels of concern over tax revenues, especially in the case of EMDEs, whose revenue-generating industries have greater exposure 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.[17] Ratings were collected on a scale of 1 (not at all concerned) to 5 (extremely concerned). The variables included: *GDP; real interest rates and credit ratings; employment; government revenues; government expenditures; competitiveness and trade balance; physical, human, and natural capital*; and *the value of SOEs*. Forty-one MoFs provided information on all nine sub-questions and were therefore included in the analysis.

Competitiveness and the trade balance, as well as GDP, were perceived as being most impacted by the global transition to net zero, with 56% of respondents rating the impact of both as a level 4 or 5 concern. Government expenditure and revenue were also notable concerns, with 51% and 49% respectively rating the impact as a level 4 or 5 concern.

By contrast, interest rates and credit ratings were perceived as being less impacted by the global transition, with 17% of respondents rating the impact of both as a level 4 or 5 concern. Similarly, physical, natural, and human capital taken together was among the variables of least concern (24% rating this variable at 4 or 5).

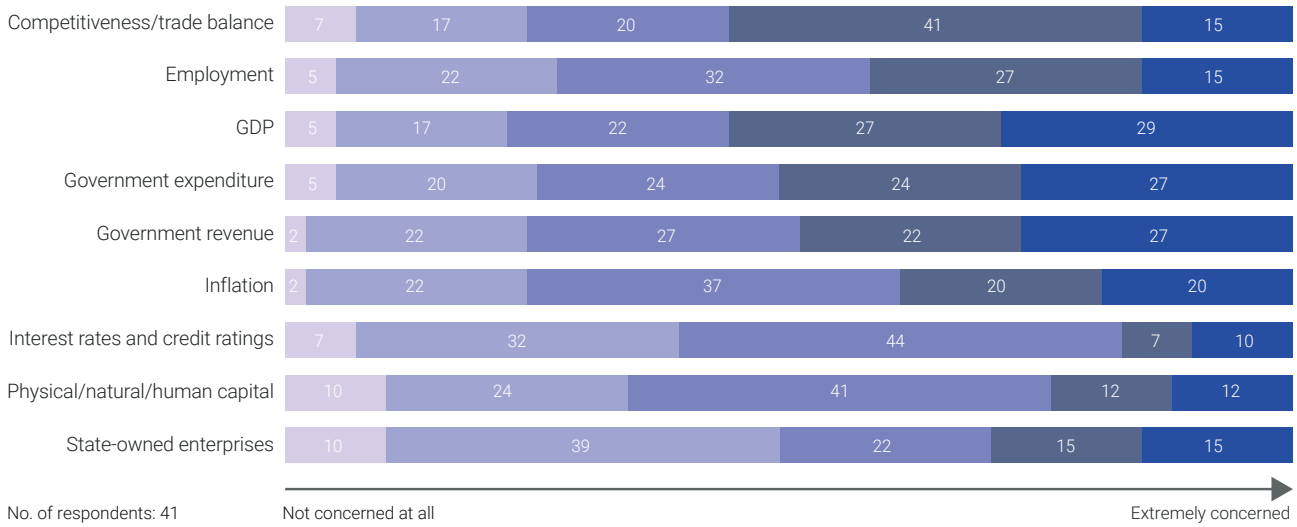
A notable difference emerged between economies of varying development status. EMDEs reported a higher mean perception of 3.4, while AEs had a lower mean of 3.1, suggesting that EMDEs expressed more concern than AEs about the potential macroeconomic impacts of the global transition to net zero (see Figure 2.7b and Table 2.4).

Qualitative insights

Respondents were asked in an open-ended question to comment on the transition risk drivers of particular concern. Overall, 30 countries responded to this question (see Figure 2.8). 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 concerns does not imply a lower level of concern in those categories where EMDEs are represented.

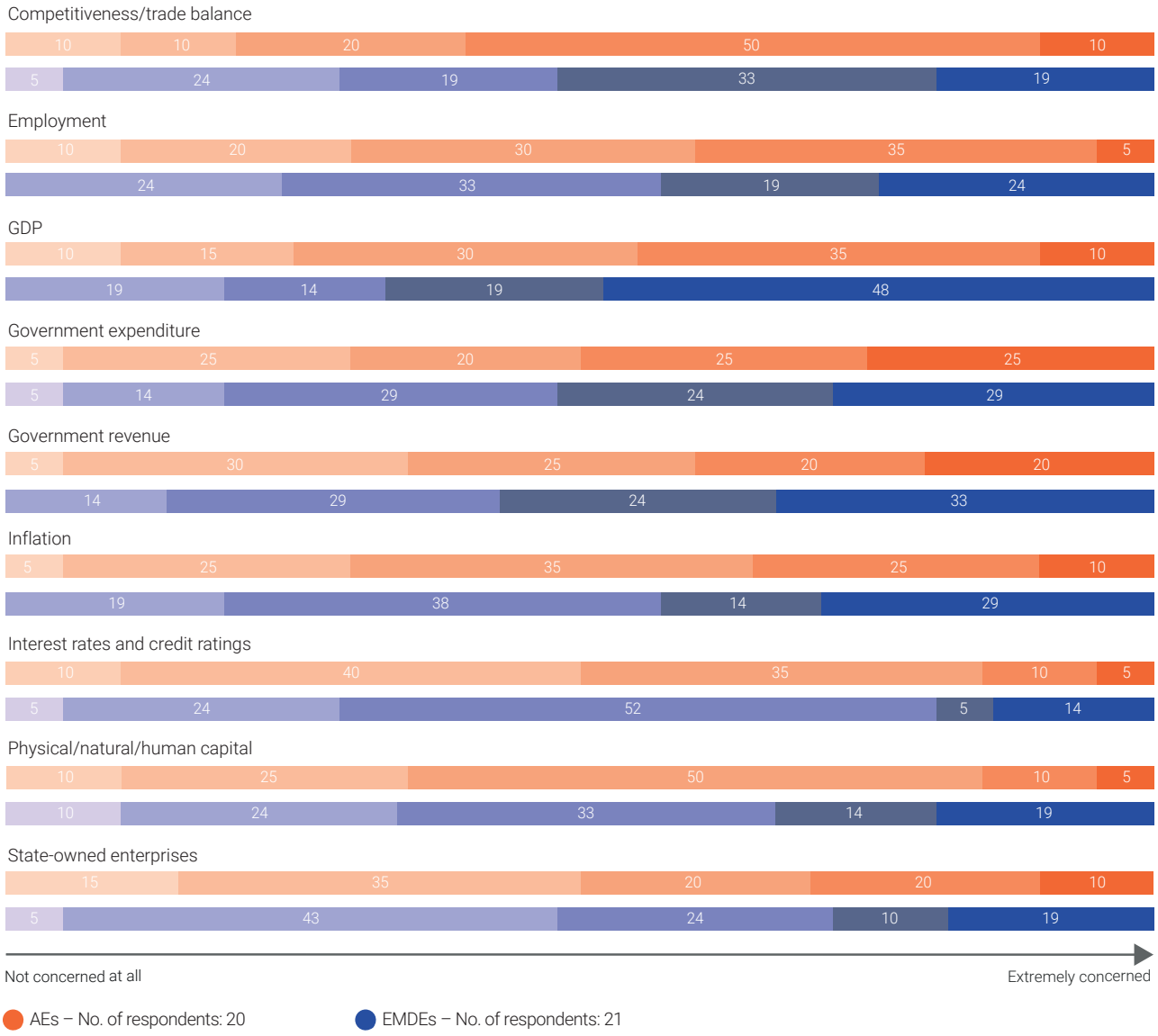
Figure 2.7. How concerned are Ministries of Finance about the impact of global transition risks on key macroeconomic indicators? (%)

a. All Ministries of Finance



[17] Global transition risks refer to the potential macroeconomic implications of a global transition to a low-carbon economy, including from the reduction in global fossil-fuel demand brought about by climate policies and other factors around the world, or the potential impact of other countries' climate policies on the competitiveness of a nation's existing exports.

b. AE and EMDE breakdown



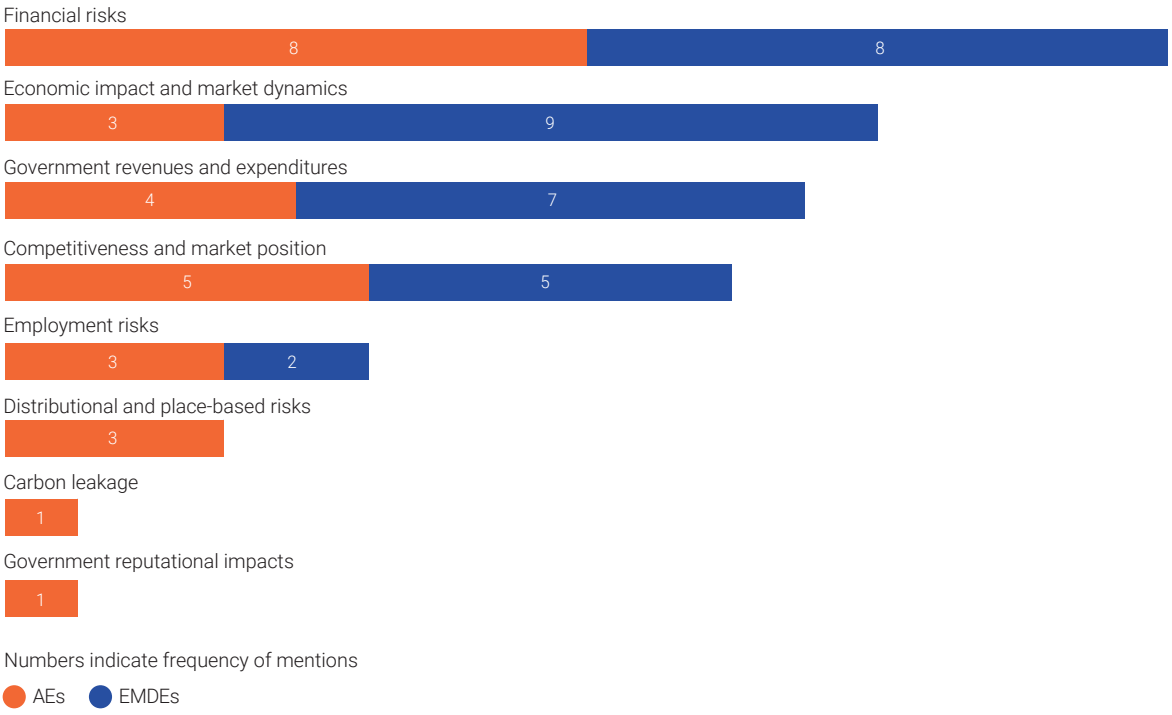
Where MoFs provided sufficient information on transition risk drivers, responses were further categorized to enhance understanding of how transition risk concerns manifested across various mechanisms, sectors, and scales (domestic or global). These contextualizing categories will be examined before exploring the risk categories visualized in Figure 2.8.

Mechanisms, sectors and scale

Transition risk drivers, where adequately detailed by MoFs, were categorized based on the mechanisms through which they manifest. The transition risk mechanisms identified included: *Carbon pricing* (n=6); *renewable energy and net zero transition* (n=6); and *reduced fossil-fuel demand* (n=2).

The *carbon pricing* transition risk included two subcategories: *Carbon border adjustment mechanism* (CBAM) (n=3) and *carbon pricing and taxes* (n=3). Notably, this category exclusively comprised contributions from LICs (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 EMDE Ministries within the sample to respond and adapt to CBAMs.

Figure 2.8. Which transition risk drivers do Ministries of Finance mention the most as being a concern?



In terms of sector-specific transition risks, MoFs most frequently cited manufacturing- and industry-related concerns, particularly with regard to emissions-exposed or -intensive industries (although AEs were absent from this category). These 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 MoF highlighted challenges in aligning dispatchable energy supply with renewable energy production, as well as the potential financial burdens on enterprises and households from the volatility of renewable energy outputs. Similarly, one LIC MoF emphasized the costs businesses face in adapting to international standards in the energy sector. In the transport sector, one AE MoF raised concerns about phasing out fossil fuels for transportation.

The transition risks cited by Ministries were spread across the global (n=8) and domestic (n=7) scales. Global concerns centered on how the global transition would place additional costs on domestic industries, affecting exports of fossil fuels or high-emission products, and investment flows. Domestic concerns pertained to the economic impact of transitioning away from fossil fuels and the impact of the transition on the energy matrix and intermittency. One AE MoF noted that its greater control over the domestic transition had led to higher levels of concern about the global transition.

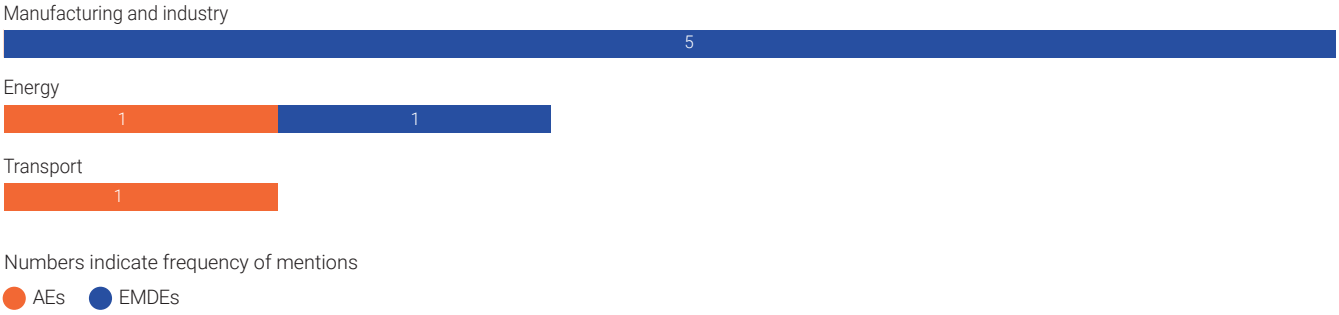
By sector, the manufacturing- and industry-related transition risks largely revolved around the impact of the global transition on domestic economies. Conversely, transport and energy concerns related more to the domestic than the global transition, so were dominated more by AEs' need to navigate risks associated with national decarbonization (see *renewable energy and net zero transition* in Figure 2.9).

Financial transition risks

When it came to individual transition risks, financial risks featured most frequently. Risks reported by MoFs in this category included: *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).

Figure 2.9. Which transition risk mechanisms do Ministries of Finance mention the most as being a concern?

Figure 2.10. Which sectors do Ministries of Finance mention the most as being at risk from the transition?



Financial risks reported by AE MoFs related to investment financing, particularly with regard to potential reputational losses that could adversely affect their investment strategies and international negotiating positions. AEs also noted uncertainty surrounding frictions in labor and capital markets that might hinder the mobilization of private finance for climate-related initiatives. In contrast, LIC economies said they were grappling with increased borrowing costs and the high cost of green capital, making it challenging for them to secure the necessary financing for sustainable projects.

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

On the issue of uncertainty, one AE MoF expressed a lack of clarity on investment needs, complicating planning and decision-making processes. One LIC said rapid changes in tax or economic policies generated significant uncertainty that created risks for businesses and investors. LICs highlighted the risk of stranded assets as a consequence of the global transition to greener economies. Given their 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 associated with 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 groups reporting concern about inflation, including price increases for food and energy due to carbon taxes or power-plant

retrofitting. One AE also reported a desire to understand how the transition would impact consumption, while one EME expressed anxiety about a period of economic depression that might accompany the net zero transition.

In contrast, only EMDEs voiced concern about trade and investment, including disrupted trade flows, foreign and national investment, and supply-chain disruption. This manifested in concerns over geopolitical conflict disrupting global supply chains and international trade, and the impact of international climate policies on trade and investment.

Government revenues

Government revenue-related concerns raised by MoFs included: *tax revenues* (n=6); *funding* (n=3); *public debt* (n=1); and *revenues from government-owned companies* (n=1).

AE MoFs voiced 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 revenue-related concerns. Two EMEs said government income from oil extraction played a crucial role in their overall state finances, with oil revenue accounting for 33% of the budget and 29% of total exports in one country. However, another country said it was now exploring new avenues to bolster tax revenues and develop green budgeting by developing green industries, such as green hydrogen and copper and lithium mining to support battery manufacturers, and investing in renewable energy. The LIC that mentioned a tax-revenue concern underscored the detrimental impact that global carbon taxes could have on domestic public-sector revenues.

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

Competitiveness and market position

AEs cited 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 CBAMs). Within EMDEs, more LICs (n=2) than EMEs (n=1) expressed concern about competitiveness generally. One EME mentioned unrealized natural resource rents (and the opportunity cost of foregone revenues) as a key transition risk. While both AEs and EMEs said taking advantage of transition opportunities was a key concern, this did not feature among LICs.

Employment risks

The most prominent employment-related risk raised by MoFs was employment distribution and labor-market transformation (n=3). Here, one AE reported a high level of concern about the distribution of future employment opportunities across sectors, communities and workers, particularly in 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 transformation in the context of the energy transition and potential re-industrialization.

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

Other transition risks

The remaining transition risks were raised by AE MoFs. Distributional and place-based risks included distributional impacts across income groups, regions, occupations, and industries, the difficulties of estimating place-based impacts, and the impact of the net zero transition on inequality and wealth distribution. One MoF emphasized that if governments lowered their climate ambitions, or failed 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 modeling the impact of these policies, resulted in difficulties understanding the risk of (particularly EU) policies on carbon leakage.

Economic opportunities

Ministries of Finance differ in their approach to 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 such evaluations at all. No notable differences were found between EMDEs and AEs, suggesting a broadly similar approach to green economic assessments.

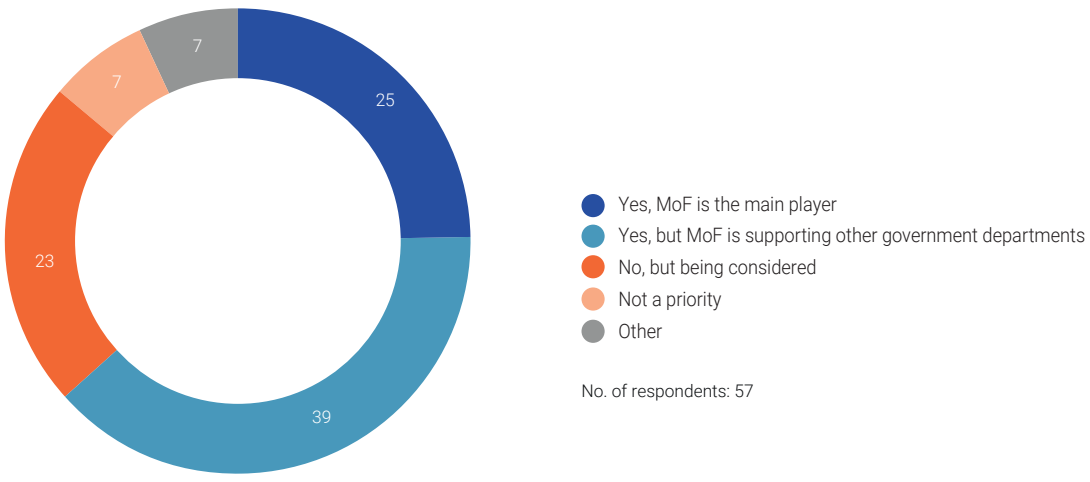
MoFs appear keen to capitalize on both current and potential comparative advantages, particularly those that can be strengthened through proactive climate action. Moreover, energy independence, insulation from geopolitical volatility, and protection from price instability and foreign influence are of paramount importance to Ministries in all development stages. AEs frequently cited opportunities pertaining to intellectual property, diversification, and green technology, while LICs generally noted a narrower range of potential benefits, primarily the avoidance of physical risks, investment, and job creation (areas that received fewer mentions by AEs). This suggests that LICs see limited opportunities from climate action, highlighting the significant challenges they face in accessing the full range of climate-related benefits. Further emphasizing the disadvantage, countries citing comparative advantage saw it as a prerequisite to unlocking the additional benefits of climate action, such as job creation, business growth, and stronger public finances through the transition to low-carbon technologies.

Quantitative insights

Respondents were asked if their Ministry undertook economic analyses to assess the impacts of policies aimed at creating green economic opportunities, including the potential economic benefits of green policies on key indicators such as GDP, trade flows, competitiveness, employment, and productivity. Respondents could choose one of 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.

Twenty-five percent of respondents said their Ministry played a leading role in designing and considering the impacts of green economic policies. The majority, 39%, said the Ministry supported other government departments in this area. Twenty-three percent stated that, although their Ministry did not conduct a formal analysis, some consideration was given to identifying relevant policies (see Figure 2.11).

Figure 2.11. Do Ministries of Finance undertake economic analyses to assess the impacts of policies aimed at creating green economic opportunities? (%)

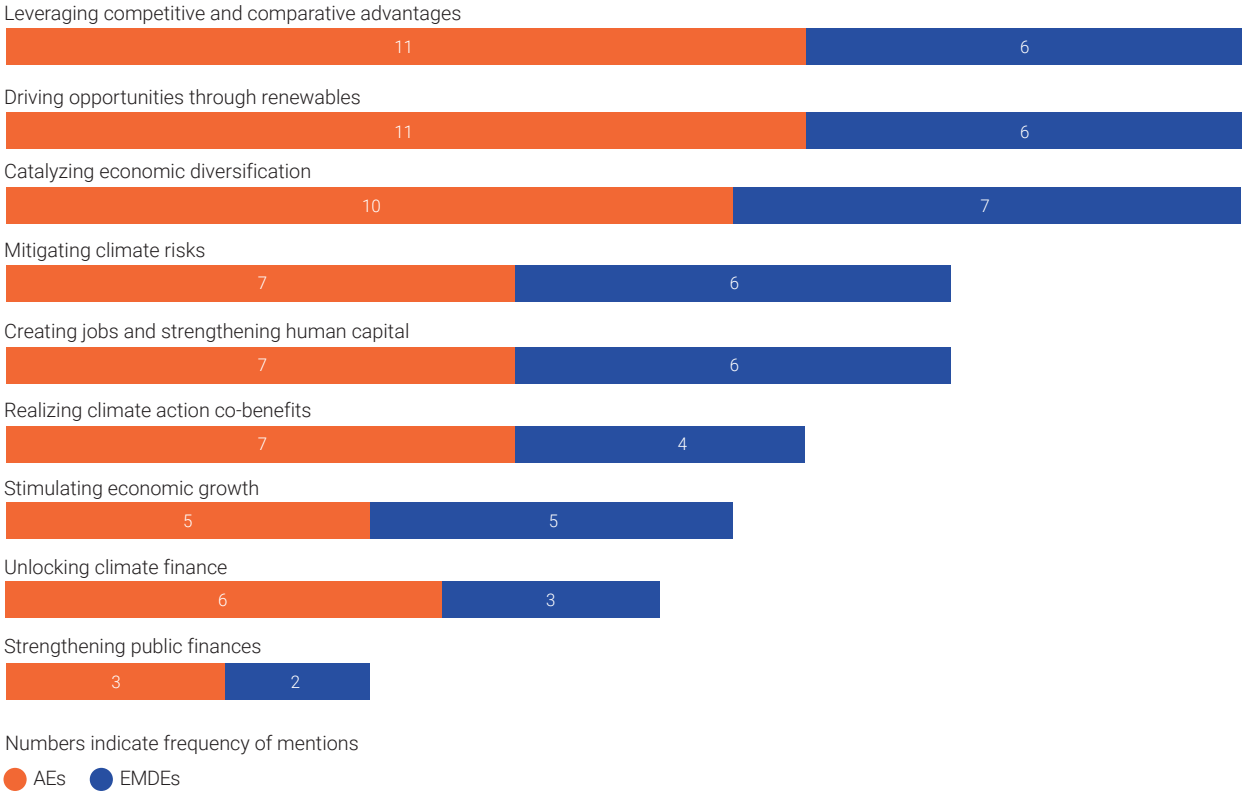


Further analysis suggests that both EMDEs and AEs have a similar distribution in terms of their Ministries' engagement in assessing green economic opportunities, be it in a leading role, in a supportive function, or as an exploratory consideration.

Qualitative insights

Respondents were asked to identify what they considered to be the most important positive economic impacts or opportunities of climate action.[18] Thirty-eight MoFs responded to this question, with the most frequently cited opportunities being: *leveraging competitive and comparative advantage; catalyzing economic diversification; driving opportunities through renewables; mitigating climate risks*; and *unlocking climate finance* (see Figure 2.12).[19]

Figure 2.12. Which potential positive economic impacts or opportunities resulting from climate action do Ministries of Finance mention the most?



Catalyzing economic diversification

MoFs frequently mentioned opportunities related to catalyzing economic diversification, underscoring how supportive climate policies can incentivize domestic innovation in green technologies, which can, in turn, enhance green supply chains and manufacturing capabilities. Specific opportunities in this category were: *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).

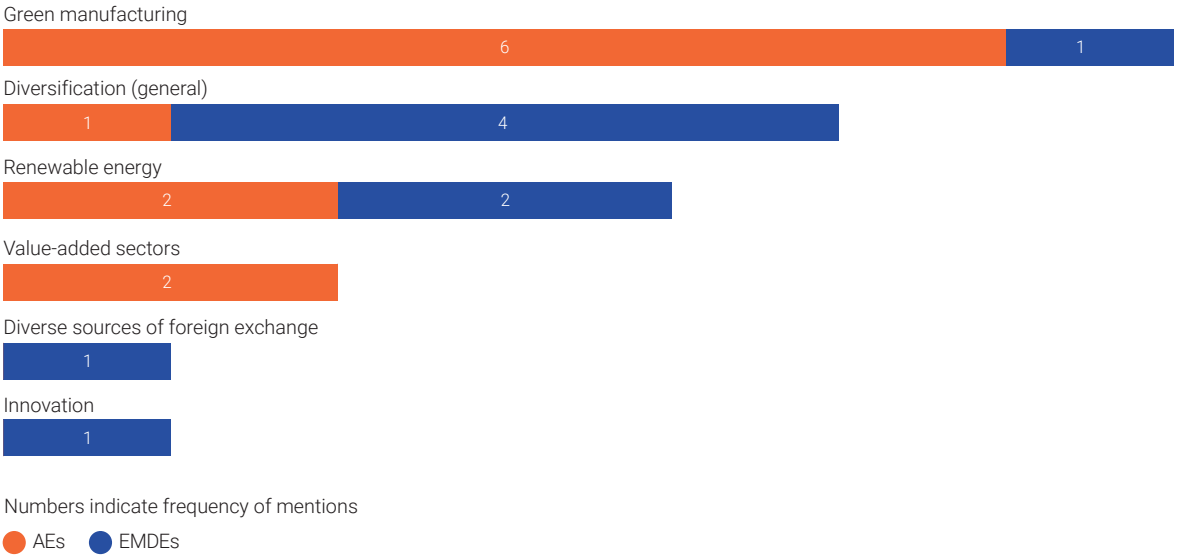
AE MoF responses frequently centered on discussions around green manufacturing capacity, emphasizing several key areas for development, including scaling up negative-emission industries and enhancing manufacturing capabilities in clean energy supply chains, particularly with regard to critical minerals. There was also a strong focus on the production of green steel, in addition to new economic sectors arising from the green transition, such as batteries and hydrogen technologies.

[18] 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.

[19] Countries were also asked to specify the expected time horizons over which these benefits might accrue: short-term (1–2 years), medium-term (2–5 years), or long-term (5–25 years). However, countries did not generally respond to this element of the question, so it was excluded from the analysis.

EMEs most frequently mentioned opportunities to be gleaned from the diversification of the industrial sector, the export basket, and economic activities more generally. One LIC cited an opportunity to diversify the local energy supply chain using renewables.

Figure 2.13. Which potential positive economic impacts or opportunities resulting from climate action related to catalyzing economic diversification do Ministries of Finance mention the most?



Pursuing opportunities from renewables

Respondents noted many opportunities to be had from supporting the transition to renewable energies (see Figure 2.14). Ministries in all categories highlighted the importance of reducing foreign dependence on fossil fuels and thereby improving energy security, making energy independence and energy security the most frequently cited opportunities associated with renewable energy. This highlights the paramount and universal importance of autonomy and reduced exposure to geopolitical risk to MoFs globally.

AEs cited opportunities across the board in this category, apart from energy accessibility through decentralized solar deployment, something that was mentioned by just one LIC. Only AEs cited energy price stability and energy efficiency from renewables deployment as potential opportunities.

Figure 2.14. Which potential positive economic impacts or opportunities resulting from climate action related to renewable energy do Ministries of Finance mention the most?

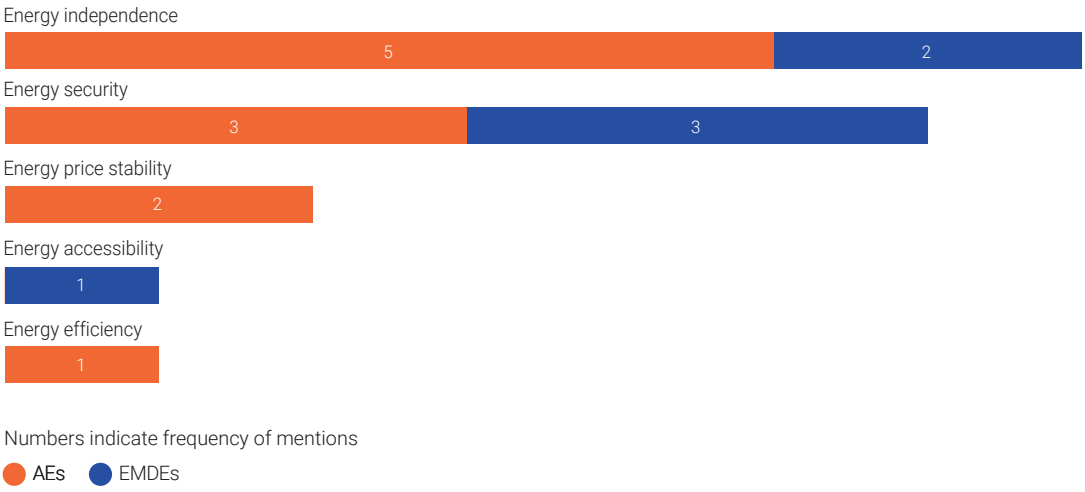
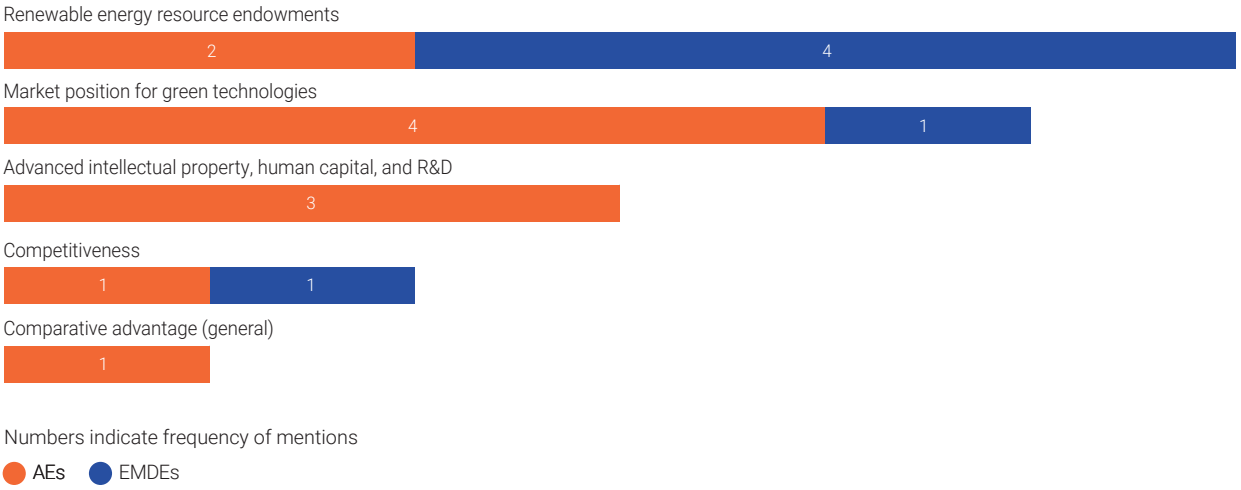


Figure 2.15. Which potential positive economic impacts or opportunities resulting from climate action related to comparative advantage do Ministries of Finance mention the most?



Leveraging comparative and competitive advantage

Country responses that fell into the *leveraging comparative and competitive advantage* category referenced the exploitation of existing competitive and comparative advantages, or explicitly mentioned gaining an advantage from an export-oriented perspective (see Figure 2.15).

AEs dominated this category, reporting a desire to seize long-term competitive advantage, boost exports, accelerate economic growth, and secure the positioning as a global leader in green industries that can come with being an early and decisive player in climate action. These countries linked this to their advantageous market position, human capital, R&D capacity, and advanced intellectual property status. EMDEs, particularly EMEs (n=4), more frequently cited opportunities to be had in taking advantage of renewable energy resource endowments, though they were still overshadowed by AEs in this category.

Only one LIC mentioned an opportunity in this category, noting how countries and companies that took the lead in clean technologies, electric vehicles, and energy storage could become global leaders, boosting growth and exports in the medium to long term.

Creating jobs and strengthening human capital

Three employment opportunities addressed by MoFs included *job creation* (n=8); *human capital development* (n=2); and *labor productivity* (n=1). On employment, Ministries acknowledged that investment in green sectors (i.e., renewables, green manufacturing, and critical minerals) could potentially generate employment in the short, medium, and long term. Two AE MoFs highlighted that the green transition, for example through just transition policies, would result in the re-skilling and up-skilling of the workforce, leading to human capital accumulation. One EME noted potential improvements to labor productivity.

Mitigating climate risks

Rather than opportunities, many Ministries noted the avoidance of risk as a key opportunity to be had from climate action. In particular, countries noted that climate action would be accompanied by: *avoided physical risks* (n=10); *avoided financial risks* (n=3); *avoided economic and employment risks* (n=2); and *avoided health risks* (n=1).

Realizing climate action co-benefits

The co-benefits of climate action cited by Ministries included: *air quality and public health* (n=4); *protecting biodiversity* (n=3); *ecosystem services* (n=1); and *food security* (n=1). The most frequently reported co-benefits were a reduction in environmental health hazards and better public health and wellbeing outcomes related to air quality improvements. This was followed by the protection of biodiversity and natural resources. While AEs reported potential co-benefits from all four opportunities in this category and EMDEs reported only two, responses were largely similar within each theme, regardless of development stage.

Unlocking climate finance

Many Ministries noted 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 cited by EMDEs (n=4). EMEs listed potential opportunities arising from global climate access, namely increased access to and the crowding-in of green foreign direct investment, including sustainable financing and green technologies. LICs said a policy emphasis on renewable energy could boost private investment, with green finance initiatives, such as green bonds and responsible investments, increasingly attracting capital for businesses adopting sustainable practices. One AE also said that climate action could attract and enable investment in its domestic renewable energy transition, particularly in rural areas.

AEs noted an additional financial opportunity in investing in domestic innovation and manufacturing capabilities in clean energy supply chains, including critical minerals, green steel, and green hydrogen, to strengthen economic resilience and security, and to create new jobs. One LIC cited a potential opportunity in the construction and resource management sectors. One EME observed that capitalizing on these opportunities would necessitate ensuring certainty for investors.

Strengthening public finances

Five countries (three AEs and two EMEs) cited strengthening public finances as a potential opportunity of climate action, noting the fiscal opportunities to be had from climate action. These included a rise in public revenue from an increase in renewable energy production, or a comparative advantage in low-carbon technologies, and enhanced capacity to invest in sustainable development projects.

2.3. Priorities for climate policy design and implementation

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

Economic prioritization

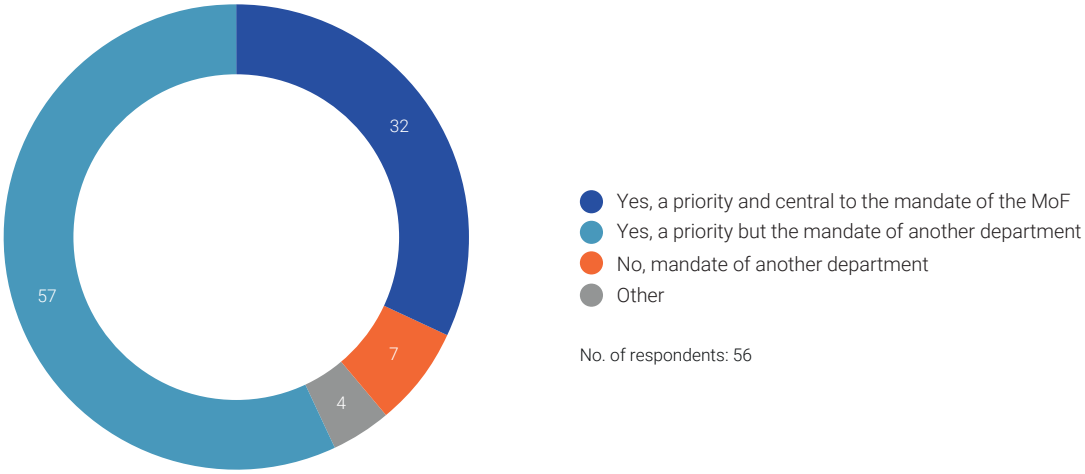
> Ministries of Finance see climate action as an important economic consideration, but often view their role as supporting climate initiatives led by other departments rather than leading these efforts directly. While a portion of MoFs consider climate action central to their mandate, most focus on facilitation rather than primary responsibility.
>
> Qualitative responses also show that, even when direct climate strategy is led by other departments, MoFs often play a critical role in integrating climate goals into public finance, prioritizing sustainable growth, and supporting cost-effective carbon management.

Quantitative insights

Respondents were asked whether their Ministry viewed climate action as a core economic issue, central to its mandate, or primarily as the responsibility of other government departments. Four response options were provided, with respondents allowed to select only one: *yes, climate action is seen as a key economic priority and central to the Ministry's mandate; yes, climate action is an important economic consideration, but the Ministry mainly focuses on helping accelerate action by other departments; no, climate action is mainly the mandate and responsibility of other government departments;* and *other*. A total of 56 responses were recorded.

Thirty-two percent of respondents indicated that their MoF viewed climate action as a key economic priority, central to its mandate. The majority, 57%, said climate action was an important economic consideration, but that the Ministry focused primarily on supporting and accelerating actions by other departments. A smaller proportion,

Figure 2.16. Does the Ministry of Finance consider climate action a core economic issue? (%)



7%, said climate action was mainly viewed as the responsibility of other departments (see Figure 2.16). While AEs and EMDEs have similar views on climate as a core economic issue (92% of AEs and 87% of EMDEs consider it a core issue), more EMDEs consider it central to the mandate of the MoF (40%, versus 23% of AEs). By contrast, more AEs consider climate action the priority of another department (69%, versus 47% of EMDEs).

Qualitative insights

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

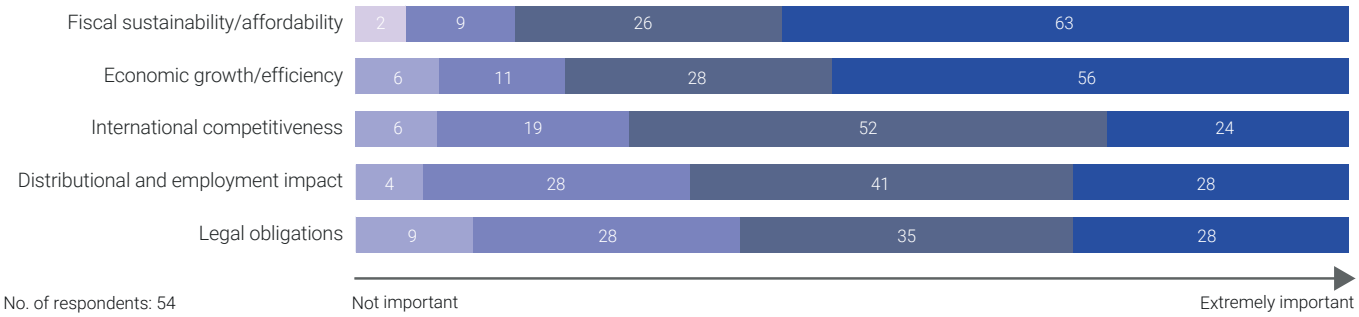
Climate policy decision-making criteria

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 slightly less critical, with fewer respondents rating them as highly important.

While there is broad alignment between emerging and advanced economies on prioritizing fiscal sustainability and economic growth, EMDEs tend to value economic growth slightly 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 the policy design of climate-related initiatives in different economic contexts.

Respondents were asked to rate the importance of several key policy considerations when designing climate-related policies in their Ministry. The response scale ranged from 1 (not important at all) to 5 (extremely important). Options included: *economic growth and efficiency; international competitiveness; distributional and employment impacts; fiscal sustainability and affordability;* and *legal obligations*. Fifty-four MoFs provided information on all five sub-questions and were therefore included in the analysis.

Figure 2.17. How important do Ministries of Finance rate key policy considerations when designing climate-related policies? (%)



Fiscal sustainability was the highest-rated policy criterion, with 89% of respondents rating it as 4 or 5 on the importance scale, suggesting MoFs place a strong emphasis on the long-term fiscal impacts of climate-related policies. This was followed by economic growth and efficiency, with 83% of respondents rating it a 4 or 5. Meanwhile, international competitiveness and distributional and employment impacts were also rated highly, with 76% and 69% rating them a 4 or 5, respectively (see Figure 2.17).

Legal obligations, in contrast, including those related to international agreements such as the UNFCCC and the Paris Agreement, were rated comparatively lower. Sixty-three percent of respondents rated this criterion as a 4 or 5, suggesting that legal commitments are less of a priority than economic and fiscal considerations for some Ministries when designing climate-related policies.

While there is broad alignment between EMDEs and AEs on prioritizing fiscal sustainability and economic growth, EMDEs tend to value economic growth slightly more than AEs (with a mean rating of 4.5 for EMDEs and 4.2 for AEs). AEs place slightly more weight on legal obligations, including those related to international agreements, such as the UNFCCC or the Paris Agreement (with a mean rating of 4.0 for AEs, and 3.7 for EMDEs).

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 such as strengthening the resilience of public finances, green budgeting, and greening central banks, with a substantial portion of respondents indicating that such topics are either under consideration or not being pursued.

Implementation in AEs is somewhat more advanced than in EMDEs. In particular, EMDEs are more commonly not yet implementing green fiscal subsidies, strengthening the resilience of public finance, or green budgeting, or considering doing so.

Respondents were asked to rate the level of engagement of their MoF in key climate policy areas. Respondents were allowed to select just one option from the following: (1) *currently not being considered by the Ministry of Finance* (with the option to provide a qualitative explanation); (2) *currently under consideration*; (3) *currently being implemented;* and (4) *other*. They were also encouraged to provide a brief explanation of the reason for their selection, where appropriate. Forty-six MoFs provided information on all 12 sub-questions and were therefore included in the analysis.

The results suggest that MoFs are actively implementing, or involved in the implementation of, climate policies in a range of different areas, with substantial variations from policy to policy (see Figure 2.18). More than half of MoFs are engaged in shaping national climate strategies (65%), mobilizing funding (59%), providing green fiscal

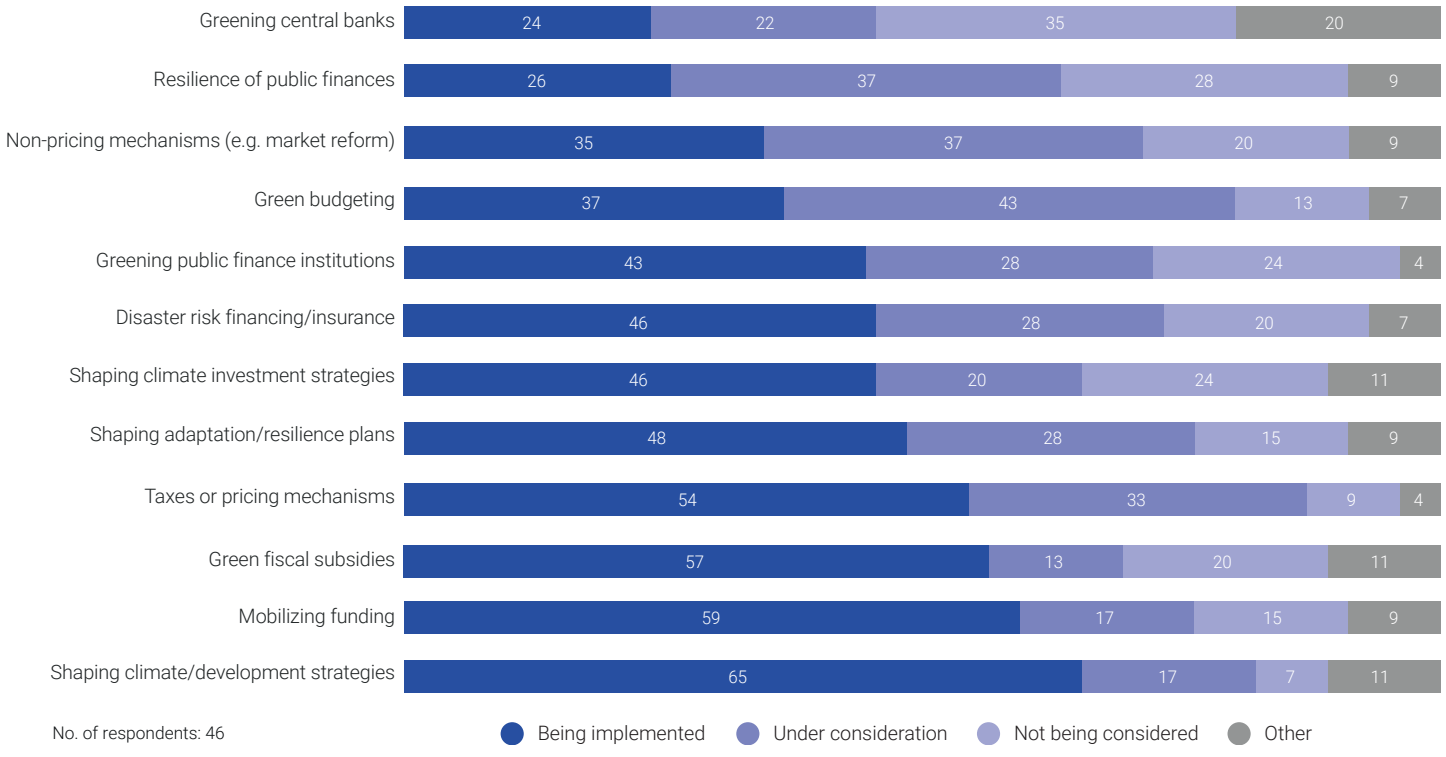
subsidies (57%), and using taxes and pricing mechanisms to change market incentives (54%). Many MoFs are considering the following policies: embedding green budgeting in national budget processes (43%), implementing non-pricing mechanisms to change market incentives (37%), and strengthening the resilience of public finances for a net zero economy (37%). Over a quarter of MoFs are not currently considering taking action to green central banks (35%), or boosting the resilience of public finances for a net zero economy (28%).

Implementation in AEs is somewhat more advanced than in EMDEs, particularly around mobilizing funding (being implemented by 77% of AEs and 42% of EMDEs) and introducing taxes or pricing mechanisms (being implemented by 73% of AEs and 38% of EMDEs).

Implementation in EMDEs is particularly lagging behind on strengthening the resilience of public finance (which 46% of EMDEs and 9% of AEs are not yet considering), green fiscal subsidies (not being considered by 33% of EMDEs and 5% of AEs), and green budgeting (not being considered by 25% of EMDEs, whereas no AEs said they were not considering this).

Figure 2.18. Which climate-related policies are Ministries of Finance engaging with? (%)

a. All Ministries of Finance



b. AE and EMDE breakdown

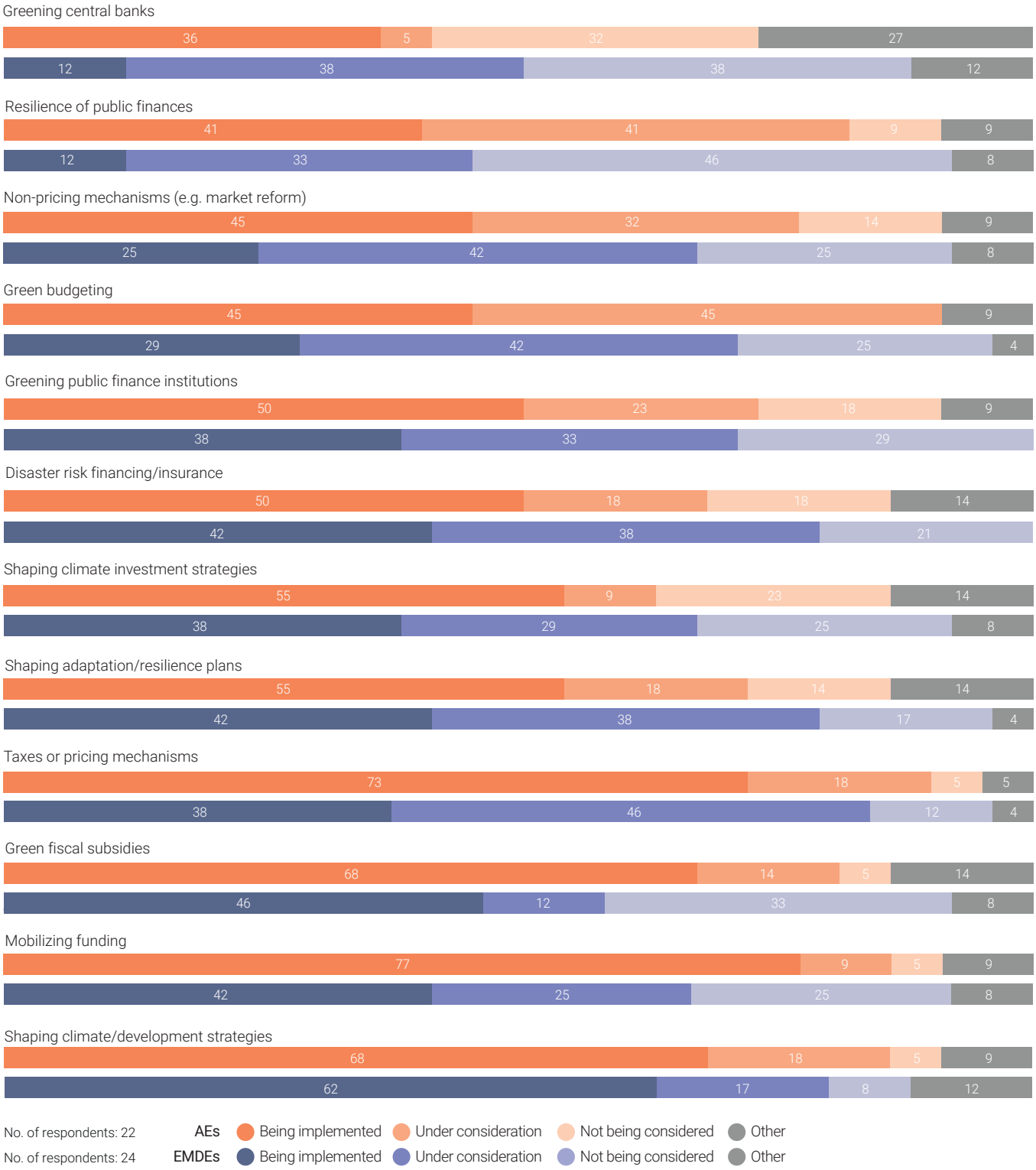


Figure 2.19. Which key issues do Ministries of Finance most often identify as having insufficient information to address?

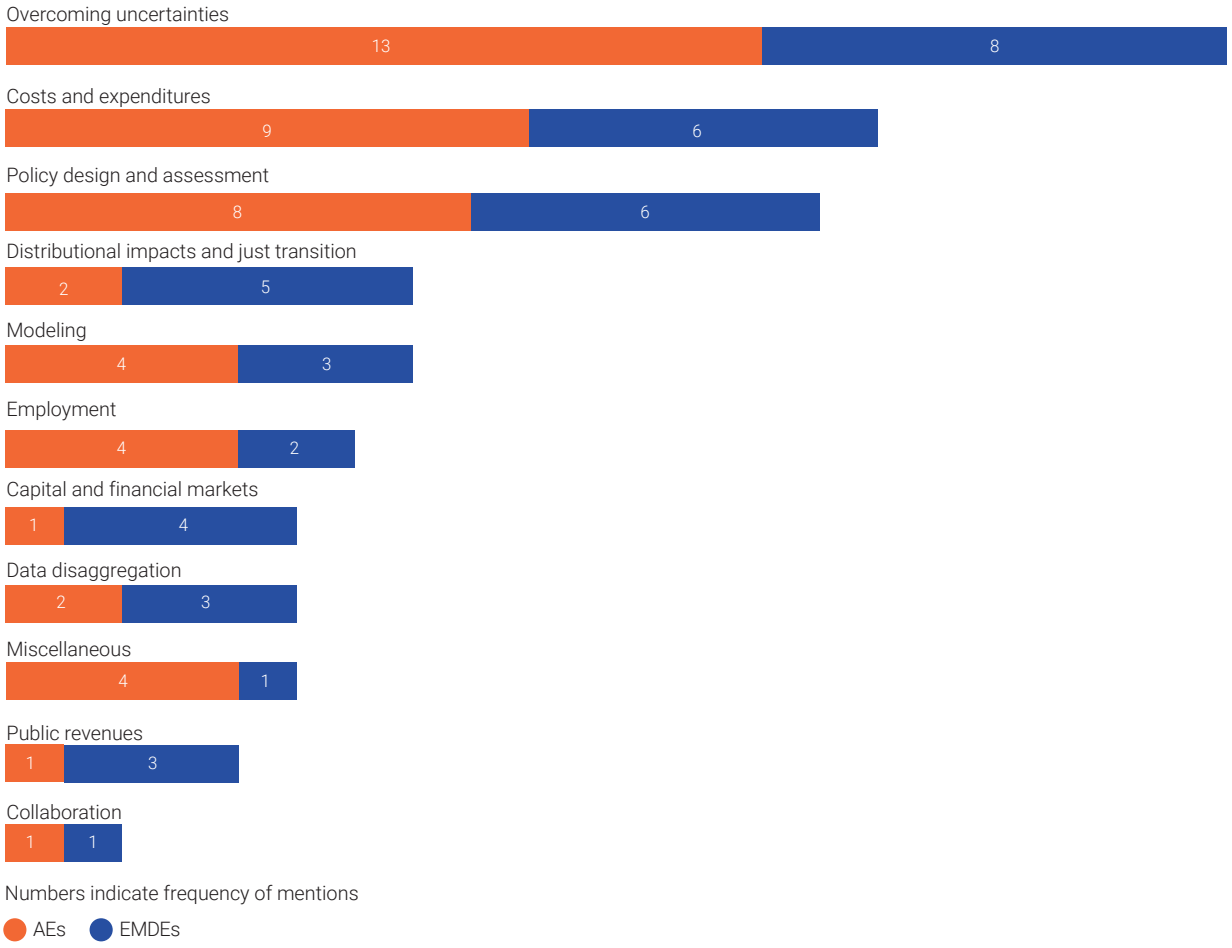
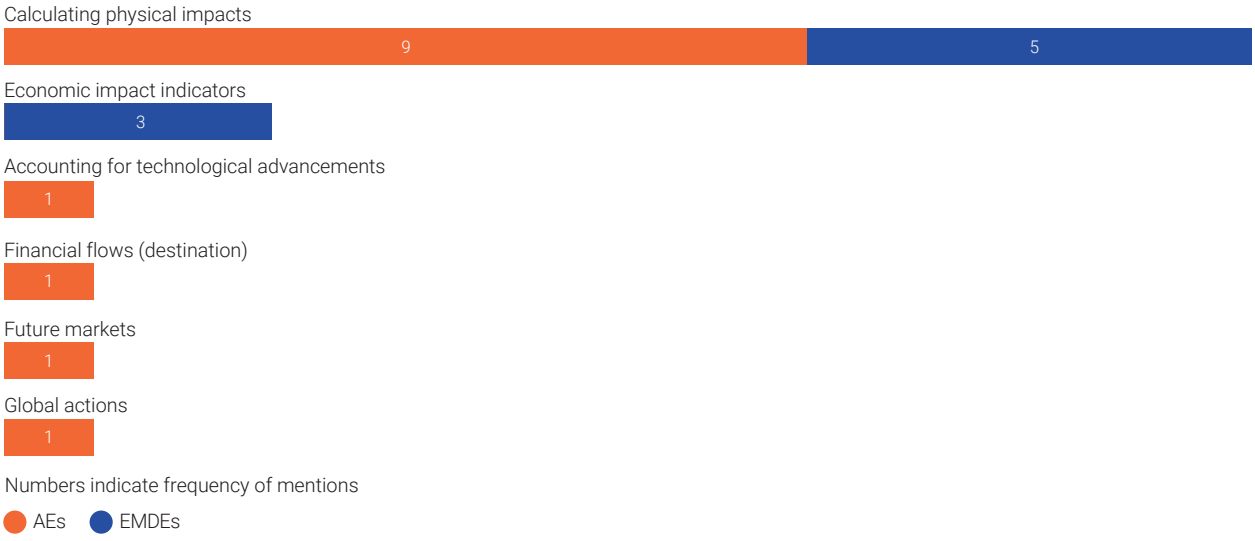


Figure 2.20. Which areas related to overcoming uncertainties do Ministries of Finance most often identify as having insufficient information to address?



Key policy and analytical questions

Ministries of Finance said they were grappling with a range of urgent climate-related policy questions in several critical areas, including overcoming uncertainties, costs and expenditures, policy design and assessment, and data disaggregation. These questions often involved key policy instruments, such as tax policies and carbon pricing. Low-income countries said they were prioritizing immediate adaptation needs, while EMEs and AEs were balancing adaptation and mitigation in their agendas. For many countries, the costs associated with adaptation and mitigation, as well as the physical climate change risks, remain opaque, hindering their capacity to undertake cost-benefit analyses for climate action to select the best policies, or justify budgetary expenditures. In addition, Ministries' desire to seize comparative advantage is offset by a lack of knowledge of how to do so and a dearth of information in key areas, ultimately hindering their ability to take the decisive action needed to achieve climate and climate-related strategic goals.

Qualitative insights

Ministries were asked to identify the most pressing climate-related policy and analytical issues that they currently had insufficient information to address (Figure 2.19). The response format was open-ended, encouraging countries to provide detailed qualitative insights. Twenty-eight MoFs provided responses, citing a wide range of climate-related topics, most of which fell into the following categories: *overcoming uncertainties; costs and expenditures;* and *policy design and assessment*. These categories are explored in detail below, followed by a comprehensive meta-analysis of the specific policy tools associated with them.

Questions on overcoming uncertainties

The uncertainties that emerged across MoF responses centered on insufficient data on climate risks and actions, emissions, and adaptation costs, which made it difficult to assess the financial impact of climate policies, plan for risks, and prioritize investments (Figure 2.20). AEs cited a more diverse array of uncertainties in this category, but Ministries at 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 so as 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 and 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 2.21).

Questions on mitigation and transition costs were the most frequent ones within this category. AEs expressed uncertainty about the costs of sectoral abatement technologies and overall energy transition investment needs,

Figure 2.21. Which issues related to costs and expenditures do Ministries of Finance most often identify as having insufficient information to address?

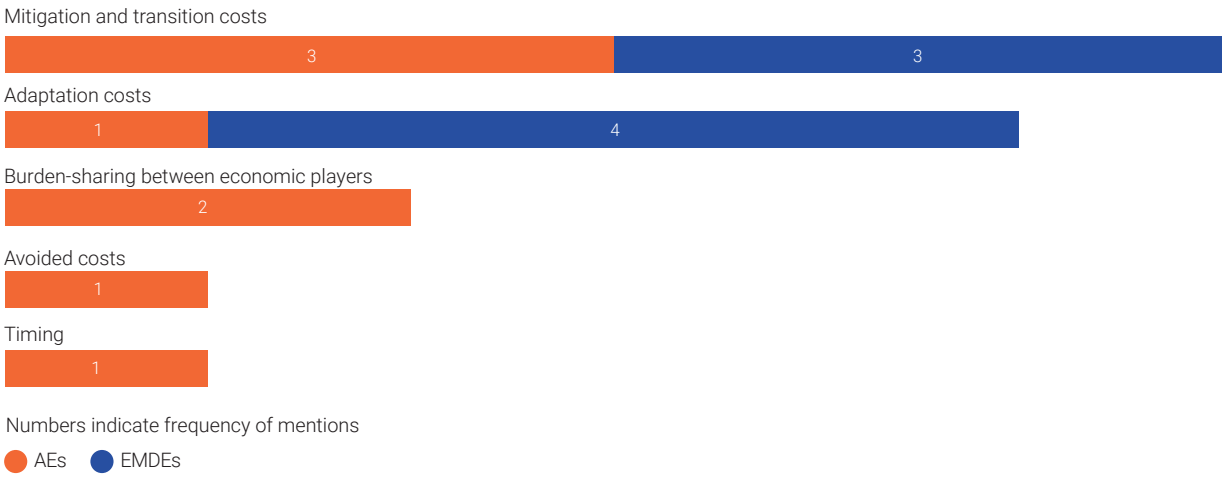
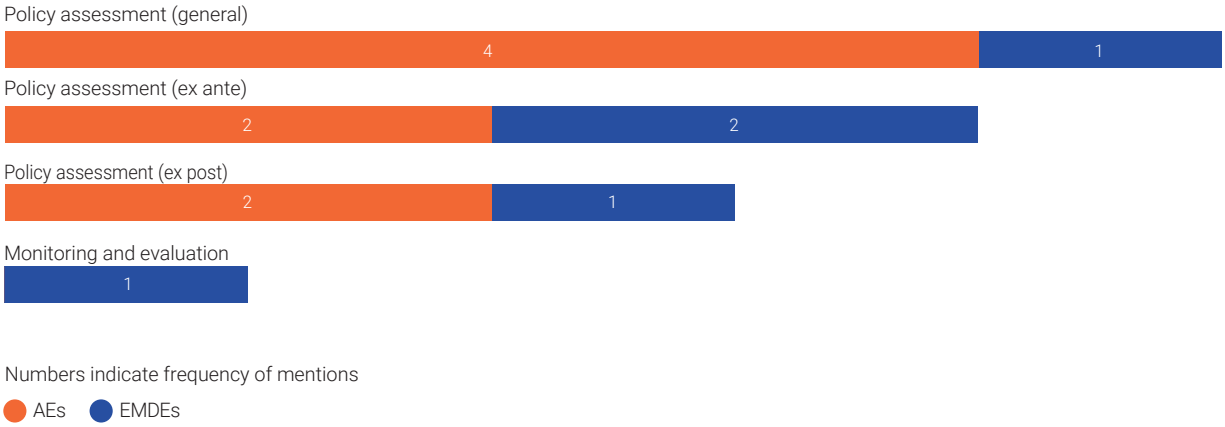


Figure 2.22. Which issues related to policy design and assessment do Ministries of Finance most often identify as having insufficient information to address?



as well as the best ways to decrease the cost of capital for clean energy projects in EMDEs, and to scale up the mobilization of private capital. EMEs expressed uncertainty over the costs of implementing carbon pricing measures, as well as the precise costs in the short and long term of various climate change mitigation strategies. LICs noted uncertainty over how to fund climate mitigation projects.

One AE highlighted a lack of clarity over how to quantify adaptation costs, but EMDEs expressed greater uncertainty overall. EMEs commented on the lack of disclosure of adaptation costs compared with mitigation costs, and how the lack of data on cost estimates for adaptation measures hindered effective planning and resource allocation for climate resilience. In addition, one EME emphasized the importance of understanding the precise short- and long-term costs and benefits of various adaptation strategies. LICs, which voiced slightly higher concern over adaptation than mitigation costs, inquired as to the costs of public- and private-sector infrastructure for adaptation, as well as how these costs would be financed.

Questions on policy design and assessment

AEs exhibited a greater, and more granular, interest in questions regarding policy design and assessment. Countries cited the need for policy assessment to improve design and effectiveness; to improve ex-ante projections for economic impacts; to better understand the effects of decarbonization policies (particularly those of emissions-intensive industries); and to better understand the effects of adaptation policies (particularly with regard to quantifying avoided physical risks) (Figure 2.22).

One EME raised the question of how to identify the most effective metrics and indicators for monitoring progress on climate action and its economic impacts, emphasizing the importance of enabling timely policy adjustments and rollbacks, as well as more informed future policymaking based on observed outcomes.

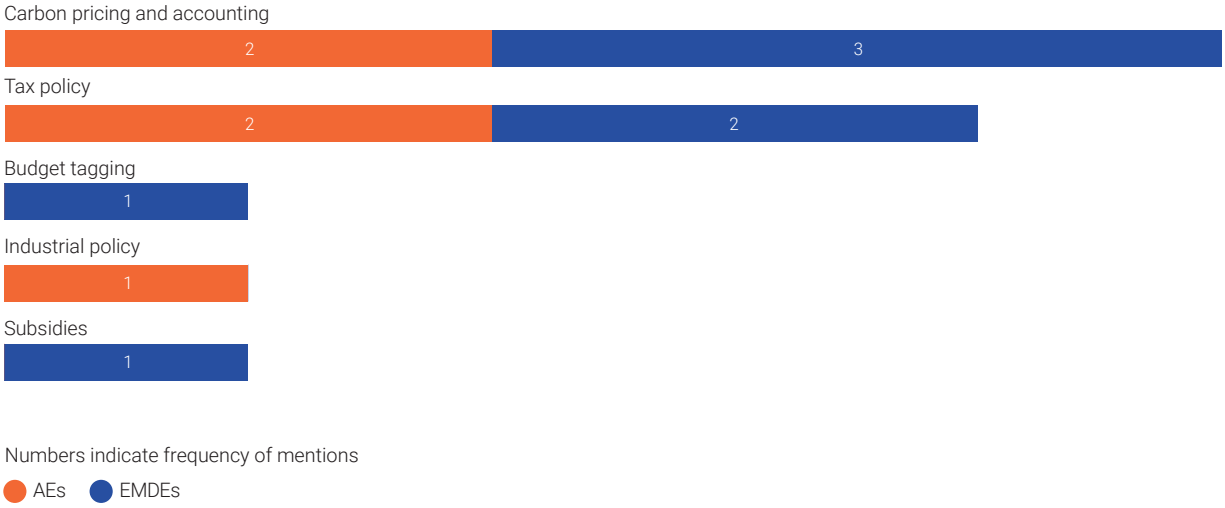
Questions on modeling

Only AEs and EMEs raised questions about modeling. AEs' questions related to modeling the economic impacts of climate change and adaptation (n=1); the theory of, 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 they 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 predictions of the economic impacts of climate policies (n=1).

Questions on distributional impacts and just transition

In this category, countries most frequently raised questions about coordinating a just transition (n=6). In relation to mitigation policies generally, one AE raised a question about the effects of different policies (including taxes and regulation) on income distribution, particularly from a macroeconomic perspective. One EME posed questions on impacts across different socioeconomic groups and the measures needed to ensure a just transition. Two EMDEs asked about mechanisms to ensure that the costs of the low-carbon economic transition did not fall disproportionately on vulnerable populations, as well as the estimation of social impacts of the energy transition.

Figure 2.23. Which policy instruments do Ministries of Finance most often identify as having insufficient information on?



Within the context of coordinating a just transition, two countries addressed carbon pricing specifically. One AE asked about estimating carbon pricing impacts on citizens through distributional analysis, as well as steps for countering adverse impacts. One EME asked how to minimize disproportionate impacts on vulnerable populations. Another EME raised a question on climate policy more generally, on sourcing disaggregated data for investigating social impacts and designing inclusive policies to protect vulnerable groups through modeling.

Questions on 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 said that existing approaches to generating cost estimates were largely top-down and economy-wide and that this, as the sectoral focus of many exercises, did 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 one particular sector relative to another. Another AE cited the need to understand local physical climate change impacts to permit more detailed and cost-effective adaptation planning.

EMDEs expressed the need for socioeconomic data disaggregated by income, gender, region, and other factors to understand how climate policies affect different population groups and potentially exacerbate existing inequalities, so as to design inclusive policies that protect vulnerable groups. They also expressed the need to understand localized long-term climate projects and how different sectors will be affected by climate change and climate policies. EME responses dominated in this area, while LICs did not provide any responses.

Questions on policy instruments

This section examines MoFs' responses to identify and highlight the policy instruments most frequently mentioned in key categories.

Carbon pricing and accounting, and tax policy were the policy instruments most frequently mentioned by all MoFs. AEs more frequently mentioned carbon pricing and accounting, and tax policy over other policy types, while EMEs prioritized carbon pricing and accounting, followed by budget tagging. Among LICs, tax policy was the most frequently mentioned policy instrument.

Where carbon pricing was concerned, AEs were worried about the acceptability to households of carbon pricing as an instrument, particularly in the context of socioeconomic impacts and the disproportional burden on low-income populations. EMEs were concerned about the kinds of financial infrastructure needed to support carbon markets, as well as the costs of, and strategies for, implementation. LICs posed questions on how carbon credit implementation would affect the economy.

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

2.4. Evaluation 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 on adaptation, decarbonization, and diversification costs, as well as projected expenditure needs, and potential new sources of fundraising.

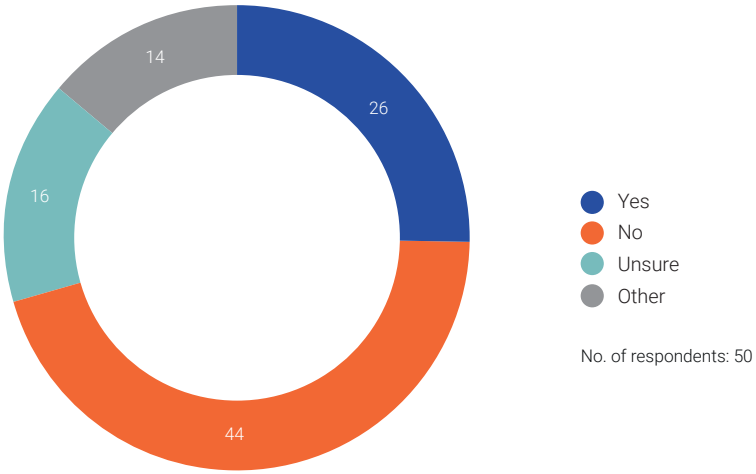
Adaptation investments and expenditures

A notable proportion of Ministries of Finance have yet to conduct analyses estimating public expenditure and financing needs for climate adaptation and resilience, with nearly half of all respondents saying no such analyses had been performed. Around a quarter of respondents said such assessments had been undertaken, while 30% were either unsure or gave an "other" response.

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. They could choose between four responses: *yes, no, unsure,* and *other*. A total of 50 responses were received.

Forty-four percent of respondents said that their MoF had not conducted such analysis, while 26% said their MoF had done so. An additional 16% of respondents were unsure (see Figure 2.24). No meaningful difference between AEs and EMDEs was observed.

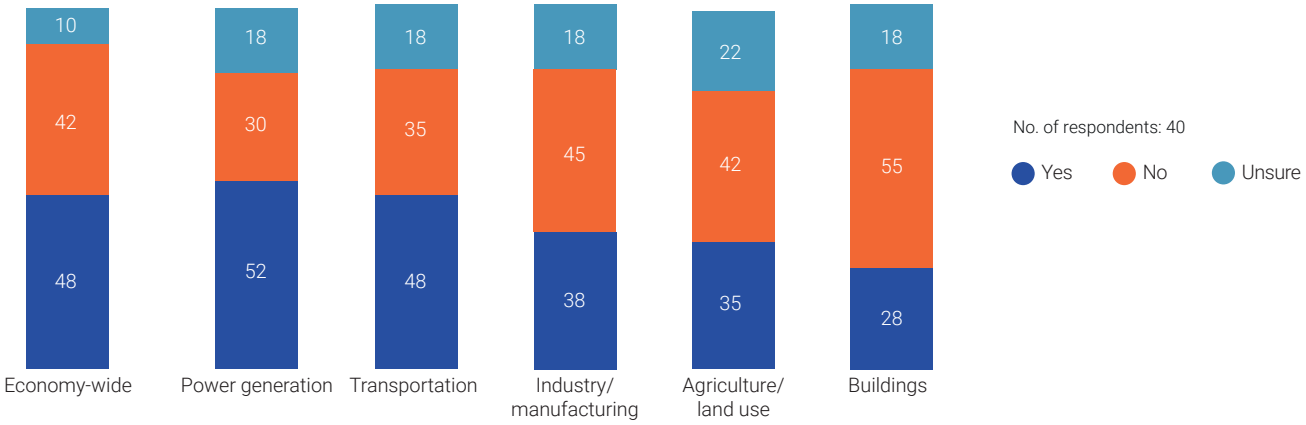
Figure 2.24. Has the Ministry of Finance conducted any analysis to estimate public expenditure and financing needs for adaptation/resilience? (%)



Decarbonization investments and expenditures

Nearly half of Ministries of Finance have conducted economy-wide decarbonization cost estimates of public expenditure and financing needs for policies for decarbonization. Power generation and transportation have the highest reported rates of assessment, while reporting on buildings, industry/manufacturing, and agriculture is lagging behind. AEs somewhat more commonly estimate costs in the buildings and industry sectors, but overall, both AEs and EMDEs show similar levels of engagement in assessing decarbonization costs.

Figure 2.25. What proportion of Ministries of Finance have produced estimates of public expenditure costs and financing needs associated with policies for the decarbonization of key sectors? (%)



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. Forty MoFs provided information on all six sub-questions and were therefore included in the analysis.

Forty-eight percent of MoFs said they had conducted economy-wide estimates for decarbonization, However, 42% responded "no" and 10% were unsure, indicating that for a substantial number of countries, the public expenditure and financing needs for decarbonization are either unquantified, or in the early stages of analysis. Power generation is the sector where most (52%) respondents said they had conducted analysis, followed by transportation (48%). Rates were slightly lower for industry/manufacturing (38%), agriculture and land use (35%), and buildings (28%).

AEs somewhat more commonly estimate costs in the buildings and industry sectors, but overall both AEs and EMDEs show similar levels of engagement on assessing the public expenditure costs and financing needs associated with policies for decarbonization.

Diversification expenditure

> Around one-third of Ministries of Finance have estimated the financing needs required to transition key sectors away from fossil fuels, while about the same proportion of MoFs has yet to do so. A large proportion of respondents also reported being uncertain about whether such estimates had been conducted.

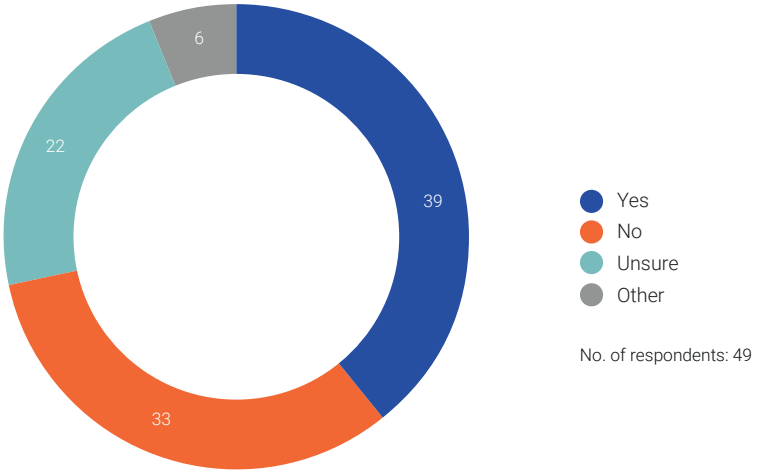
Respondents were asked whether their MoF had estimated the financing needs or support required to transition key sectors away from fossil fuels.[20] The responses were categorized into four groups: *yes, no, unsure*, and *other*. A total of 49 responses were received.

Thirty-three percent of respondents said their Ministry had not yet conducted such analysis, while 39% said they had done so. Twenty-two percent of respondents said they were unsure, suggesting that some Ministries were unaware of whether these financing needs had been assessed.

No meaningful difference between AEs and EMDEs was observed.

[20] Expenditure costs and financing needs could include direct costs, subsidies, or compensation for fossil-fuel industries or infrastructure, such as support for re-skilling the labor force in areas dependent on fossil fuels, retrofitting, or repurposing existing infrastructure.

Figure 2.26. Has the Ministry of Finance conducted any analysis to estimate the financing needs or support required to transition key sectors away from fossil fuels? (%)



Sources of revenue

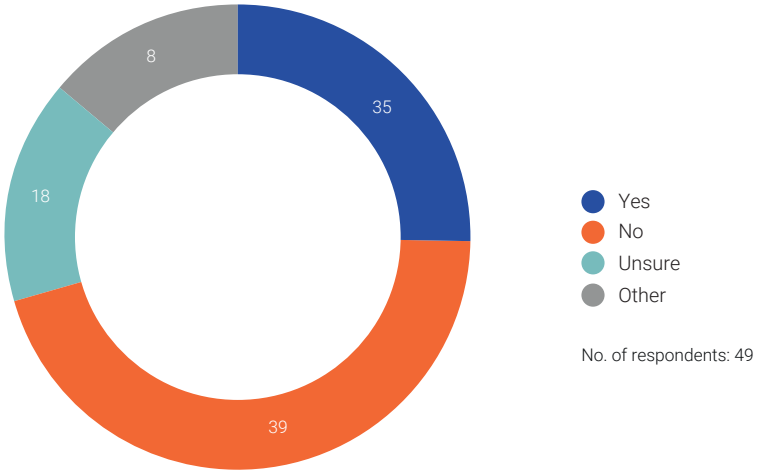
Varying levels of engagement were observed among MoFs with regard to leadership in identifying and designing new revenue measures for a low-carbon economy. While some Ministries were actively pursuing such assessments, others had yet to start, and some were uncertain about their involvement.

Respondents were asked whether their MoF had taken the lead in analytical efforts to identify and design new revenue-raising measures tailored to a low-carbon economy. Response options included: *yes, no, unsure,* and *other*, with participants asked to select the option that best reflected their Ministry's activities. Forty-nine Ministries responded to this question.

The results reveal a diverse range of involvement as regards ministerial leadership in analytical efforts to devise new revenue measures for a low-carbon economy. Thirty-five percent of respondents answered "yes", suggesting their Ministry had actively engaged in exploring new revenue options. Thirty-five percent of respondents answered "no", indicating that their Ministry had not yet pursued such initiatives. A notable portion, 18%, selected "unsure", reflecting either uncertainty or a lack of clarity about whether such analytical work had been undertaken.

No meaningful difference between AEs and EMDEs was observed.

Figure 2.27. Has the Ministry of Finance led analytical work to identify and design new measures for raising revenue in a low-carbon economy? (%)



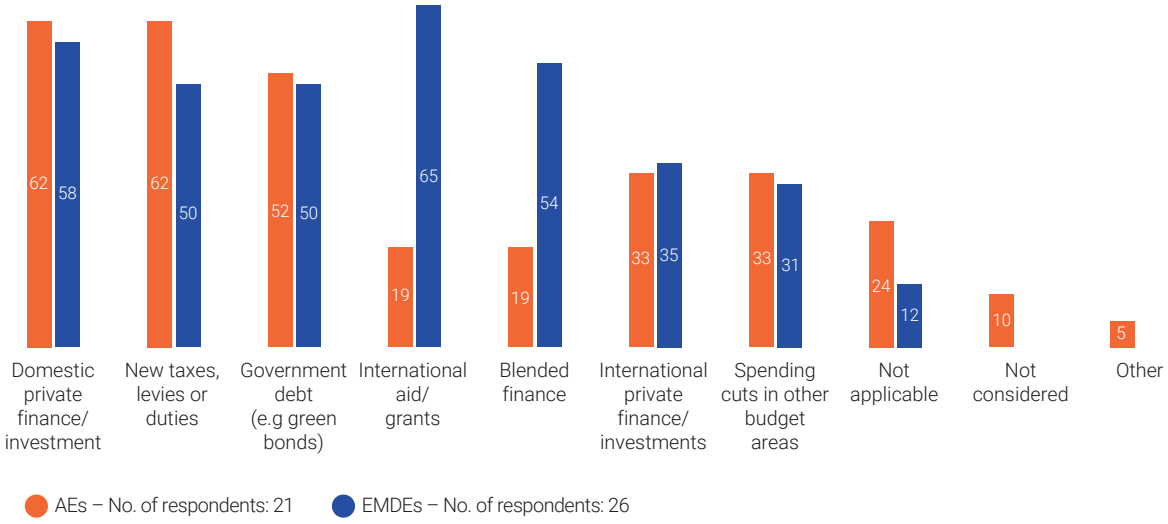
Sources of funding

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, such as green bonds, international aid or grants, and blended finance were also frequently cited as significant funding avenues. In addition, some Ministries are considering spending cuts in other areas, as well as international private finance, to support climate-related expenditures. Only a few Ministries said they had not yet considered specific funding options, or that the issue was not currently relevant to their planning.

Respondents were asked to identify the sources of funding from which their MoF thought the majority of fiscal costs related to climate adaptation, the transition to net zero, and diversification could come. The options included a variety of potential funding mechanisms, including: *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*. For this particular question, multiple answers were allowed, to reflect the diverse strategies Ministries might consider for financing these initiatives. They also had the option to choose *not considered, other,* or *not applicable*. Forty-seven MoFs responded to this question.

The responses indicate that Ministries are considering a diverse array of funding sources to address climate-related financial needs (see Figure 2.28). The most frequently selected source was domestic private finance/investment, reflecting strong interest in leveraging local private-sector capital. This was closely followed by new taxes, levies or duties, and government debt instruments, such as green bonds.

Figure 2.28. From which sources of funding does the Ministry of Finance assume the majority of fiscal costs related to climate adaptation, transition to net zero, and diversification can be mobilized? (%)



2.5. Existing analytical tools and approaches

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

General analytics

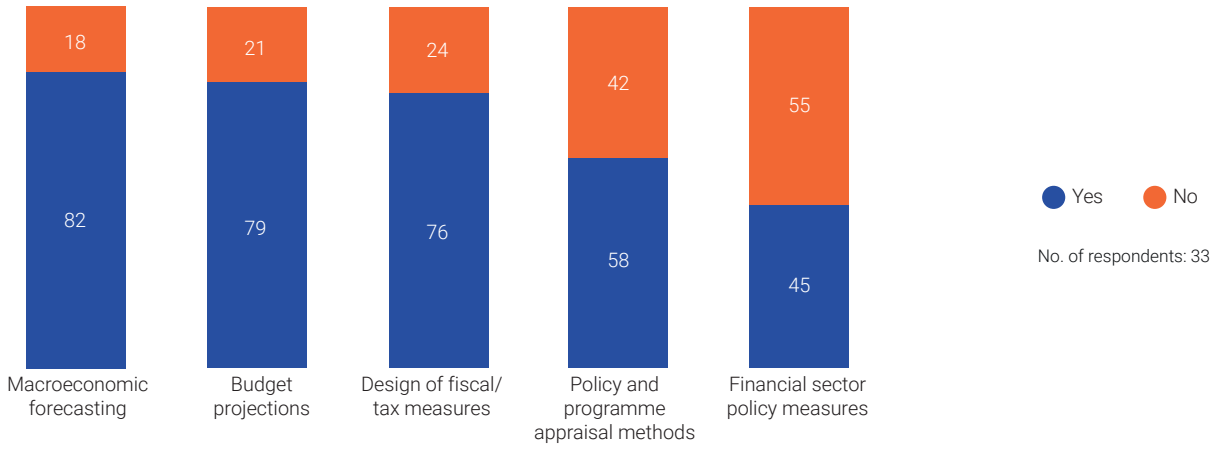
Economic modeling

Ministries of Finance widely use economic analysis and modeling across key functions, with macroeconomic forecasting and budget projections the most common. The design of financial sector measures and policy appraisal methods, in contrast, are used less frequently. Most respondents provided details on the types of model 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 of the types of economic analysis and modeling currently being used in their Ministry for key analytical functions, including: *macroeconomic forecasting; budget projections; design of fiscal and tax measures; quantitative policy and program appraisal*; and *design of financial sector measures*. Respondents were given the option to report the name and type of the models used for a given analytical function, the name of the entity that developed the model, and the typical time horizon considered in the analysis. Where respondents provided information, this was interpreted as "yes". Thirty-three MoFs provided information on all five sub-questions and were therefore included in the analysis.

Economic analysis and modeling approaches were most commonly used in macroeconomic forecasting (82% of respondents), while budget projections came in a close second (see Figure 2.29). No large differences between AEs and EMDEs were observed, although somewhat more AEs than EMDEs reported using most approaches, particularly policy appraisal methods (69% of AEs compared with 47% of EMDEs), and budget projections (88% of AEs compared with 71% of EMDEs).

Figure 2.29. Does the Ministry of Finance report using economic analysis and modeling approaches for general economic policy analysis across the key analytical functions listed? (%)



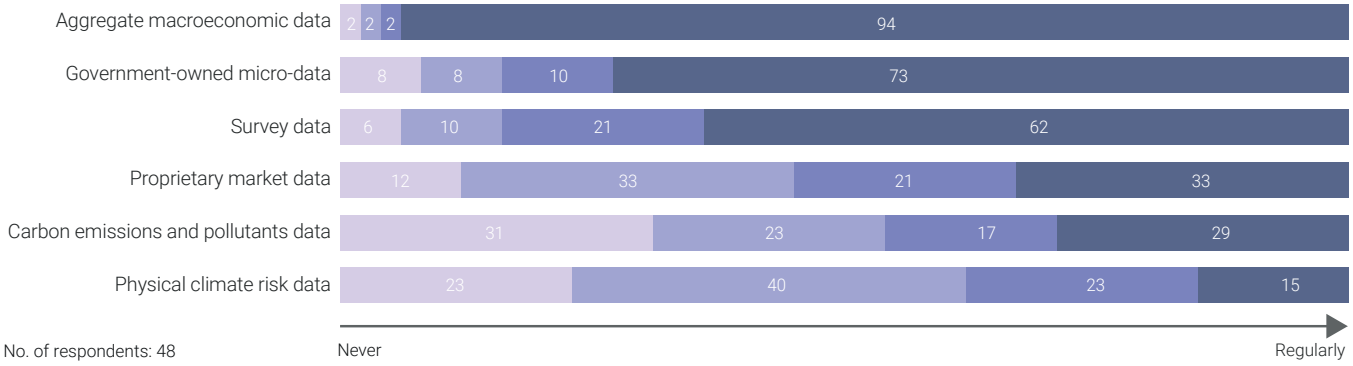
Data usage and challenges

Ministries of Finance reported varying frequency of data usage for economic analysis. Aggregate macroeconomic data and government-owned micro-data were the most frequently utilized, reflecting regular use by a majority of respondents. Survey data also saw moderate usage, while physical climate risk and carbon emissions data were the least utilized, next to proprietary market data. Key data-related challenges that arose in MoF responses related to harmonization, granularity, gaps, frequency, accessibility, and systemization.

Quantitative insights

Respondents were asked about the types and frequency of data used by Ministries as part of their economic analysis. Available options included: *government-owned micro-data; survey data; aggregate macroeconomic data;*

Figure 2.30. What types and sources of data does the Ministry of Finance use for its general economic analysis of policy options and how frequently? (%)



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". Forty-eight MoFs provided information on all six sub-questions and were therefore included in the analysis.

Aggregate macroeconomic data was used most frequently, with 94% of respondents reporting regular use. Government-owned micro-data came in second, with 73% reporting regular use, followed by survey data, at 62% (see Figure 2.30).

Data usage is broadly similar between AEs and EMDEs. However, AEs use carbon emissions and pollutants data somewhat more frequently, whereas EMDEs report a more frequent use of survey data.

Qualitative insights

Respondents were asked to provide open-ended insights into the most pressing climate-related data challenges they face. Twenty-eight countries responded to this question, comprising 14 AEs and 14 EMDEs (8 EMEs and 6 LICs), 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, granularity, gaps, frequency, accessibility, and systemization.

Key data challenges for AEs were data gaps, granularity and disaggregation, and harmonization. Data gaps centered on the parameterization of abatement possibilities; physical and economic climate risks; national emissions inventories; carbon intensity metrics for the embodied carbon emissions of foreign products; private investment data; agriculture, forestry and other land-use (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 issues focused on carbon pricing data, green investment reporting, and ex-post analysis of subsidies. These data gaps are hindering coherent data framework and dataset linking, including federal and regional datasets, and analysis of the cost-effectiveness of climate action.

Other data challenges raised by AEs included data frequency, including on carbon intensity metrics for foreign products; data accessibility related to differing access procedures; difficulties acquiring stakeholder approval; and accessing disaggregated data on energy prices and consumption, and climate investments by households and industries. One respondent stated a desire to link with the European Commission's Green Budgeting Reference Framework and the Organisation of Economic Co-operation and Development (OECD) Paris Collaborative on Green Budgeting's framework to aid green budgeting.

For EMEs, a key data-related challenge involved data gaps related to short-term projections of climate impacts; historical and real-time data; the impacts of climate change physical risks on infrastructure; the geophysical location of companies; industrial and residential water consumption; and firm-level energy consumption. Other key concerns

revolved around granularity in relation to sectoral and, in particular, geographic data, notably, high-resolution, localized climate data, and data inaccessibility. EMEs also cited challenges related to the frequency of national-level data, systematized adaptation data, and the harmonization of data across sources. General topics 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 LICs included geographic and temporal data granularity, data frequency, data harmonization across sources, and data insufficiency at a more general level. One country said it was financially unable to compile the necessary data. The data challenges pertained to climate finance, emissions (general, sectoral, and project data), and the costs of abatement.

Collaboration

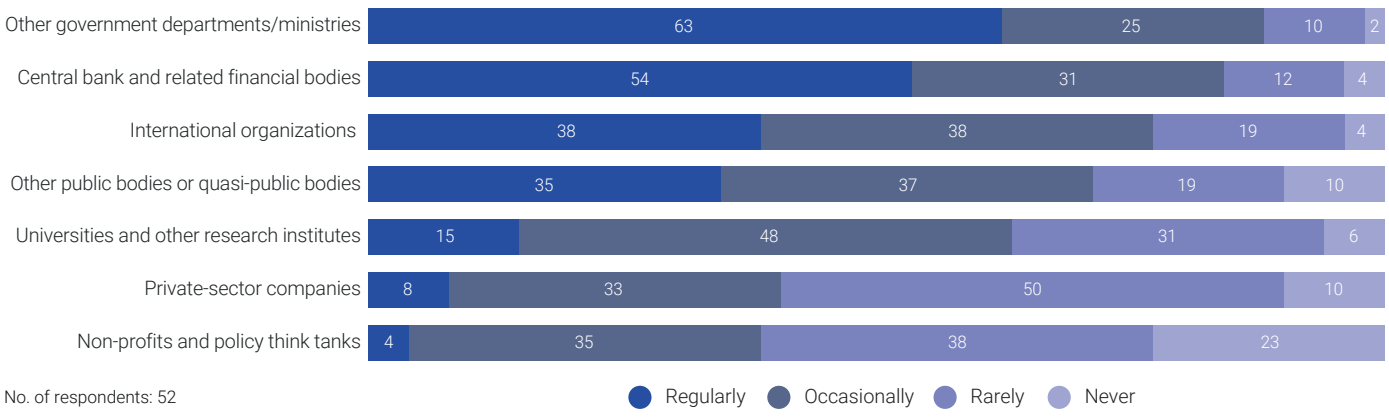
Ministries' frequency of collaboration on policy analysis and economic modeling varied, with most collaboration taking place with other government departments, central banks, and international organizations. In contrast, collaboration with non-profit organizations, private-sector companies, and universities was less frequent, suggesting limited engagement with external non-governmental and academic entities. Collaboration with other public bodies varied the most, while collaboration with other government departments was the most consistent.

Respondents were asked about ministerial collaboration on economic analysis and modeling 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; international organizations;* and *other*. For each entity, apart from "other", respondents could choose a number on an ordinal scale from 1–4, with 1 indicating "never" and 4 indicating "regularly". Fifty-two MoFs provided information on all seven sub-questions and were therefore included in the analysis.

Most collaboration was with other government departments and ministries, with 63% reporting regular consultation. This was followed by cooperation with central banks and related financial bodies, at 54%, and international organizations, at 38% (see Figure 2.31).

Collaboration with external parties follows similar patterns in AEs and EMDEs, although more AEs collaborate 'regularly' with other public bodies (46%, versus 25% of EMDEs), and with universities and other research institutes (25% of AEs, 7% of EMDEs).

Figure 2.31. How regularly does the Ministry of Finance collaborate with external parties as part of its economic analysis and modeling of policy options? (%)

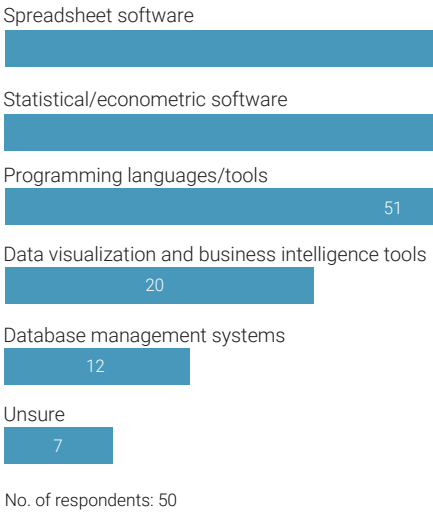


Analytical software

Respondents were asked about the types of software used by their Ministry of Finance 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 specialized alternatives.

Respondents were asked about the types of software used by their MoF as part of general economic analysis of policy options. Respondents could select multiple options from a list that included: *spreadsheet software; statistical and econometric software; programming languages and tools; data visualization and business intelligence tools*; and *database management systems*. Respondents could also select *none* and *unsure*. Overall, 50 countries responded to the question and spreadsheets are the type of software most frequently used by MoFs. There are no substantial differences between AEs and EMDEs on this front, though EMDEs use spreadsheet software somewhat more frequently, while more AEs use statistical/econometric software and data visualization tools.

Figure 2.32. What types of software do Ministries of Finance use as part of their general economic analysis of policy options? (%)



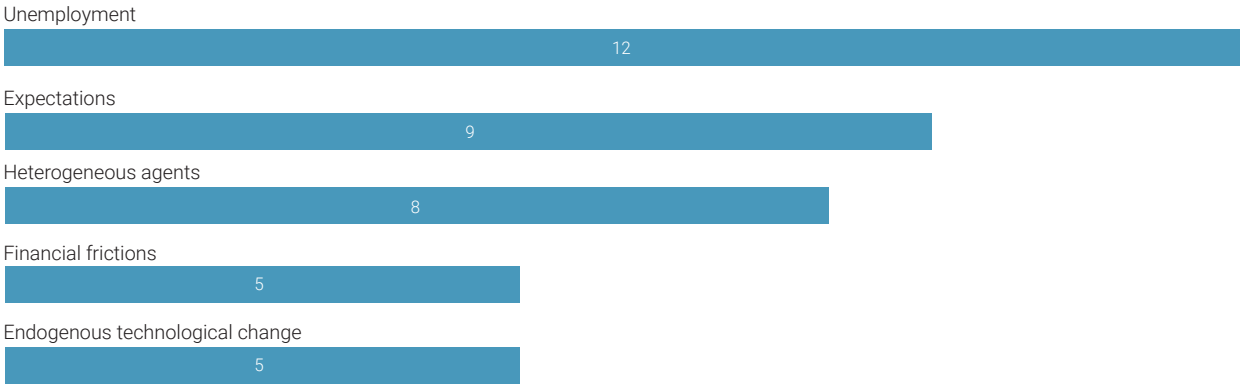
Advanced models

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 such as 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 the 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 had developed the model, and detail how it was being operated. Respondents were also asked to share details on the approximate number of equations, sectors, and regions in their model, and to indicate whether their model included any of the following features: heterogenous agents; financial frictions; endogenous technological change; unemployment; and expectations. Lastly, respondents were asked whether the model had ever been used to conduct climate-related economic policy analysis. Details on the qualitative responses provided to this question can be found in Table A5 (Appendix A2).

Overall, 29 countries responded to the questions in this section, with 24 sharing the name of their model, two indicating that the model was still under development, and one indicating that no model was available (see qualitative results

Figure 2.33. What are the main key features of the most advanced models used by Ministries of Finance?



Numbers indicate frequency of mentions

below). Fifteen countries replied to the question on key model features, with the majority reporting that their model included features such as unemployment (80%), expectations (60%), and heterogenous agents (53%). Only a minority of models included features such as financial frictions and endogenous technological change (33%) (see Figure 2.33).

Nine countries reported the total number of equations in their most advanced model, with a mean of 1,764 and a median of 256 equations, indicating a high degree of heterogeneity. There was one outlier, with 10,000 equations, while the rest ranged between 14 and 1,800. The same number of countries responded to the question on regions in their most advanced model, with a median of 1 and a range of 1–8. Fourteen countries provided the number of sectors in their most advanced model, with a mean of 32, a median of 8, and a range of 1–186.

Thirty-nine percent of countries said their model was used to conduct climate-related economic policy analysis, while 61% said it was not.

Climate analytics

Integration of climate-related considerations into modeling

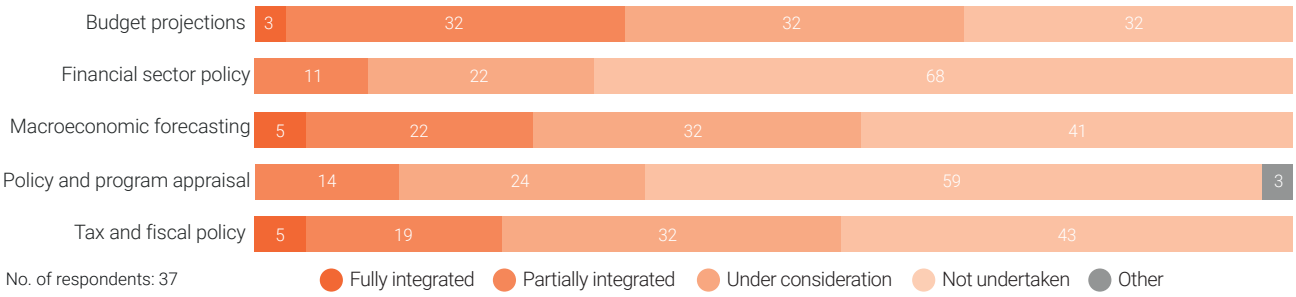
> The integration of physical climate change and transition considerations into Ministries' economic analysis remains limited. Physical climate considerations are least integrated into financial sector policy design and appraisal of policies and programs, while budget projections and tax/fiscal policy have seen modest progress, although only a small proportion of countries have achieved full integration. Decarbonization considerations show slightly more progress, particularly in the context of tax and fiscal policy, as well as budget projections, but a majority of countries have yet to incorporate these considerations into their analytical frameworks.

Respondents were asked about the integration of physical climate change and transition considerations into various analytical functions, including: *macroeconomic 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 to 4, with 1 indicating *not undertaken*; 2 indicating *currently under consideration*; 3 indicating *partially integrated into model*; and 4 indicating *fully integrated into model*. Each selection included an optional textbox, allowing respondents to share examples and links to any relevant documents. Thirty-seven MoFs provided information on all five sub-questions related to physical climate considerations, and 38 on all five related to transition considerations, and were therefore included in the analysis. Details on the qualitative responses provided to these questions can be found in Tables A1 and A2 (Appendix A2).

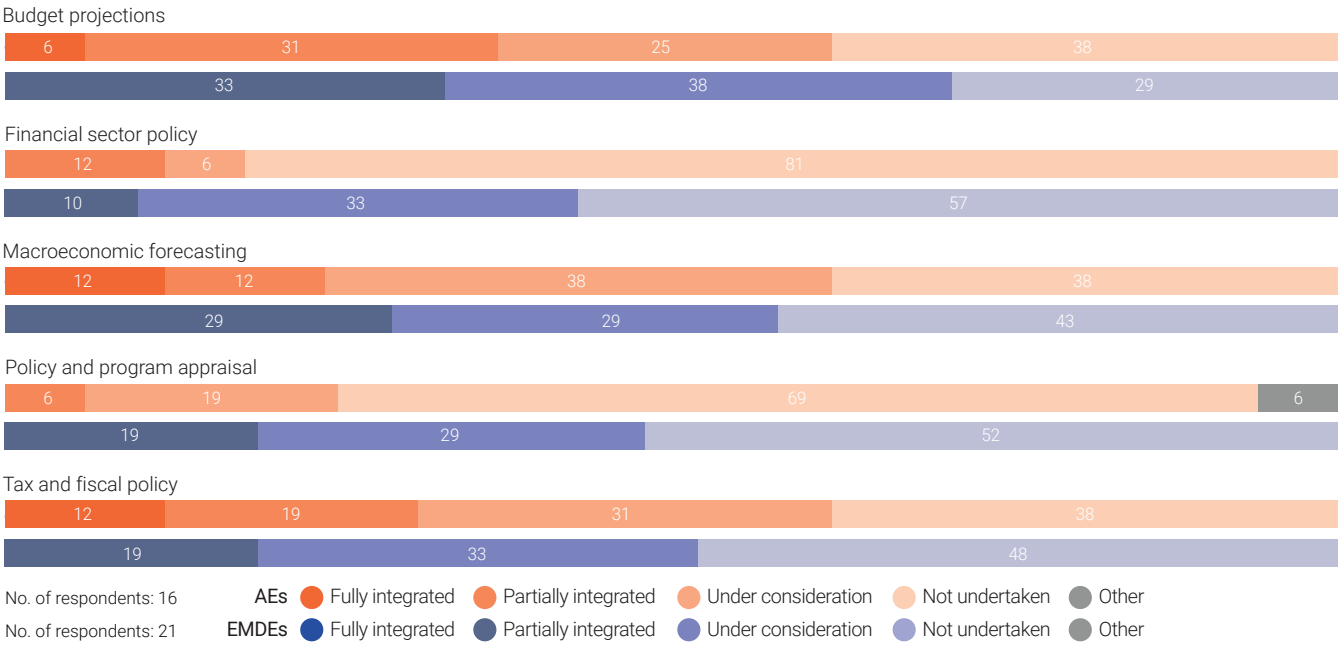
On the integration of physical climate considerations, the highest rates were reported for macroeconomic forecasting and design of tax/fiscal policy, with 5% of countries saying they had fully integrated physical considerations into those functions. Looking at partial and full integration together, however, most progress was observed on budget projections, with 35% of countries reporting full or partial integration, and the least progress made on financial sector policy design (at 11%) and quantitative policy/program appraisal (at 14%) (see Figure 2.34).

Figure 2.34. To what extent has the Ministry of Finance integrated physical climate considerations/ adaptation into core analytical functions? (%)

a. All Ministries of Finance



b. AE and EMDE breakdown



The integration of physical climate considerations is somewhat more advanced in AEs than EMDEs across all functions apart from policy and program appraisal, which 19% of EMDEs and 6% of AEs have partially integrated and none have fully integrated (see Figure 2.35b).

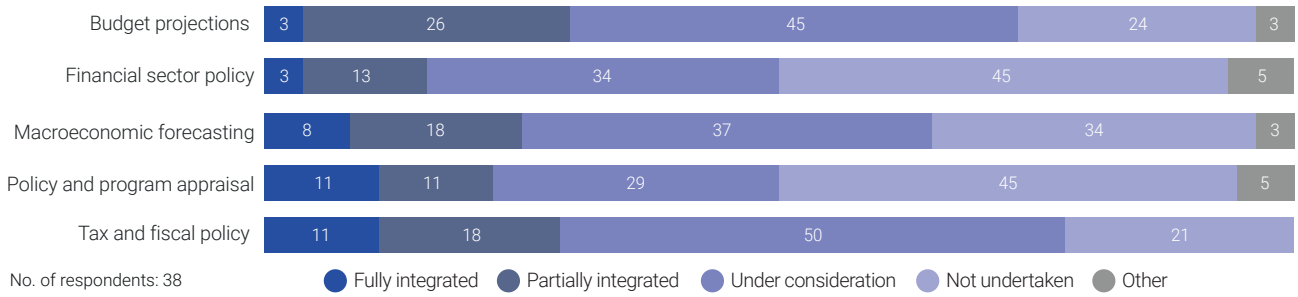
On the integration of decarbonization considerations, the highest rates of integration were reported for tax/fiscal policy and quantitative policy/program appraisal, with 11% of countries saying they had fully integrated transition considerations into these functions. Including partial integration in the calculations, at 29% the design of tax/fiscal policy was still the function where most integration progress had been made, together with budget projections (also 29%), with the least progress seen on financial sector policy design (at 16%) (see Figure 2.35a). All in all, there has been slightly more progress on the integration of decarbonization considerations compared with physical climate considerations.

As with physical climate considerations, the integration of decarbonization integrations is higher in AEs, particular on budget projections, macroeconomic forecasting, and tax and fiscal policy (see Figure 2.35b).

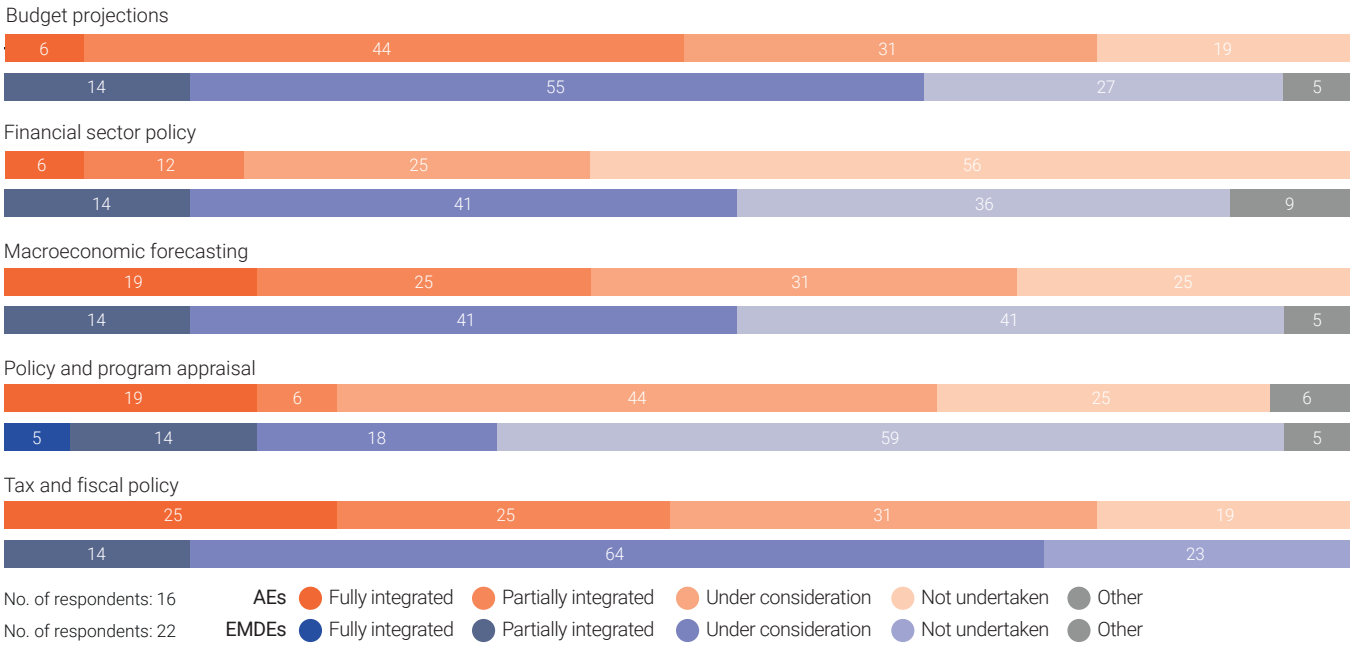
The average integration score was calculated for each country using their reported results for each function. The median score obtained from the average dataset was 2. As with physical climate considerations, while integration in AEs is more advanced across some functions (see Figure 2.34b), on average, no meaningful distinction was observed between EMDEs and AEs.

Figure 2.35. To what extent has the Ministry of Finance integrated decarbonization/mitigation considerations into core analytical functions? (%)

a. All Ministries of Finance



b. AE and EMDE breakdown

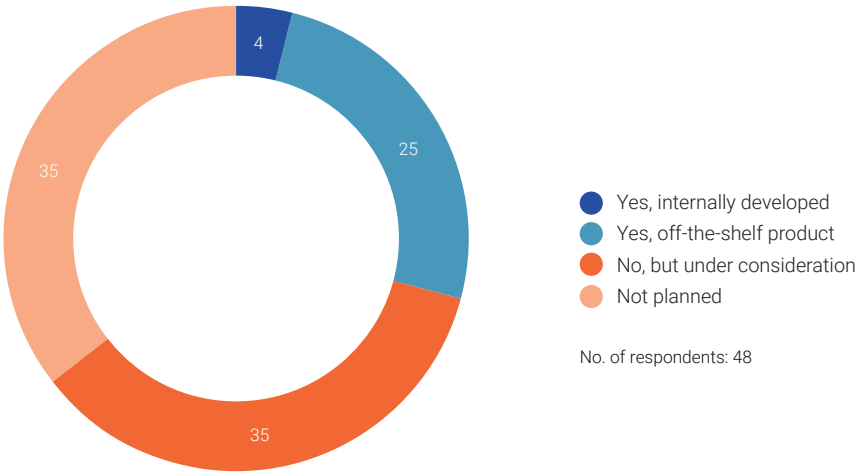


Climate and transition scenarios

Most Ministries of Finance have yet to integrate climate-related scenarios into their economic analyses, with a decided preference for off-the-shelf climate scenarios over internally developed ones when they do. A majority of MoFs have not adopted any scenario-based analysis for physical climate pathways, while those that have typically rely on established external rather than custom scenarios. Slightly more MoFs have started to incorporate transition-related scenarios, showing a particular preference for climate policy pathways over sector-specific or technological cost models. Uptake of climate and transition scenarios is somewhat more advanced in AEs than EMDEs.

Respondents were asked whether their Ministry was using climate-related scenarios of global warming (physical climate pathways) to inform their economic policy analysis (Figure 2.36). Respondents could choose multiple options from those presented, including: *not planned; no, but currently under consideration; yes, using those adapted from off-the-shelf physical climate scenarios based on greenhouse gas emission pathways*; and *yes, using internally developed physical climate scenarios*. No respondents selected more than one choice, despite having the option to do so. Overall, 48 countries responded to the question.

Figure 2.36. Is the Ministry of Finance using climate-related scenarios of global warming (physical climate pathways) to inform general economic policy analysis? (%)

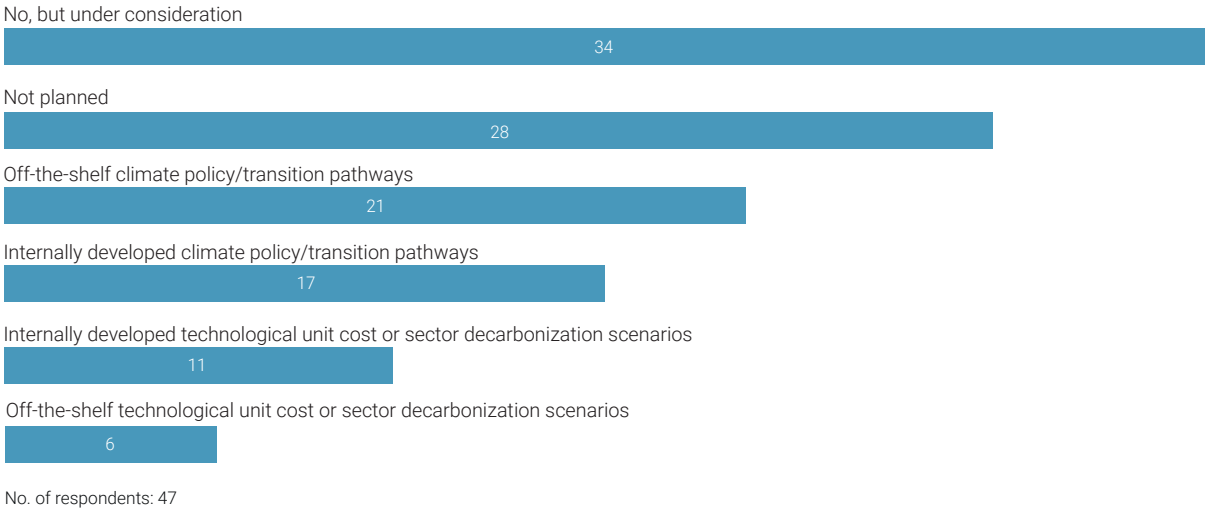


Seventy-one percent of countries said they had not yet used climate-related scenarios of global warming. Of those that had, the overwhelming majority had used off-the-shelf scenarios rather than internally developed ones. Additional analysis revealed some differences between AEs and EMDEs, with 38% of AEs having used off-the-shelf or internally developed models, compared with 21% of EMDEs.

Next, respondents were asked whether their Ministry used climate-related transition scenarios (including baseline emissions and climate policy scenarios) to inform economic policy analyses. Respondents could choose multiple options from those presented, including: *not planned; no, but currently under consideration; yes, using those adapted from off-the-shelf climate policy/transition pathways; yes, using those adapted from off-the-shelf technological unit cost or sector-specific decarbonization scenarios*; and *yes, using internally developed technological unit cost or sector-specific decarbonization scenarios*. Overall, 47 countries responded to the question, but unlike the previous question, at least four respondents selected multiple options.

Sixty-two percent of countries said they had not yet used transition-related scenarios. Of those that had, off-the-shelf scenarios were most common, followed by internally developed ones. More EMDEs (79%) are yet to adopt transition-related scenarios than AEs (43%), while 8% of EMDEs report using internally developed transition-related scenarios, technological unit cost or sector decarbonization scenarios, compared with 48% of AEs.

Figure 2.37. Is the Ministry of Finance using climate-related decarbonization scenarios to inform general economic policy analysis? (%)



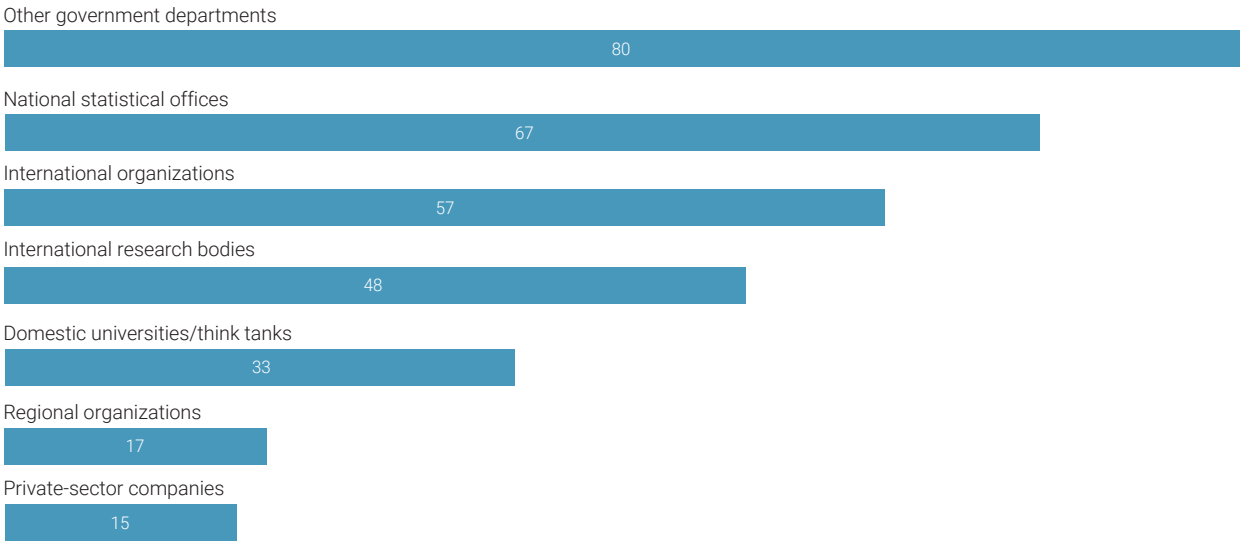
Climate and transition data usage

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.

Respondents were asked where their Ministries obtained their empirical climate-related data (e.g., carbon emissions data, spatially specific vulnerability to floods or droughts, damage functions) (Figure 2.38). Options included: *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 institutions*; *other government departments or other public bodies* (such as the Ministry of Environment); and *private-sector companies* (such as climate consultancy firms). Multiple options could be selected from the list. Overall, 46 countries responded to the question. The average number of options selected was 2.4, indicating that countries are using multiple data sources.

Climate-related data was mainly obtained from other government departments (80%) and national statistical offices (67%), followed by international organizations (57%), and international research bodies (48%). Regional organizations (17%) and private-sector companies (15%) were the least used sources. Additional analysis revealed only small differences between EMDEs and AEs, with more AEs obtaining data from national statistical offices (77% compared with 58% of EMDEs) and universities and think tanks (41% compared with 25% of EMDEs), and EMDEs obtaining more data from regional organizations (25%, compared with 9% of AEs).

Figure 2.38. From where do Ministries of Finance get climate-related data? (%)



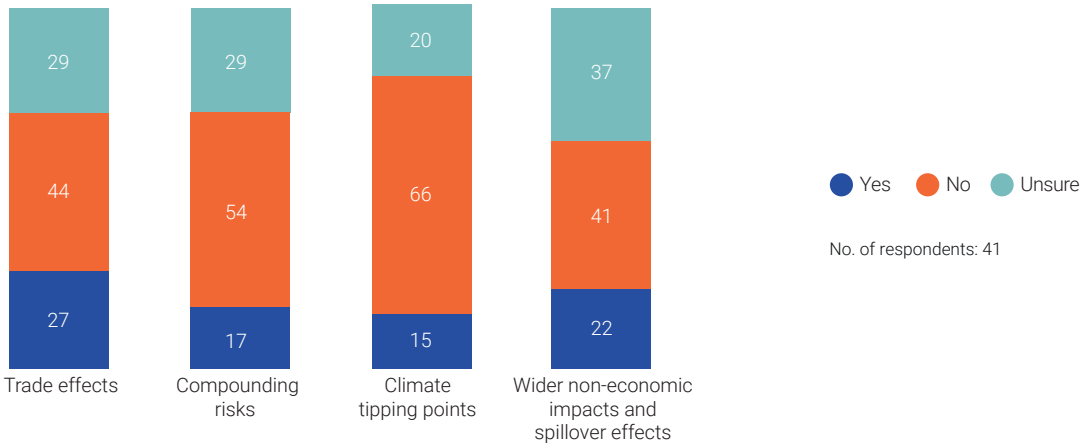
No. of respondents: 46

Climate scenario dynamics

Tipping points and compounding risks are the climate scenario dynamics least frequently integrated into climate-related analytical exercises. Sixty-six percent of Ministries of Finance said they had not integrated tipping points into their analysis, while 54% said they had not integrated compounding risks. The integration of trade effects was 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 whether their Ministry had integrated specific dynamics into any of its climate-related analytical exercises. These included: *physical climate tipping points*; *compounding risks* (such as an economic

Figure 2.39. Has the Ministry of Finance considered the following dynamics in any of its climate-related analytical exercises? (%)



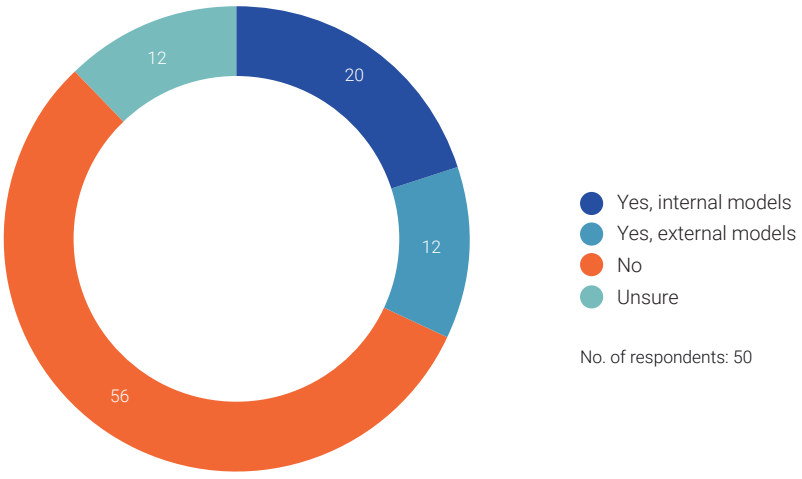
recession coupled with an acute physical climate event); *trade effects* (such as the impact of CBAMs on trade); *wider non-economic impacts and spillover effects*; and *other*. Respondents were asked to select one of three options for each category apart from *other: yes, no,* or *unsure*. Forty-one MoFs provided information on all four sub-questions and were therefore included in the analysis. Details on the qualitative responses provided to this question can be found in Tables A3 and A4 (Appendix A2).

Tipping points and compounding risks were least commonly integrated into climate-related analytical exercises, with 66% of MoFs answering "no" to tipping points and 54% saying "no" to compounding risks. The most frequently included features were trade effects, at 27%, and wider impacts, at 22%. A notable proportion of countries were unsure about whether such specific features were included in their analytical exercises, particularly EMDEs. EMDEs somewhat more frequently incorporated compounding risks (23% versus 11% in AEs), but more AEs incorporated trade effects (42%, versus 14% in EMDEs). Otherwise, no meaningful differences were detected between AEs and EMDEs.

Climate and transition models

The majority of Ministries of Finance said they did not currently use dedicated climate–economy models for assessing mitigation or adaptation policies, with most relying instead on general economic models. A small proportion said they had implemented internal or external climate-specific models, though some Ministries remained unsure about the presence of such tools.

Figure 2.40. Does the Ministry of Finance use dedicated climate–economy models of mitigation or adaptation policies that differ from the general economic models being used? (%)



Respondents were asked whether their Ministry had dedicated climate–economy models of mitigation, or adaptation policies that differed 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.

Fifty-six percent of respondents said they did not have dedicated climate–economy models. Only 20% of respondents confirmed the use of internal climate–economy models, while an additional 12% said they used external models. The level of uncertainty was also notable, with 12% of respondents saying they were unsure whether such models existed in their Ministry (see Figure 2.40). The distribution of responses showed that while some Ministries had begun to integrate dedicated internal or external climate–economy models, they had not been broadly adopted. In particular, AEs have more commonly adopted climate–economy models, with 48% having adopted either internal or external models, compared with 16% of EMDEs.

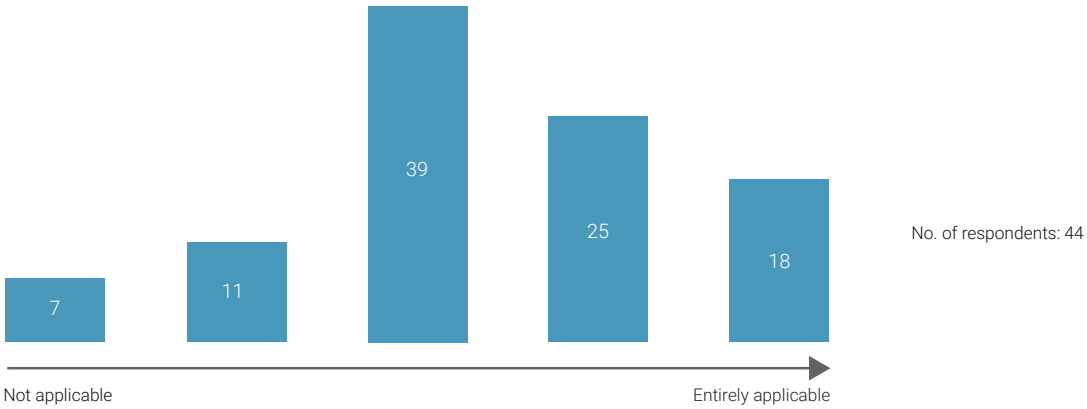
Governance and analytics

> Ministries of Finance generally declared their governance mechanisms to be moderately effective in delivering climate-related analysis to decision-makers, with significant variation between countries. AEs more commonly than EMDEs have clear mechanisms to ensure climate-related analysis reaches decision-makers in a timely manner.

In this question, respondents were asked to rate the extent to which the following statement applies to their 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." The rating scale ranged from 1 (not at all applicable) to 5 (entirely applicable). Overall, 44 countries responded to this question.

The mean score of 3.4 indicates moderate agreement with the statement. The results reveal a broad distribution of responses (see Figure 2.41). Ministries in AEs have a higher mean score (3.8) than those in EMDEs (3.0), indicating that AEs generally have clearer governance mechanisms in place for climate-related analysis.

Figure 2.41. What proportion of Ministries of Finance agree that they have clear mechanisms to ensure climate-related analysis reaches decision-makers in a timely manner? (%)



2.6. Climate-related analytical capabilities

This section reviews core climate-related capabilities in Ministries of Finance 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 of Finance Ministers for Climate Action's role in supporting MoFs' efforts to address these challenges and build capacity in climate-focused areas.

Main barriers

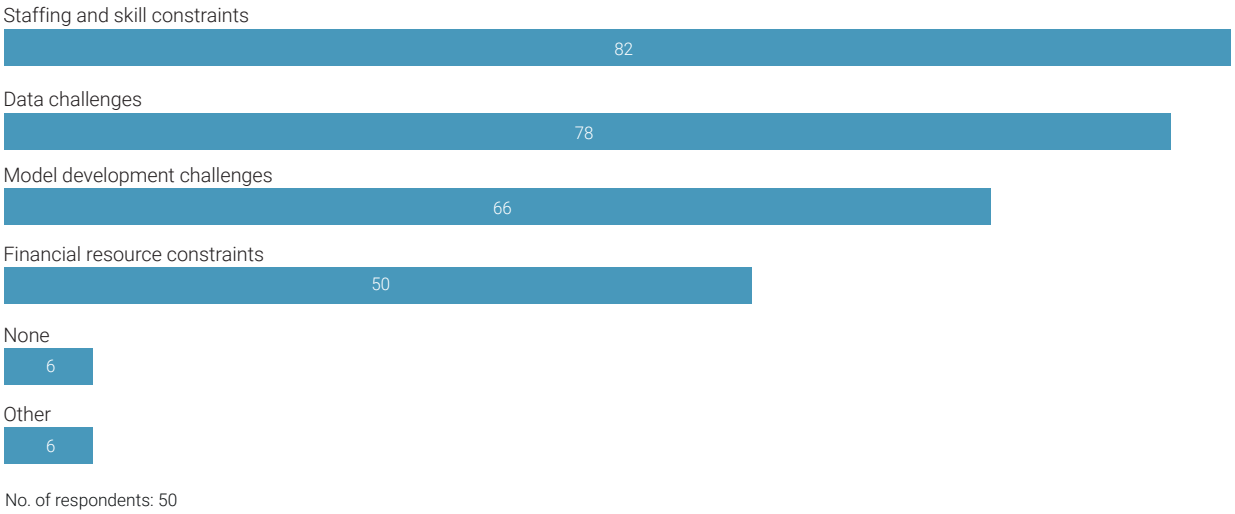
Substantial barriers were reported with respect to integrating climate-related issues into Ministries' economic analysis, with staffing and skills constraints, and data challenges the most commonly reported obstacles. Many MoFs also face financial limitations and difficulties with model development, indicating that resource constraints are broadly hindering progress on climate integration. Only a few respondents reported no significant barriers, suggesting that most MoFs are encountering multiple challenges in advancing climate-focused economic analysis.

Respondents were asked to identify significant barriers to incorporating climate-related issues into their economic analysis and modeling approaches. They were allowed to select multiple barriers from the following options: *data challenges; model development challenges; staffing and skills constraints; financial resource constraints; none;* and *other*.

A total of 50 countries responded. Their answers suggest that data challenges, coupled with staffing and skills constraints, are the most prevalent barriers, as selected by 78% and 82% of respondents, respectively. In addition, 66% of countries said they faced model development challenges, while 50% of respondents identified financial resource constraints as being problematic.

Only 6% of respondents said they did not face significant barriers in integrating climate considerations into economic analysis. This suggests that the vast majority of respondents have encountered at least one substantial barrier when attempting to incorporate climate-related issues into their analytical frameworks. Some differences between EMDEs and AEs exist, with EMDEs more frequently reporting financial resource constraints (70%, compared with 26% of AEs) and data challenges (96%, compared with 57% of AEs).

Figure 2.42. What barriers does the Ministry of Finance face in incorporating climate-related issues into economic analysis and modeling approaches? (%)



Capability support

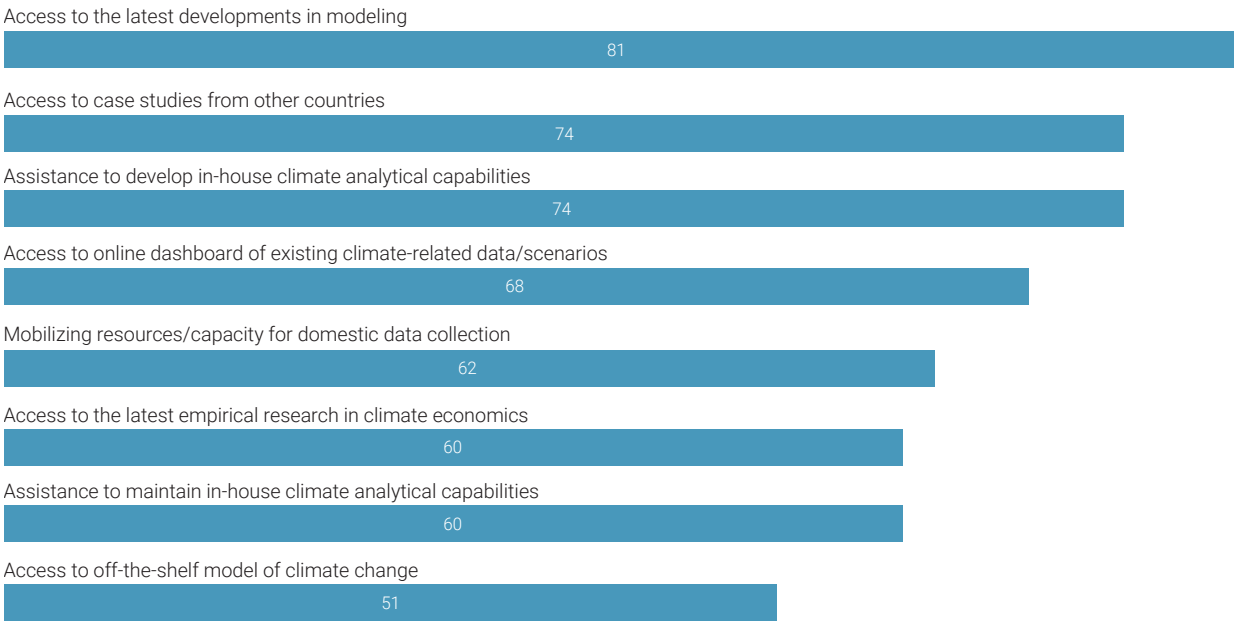
Ministries of Finance underscored a strong need for various forms of support to boost their climate-related analytical capabilities. Their top priorities included access to the latest climate–economy modeling developments, technical assistance for building in-house expertise, and case studies from other countries. Many MoFs reported seeking resources such as online dashboards for climate data, enhanced domestic data collection capacity, and access to empirical research in climate economics. Some respondents expressed interest in ready-made macroeconomic climate models to aid their analytics. These needs were broadly consistent in both advanced and emerging economies. MoFs also shared a variety of ways in which the Coalition could help them to enhance their climate-related analytical capabilities. These included facilitating technical assistance on models, analytical skills, and methodologies; knowledge sharing on best practices, experience, and case studies; collaboration with institutional partners, the academic community, MDBs, and others; and access to resources such as datasets and tools.

Quantitative insights

Respondents were asked to identify the types of support that would enable their Ministry to enhance its climate-related analytical capabilities. Multiple options were provided, allowing respondents to select all relevant types of support, including: *access to case studies from other countries; access to the latest developments in climate–economy modeling; 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.* There was also space to specify additional types of support.

Of the 47 countries that responded to the question, 81% cited access to the latest developments in climate–economy modeling as a priority, followed closely by technical assistance to develop in-house, climate-related analytical capabilities (74%), and access to case studies from other countries (74%). Sixty-eight percent of

Figure 2.43. What types of additional support would enable the Ministry of Finance to enhance its climate-related analytical capabilities? (%)



No. of respondents: 47

respondents indicated a need to access an online dashboard of climate-related data and scenarios, while 62% 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 (60%) and assistance to maintain in-house analytical capabilities (60%). Lastly, 51% of respondents said they needed access to an off-the-shelf macroeconomic model of climate change. EMDEs indicated a greater need for support, citing assistance to develop in-house capacities (92% of EMDEs, compared with 55% of AEs), maintaining existing capacities (80% of EMDEs; 36% of AEs), and with mobilizing resources/capacity for domestic data collection (76% of EMDEs; 45% of AEs).

Qualitative insights

Respondents were asked to provide open-ended insights into how the Coalition could best support their Ministry in enhancing climate-related analytic capabilities. Thirty-five countries responded to this question, comprising 13 AEs and 22 EMDEs (15 EMEs and 7 LICs). They highlighted the following: technical and methodological assistance (n=11), access to resources (n=9), collaboration (n=7), information exchange platform (n=7), championing the role of Ministries of Finance (n=6), direct assistance (n=6), and a community of practice (n=2).

Technical and methodological assistance

This category focused on the need for training on various subjects. EMDEs dominated, with EMEs citing the need for training on developing economic climate models and in-house analytical tools (n=5), modeling 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 as they relate to energy-focused SOEs (n=1). LICs reported the need for training on integrating climate into economic policies (n=1), and workshops and seminars to gain technical skills and analytical know-how on climate risk analysis (n=1). One AE cited the need for basic training courses, such as workshops or seminars on modeling for MoF staff.

Access to resources

In this category, MoFs made specific requests for tools and data. With the exception of one AE, this was dominated by EMDEs. Three EMEs and one LIC cited the need for data accessibility, while EMEs also requested specific geographic information, such as production chains, flood maps, and wildfire maps. The LIC requested greenhouse gas emissions data. In terms of tools, the AE requested access to off-the-shelf models that were externally maintained and quickly usable. Two EMEs requested macroeconomic climate change models, and three LICs requested models and climate risk management tools.

Collaboration

This category captured opportunities for enhanced collaboration. The responses were diverse, with most of the opportunities for collaboration each receiving one mention. AEs cited a desire for opportunities for feedback, particularly in relation to the social accounting matrix; exchange mechanisms for collaborative work on models and using standard scenarios (particularly for countries in the EU); and collaborative work to better package modeling results for policymakers. Two EMEs said they would like to connect with institutional partners and AEs, and engage in an exchange of experts. One LIC expressed interest in collaborative opportunities with international financial institutions, MDBs, and other organizations.

Information exchange platform

This category encompassed opportunities to establish channels for information exchange. One AE and two EMEs cited a desire to share case studies (both successful and unsuccessful), as well as examples of climate–economy models that effectively support policy development. One AE, one EME, and two LICs requested the sharing of best practices and the development of guides, while one EME was keen to discover how to incorporate climate change concepts into MoF planning in various areas (e.g., economic planning, tax aspects, and green financing).

Championing the role of Ministries of Finance in climate policy

This category comprised responses from AEs and EMEs, with countries in both income groups citing the need to highlight to MoF leadership the importance of the net zero transition and climate issues to the budget,

macroeconomic projects, and other central areas (n=2), as well as, reciprocally, the importance of Ministries of Finance to climate policy (n=2). One EME also cited the need to demonstrate the impact of climate issues on economic variables and one the need to engage directors from other departments in understanding the relevance of climate within their areas.

Direct assistance

EMDEs cited further opportunities where direct assistance was needed. For EMEs, this entailed financial assistance, retooling assistance, and integrating models into analysis. For LICs, this involved policy development assistance, as well as capacity assessments to identify where Coalition assistance might be needed.

Community of Practice

AEs specifically highlighted the value of a Community of Practice, 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).

PART 3. Interview findings in depth

Contents

PART 3. Interview findings in depth

3.1. Overview of approach and respondents

This part of the report discusses in depth the findings from the semi-structured interviews carried out with 15 Ministries of Finance (listed in Table 3.1). The analysis examines the status of climate mainstreaming into their work, their most pressing policy and analytical questions, and the key challenges they face with regard to modeling and analytical tools. In this introductory section, we first expand on the approach taken and who responded.

The interviews were conducted to inform and complement the survey described in Parts 1 and 2 above. Given the limited sample size, the interview findings are not representative. However, they provide additional insights into the dynamics and complexities that the survey could not cover fully. These include issues such as how MoFs use tools to influence policy decisions, the role of institutional politics, capacity constraints, and the dynamics of external collaboration.

Table 3.1. List of Ministries of Finance (or similar government bodies) that participated in the interviews

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

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 Ministers for Climate Action. The individuals interviewed were typically representatives of the relevant modeling and policy teams, accompanied by representatives of relevant policy units.

The semi-structured interviews[21] covered four main topics, which the research team identified in coordination with the Steering Committee and were informed by engagement with other MoFs. These topics were:

- **Policy and analytical priorities**: Interviewees were asked to elaborate on current climate policy issues that require robust analysis, as well as their Ministry's top climate policy priorities.
- **Climate economic modeling and analysis**: Interviewees were asked to discuss the various economic and climate modeling tools used by their Ministry, with a particular focus on modeling needs, including internal technical capacity and collaboration.
- **Challenges with regard to data, model design and methodology**: Interviewees were asked about the analytical barriers they faced, as well as challenges with regard to 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.

[21] A sample interview structure is provided in Annex 2.

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

The remainder of Part 3 follows the four aforementioned themes: policy and analytical priorities, climate economic modeling and analysis, challenges and barriers, and wider analytical capabilities.

3.2. Policy and analytical priorities

> **To navigate climate change, Ministries of Finance are having to juggle a range of policy and analysis priorities.** Particularly common priorities include: 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; the impact on budget and medium- to long-term debt; assessments of the impact on revenue; and the identification of alternative revenue-raising measures. Other policy and analytical priorities included enabling green finance, financing adaptation and a green and resilient transition, and ensuring fiscal resilience.

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

- **Identification of climate policies**. Many of the MoFs recognize the need to play an ever-greater role in shaping national climate and development strategies, with 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 recognize the need to identify and manage the risks associated with both climate change and the green transition. They highlighted the need to better understand future increases in chronic physical climate change and acute physical risk hazards, and the likely economic impacts of 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 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 regulation, 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 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 workforce.
- **Impact on budget and medium- to long-term debt management**. Most MoFs highlighted the need to embed transition-related considerations into 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 Nationally Determined Contributions and National Action Plans, and the increasing damage 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 assessing:
  - 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 to 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 include:
  - How to create instruments, such as disaster risk financing, insurance, and sovereign or municipal green bonds, to finance 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 are changing with regard to the green transition.

3.3. Climate economic modeling and analysis

Ministries of Finance are increasingly aware of the pressing need to address climate action, yet many face limitations on their ability to perform climate economic modeling and analysis. The findings are based on interview questions that asked MoFs to elaborate on specific live policies, with a focus on the type of analysis being used to inform policy design (i.e., how well MoFs can model those priorities, what challenges they have 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 into 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, laying a strong foundation for resilient, data-driven climate policy.

Ministries have varying analytical needs

Ministries show substantial variation in their modeling needs and approaches, depending on the stage of their climate policy implementation, their prioritization, and their 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 the 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 associated with climate change and the green transition before moving on to forward-looking modeling. Tools such as green budget tagging, already used by some MoFs, serve as a foundational step for building analytical capabilities and an empirical base. This approach helps to 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.

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, such as 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 uncertain conditions. Consequently, some MoFs 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: in EMDEs, in particular, many Ministries rely on external (typically global) models that do not

always provide suitable answers to their country's unique policy questions and circumstances. For these countries, there is a need for tools that 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 other 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.

Model use can have unintended consequences

Some MoFs highlighted how the dominance of a few model types and outdated assumptions can 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 MoFs 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 between MoF analytical teams and policymakers are needed to ensure the transparent communication of analytical results.

3.4. Data and methodological challenges

Ministries of Finance 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 into critical indicators. These barriers are especially pronounced in Ministries with limited resources. Furthermore, MoFs noted a crucial 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 highlighted challenges in applying and developing analytical tools effectively, particularly in adapting models to local contexts and understanding complex decision-making factors, such as consumer behavior and investment needs. Overall, MoFs emphasized the need for clearer understanding and communication of the structural differences between various models and analytical frameworks, as these are based on different economic theories and assumptions. Awareness of these foundational design features is essential to the effective use and interpretation of model results.

Data-related challenges

MoFs identified the following data-related challenges:

- **Data quality**: Many MoFs reported 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, which have multi-year time lags. There is also a shortage of granular, disaggregated data at a sectoral and geographical level, 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 due to limited internal resources, including scenario pathways, technology forecasts, energy projections, emissions data, and hazard maps. Access to innovative data, such as emissions intensity for CBAMs, 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, such as 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.

Methodological and model design challenges

MoFs 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 the 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 computable general equilibrium, or CGE models) often have embedded assumptions 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**: Ministries use a variety of models and methodologies, making cross-comparisons and consistent assessments challenging, and potentially limiting MoFs' ability to challenge policy proposals. This is aggravated by a lack of transparency in the calibration and setup of various analytical tools used across departments (see next section).
- **Modeling specific policy needs and impacts**: There are many layers of complexity in climate modeling and analysis that MoFs need to be better understand. Specific examples include, but are not limited to:
  - **Quantifying investment needs for the green and resilient transition**: High-level estimates of investment needs for mitigation and adaptation are no longer sufficiently useful for MoFs that are designing specific policies. More granular information and analysis are needed to support effective policy design. Those estimates are largely unavailable and highly sensitive to country-specific factors and policy ambition.
  - **Modeling discrete consumer decisions**: Many climate-related consumer choices (e.g., adopting electric vehicles [EVs] 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 when it comes to policy effectiveness analyses (e.g., subsidy impacts on EV adoption).
  - **Newer climate policies (e.g., CBAMs)** require highly specific information, such as emissions intensity by product or sector, which may not be easily accessible or publicly available. Standard models do not have transmission channels to capture those dynamics.

- **Some MoFs are reliant on the integration of social accounting matrixes (SAMs) into their CGE models**. Embedding sustainable and environmental considerations into SAMs is, therefore, critical to enhancing and revamping the ability of CGE models to perform climate-related analysis.

However, while most MoFs 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, 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 of which are discussed in the next section), are more crucial to strengthening climate analytical capabilities within MoFs.

3.5. Capabilities

High-level buy-in and strong political leadership are needed to build and maintain climate analytical capabilities successfully. They are not always a given. Depending on a country's size, the potential impact of a policy, and its modeling capabilities, Ministries of Finance can use climate modeling to inform different stages of the policy cycle and the Ministry's core functions, from defining long-term priorities to fine-tuning policy options. Finding appropriate ways of sharing analysis with policymakers outside defined processes, in a format that is useful to them, is essential in order to influence decision-making.

All climate modelers interviewed interact with stakeholders outside the Ministry, in particular, line ministries and government agencies, international organizations, academia, NGOs, 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 the IMF and World Bank.

All MoFs interviewed lack, to one extent or another, the skills and expertise to do the modeling and analysis they would like to do to answer pressing policy questions. External support is helpful, but can also create more challenges for resource-constrained MoFs, as work done by consultants or technical assistance providers is time intensive, requires a high level of expertise, and may not always be suited to domestic needs.

Governance and leadership

Strong leadership, governance mechanisms, and institutional setups are essential to 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, facilitating the necessary buy-in from top officials. By contrast, changing government commitments and varying support for climate work within MoFs undermine the continuous build-out of capabilities. For example, one MoF said staff employed to focus on climate analytics were continuously pulled away to do other work when priorities shifted.

Some MoFs noted how the executive branch of the government can have an important coordination function in guiding strategic analytical work and interaction between ministries. Such a centralized coordination function is rare, however, and requires a clearly formulated climate strategy.

The Ministries interviewed have one of two main types of internal climate governance: (i) full integration or (ii) dedicated climate hubs. With full climate integration, MoFs follow a systemic approach that integrates climate considerations into all relevant units. 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. Dedicated climate hubs, in contrast, have centralized capabilities that also act as a coordination point for other work within the Ministry.

Some MoFs pointed out the importance of effective coordination by different units within the Ministry. The coordination of different teams working in core functions (such as economic strategy, fiscal policy, and budget management) is key to ensuring the exchange of information, avoiding the duplication of efforts, and fostering coherence of efforts. A centralized climate hub can serve such a function and also as a focal point for external communication and coordination. This is particularly important when climate modeling is undertaken in other line ministries (e.g., the Ministry of Environment) and input from the MoF needs to be coordinated.

MoFs use climate modeling and analysis at different points in the policy cycle, for example 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 to policymakers and the wider public about the impact of policies that have already been decided.

The majority of MoFs use their analysis and modeling to perform an important challenge function. They coordinate, inform, and assess activities or policies 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 with those line ministries. Most MoFs said that on important policy priorities, early engagement was key to ensuring successful outcomes. However, MoFs are often not directly involved in the early policy design and drafting stage, particularly when it comes to smaller regulations and policy packages. In addition, some MoFs face challenges in comparing results across the wide range of analytical tools used by governments. Different line ministries may use an array of analytical approaches to assess policy proposals. A lack of inter-agency consistency and transparency on 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 the strategic formulation of long-term planning and helping to identify risks and opportunities to assist policymakers in their strategic focus. An effective governance structure and process on how analytical work feeds into decision-making discussions is crucial to raising awareness on critical climate priorities. Detailed evidence can be used to convince stakeholders across government of policy choices.

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

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

Collaboration and coordination

There is a substantial divergence in the extent to which MoFs collaborate and interact with other line ministries on climate-related analysis, both across government and internationally. However, most MoFs see collaboration in multiple areas as a critical means of 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 ensuring consistency.
- Topical engagement with experts from other line ministries is important when Ministries are tasked with analyzing the impact of specific regulation, or policies that sit outside the expertise of MoFs.
- Exchanging information and best practices, both bilaterally and multilaterally, with other countries that have similar priorities, and where previous relationships exist, 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 a useful way of understanding market sentiment and collecting valuable data (e.g., historical loss data on insurance claims, or counterparty financial exposure of banks and asset owners to critical industries).
- Establishing stakeholder engagement with industry, scientific councils, academia, and NGOs is critical to providing answers on 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 highlighted the need to engage in knowledge exchange with partner institutions and other countries to build out the requisite capabilities. Enhanced knowledge exchange within and between governments raises awareness and consciousness of 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 are more reliant on partnerships and collaborations with external stakeholders. Smaller countries tend to collaborate more with external institutions (e.g., academia and 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 highlighted the benefits of consulting with and drawing on stakeholders to support analytical tasks (e.g., techno-economic modeling for certain industries). However, some MoFs said such engagement could absorb significant resources.

Skills and expertise

The majority of MoFs currently have substantial gaps in the skills and expertise needed to develop and use models to answer the most pressing policy and analytical questions they face. This makes it difficult for MoFs to integrate climate considerations appropriately 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 results from the fact that, for most MoFs, climate considerations are not yet fully integrated into the standard macroeconomic toolkit, but are quantitatively or qualitatively assessed complementarily, using a suite of different approaches and tools with varying levels of sophistication.

This study has identified two broad groups of MoFs when it comes to analytical capability: (i) Ministries with advanced capabilities that 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, as well as detailed policy evaluation; and (ii) MoFs with less developed capabilities and resources that require simple but robust estimates for identifying trends and changes in macro-critical indicators to inform government strategy and map broader risk and opportunities. Those MoFs are not yet at a stage where their analysis can 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 the qualitative assessment of fiscal risk stemming from climate change and the impact of climate policy to more quantitative exercises. This process involves a more thorough integration of climate considerations into general economic modeling and macroeconomic frameworks.

Another challenge when building out modeling capabilities, highlighted by MoFs, is that modelers and policymakers, but also economists, and energy specialists or engineers, speak very different languages. MoFs say 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 useful decision-making, MoFs cited a minimum need for a small team of people dedicated to (i) modeling the impacts of policies on emission pathways and (ii) modeling the impact of policies on key economic variables.

One MoF emphasized the need for better software, capable of handling larger and more complex models, along with greater open-source transparency to enhance knowledge sharing and comparability. An upgrade of software tools would better support the growing 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 interviewees observed that MoFs can draw valuable lessons from their experience of integrating other cross-cutting issues, such as demographic change and aging populations, into their modeling frameworks. The insights gained in building political buy-in and developing robust analytical infrastructure for these issues create a foundation for addressing climate challenges. For instance, demographic shifts are similar to climate issues, in that they are long term, marked by a high degree of uncertainty, and have wide-reaching effects on the entire economy and all core MoF functions. Leveraging this experience can inform effective strategies for integrating climate considerations into economic and policy planning.

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 critical roles. There was broad consensus among the MoFs interviewed that such technical assistance is highly important for knowledge transfer. One Ministry noted that simple tools and models can act as a critical starting point for feeding climate data into existing model infrastructure, or serve as a useful learning exercise for staff with lesser modeling capabilities. Some MoFs in developing countries cited 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" modeling.

External support is helpful, but can also be challenging, as work done by consultants or technical assistance providers is time intensive, requires a high level of expertise, and may not always be suited to domestic needs. In addition, MoFs voiced concern that model owners might have their own agendas, noting that control over model design may be limited. They highlighted the importance of being more closely involved in model development and having greater ownership over model adjustments in future.

Some MoFs said collaboration with external organizations needed to be strengthened to support effective model co-development and to 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 to 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 argued that they would benefit from being more actively involved in model development, to enable them to adapt and refine the models over time. Others said they would rather receive enhanced support to strengthen internal capacity to build customized, in-house models that directly addressed their specific needs.

Appendix

A1. Survey – Full methodology

Researchers at the Grantham Research Institute on Climate Change and the Environment developed a detailed questionnaire, following extensive consultations with subject-matter experts from academic institutions, policy think tanks, international organizations, and representatives from various Ministries of Finance. After undergoing multiple iterations and testing with a small number of MoFs, the final survey comprised 120 questions. Ten 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 lead of Helsinki Principle 4, 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 for outreach efforts to MoFs was solicited from international organizations that form part of the program's technical advisory group and wider partner network, including the World Bank, the African Development Bank, the Inter-American Development Bank, and the Asian Development Bank. The initial invitation was followed up with multiple formal and informal inquiries, primarily conducted by email.

The majority of survey submissions were received between May and August 2024. As at October 2024, a total of 188 submissions had been recorded, including seven that had been completed manually in a Microsoft Word document and submitted by email. The remaining submissions were made through the online Qualtrics platform. Among the 181 submissions on Qualtrics, most were incomplete or entirely blank. In addition, at least 11 countries submitted responses more than once. Where there were duplicate submissions, only the most recent entry was considered, unless there was a significant discrepancy in the completeness of 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 later version consistently included more inputs. After cleaning the data, 61 individual and complete submissions remained. However, two submissions were omitted from the analysis due to their submission far after the deadline.

The quantitative survey data was cleaned using Microsoft Excel and R, with the majority of data analysis conducted in STATA and 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. Qualitative data was processed primarily using NVivo. Open-ended responses underwent coding and evaluation based on an analytical framework tailored to each question (see section A2 below for further details).

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, recurring themes that emerged from multiple responses were organized and the key trends summarized. Thematic categorization allowed the effective identification of prevalent concerns or opportunities raised by the respondents.

For four out of seven standalone, open-ended, qualitative questions in the survey, a more advanced methodology was used to explore the responses in greater depth and granularity. These questions were selected based on the frequency, length, and depth of responses. The same data familiarization process as before was used to identify and compile key patterns, themes, and insights, and to provide a deep understanding of the contents, before proceeding to subsequent analysis. From there, data-driven codes were applied inductively to encapsulate themes and subthemes. To organize these codes systematically, code trees, drawn from existing climate economics

frameworks, were used to ensure the structure was aligned with broader discussions on risks, costs, capacities, fiscal concerns, and opportunities in the field. These themes were refined and adjusted as necessary to capture patterns that emerged during the immersion stages, to incorporate Ministry concerns in a manner that contributed to existing policy discussions.

Lastly, 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, emerging, and developing economies, allowing a more nuanced analysis of how risks, opportunities, and priorities are perceived across various development contexts. Using this software, particularly by generating queries based on respondent attributes, enabled greater organization and visualization of relationships in the data.

A2. Additional qualitative survey results

Tables A1–5 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 A1 and A2), as well as greater detail on models employed by MoFs and the policy areas they cover (Tables A3–5).

Table A1. 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
Six MoFs provided additional detail. Two MoFs said they had not integrated climate mitigation/ decarbonization into macroeconomic forecasting due to either government transition or macroeconomic forecasting falling under the jurisdiction of other agencies. One MoF indicated periodic baseline revisions to a climate–economy model. Other MoFs noted the integration of climate mitigation/ decarbonization through exogenous variables, green investment projections in the investment model, and periodic baseline revisions to a climate–economy model.	Two MoFs provided additional detail on how climate mitigation and decarbonization have been integrated into budget projections. One MoF reported periodic baseline revisions to a climate–economy model, as well as through a green budgeting review. The other MoF said that 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.	Three MoFs provided additional detail, sharing that climate mitigation and decarbonization had been integrated into the design of tax and fiscal policy options through exogenous variables, long-term strategic budget projections, and the application of a climate economic model for the analysis of green tax reforms in agriculture.	Four MoFs provided additional detail, with two saying that the design of financial sector policy options did not fall under the MoF's jurisdiction, one citing government transition, and one indicating that fiscal channels were under development for a climate–economy model to ensure better alignment with observed public finance outcomes.	Six MoFs provided additional detail. The responses indicated that climate mitigation and decarbonization had 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). One MoF said this was not planned as part of its climate–economy model program, while another MoF said it was unsure.

Table A2. Has the Ministry of Finance integrated physical climate risk and/or adaptation measures into the following analytical areas?

Macroeconomic forecasting	Design of tax and fiscal policy options	Design of financial sector policy options	Quantitative policy and program appraisal methods
Three countries provided additional information. One country reported that physical climate risk and/or adaptation measures were being integrated into macroeconomic forecasting through an assessment of the short-term economic impact of major natural disasters (e.g., wildfires, extreme weather) in monitoring GDP and GDP inflation (one and two quarters ahead). One stated that macroeconomic forecasting did not fall under MoF jurisdiction, while another noted ongoing consideration of a separate climate–economy model realigned to the medium-term macro-fiscal outlook.	Two countries provided additional information. One country said the integration of physical climate risk and/or adaptation measures into the design of tax and fiscal policy options was done for long-term strategic budget projections. Another country said the integration of physical climate risk and adaptation costs into fiscal projections was more straightforward than integration into the macroeconomic model.	Two countries provided additional information, both stating that the integration of physical climate risk and/or adaptation measures into the design of financial sector policy options fell under the jurisdiction of the central bank, though one cited the possibility of future consideration in MoF modeling work.	Two countries provided additional information, with one stating that it was not sure, and the other saying that its climate economic model lacked sufficient disaggregation within its fiscal channels to conduct granular policy program appraisals.

Table A3. Does the Ministry of Finance have any internal climate–economy models? For which policy area or analytical question is this model being used?

Model name	Type	Policy area/analytical question/additional notes
Treasury Industry Model (TIM)	Forward-looking, multisector dynamic equilibrium model	National macroeconomy
Industrial and Resources Abatement Model	Partial equilibrium techno-economic model	Least cost abatement for large industrial emitters (part of the safeguard mechanism)
Electricity Market Model	Partial equilibrium techno-economic model	Analysis of capacity expansion and detailed dispatch for key electricity grids (shared with other department)
FIN-GLOBAL variant	Multisector multi-region CGE model that incorporates combustion and process emissions	Modeling economic impacts of mitigation policies (does not consider climate-related feedbacks)
GEMMES, ENCORE	[No information provided]	[No information provided]
GreenREFORM	Dynamic CGE model	Policy assessment for climate measures in agriculture
ThreeME	Multisector, new Keynesian CGE model	Assesses the macroeconomic impact of sectoral mitigation policies (particularly in housing and automobile sectors)
SNOW	[No information provided]	[No information provided]
N/A	Budget-impact model	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+
UGAMOD, REEA	[No information provided]	[No information provided]

Table A4. Does your Ministry have dedicated external climate–economy models? For which policy area or analytical question is this used?

Model name	Type	Policy area/analytical question/additional notes
Global Trade and Environment Model	Dynamic global CGE	Addresses total, sectoral, spatial, and temporal efficiency of resource allocation
G-Cubed	Intertemporal general equilibrium model of the world economy	Based on explicit intertemporal optimization by the agents (consumers and firms) in each economy; time and dynamics are of fundamental importance to the G-Cubed model
N/A	Dynamic macroeconomic CGE model based on GreenREFORM, with bottom-up technology data; emission abatement technology curves developed by DREAM	Models the macroeconomic costs of the net zero transition to fulfill National Energy and Climate Plan requirements coupled with a microsimulation model that can capture the impact of energy and climate policies on specific socioeconomic groups (distributive impact)
TIMES-BE (open source)	[No information provided]	Energy model that seeks cost-efficient solutions based on technical or economic preconditions (e.g., energy supply security or carbon neutrality by 2050)
N/A	Dynamic input-output model + energy systems model	Externally developed and run
CPAT	[No information provided]	[No information provided]
GEM-E3-SK	[No information provided]	[No information provided]
ESRI-I3E	Intertemporal CGE climate model (and other external climate–economy models)	Developed under a joint research program
Open Source Empirical Macro (OSEM) (currently rolling out)	[No information provided]	[No information provided]
GreenREFORM (near future)	CGE	[No information provided]

Table A5. 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 (TIM)	[No information provided]
Excel	[No information provided]
Financial Programming and Policies (FPP)	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	[No information provided]
MAKRO	Developed externally (DREAM), operated internally
CGE	[No information provided]
EUROMOD	[No information provided]
Mesange	Developed internally, operated internally
Oxford Global Economic Model	[No information provided]
ITEM	[No information provided]
General and partial equilibrium models	[No information provided]
MMM	[No information provided]
ThreeME	Developed externally, operated internally
SNOW	[No information provided]
Financial Programming Policy	[No information provided]
Integrated Macro Model (SLIMM)	[No information provided]
Dynamic CGE	[No information provided]
DSGE + time series approaches	[No information provided]
Macro-structural models (business cycle and public finance implications)	[No information provided]
IMEM	[No information provided]
Macro-econometric (New Keynesian) and vector auto-regression	Developed internally, operated internally
KOOMA	[No information provided]
OSEM at beta stage of implementation	[No information provided]

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