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## Macroeconomic Risks Stemming from Climate Change and Transition Pathways

A G20 Report

July 2023



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## Executive Summary

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The G20 Finance Ministers and Central Bank Governors in February 2023 emphasised “deepening the G20 Finance Track policy discussions on assessing the macroeconomic risks to strong, sustainable, balanced, and inclusive growth (SSBIG), including those stemming from climate change and various transition policies taking into account country-specific circumstances”. Based on this mandate, this report<sup>1</sup> provides an overview of G20 members’ and invited countries’ experiences in managing the macroeconomic risks of climate change and transition pathways. Subject to country-specific circumstances, members can draw on the insights from this report to further develop their policy response to climate change, including to help achieve a more complete understanding of the macroeconomic implications of climate change and transition pathways. Additionally, the report can help identify areas for co-operation to maximise the economic benefits and minimize the costs of the transition to low-carbon economies. The report is based on a member survey and technical analysis by the Network for Greening the Financial System (NGFS), the International Monetary Fund (IMF), and the International Energy Agency (IEA), as well as discussions held in the G20 Framework Working Group (FWG) and related side events.

**Climate change will have significant global economic consequences.** Physical risks such as a persistent rise in temperature, extreme weather events and longer-term shifts in climate patterns are likely to have both short-term as well as long-term macroeconomic effects. They can have negative impacts on GDP, productivity and poverty reduction, detrimental effects on the balance of payments, investments and financial stability and can lead to more volatile as well as potentially higher inflation. Evidence suggests an uneven impact of climate change on countries and regions, with a greater impact on those facing heightened vulnerability to physical risks like rising sea levels and droughts. Evidence also indicates that developing countries, including low-income countries (LICs) will be disproportionately exposed to these risks. Many members also noted that, without adaptation and mitigation, the macroeconomic impacts of climate change would become more severe.

**The macroeconomic costs associated with the physical impact of climate change are significant both at aggregate and country levels, and the macroeconomic costs of inaction substantially outweigh those of an orderly and just climate transitions, particularly in the long term.** Analysis by the NGFS suggests that a further delay to the global transition to a low carbon economy could come with increased macroeconomic costs. However,

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<sup>1</sup> There are several related aspects that merit further exploration— particularly with regard to achieving a sustainable, inclusive, and just transition; climate finance; and wider societal impacts of climate change. However, there are specific working groups mandated to work on these issues and they fall beyond the FWG’s remit.

transitioning to a low-carbon economy also entails potential macroeconomic costs, A just, affordable, and orderly approach to climate transition, subject to country specific circumstances, is essential to limit the associated costs and risks. Additionally, this analysis highlights the importance of international cooperation in avoiding disorderly transition scenarios. This is especially more relevant as countries face both mitigation and adaptation costs, with the latter weighing more on developing economies.

**The optimal policy mix for transition will vary by country and sector and there are short-to-medium-term effects from transition policies on various macroeconomic variables, including growth, employment and prices.** Depending on their specific circumstances, countries may choose among a range of policy options, including carbon pricing, non-pricing approaches, public funding, initiatives, incentives, feebates, regulation and subsidies. Implementing an optimal mix of country-specific policy interventions will maximise benefits and requires increased cooperation due to the global nature of climate change. Pathways to achieving the Paris Agreement goals can have significant economic implications in the near, medium- and long-term. The material impact of implementing these policies will likely be realised across the factors of production, labour productivity, prices, and eventually actual and potential growth. The early stages of the transition require significant investment. An inclusive, swift, cooperative and customised approach to climate transition is essential to limit the costs and risks associated with the transition while integrating country-specific circumstances and approaches. Furthermore, international spillovers will also need to be managed through increased cooperation. Recognising that resources are limited, governments need to work towards achieving their climate targets in a cost-effective way while ensuring that these efforts continue to catalyse growth and mitigate the socio-economic impact on vulnerable households and regions.

**Responses to the FWG survey acknowledge the pressing need for a just, affordable, and green transition but also highlight some concerns around the potential transition risks and costs.** In addition to managing the physical risks presented by climate change, most members recognised the positive impact that the green transition could have on growth, such as through increased capital accumulation in the long run. Members also acknowledged that pathways, risks, costs, and opportunities will differ across countries based on their relative levels of development, variance in challenges, and other factors such as socioeconomic and environmental contexts. However, given different starting positions and recent supply shocks, some members flagged the potentially high fiscal costs as well as the structural, labour market and distributional impacts that some transition pathways could pose. However, some members also highlighted that potential fiscal loss could be compensated by recycling revenues from climate mitigation policies, notably carbon pricing. Some members noted that since there is no one-size-fits-all approach, country-specific non-pricing measures such as regulatory policies, increasing public awareness and boosting investment in research and development, can also help achieve a just transition. Members also highlighted the

importance of climate adaptation to build resilience in economies, particularly given the need to manage the fiscal risks associated with climate change. Emerging economies highlighted the need to account for their growth and social development priorities while pursuing transition policies, stressing the need for enhancing access to low-cost financing and technology to enable just transitions. In this context, and in response to questions around key challenges associated with transitioning, some members reiterated the importance of delivering on international commitments to support developing economies, namely on finance, technology, and capacity building. Several members highlighted the need for long-term stable and transparent investment plans and strategies to attract private capital. Some members also flagged that the transition has the potential to create jobs.

**Cooperation through sharing of macroeconomic policy experiences and good practices could benefit governments in designing and implementing country-specific sustainable transition measures in line with their unique circumstances.** To enhance the shared understanding of the macroeconomic impacts of climate change and transition pathways, the FWG can continue to play a useful role in fostering information sharing and learning from policy experiences. This can support member countries in designing and implementing climate change policies better, subject to country-specific circumstances and being mindful of the spillover effects. This report signals a significant step forward in bringing together technical assessments by International Organizations (IOs) and member experiences, enabling the FWG discussions to contribute to a deeper understanding of the macroeconomic implications of climate change and transition pathways. Building on this analysis, the report recommends further work on macroeconomic implications of climate change and transition pathways, as appropriate<sup>2</sup>.

## I. Macroeconomic Impacts of Climate Change and Transition Pathways

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To prepare this technical report, the International Monetary Fund (IMF), Network for Greening the Financial System (NGFS), and International Energy Agency (IEA), were requested to provide analysis, as per the workplan of the Framework Working Group (FWG). This section provides a summary of this analysis. The report provides an evidence-based assessment of the macroeconomic risks stemming from climate change and transition pathways.

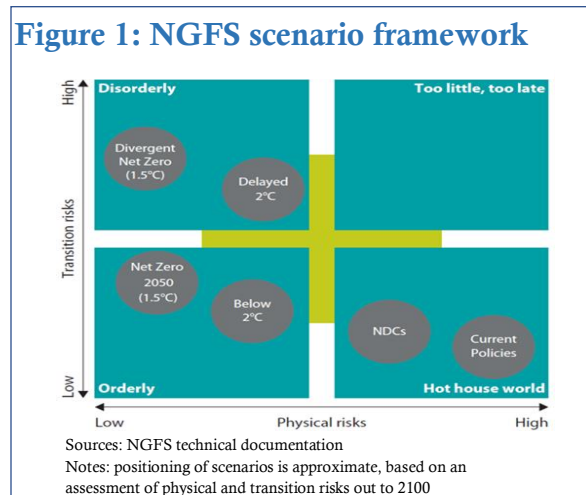
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<sup>2</sup> The contours of this work will be discussed by the G20 members during the Fourth G20 Framework Working Group Meeting in September 2023. Some of the themes which may be explored include implications of climate change and transition pathways on inflation, productivity etc, economic implications of bottlenecks to climate transition, managing international spillovers, macroeconomic implications of adaptation policies, fiscal risks from climate change and transition pathways etc.





## A. Modelling the economic impacts of Climate Change<sup>3</sup>



The NGFS climate scenarios shed light on the potential macroeconomic impacts of climate change and transition policies through the lens of different scenarios. The physical and transition risks of climate change are intertwined with the transition pathways. The NGFS climate scenarios<sup>45</sup> provide a set of six possible transition pathways (Figure 1) grouped into three categories, namely, orderly transition, disorderly transition, and hothouse world scenarios<sup>6</sup>.

**Existing models might not capture all possible downside risks, especially those from an abrupt transition in the short term as well as of economic costs from climate tipping points.** The models used to estimate the impacts of climate risks are focused on describing slow-moving shifts within the economy<sup>7</sup>. While they can be very detailed on the energy sector, they often have a simplistic macroeconomic module and so are less geared to capturing relevant short-term dynamics and frictions, such as stranded assets, and supply chain disruptions.<sup>8</sup> Additionally, current models may also not fully capture future benefits that arise from new opportunities associated with transitioning to a low carbon economy, such as the potential of technological breakthroughs or the avoidance of (likely currently under-estimated) losses due to the impacts of natural disasters. To address these shortcomings, the NGFS is currently working on developing its first set of short-term scenarios.

## B. Economic Impact of Physical Risks of Climate Change

**Physical risks are transmitted to the economy through a range of different transmission channels, mainly due to their impact on factors of production like labour, land, capital, and damages to physical property and businesses.** The NGFS scenarios distinguish between “acute” and “chronic” physical risks based on the pace of their impact on the economy. First, acute impacts from extreme weather events (for example, floods, droughts, storms), which

<sup>3</sup> It may be noted that the analysis presented in this section is subject to various assumptions made by the NGFS in their models.

<sup>4</sup> For further details, please see: <https://www.ngfs.net/ngfs-scenarios-portal/>.

<sup>5</sup> NGFS Note on Climate Scenarios to G20 FWG, May, 2023.

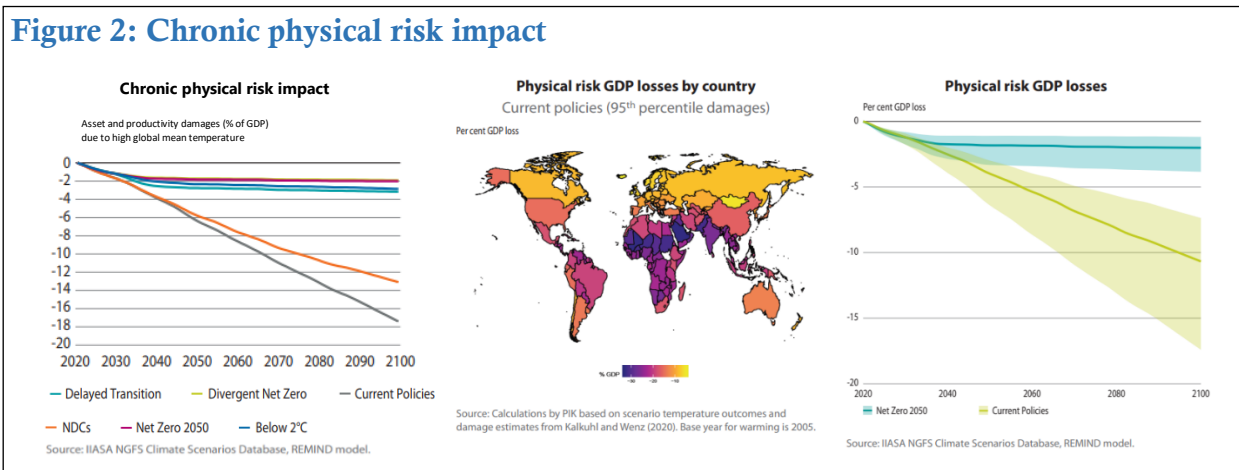
<sup>6</sup> Two orderly transition scenarios are Net Zero 2050 and Below 2°C. Two disorderly transition scenarios account in higher transition risk due to climate policies being delayed or divergent across economic sectors. Two hot house world scenarios assume that fewer climate policies are implemented in only some jurisdictions, and global efforts are insufficient to halt significant global warming.

<sup>7</sup> The NGFS scenarios are based on modelling approaches, some of which include Integrated Assessment Models (IAMs) and the National Institute Global Econometric Model (NiGEM). A detailed assessment of climate change modelling approaches may be referred to in the NGFS note on Climate Scenarios to G20 FWG, May 2023.

<sup>8</sup> Supply shocks may be caused as an economy and its sectors transition to greener technologies and production, though some policy mixes might not induce as severe a shock (shifting from labour taxation to carbon taxation for example).

are expected to increase in frequency and magnitude, can lead to business disruptions and damages to property as well as loss of life. In addition to the direct damages and losses, these events can lead to indirect effects including but not limited to the disruption of supply chains, price fluctuations, increased underwriting risks for insurers, possibly leading to lower insurance coverage in some regions, and impaired asset values. This represents an increasing fiscal risk for governments, who often act as insurers of last resort. Second, chronic impacts, particularly from increased temperatures, sea level rise and precipitation, may affect labour, capital, land, and natural capital in specific areas. Through these effects on individual businesses, households and the broader macroeconomy, acute and chronic climate risks could also translate into financial risks and affect the financial system<sup>9</sup>.

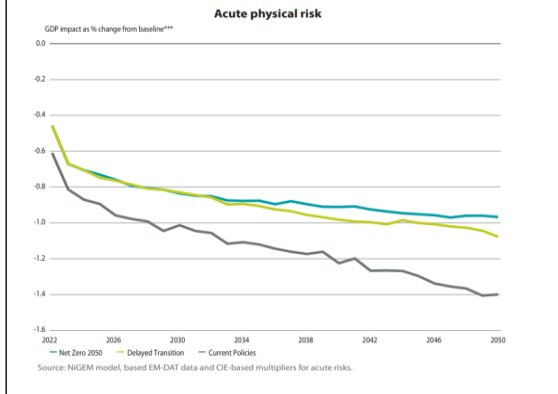
**The estimated chronic impact of climate change is disproportionately higher for tropical countries.** Some countries in these regions are especially vulnerable. For example, Pacific Island countries face very high physical risks from climate change and have fewer resources to draw on for mitigation and adaptation. The chronic physical risk is estimated to impact up to 6 percent of global GDP by 2050, rising to 18 percent of global GDP by 2100 in the current policies scenario relative to prior trends. The impact is heterogeneous across regions, with much higher GDP losses (over 30 percent) in the tropical region (**Figure 2**). GDP loss estimates also contain a degree of uncertainty about climate damages. Further, the threat to food security is not captured in estimates of GDP losses. Figure 2 also demonstrates that certain countries are particularly vulnerable to climate change and that each will have different challenges and capabilities (i.e., around human, and physical capital), especially among low-income and developing countries (LIDCs).



<sup>9</sup> NGFS note on Climate Scenarios to FWG, G20, May 2023.



**Figure 3: Acute physical risk impact**



**Extreme weather events pose acute physical risks to the economy.** NGFS models estimate that floods and tropical cyclones at global level in the current policies scenario, would lead to around 1.4 percent loss in the global GDP in 2050 compared to the baseline scenario<sup>10</sup>, notwithstanding large cross-country differences (**Figure 3**). The estimated losses here are a lower bound as they do not include all transmission mechanisms and, to date, include only floods and tropical cyclones.

### C. Macroeconomic implications of transition policy instruments

**The macroeconomic impacts of the transition to a low-carbon economy will depend on the composition of a countries’ transition policies but can be manageable if the appropriate policy mix is implemented.** Policymakers have a range of tools at their disposal to address climate change risks. These include carbon taxes, emissions trading, feebates, tradable performance standards, green subsidies, standards for green technologies, adaptation policies, and regulatory and other non-price policy measures. The optimal choice of these instruments and their applicability for specific sectors is dependent on country circumstances. Implementing an optimal mix of country-specific policy interventions will maximise benefits and requires increased cooperation due to the global nature of climate change.

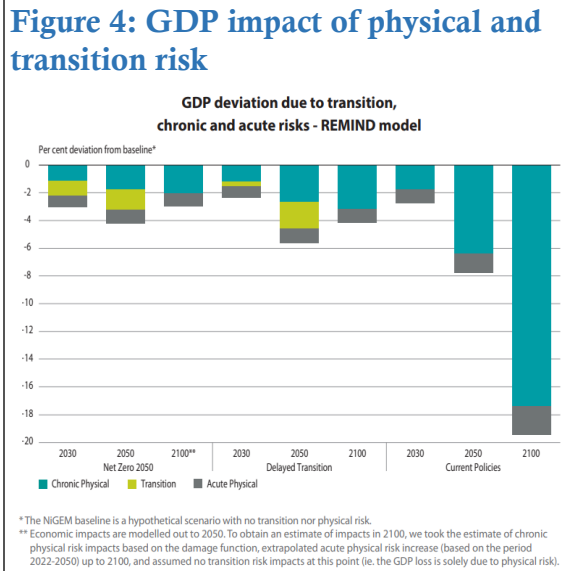
**Transition risks will affect the economy and financial system through a range of different transmission channels.** Transition risks arise from adjustments made towards developing a low-carbon economy and depend on the timing and speed of this process, as well as the level of preparedness in the economy and financial sectors. In turn, this depends on the access to resources at a reasonable cost, policies and green regulation, green technology development and its accessibility, as well as changes in consumer preferences. Transition risks will affect the profitability of businesses and the wealth (distribution) of households, particularly if the transition leads to stranded assets, creating financial risks for lenders and investors, depending on the policy timing, ambition, design and extent of anticipation. They might also affect the broader economy through investment, productivity, and relative price channels. It is also important to account for direct financial costs associated with transitioning to a low-carbon economy. These costs can include investments in new technologies, infrastructure, and other measures that are necessary to reduce greenhouse gas emissions<sup>11</sup>.

<sup>10</sup> The model’s baseline is a hypothetical scenario with no transition nor physical risk.

<sup>11</sup> The Intergovernmental Panel on Climate Change found that to limit global warming to 1.5°C by the year 2100 compared to pre-industrial times, greenhouse gas emissions must peak before 2025 at the latest and decline 43% by 2030.







NGFS estimates that the macroeconomic costs due to inaction would substantially outweigh those from an orderly climate transition scenario, particularly in the long-term, though the economic impacts of transition could still be substantial. The NGFS estimates that current policies without further climate action will lead to GDP losses exclusively due to physical risks of 8 and 20 percent by 2050 and 2100 respectively (Figure 4).<sup>12</sup> In contrast, in the NGFS Net Zero transition scenario, GDP losses are reduced to an estimated 4 percent by 2050 and 3 percent by 2100. Transition risks have a moderately negative impact on world GDP in

this scenario through 2050, accounting for roughly a third of the total losses.

**The scale and sharpness of the required adjustments grow disproportionately if action is delayed.** In the NGFS delayed transition scenario, GDP losses are greater when compared to an orderly scenario at an estimated 6 per cent by 2050 and 4 per cent by 2100<sup>13</sup>. Indeed, the projected costs of inaction may be underestimated as the true costs of acute weather events, potential tipping points and increased conflict and migration may not be fully captured, particularly as new risks are identified (despite improved modelling over recent years to better account for these damages). Further, recent research from the Peterson Institute estimates that procrastination reduces the chances of engineering an orderly transition<sup>14</sup>. NGFS analysis also finds that transition risks can also be worsened by insufficient coordination between countries, particularly in high emitting sectors.

**The transition to a low carbon economy may affect potential output and lead to a reallocation in labour markets.** This implies large opportunities in some sectors of the economy, while other sectors may shrink, and ultimately disappear – particularly carbon-intensive sectors. Countries need adequate policies in place to ensure a just transition, including reskilling and up-skilling programmes for those employed in these at-risk sectors. For example, labour will need to be reallocated to different roles, sectors, and places, which will inevitably entail friction, though policies to support the transition can help reduce these frictions. These elements, which are not modelled in the climate scenarios, illustrate the additional potential downside risks that can be expected. In addition to the reallocation within

<sup>12</sup> The model's baseline is a hypothetical scenario with no transition nor physical risk. Please consult the NGFS note on Climate Scenarios to FWG, G20, May 2023, for a description of the scenarios.

<sup>13</sup> NGFS note on Climate Scenarios to FWG, G20, May 2023.

<sup>14</sup> Jean Pisani-Ferry, 21-20 Climate Policy is Macroeconomic Policy, and the Implications Will Be Significant, (2021).



labour markets, the low-carbon transition may also impact certain parts of the capital stock (especially in the energy, transportation, manufacturing, and building sectors) as they become economically obsolete. Specifically, relative prices may drop to the extent that certain projects may have to be scrapped before reaching the end of their economic life (depending on their rate of depreciation and rate of transition), creating stranded assets and reducing potential output. Downward price rigidities may complicate relative price adjustments and lead to inflationary pressures in some transition pathways. Continued sharing of information on transition policy paths can contribute to mitigating adjustment costs.

**There are added complexities to understanding the economic impact of the transition, around which research is continuing to evolve.** Uncertainties around technology and non-linearities in climate modelling add complexity to understanding the economic impact of transition policies. However, any transition pathway will increase demand for key inputs. In this context, anticipated volatility in commodity prices, and shortages of critical minerals<sup>15</sup>, semiconductors<sup>16</sup> and other components are posing potential roadblocks for the energy transition. There is uncertainty over whether supply will expand quickly enough to meet the demand implied by current transition plans, which could also drive input prices. Therefore, it will be important to ensure global supply is scaled up to meet the demands of the global economy as it transitions. Policy makers will need to grapple with some trade-offs, working to expand supply while managing risks<sup>17</sup>. It is important that the supply chains of key inputs are resilient, transparent, sustainable and supported by a fair and efficient trading system.

**While climate transition policies can have significant short-to-mid-term costs, the choice of mitigation policy measures can potentially have varied effects on growth and inflation.** Depending on country specific circumstances, countries can choose among a range of mitigation measures including carbon pricing, taxation and pricing emissions, green subsidies and regulatory and non-priced policy measures with the overall effectiveness of these instruments quite varied based on the country and sector. IMF scenario analysis highlights the varied impact of the transition policies on inflation and growth (under certain assumptions)<sup>18</sup>. For instance, IMF analysis shows that using carbon pricing combined with revenue recycling can mitigate the negative impact on GDP and income distribution from green transition<sup>19</sup>. However, the analysis also indicates that carbon price can lead to increases

<sup>15</sup> Short- and Medium-Term Outlook for Global Energy Markets and Market Functioning” International Energy Agency Working paper to G20, March 2023

<sup>16</sup> Short- and Medium-Term Outlook for Global Energy Markets and Market Functioning” International Energy Agency Working paper to G20, March 2023

<sup>17</sup> There is ongoing analysis on how reconfiguration of supply chains could create temporary shortages (see IMF report on Geoeconomic Fragmentation and the Future of Multilateralism)

<sup>18</sup> Revenues from carbon pricing can potentially be used to fund clean energy initiatives, support low-income households (who may face the highest relative costs from climate transition), and offset the economic impacts of transitioning to a low-carbon economy. The IMF scenario analysis assumes that the imposition of carbon tax generates enough revenue for recycling purposes. Such a conclusion does not account for possible reduction in tax revenues due to adverse impact on economic growth arising from the imposition of carbon tax.

<sup>19</sup> For instance, if the revenue is used to reduce labour taxes, the net impact on GDP is minimal, as higher energy prices are offset by lower labour cost.

in natural gas and electricity prices in the intermediate period. Early experiences with carbon pricing highlight that if the consequences of the transition for income and living conditions are not taken on board in the implementation of carbon pricing, it may prove to be less acceptable (Pisani-Ferry, 2021)<sup>20</sup>. That is why it is important to complement climate mitigation policies, with measures to ensure a just transition.

**The IMF analysis also indicates that feebates and subsidies are useful options for accelerating decarbonisation, as these measures present moderate economic efficiency, political acceptability and administrative practicality.** However, the IMF notes that these tools need to be carefully designed to limit fiscal costs and to ensure that the increasing energy supply does not encourage increased consumption of “brown” energy.

**Each transition policy instrument comes with macroeconomic benefits and costs.** A mix of policies will be needed to accelerate low-carbon development, given their varying strengths and weaknesses. While non-revenue-based measures such as regulations may be easier to implement and will be required to address emissions, particularly in less price-sensitive sectors, tools that generate a revenue stream, such as a carbon tax, can provide a means to directly support economic activity in the short and long term through green investments. Besides, some studies (including the IMF analysis) indicate that, carbon pricing can foster efficiency as economic agents choose the mitigation options that are the least costly for them. However, the applicability of these instruments will depend upon country-specific circumstances and sector-specific requirements. Ultimately, most countries will pursue a mix of approaches that best suit their specific circumstances. Transition policy instruments should be able to find the right balance between efficiency and acceptability. This balance will vary across sectors and across countries. Therefore, there is no one-size-fits-all approach that can be devised for any specific policy instrument. However, there is a need for global cooperation to ensure that the benefits from transition policies are maximised.

## II. Members’ experiences of the macroeconomic implications of climate change and transition pathways

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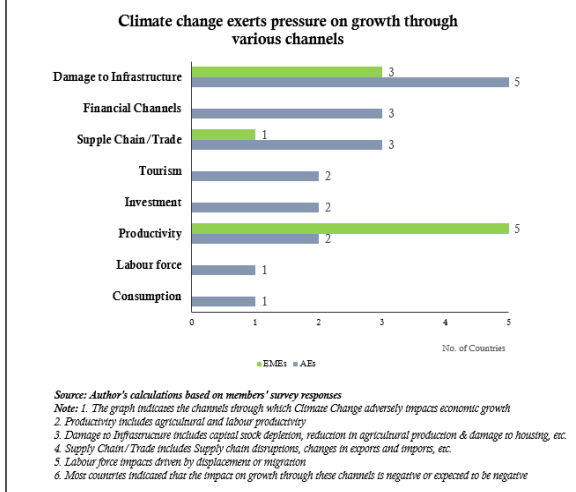
G20 members and invited countries were surveyed for their experiences in managing the macroeconomic implications of climate change and their respective transition policies; their responses are summarised below.

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<sup>20</sup> Jean Pisani-Ferry (2021), The missing macroeconomics of climate action, Chapter in Bruegel’s publication “Greening Europe’s Post-Covid-19 recovery”.

## A. Macroeconomic impacts of climate change

**Figure 5: Economic impact of climate change**



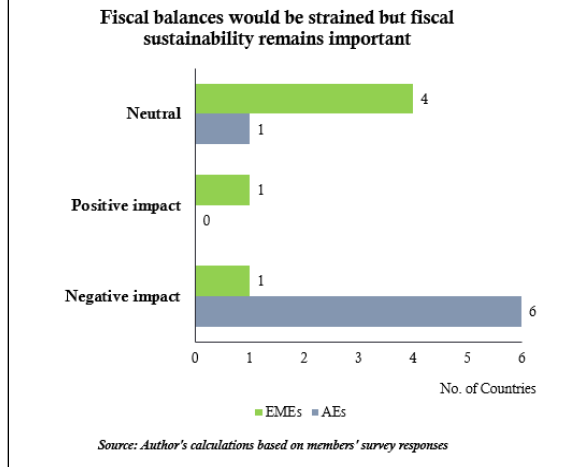
Many members anticipated adverse economic impacts of climate change on growth through various channels (Figure 5). Several members have reported physical damage to infrastructure associated with the physical risks of climate change (via increased temperatures and changes in rainfall patterns). They noted that increased temperatures would cause the destruction of productive capital, harming economic capacity and growth. Some highlighted the negative effect on GDP through a decline in productivity. Detrimental effects on investments and financial stability as a result of uncertainty in growth due to climate change were also noted by some

members. A few countries mentioned a marginal economic impact due to climate change. Many members also noted that, without mitigation, the macroeconomic impacts of climate change would become more severe. Furthermore, member responses vividly depicted the unequal impact of climate change on countries – with certain regions more exposed to physical risks (such as rising sea levels and floods).

**Additional channels of transmission, including through risks to the agriculture, tourism and energy sectors, were also noted.** Members emphasised that climate change could have damaging effects on agricultural productivity, leaving countries with significant agricultural sectors, particularly vulnerable. Adverse weather in summer months could lead to higher food prices; the destruction of productive capital may also cause a decline in agricultural productivity. However, certain opportunities for agriculture were also noted. Other sectors such as tourism, could be affected by both higher temperatures in winter and a rise in sea level. Some members mentioned risks to the energy sector and expressed concerns about rising energy prices due to some transition policies and climate change. At the same time, a few respondents highlighted the challenge of low self-sufficiency in energy and declining hydropower potential. The risks to livelihoods through channels such as extreme weather events and health outcomes were also a concern amongst some members.

## B. Macroeconomic impacts of transition policies

**Figure 6: Impact of transition policies on fiscal balances**



**Some countries expect to see short-to-medium-term negative impacts of transition policies on economic growth and fiscal balances.** Some countries expect a slowdown, at least in the short run, due to a reduction in fossil fuel usage. Members also highlighted the significant costs associated with transitioning in the short term, mainly potential inflationary pressures and socio-economic costs. Members drew attention to the pressures placed on fiscal balances to finance their transitions (**Figure 6**). However, a few emerging market economies underscored the principle of fiscal sustainability while meeting the heightened demand for fiscal

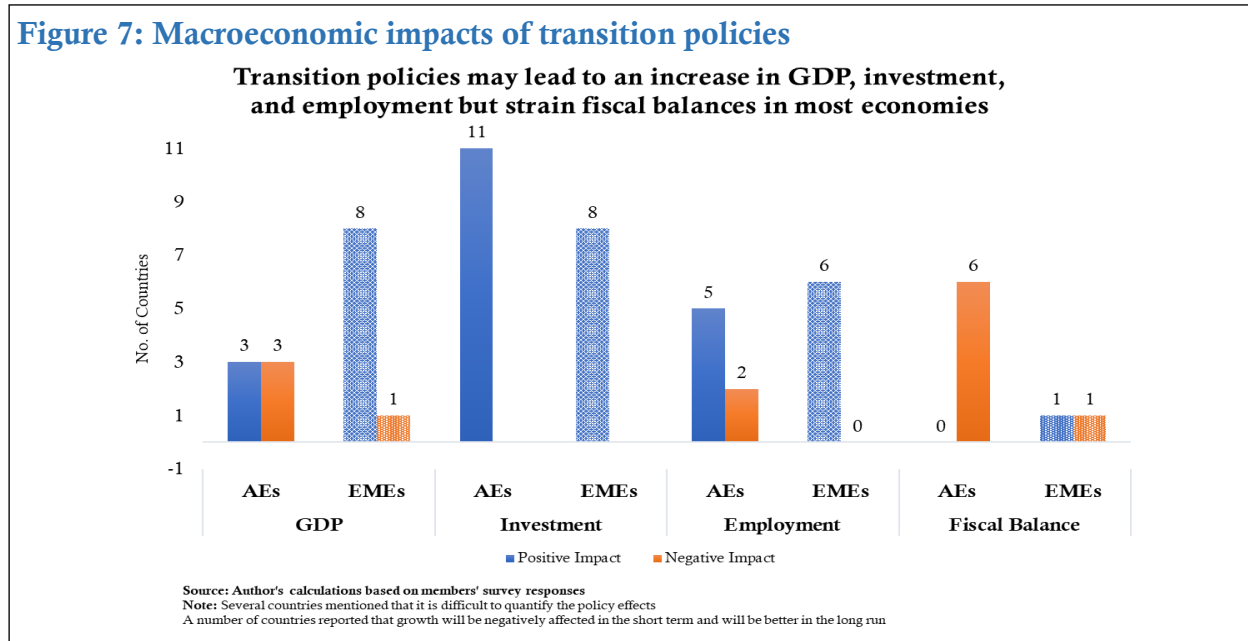
resources and expect a neutral effect on fiscal balances. Furthermore, some members highlighted how the changing composition of their economy would also impact revenue streams if large revenue-generating sectors were to slow as a result of the transition.

**Nonetheless, many members recognized the possibilities for positive outcomes of transition policies on investment and employment, therefore, enhancing growth prospects in the long run (Figure 7).** Some members viewed that transition policies could create new avenues of economic growth and employment while also accelerating investment towards adaptation and mitigation climate actions. Many Members generally noted how the short-term costs of transitioning are small compared to the longer-term prosperity it brought, particularly when compared to a baseline of a hot-house world. Many members noted that the scale of investment needed to transition would induce economic growth, and boost employment, job creation, and foreign direct investment (FDI) – particularly in sectors that would be expected to expand to facilitate the climate transition, such as mining and commodity sectors. To boost investment, some countries have also instituted investment funds to channel the finance. Supported by the massive scale of investment, some members also noted increasing employment opportunities, especially in industries in the energy, construction, and transportation sectors, amongst others. Countries with rich mineral reserves highlighted opportunities for job creation along the critical raw material value chain, contributing to economic growth. A few countries also indicated that changing sectoral dynamics would create labour shortages and labour skill mismatches and, therefore, require a reskilling of the workforce. Transition risks and policies may also change the international



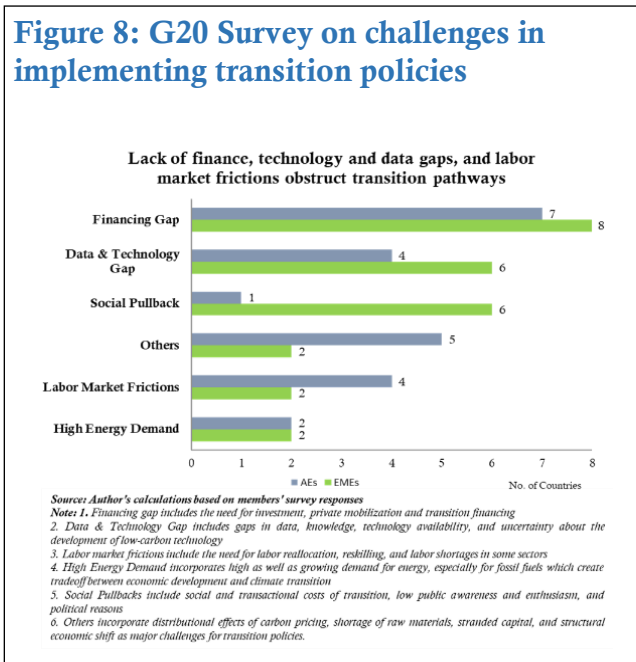
trade system significantly, with some countries expressing concerns about external trade shifts and negative impacts on trade and capital flows that could lower future growth prospects.

**Figure 7: Macroeconomic impacts of transition policies**



**Financing concerns, technology and data gaps, and labour market frictions were deemed as obstacles in the transition pathway for many members (Figure 8).** Emerging economies reported requiring low-cost financing to implement transition and adaptation policies. In this context, and in a response to questions around key challenges associated with transitioning, some members reiterated the importance of delivering on international commitments to support developing economies, namely on finance, technology, and capacity building. Several advanced economies highlighted the need for long-term stable investment plans and strategies to attract private capital. Many also perceived the socio-economic costs of transition as a near-term challenge. These include costs accrued due to structural shifts in the labour market, protecting vulnerable communities, and depleting stock of capital (stranded assets). Other key challenges highlighted were low public awareness and continuing demand for fossil fuels.

**Figure 8: G20 Survey on challenges in implementing transition policies**



**The risks linked to the climate transition have implications for fiscal policy and employment; however, the nature and impact of such risks differ because of countries' resource endowments and unique and self-assessed transition pathways.** Some respondents highlighted the challenges in meeting growing energy demand as a barrier to implementing transition policies in the near term. Surveyed countries expressed concern over the fiscal implications of such policies, particularly with regard to the potential loss in revenue, while others pointed to the adverse impact on employment in the near term in relevant sectors.

**Members called for more ambitious adaptation policies to build resilience against the physical impacts of climate change as well as to mitigate the adverse impact on public finances.** Many member countries expressed confidence that policy initiatives aimed at building resilience in agriculture and transforming the mobility and construction sectors can have a net positive impact on employment and economic growth. Members also flagged that promoting adaptation finance policies, such as pre-arranged post-disaster financing and disaster insurance, can limit the fiscal risks related to climate-related disasters.

**Some members noted the effectiveness of carbon pricing in reducing greenhouse gas (GHG) emissions, but others also noted the benefits of using non-pricing approaches for the transition.** Some members drew attention to the ability to recycle revenues generated through carbon pricing (and taxation measures), which could largely offset any negative impacts on output. A few also noted that carbon pricing measures can generate additional fiscal revenue to redistribute and compensate for the possible adverse impact of other climate mitigation policies. However, others indicated the possibility of its short-term detrimental impact on GDP due to high carbon taxes. Some also noted the new investment opportunities in green technologies as a result of carbon pricing policies. Some members noted that since there is no one-size-fits-all approach, country-specific non-pricing measures such as regulatory policies, increasing public awareness, boosting investment in research and development, can also help achieve a just transition.

### III. Key Takeaways on Policy Actions

This section draws from members' experiences and technical analysis by IOs to identify some key takeaways on actions taken by countries to deal with the macroeconomic risks stemming from climate change and transition pathways.

**The analysis by IOs presents a clear case for orderly and just transitioning to a low-carbon economy to mitigate the macroeconomic impacts of climate change. Given the scale of intervention that climate transition requires, there are significant risks in the medium-term associated with transitioning and an orderly action could maximise relative benefits.** The NGFS scenarios show that timely policy action and an orderly transition will yield the highest long-term returns, giving rise to less detrimental GDP impacts from climate change, particularly in the long term. In these timely policy action and orderly scenarios, policy

certainty supports private investment and aids risk management, allowing households and businesses to take the necessary actions to deliver the transition while managing their costs. In addition, swift action minimises physical risks, limiting direct damages and the cost of adaptation. However, given the scale of intervention that climate transition requires, there are significant risks in the medium term associated with transitioning – the quantum of which including its international dimension, is also uncertain given the numerous pathways to achieve the transition. Nevertheless, the cost of maintaining current policies far outweighs the costs of intervening to mitigate climate change, in the long run.

**Global cooperation on climate policy action can help reduce transition risks and manage spillovers.** This finding is supported by the NGFS analysis which concludes that transition risks can be worsened by delayed action or insufficient cooperation between countries. Cooperation in the areas of finance and technology will be essential to support the transition ambitions of countries and ensure that the transition is cost-effective and just. Other risks that could present bottlenecks to the climate transition can also be managed through global cooperation. Improving global data for issues that could cause barriers to the global transition more broadly will make it easier to assess the full extent of the macroeconomic impact of the green transition and enable further analysis to be undertaken.

**Countries can select from a range of policy options, but the climate policy mix choice will have a significant bearing on the longer-term macroeconomic impact.** While the optimal policy mix will depend on country-specific circumstances, different policies will not have homogenous macroeconomic consequences and will be accompanied by their own benefits and risks. A wide range of policies can play an important role in transitioning, including carbon pricing, taxation, implementing regulation and financial incentives, though each carries its own economic benefits and costs that can also vary based on country and sector conditions.

**Some concerns around the climate transition can potentially be addressed via technological innovations, capacity-building and financing.** Advanced economies indicated that long-term investment plans and strategies to attract private capital would be beneficial to address transition challenges. Filling data and knowledge gaps by boosting technology infrastructure and capacity-building and improving public awareness would facilitate a smoother transition. Additionally, emerging economies stressed the need for financing to overcome the socio-economic costs of transition. The IMF analysis complements this view, suggesting that climate finance could be used for a progressive distribution of transition costs.

#### IV. Role of the Framework Working Group going forward

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Building on the analysis presented in this report and the key policy takeaways, some of the areas that the FWG may continue on working with respect to macroeconomic implications of climate change and transition pathways are as follows:

- a. **The FWG should continue to study climate risks associated with, or leading to, macroeconomic risks under its mandate of ensuring strong, sustainable, balanced, and inclusive growth (SSBIG).** The FWG should not only continue to discuss the macroeconomic implications of climate change and transition pathways (which would allow the sharing of experiences among members) – but also provide a forum for regularly sharing and discussing macroeconomic analysis and forecasting into which climate risks and spillovers are integrated.
- b. **The FWG could be a critical forum to discuss the implications of different climate modelling analyses.** The FWG could identify areas where the analysis should be progressed and where data and modelling gaps exist, as expressed by members, while avoiding duplication with other similar multilateral efforts. This would maximise analytical progress, which will in turn better inform policy.
- c. **The FWG can also remain proactive in exploring and discussing current and emerging risks in order to provide inputs to inform FMCBG meetings in an impactful way.** The FWG may continue to consider and discuss this to understand better the macroeconomic risks associated with various bottlenecks to transition as well as of international spillovers (both positive and negative). Other issues that could be explored include the impact of climate change and transition on GDP, external balances and flows through the balance of payments or the shorter-term issues associated with the increasing frequency of extreme weather events. Members have noted that areas for relevant work could also include macroeconomic implications of adaptation policies, which is of important interest to EMDEs and fiscal risks from climate change and transition pathways.

**Through the work undertaken in the preparation of this report, it is clear that there are gaps in the global conversation on the macroeconomic implications of climate change and transition pathways.** The FWG could be used as a forum to share member experiences on the policy responses/analysis undertaken to maximise the benefits and minimise the costs of the transition. Such endeavours can help in minimising the transition imbalances and therefore, ensure an equitable transition. In this context, further work on the macroeconomic implications of climate change and transition pathways, as appropriate, is recommended<sup>21</sup>.

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<sup>21</sup> The contours of this work will be discussed by the G20 members during the Fourth G20 Framework Working Group Meeting in September 2023. Some of the themes which may be explored include implications of climate change and transition pathways on inflation, productivity etc, economic implications of bottlenecks to climate transition, managing international spillovers, macroeconomic implications of adaptation policies, fiscal risks from climate change and transition pathways etc.