Adaptation finance gap

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Chapter 4

Adaptation finance gap

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Inle Lake is a freshwater lake located in the Nyaungshwe Township of Taunggyi District of Shan State, part of Shan Hills in Myanmar.

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Key messages

▶ This year’s Adaptation Gap Report (AGR) includes a comprehensive assessment of the literature and has commissioned new studies to provide updated estimates of the cost of adaptation and current adaptation finance flows, and thus the adaptation finance gap for developing countries.

▶ The costs of adaptation from this new assessment are estimated to be in a plausible central range of US$215–387 billion/year for developing countries this decade. This is a significant increase from the previous AGR estimate. This is based on two evidence lines:

   ● A modelling analysis estimates that the costs of adaptation could be US$215 billion/year this decade, with a range of US$130–415 billion/year. These costs are projected to rise over future decades towards 2050.

   ● An analysis of the needs communicated in nationally determined contributions (NDCs) and national adaptation plans (NAPs), with extrapolation to all developing countries, estimates adaptation finance needs at US$387 billion/year for 2021 to 2030, with a range of US$101 billion to US$975 billion/year.

▶ An analysis of international public adaptation finance flows to developing countries estimates these at US$21 billion in 2021 – a 15 per cent decrease compared to 2020.

▶ Of the total bilateral finance commitments to developing countries over the period 2017–2021, only 66 per cent was disbursed compared with 98 per cent for all bilateral development finance. This indicates that there are specific barriers to adaptation that impede implementation.

▶ Based on this new assessment of costs and flows, the adaptation finance gap has grown significantly since previous assessments. The estimated costs/needs of adaptation are now approximately 10–18 times as much as international public adaptation finance flows. A widening gap indicates a deepening climate crisis and will mean increased loss and damage.

▶ This indicates that a significant increase in international public adaptation finance is needed, which should be anchored in the new collective quantified goal. However, any such increase is unlikely to bridge the adaptation finance gap on its own. For example, reaching the goal of the twenty-sixth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 26) of doubling international public adaptation finance by 2025 would require an increase of 16 per cent per year (on average), but this would only close the adaptation finance gap by approximately 5–10 per cent.

▶ Domestic expenditure and private finance could be vitally important sources of adaptation finance, but quantitative estimates are not yet available. However, neither domestic expenditures nor private finance flows are likely to bridge the adaptation finance gap alone, especially in low-income countries (including the least developed countries [LDCs] and small island developing States [SIDS]) and there are important equity issues in using these flows to fill the gap in these countries.

▶ For the first time in the gap report, an analysis of gender equality and social inclusion has been made. This indicates that gender is only weakly included in adaptation finance. Of the international public finance for adaptation that is also tagged with gender equality as a principal marker, only 2 per cent is assessed as gender-responsive, with a further 25 per cent as gender-specific or gender integrative. Analysis of costed NDCs and NAPs finds that 20 per cent of these now include dedicated costs for gender aspects, and the budget allocated to these interventions is generally low, at 2 per cent on average. Only one country’s document is considered gender-responsive, with the rest gender-specific or -integrative. Among both finance flows and finance needs, other aspects of social inclusion (e.g. Indigeneity, ethnicity, disability, age or migration status) receive little attention.
Bridging the adaptation finance gap requires more ambitious mitigation and effective adaptation. In addition to increased international public adaptation finance, private-sector finance and domestic expenditure, several approaches can help bridge the gap. These include remittances, increased finance for small and medium-sized enterprises (SMEs), reform of the international financial system and the implementation of article 2.1(c) of the Paris Agreement. The latter offers significant potential, including for developing countries, but it also brings the risk that vulnerable developing countries become less attractive to invest in if article 2.1(c) is driven solely by financial materiality.

4.1 Introduction and context

The adaptation finance gap is defined as the difference between the estimated costs of meeting a given adaptation target and the amount of finance available for adaptation (United Nations Environment Programme [UNEP] 2014). The AGR 2023 has undertaken a new and comprehensive analysis to estimate the adaptation finance gap for developing countries (the non-Annex I countries under the United Nations Framework Convention on Climate Change [UNFCCC]).

In practice, estimating the gap is challenging, both conceptually and quantitatively (UNEP 2016a). Furthermore, while a monetary metric helps communicate the scale and urgency of the gap, finance is a means rather than an end, as the availability of funds does not guarantee that they will be used efficiently and effectively (see chapter 3). There may also be ‘soft’ and ‘hard limits’ to adaptation (see glossary). Nevertheless, a widening finance gap indicates a deepening climate crisis and will mean higher losses and damages (see chapter 5), whereas a narrowing gap indicates progress. The finance gap estimate is based on three evidence lines:

- An updated analysis and estimate of the costs of adaptation based on global sectoral models
- An updated analysis and extrapolation of adaptation finance needs reported in NDCs and NAPs
- An updated analysis of global adaptation finance flows (where possible) at the country level

Based on this analysis, the chapter compares the adaptation costs and finance needs against the current adaptation finance flows to estimate the size of the adaptation finance gap. It has also considered the gender equality and social inclusion dimensions of adaptation costs, needs and finance. Finally, the chapter discusses ways to potentially bridge the gap. Additional information on the analysis is provided in the supporting Adaptation Finance Gap Update 2023 (AFG Update 2023).

This new adaptation finance gap estimate is relevant to the discussion of the nature and size of the new collective quantified goal on climate finance, which is to be set prior to 2025 by the Parties to the UNFCCC and which will be fundamental to helping close the adaptation finance gap, in particular for more vulnerable countries such as the LDCs and SIDS. It is also relevant to the decision taken at COP 26 in Glasgow to urge developed countries to at least double their collective provision of finance for adaptation to developing countries from 2019 levels by 2025 (decision CMA.3).

4.2 The costs of adaptation in developing countries

4.2.1 Introduction, approaches, challenges, methods and evidence lines

The costs of adaptation can be defined as the costs of planning, preparing for, facilitating and implementing adaptation measures to moderate harm or exploit beneficial opportunities arising from climate change. In simple terms, the costs of adaptation can be assessed by estimating the current and future impacts of climate change, then...
assessing the reduction in these impacts (the benefit of adaptation) and its associated cost (UNEP 2016b). However, there is a trade-off involved over how much adaptation to do, and on the level of residual damage costs after adaptation (noting these include both market and non-market damages). This reflects the fact that adaptation is rarely 100 per cent effective and that it usually becomes more costly (and less cost-effective) to reduce impacts towards zero. This residual damage after adaptation closely relates to the concept of loss and damage (see chapter 5), including economic and non-economic impacts. It is highlighted that the trade-off between adaptation costs and residual damage involves ethical as well as technical considerations, and that different actors may have different views on these issues.

In practice, estimating the costs of adaptation is extremely difficult (UNEP 2016a, 2021a) and there is no single definitive estimate, because costs depend on the objectives chosen, as well as on the definitions and methods used (UNFCCC 2022a). Further discussion of why estimates of the adaptation costs can vary is summarized in box 4.1, with a fully referenced discussion in the AFG Update 2023.

### Box 4.1 Why do the estimated costs of adaptation vary?

#### Framing issues

- **Objectives.** There is no single agreed quantitative goal for adaptation. The costs of adaptation vary with the objective and whether this is based on economic efficiency, acceptable risk levels or reducing impacts to current levels. This also determines residual damages, which are relevant for losses and damages.

- **Uncertainty.** There is high uncertainty around the future risks of climate change and thus the amount and cost of adaptation needed. This arises from alternative future emission and socioeconomic scenarios, alternative climate models as well as from uncertainty around the level of (physical) climate impacts.

- **Coverage and boundaries.** Adaptation costs vary with the coverage of sectors and the risks as well as the boundaries e.g. whether to include costs to address existing natural climate variability and extremes, and whether general development is included (e.g. activities to increase household incomes).

To help address these framing issues, the AGR uses different evidence lines and undertakes sensitivity analysis where possible, for example to capture the effects of uncertainty.

#### Methodological issues and assumptions

- **Estimating adaptation costs is challenging because of the site- and context-specific nature of risks (hazard, vulnerability and exposure), which change over time non-linearly and have high uncertainty (as above).**

- **Adaptation costs vary with the method used, the assumptions within the modelling or analysis framework, and with the assumed effectiveness of adaptation (in reducing climate risks).**

- **The incremental level of climate impacts and the level of adaptation and costs both depend on the historical reference period chosen. More recent baselines reduce the level of impact and thus adaptation costs.**

- **Adaptation costs vary depending on whether autonomous adaptation is included in the analysis of impacts (e.g. from natural acclimatization to heat or from changes in prices in markets).**

- **Adaptation costs are higher if real world implementation is considered, and if associated opportunity and transaction costs as well as design, management, implementation and monitoring costs are taken into account.**

- **Adaptation costs are lower if learning and innovation are included, and if soft options are considered (e.g. early warning), as these can have lower costs than engineered options.**

- **Adaptation costs expressed in US$ can vary. Different studies have different price years and some estimates are presented as purchasing power parity values.**

- **Adaptation is often described as a process. An adaptive management approach frames risks iteratively over time, then uses decision-making under uncertainty, and so identifies different adaptation options and costs, compared with a linear static analysis.**
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These issues are acknowledged in the AGR, and analysis is made of their influence on reported values.

Additional factors and key gaps

While there has been significant progress in estimating adaptation costs, there remain areas that are still not well captured in the literature, which are priorities for future updates.

- Most adaptation costing has focused on incremental adaptation, but the need for transformative and transformational adaptation will involve very different costs (and is a priority for further analysis).
- Adaptation costs will vary with soft and hard limits to adaptation, which also determine residual damages, but these limits have rarely been considered in analysis.
- Most studies have focused on direct climate change impacts, but there is increasing awareness of the need to adapt to cascading and compounding risks and address interdependencies.
- Adaptation that considers gender equity and social inclusion, or distributional analysis, will give different weight to different groups, which can affect costs.
- Mitigation and adaptation can involve positive synergies and potential trade-offs. Considering these can change adaptation options and costs.
- Adaptation is often delivered by integrating in existing policies and programmes, rather than as a stand-alone policy, and there can be synergies (or trade-offs) with other policy objectives, which affect costs.

Noting these challenges, the AGR has identified indicative ranges of adaptation costs using two alternative evidence lines and metrics: first, estimates of the costs of adaptation from modelling studies (4.2.2) and second, adaptation finance needs as estimated and communicated by national governments in UNFCCC submissions (4.2.3).³

4.2.2 The modelled costs of adaptation

A comprehensive review and assessment of the literature, and commissioned studies, have been used to update the modelled costs of adaptation. Full details are presented in chapter 2 of the supporting the AFG Update 2023.

Global model assessments. Since the AGR 2016, there have been a significant number of new modelling studies on the global economic costs of climate change, as reported in the Intergovernmental Panel on Climate Change Working Group II Sixth Assessment Report (IPCC WGII AR6) (O’Neill, van Aalst and Ibrahim 2022). This includes the use of global integrated assessment models, structural models (including computable general equilibrium models) and econometric (statistical) analysis to assess the economy-wide effects of climate change. However, there has been much less progress in producing new estimates of global adaptation costs. Indeed, adaptation remains poorly represented in current global modelling frameworks and models (van Maanen et al. 2023). The IPCC WGII AR6 (New et al. 2022) reviewed the global costs of adaptation for developing countries. A review for the AGR 2023 has identified only a limited number of additional adaptation studies since the IPCC report (de Bruin and Ayuba 2020; van der Wijst et al. forthcoming).

Sector modelling assessments. Because of the challenges in integrating adaptation into the global economic models above, and thus the low number of published studies, an alternative approach is to aggregate adaptation costs produced at the sector level. This includes the use of sector-integrated assessment models, sector economic models and sectoral assessments. This approach allows an improved representation of adaptation, though it does not capture the wider economic and cross-sectoral linkages that are possible with the above-mentioned global economic frameworks. Ideally these sector studies are run using consistent scenarios and assumptions to facilitate aggregation which can then be input into integrated global economic models.

This report has used a sectoral approach to produce new estimates of the costs of adaptation. It has derived adaptation cost estimates from established sector models and recently published studies, working with modelling teams to extract adaptation cost information and updating to current prices (presenting values as annual undiscounted adaptation costs). The analysis is summarized in table 4.1. This includes updates to previous sectoral assessments but also the extension to additional sectors and risks. The

³ All values in this chapter are reported in constant 2021 prices (to year end 2021), in alignment with the method used in the Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) database, without purchasing power parity adjustment. The price level adjustment was also applied to previous AGR estimates and estimates of adaptation finance needs.
resulting estimates have been aggregated to provide a new indicative cost of adaptation for developing countries. This approach has allowed a comprehensive update of the costs of adaptation, although it was not undertaken as a fully integrated analysis.4

Table 4.1 Approach and results for the sectoral modelled costs of adaptation for developing countries

<table>
<thead>
<tr>
<th>Sector or theme</th>
<th>Approach</th>
<th>Estimated adaptation costs (central) for developing countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal zones</td>
<td>DIVA model (Hinkel et al. 2013; Hinkel et al. 2014) and model runs (Lincke et al. 2018)</td>
<td>Cost of coastal protection and beach nourishment estimated at US$56 billion/year for 2020–2030 (adaptation cost only, excluding residual damage, RCP4.5–SSP2). Costs increase by 2050s, especially for higher emission scenarios, and increase rapidly thereafter. High residual costs remain after adaptation, though levels vary with protection levels.</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>World Bank Studies (Hallegatte, Rentschler and Rozenberg 2019; Hallegatte et al. 2019), extended to 2050 (AFG Update 2023)</td>
<td>Costs of making infrastructure resilient in the energy and transport subsectors estimated at US$56 billion/year. Adaptation reduces the risks of damage by a factor of two to three, though residual impacts remain. Costs increase significantly towards 2050. Does not include adaptation costs for other infrastructure (including urban).</td>
</tr>
<tr>
<td>Agriculture</td>
<td>IFPRI modelling suite and model runs (Sulser et al. 2021)</td>
<td>Annual adaptation investment needs to address the impact of climate change on chronic hunger estimated at US$16 billion/year over the period 2015–2050, based on costs of agricultural research and development, water management and infrastructure.</td>
</tr>
<tr>
<td>Fisheries, aquaculture and marine ecosystems</td>
<td>AFG Update 2023 using fisheries impact data from the Food and Agriculture Organization of the United Nations (2018)</td>
<td>Costs of adaptation to address changes in fish catch potential estimated at US$5 billion in the 2020s, rising towards 2050s. Includes costs for adaptation for marine and coastal ecosystems (marine protected areas) and safety at sea, but not ocean acidification.</td>
</tr>
<tr>
<td>Health</td>
<td>AFG Update 2023 using health impact data from the World Health Organization (2014)</td>
<td>Costs of disease control to address increases in malaria, dengue and diarrhoeal diseases (RCP4.5) and to address increased heat-related mortality, plus indicative costs of increased disease surveillance and making Water Sanitation and Hygiene for All and health infrastructure resilient. Total estimated at US$11 billion/year.</td>
</tr>
<tr>
<td>Early warning and social protection</td>
<td>AFG Update 2023</td>
<td>Costs of weather and climate services (including early warning systems [EWS]) from the Early Warning for All Assessment (World Meteorological Organization 2022) and a review of 31 national studies. Costs of adaptive social protection based on costs of additional funding for shock response programmes from 11 national studies. Total US$16 billion/year.</td>
</tr>
</tbody>
</table>

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4 While the analysis has aimed to harmonize as much as possible, this means there are some differences in the exact reference periods, in the representative concentration pathways (RCPs) and shared socioeconomic pathways (SSPs) considered, and for the specific climate model/s used for each RCP.
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Terrestrial biodiversity and ecosystem services

<table>
<thead>
<tr>
<th>AFG Update 2023 based on data and approach of Protected Planet (2023), Waldron et al. (2020) and UNEP (2022). Noted as underestimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicative analysis of the costs of adaptation for protected areas only estimated at US$1.5 billion/year, with climate change attribution based on the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019). Costs rise significantly in 2050 to address changes in species abundance. Estimate is an underestimate as does not capture adaptation to address non-protected areas or wider impacts on ecosystem services.</td>
</tr>
</tbody>
</table>

Cooling demand and labour productivity

| Qualitative review (quantified analysis planned for next AGR) |
| Review of adaptation costs for heat-related impacts for built environment and energy demand for cooling as well as impacts on labour productivity. While impacts are autonomous or fall to the private sector/households, they do involve costs for developing countries. |

Business and industry

| Qualitative review (due to low evidence base) |
| Review of adaptation costs for business and industry, including tourism and for supply chains. |

Capacity-building and governance

| Qualitative review (due to low evidence base) |
| Review of potential adaptation costs associated with capacity-building and governance. |

Socially contingent effects

| Qualitative review (no quantified estimates available) |
| Review of potential adaptation costs for social sectors (e.g. education) and socially contingent effects such as migration or conflict. |

Note: Coverage of sectors and risks is partial and in some cases only qualitative. All values are presented in constant 2021 prices, and thus values differ from original published studies. Further discussion and the ranges around the central values are presented in chapter 2 of the AFG Update 2023.

The results of this updated analysis are presented in figure 4.1. This shows the aggregated costs of adaptation (undiscounted annual cost in the period of the 2020s i.e. for the period up to 2030) for developing countries by sector, region and by income level group. The indicative total cost of adaptation (central estimate) is estimated at US$215 billion/year for all developing countries, though there is a large range around this value. This central estimate is equivalent to 0.56 per cent of gross domestic product (GDP) (2021) for all developing countries (or approximately US$33 per capita/per year). The highest adaptation costs are for river flood protection, infrastructure, coastal protection and for the regions of East Asia and the Pacific as well as Latin America and the Caribbean. The highest absolute costs are for the upper and lower middle-income countries, but when expressed as a percentage of GDP, adaptation costs are much higher for low-income countries (3.5 per cent) than for lower-middle (0.7 per cent) or upper-middle (0.5 per cent).

The modelled costs for the LDCs and SIDS have been considered separately. The indicative central values are estimated at US$4.7 billion/year for SIDS (0.7 per cent of GDP), and US$25 billion/year (2 per cent of GDP) for LDCs, totalling US$29 billion/year (noting that some SIDS are also LDCs). The costs of adaptation for LDCs and SIDS are 12 per cent of the modelled adaptation costs for all developing countries.

There are several issues to highlight with these global adaptation costs, which link to the issues raised in box 4.1. First, while the coverage is wider than earlier studies, it remains partial. For example, it does not include adaptation costs related to the built environment or labour productivity, and values for biodiversity and ecosystem services only cover protected areas. Second, these figures only include the costs of adaptation, and there are additional residual costs (which are especially relevant for loss and damage). Finally, there is a significant range around these central values. Sensitivity testing has been undertaken to explore the influence of these factors. Based on the information available, the range around the indicative central value – for alternative representative concentration pathways (RCPs) and climate models – is US$130 billion/year to US$415 billion/year. However, a much wider range emerges when other factors are considered. As an example, the use of different objectives (e.g. for river floods) alters the adaptation costs by a factor of two or more, as well as the level of residual damage, with more ambitious adaptation reducing residual levels. Different functions or models for the same sector, and different assumptions on adaptation effectiveness and costs, also significantly affect the values. Further details are provided in the AFG Update 2023.
Figure 4.1 Estimated costs of adaptation for developing countries by sector (panel A), region (panel B), and income group (panel C) for 2030 (indicative central value).

Note: For details, see table 4.1 and the AFG Update 2023.

These updated values can be compared with previous estimates. A similar sectoral modelling approach was used in the earlier World Bank Economics of Adaptation to Climate Change study (World Bank 2010; Narain, Margulis and Essam 2011). This estimated the costs of adaptation for developing countries at approximately US$70 to US$100 billion/year for the period 2010–2050 for a 2°C scenario (by 2050) (2005 prices), which is equivalent to US$125 to US$171 billion/year in current prices (2021). The modelled costs in this update are therefore considerably higher, even when the same models have been used for sectoral analysis (as in coastal, river floods and agriculture). This reflects the more negative impacts of climate change reported in the literature (IPCC 2022), as well as updates to the level of adaptation costs, but it also reflects the addition of new risks and sectors.

The modelled costs of adaptation are estimated to increase significantly by 2050 for most sectors and risks, especially for high warming scenarios (see AFG Update 2023). For example, the annual costs of adaptation for coastal protection rise with increasing sea level rise by 2050, especially under the RCP6.0 and RCP8.5 scenarios. Similarly, for new infrastructure there are rising annual costs of adaptation because of rising risks, but also the growing stock of new infrastructure assets to protect. However, some adaptation cost estimates decrease with time. For example, additional cases of diarrhoeal disease owing to climate change are estimated to be lower in 2050 than 2030 (World Health Organization 2014) due to reductions in baseline levels from socioeconomic change. The sector studies show that adaptation costs will be significantly lower in a world where the Paris Agreement goals are met, especially towards mid-century and beyond. This highlights the need for mitigation in reducing future impacts as well as the future costs of adaptation.
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4.2.3 Adaptation finance needs

A comprehensive assessment and new analysis have been made of adaptation finance needs for domestic adaptation priorities, as submitted to UNFCCC in NDCs and NAPs by countries. Among 155 developing (non-Annex I) countries, all except Libya and Yemen, have submitted at least one NDC, and 46 countries have also submitted their NAPs as at 31 July 2023 (UNFCCC 2023a; UNFCCC 2023b).

The country-driven, bottom-up and dynamic nature of the information in NDCs and NAPs makes these documents an important source of evidence for estimating the adaptation finance needs of developing countries. However, the information provided in these documents is highly heterogeneous: the plans differ in terms of their adaptation ambition, consideration of future climate and socioeconomic scenarios, methods employed to identify and prioritize adaptation options, costing methodologies, sectoral coverage and implementation time frame (box 4.1). Therefore the adaptation finance needs reported should be interpreted with their inherent limitations. The data collection, processing and analysis methodology and detailed results are further explained in chapter 3 of the AFG Update 2023.

Box 4.2 Modelled costs versus adaptation finance needs

The modelled costs of adaptation (4.2.2) are typically based on an analysis of the adaptation needed to reduce incremental climate risks, relative to a reference period, without consideration of how this is financed. The country adaptation finance needs (4.2.3) involve similar metrics (US$) but refer to the financial resources required by countries from international and domestic sources to implement their domestic adaptation plans. These are influenced by existing adaptation ambition and socioeconomic circumstances. The two approaches also tend to use different methods. Adaptation finance needs tend to be based on programme and project level costing, and often include different definitions to modelled studies of adaptation costs. There can also be differences in the sectors and risks included, and the objectives set for adaptation. All of this means that there are often differences between needs and modelled costs for the same country.

Status of adaptation finance needs information in the countries’ domestic adaptation plans

Of the submitted NDCs and NAPs, 85 developing countries have specified their adaptation finance needs for the period 2021–2030 in at least one of their submissions. The proportion of countries specifying adaptation finance needs rises with income. Among low-income countries, 89 per cent have stated their finance needs, compared with 68 per cent of lower-middle-income countries, 42 per cent of upper-middle-income countries and just 16 per cent of high-income countries.

Case study: Navigating climate risks – The path of San Pedro Sula to a resilient future

The climate crisis is exacerbating existing risks and creating new challenges for cities worldwide. Across the globe, communities grapple with the same pressing questions, such as, “How can we adapt to changing rainfall patterns, floods and storms made worse by the climate crisis?” These challenges are often combined with limited access to information.

To understand and project evolving climate risks, cities need to bridge these knowledge gaps to enable measures that offer the best cost-to-benefit ratio and protect the most people.

In San Pedro Sula, Honduras, 20 adaptation measures were assessed in a framework that gave the municipality concrete information to take a proactive approach to confronting climate risks, significantly improving its ability to reduce these threats. This example offers a model for municipalities across the world on the benefits of bridging knowledge gaps. In turn, this enables local governments to tackle complex climate risks, while highlighting the importance of further investment into climate risk-related data, enhancing weather-monitoring networks and strengthening early warning systems.

Note: This case study is not connected to the chapter. The full case study is available online.

Authors: Alvaro Rojas (Munich Climate Insurance Initiative), Jorge Cálix Tejeda (Municipality of San Pedro Sula Honduras), David Daou (United Nations University and Munich Climate Insurance Initiative), Maxime Souvignet (United Nations University)
of high-income countries. This suggests low-income
countries have a greater need for international climate
finance assistance and are more proactive in expressing
their finance needs. These needs are mostly based on
sector- and project-based estimates. Some countries also
reference previous studies that have utilized economic
and integrated assessment models to indicate their
adaptation finance needs.

Figure 4.2 Status of adaptation finance needs information in developing countries’ NDCs and NAPs

The cost of implementing adaptation priorities and plans for
these 85 developing countries totals US$105 billion per year
on average for the period 2021–2030. This amount equates
to 1.5 per cent of their GDP on average. A total of 31 countries
have also indicated their conditional and unconditional
adaptation finance needs. Among those, around 85 per cent
of the adaptation finance needs submitted by countries
are conditional, relying on international climate finance
support. The remaining 15 per cent is unconditional and
they are expected to be financed domestically.

It is important to recognize that not all NDCs and NAPs,
as well as the identified adaptation needs in these plans,
have been fully costed. Many countries have highlighted
methodological challenges and capacity gaps in quantifying
adaptation finance needs (UNFCCC 2021a). Therefore, even
for those countries that have submitted costed estimates,
actual adaptation needs may potentially be larger. At the
same time, the lack of rigorous assessments and countries’
interest in attracting international finance means there is a
possibility that adaptation finance needs are overestimated.

Sectoral distribution of adaptation finance needs
A total of 52 countries have provided a breakdown of
adaptation finance needs by sector (for at least three
sectors). Water, agriculture and infrastructure are the
priority sectors identified in adaptation finance needs
across regions, though the priorities vary as shown in
figure 4.3. Further details are in the AFG Update 2023.

Global adaptation finance needs
The analysis of the adaptation finance needs submitted
in NDCs and NAPs shows that per capita needs tend
to increase with the income level, with high-income
countries having higher average per capita needs in
their submissions (figure 4.4, panel A). The average
per capita adaptation finance needs in low-income
countries is only US$22 with an interquartile range (IQ)
of US$9 to US$36. In lower-middle-income countries, the
average per capita adaptation finance needs increase
to US$51 (IQ range US$22–109). The average per capita
adaptation finance needs are US$81 (IQ range US$9–238)
in upper-middle-income countries and high-income
countries. The average per capita adaptation finance needs
in the LDCs is US$25 (IQ range US$13–$46), and in SIDS is
However, a different trend emerges when finance needs from country submissions are expressed as an equivalent percentage of GDP. In this case, the needs are higher in low-income countries (figure 4.4, panel B). The average adaptation finance needs in low-income countries is 3.09 per cent of GDP (IQ range 1.18–4.96 per cent), whereas the adaptation finance needs are 2.5 per cent of GDP (IQ range of 0.77–4.41 per cent) in lower-middle-income countries, and 1.43 per cent of GDP (IQ range of 0.14–3.20 per cent) in upper-middle-income countries and high-income countries. In the case of LDCs and SIDS, the adaptation finance needs are 2.67 per cent of GDP (IQ range 1.14–4.74 per cent) and 3.39 per cent of GDP (IQ range 1.28–4.62 per cent), respectively.

These results may indicate that wealthier countries, which typically have more assets and infrastructure to adapt to climate change, tend to estimate higher needs in terms of absolute dollar values, and/or that they have a higher value at risk. These countries may have higher adaptive capacities and can afford to invest more in adaptation. In case of the SIDS, the high per capita adaptation finance need partly results from their small population size and partly from the level of adaptation necessary given their high vulnerability. On the other hand, adaptation finance needs for low-income countries constitute a larger relative proportion of their economies (i.e. of GDP). The existing low development baseline in the low-income countries – and their limited technical and financial capacity to conduct robust needs assessments – might have also contributed to lower adaptation finance needs, even though these countries are more likely to require increased international climate finance because of domestic budget constraints.
Figure 4.4 Annual adaptation finance needs in per capita (panel A) and as a percentage of GDP (panel B) by income level, from submitted NDCs and NAPs. Figure shows the median, IQ and full range.

Global and regional adaptation finance needs
To estimate the total regional and global adaptation finance needs of developing countries, the analysis uses the annual per capita adaptation finance needs from submitted NDCs and NAPs (median and IQ range) (figure 4.4, panel A and table 4.2) by income group as an extrapolation factor. The average annual adaptation finance needs in developing countries for the period 2021–2030 from this extrapolation are estimated at US$387 billion, with a range of US$101–975 billion. The wide uncertainty range highlights the challenges in determining global adaptation finance needs. These values can be expressed as a percentage of GDP. The average adaptation finance needs in developing countries equate to 1 per cent of GDP (with a range of 0.25–2.50 per cent). The annual adaptation finance needs in LDCs and SIDS are US$41 billion with a range of US$16–83 billion: while this amount is small in absolute dollar value, the amount is equivalent to 2 per cent of their GDP (with a range of 0.80–4 per cent). The analysis has also considered the income level specific annual adaptation finance needs in per cent of GDP as an alternate extrapolation factor (figure 4.4, panel B). These values are presented in the AFG Update 2023.

4.3 International adaptation finance flows
A revised assessment of current adaptation financial flows to developing countries has been undertaken, as these flows will allow implementation of the adaptation costs or financing needs outlined in previous sections. This analysis focuses on the finance flows from developed to developing countries, compared with existing reports focusing on global financial flows including for developed and developing countries (Global Center on Adaptation (GCA) and Climate Policy Initiative (CPI) 2021; UNFCCC 2022).

Adaptation projects in developing countries are financed by both public and private sources. Each of these includes both international finance flows as well as domestic expenditures. Existing data sources allow for analysis of international public finance only. Data also exist for private finance mobilized by public bilateral and multilateral channels. However, the data quality of other private flows, as well as domestic expenditures (public and private) is not sufficient to allow inclusion (figure 4.5).
Table 4.2 Estimated developing countries’ adaptation finance needs by region for the 2021–2030 period

<table>
<thead>
<tr>
<th>Region</th>
<th>Annual adaptation finance needs in US$ billion (2021 value)</th>
<th>Annual adaptation finance needs as a percentage of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>Min – Max</td>
</tr>
<tr>
<td>East Asia &amp; the Pacific</td>
<td>158</td>
<td>27–439</td>
</tr>
<tr>
<td>South Asia</td>
<td>97</td>
<td>40–205</td>
</tr>
<tr>
<td>Latin America &amp; the Caribbean</td>
<td>51</td>
<td>6–149</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>46</td>
<td>17–96</td>
</tr>
<tr>
<td>Middle East &amp; North Africa</td>
<td>27</td>
<td>8–66</td>
</tr>
<tr>
<td>Europe &amp; Central Asia</td>
<td>8</td>
<td>2–20</td>
</tr>
<tr>
<td>Global</td>
<td>387</td>
<td>101–975</td>
</tr>
</tbody>
</table>

Note: Values are based on extrapolation of median and IQ range of annual per capita adaptation finance needs for each income class from figure 4.4 (panel A) to all developing countries (including those that have submitted finance needs).

Figure 4.5 Finance types for adaptation projects in developing countries

Source: Authors, based on OECD (2022a).
Note: Figure provides an overview of main actors and flows in the climate finance for developing countries.

In November 2021 a decision was taken at COP 26 to urge developed countries to at least double their collective provision of finance for adaptation to developing countries from 2019 levels by 2025 (decision CMA.3). The data included in this analysis (to the end of 2021) provides an overview of adaptation finance between 2017 and 2021 and an estimate on the progress towards this target.
4.3.1 Data sources and methodological approach

A comprehensive assessment and analysis have been made of the self-reported public international adaptation finance flows from bilateral and multilateral finance providers to developing countries. Full details are provided in chapter 4 of the AFG Update 2023.

Such analysis is constrained by data availability and limitations (Canales et al. 2023, Roberts and Weikmans 2022), including around definitions, methodological differences among finance providers, accounting issues, confidentiality restrictions and a lack of universally accepted definitions (for an overview see AFG Update 2023). Several studies claim that the self-reporting by climate finance providers and the lack of independent quality control result in low data reliability and sometimes substantial overestimations of finance flows (Weikmans et al. 2017, UNEP 2021b, Toetzke, Stünzi and Egli 2022). This reduces the accountability and transparency of climate finance, which is fundamental for building trust in climate negotiations (Pauw et al. 2022b).

This highlights the benefits of having a more standardized tracking system based on the principles of accountability and transparency. Despite the data limitations, analysing international public finance flows for adaptation provides valuable insights. Table 4.3 presents the approach used.

### Table 4.3 Data sources and main methodological choices for the analysis of international public adaptation finance flows

<table>
<thead>
<tr>
<th>Technical factor</th>
<th>Methodological choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data source</td>
<td>OECD DAC</td>
</tr>
<tr>
<td>Finance type</td>
<td>International public finance</td>
</tr>
<tr>
<td>Period covered</td>
<td>2017–2021</td>
</tr>
<tr>
<td>Geographic classification</td>
<td>Annex II Parties to non-Annex I Parties</td>
</tr>
<tr>
<td>Sources of finance</td>
<td>Bilateral flows.</td>
</tr>
<tr>
<td></td>
<td>Multilateral outflows (from multilateral development banks (MDBs), climate funds and other multilateral institutions) attributed to developed countries.</td>
</tr>
<tr>
<td>Financial instruments</td>
<td>Grants and loans (concessional and non-concessional).</td>
</tr>
<tr>
<td></td>
<td>Other (equity and shares in collective investment vehicles, mezzanine finance instrument).</td>
</tr>
<tr>
<td>Point of measurement</td>
<td>Commitments and disbursements</td>
</tr>
<tr>
<td>Methodological decisions</td>
<td>Activities marked as “significant” and “principal” under the Rio marker methodology were discounted based on coefficients to estimate climate-specific amounts.</td>
</tr>
<tr>
<td></td>
<td>For multilateral finance providers outflows, coefficients to identify amounts attributable to developed countries were applied.</td>
</tr>
<tr>
<td></td>
<td>Exclusion of: export credits, coal-related projects, administrative costs of finance providers.</td>
</tr>
</tbody>
</table>

4.3.2 Total international public climate finance for developing countries

Between 2017 and 2021 (the five years following the year Paris Agreement entered into force and the latest five years for which comparable data for bilateral and multilateral sources is available), total climate-specific international public finance commitments towards developing countries from bilateral and multilateral finance providers remained well below US$70 billion per year (figure 4.6, panel A). At US$65 billion, 2020 was the year with the highest amount. Notably, the increasing trend between 2017 and 2020 is followed by a decrease in finance commitment in 2021 (figure 4.6, panel A). This decrease is driven by the lower financial commitments for adaptation, which dropped by 15 per cent. Often year-on-year variations in climate finance can be influenced by both large individual projects (such as infrastructure) as well as changes in methodologies used by each financial provider for reporting its climate finance. However, our analysis shows that the 2021 decline is not attributed to a single or a handful of sectors or finance providers. This implies a more general trend of decline for adaptation finance. On the other hand, both mitigation and cross-cutting commitments indicate slight increases on the order of 1.4 per cent and 5 per cent, respectively.

Total adaptation-specific international public finance towards developing countries remained well below US$30 billion per year between 2017 and 2021 (figure 4.6, panel A). In 2019, the baseline year for the doubling of adaptation finance by 2025, the estimates point to total
financial commitments for adaptation of US$19.2 billion, implying that US$38.4 billion would be needed by 2025 to achieve the doubling. In 2020, finance increased by 31 per cent, reaching US$25.2 billion. However, the decrease of adaptation-specific finance between 2020 and 2021 implies that, to reach a doubling by 2025, a 16 per cent annual compound growth rate is needed between 2021 and 2025.

In line with article 9, paragraph 4 of the Paris Agreement, climate finance is meant to be balanced between adaptation and mitigation. Total international public climate-specific finance for the period 2017–2021 towards developing countries was US$289 billion (figure 4.6, panel A). Of this total, around US$95 billion (33 per cent) went to supporting adaptation activities, and an additional US$40 billion (14 per cent) was earmarked for initiatives addressing both adaptation and mitigation, also known as cross-cutting. In terms of income groups (figure 4.6, panel B), low-income and lower-middle-income country groups received higher commitments for adaptation than for mitigation compared with upper-middle- and high-income country groups. The highest amount of climate finance and adaptation finance is concentrated in lower-middle-income country groups, which is also the group with the highest number of countries (53 countries) in the analysis. The share of adaptation in total climate-specific finance is the highest in low-income countries (at 55 per cent), followed by lower-middle-income and upper-middle-income countries (with 38 per cent and 24 per cent, respectively). LDCs and SIDS also receive higher commitments for adaptation (51 and 52 per cent) than for mitigation (39 and 30 per cent). Regional allocations that represent multi-country finance for regional cooperation for adaptation receive a substantial amount (roughly 10 per cent of total commitments in the period 2017–2021).

Figure 4.6 Climate-specific finance commitments from developed to developing countries per year (panel A) and per income group (panel B) for the period 2017–2021 (US$ billions, constant prices)

A.

<table>
<thead>
<tr>
<th>Year</th>
<th>Adaptation</th>
<th>Mitigation</th>
<th>Cross-cutting</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>51.8</td>
<td>7.5</td>
<td>14.9</td>
</tr>
<tr>
<td>2018</td>
<td>52.4</td>
<td>7.6</td>
<td>14.8</td>
</tr>
<tr>
<td>2019</td>
<td>57.8</td>
<td>7.6</td>
<td>19.2</td>
</tr>
<tr>
<td>2020</td>
<td>65.0</td>
<td>8.4</td>
<td>21.3</td>
</tr>
<tr>
<td>2021</td>
<td>62.0</td>
<td>8.8</td>
<td>31.9</td>
</tr>
</tbody>
</table>

B.

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Adaptation</th>
<th>Mitigation</th>
<th>Cross-cutting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-income countries</td>
<td>33.9</td>
<td>11.6</td>
<td>18.5</td>
</tr>
<tr>
<td>Lower-middle-income</td>
<td>7.8</td>
<td>33.9</td>
<td>51.8</td>
</tr>
<tr>
<td>Upper-middle-income</td>
<td>7.8</td>
<td>54.8</td>
<td>0.9</td>
</tr>
<tr>
<td>High-income countries</td>
<td>7.8</td>
<td>27.5</td>
<td>13.4</td>
</tr>
<tr>
<td>Regional</td>
<td>0.1</td>
<td>8.8</td>
<td>5.2</td>
</tr>
<tr>
<td>Unspecified</td>
<td>0.4</td>
<td>0.4</td>
<td>6.4</td>
</tr>
</tbody>
</table>

Note: Small errors in some totals are due to rounding of numbers. Amounts are presented at face value. Regional allocations include financial commitments that were reported separately from allocations to individual countries and unspecified allocations are allocations without any recipient country or region information. For more on the data and methodology see AFG Update 2023.
Figure 4.7 Adaptation-specific finance commitments to developing countries per finance provider type over time (US$ billions, constant prices)

Note: Small errors in some totals are due to rounding of numbers. The amounts include financial commitments for adaptation and exclude financial commitments for initiatives that target both adaptation and mitigation simultaneously (cross-cutting). Amounts are presented at face value. For more on the data and methodology see the AFG Update 2023.

Adaptation finance commitments over time and per finance provider
Looking at adaptation-specific finance, which includes finance across financial instruments (mainly loans and grants), per finance provider type, MDBs are the largest provider type throughout the period (figure 4.7). Their financial commitments follow a continuous increase from 2017 to 2020 which is, however, followed by a decrease (11 per cent) in 2021. For bilateral providers, the second largest finance provider type, there has been a steeper increase between 2018 and 2020 (roughly 51 per cent from 2018 to 2019 and 58 per cent 2019–2020), which was also followed by a decrease of 25 per cent in 2021. Multilateral climate funds comprise the only finance provider type that increased its commitments between 2020 and 2021. A breakdown of finance per financial instrument is provided in the following section.

Adaptation finance commitments per instrument
In addition to the total volume of finance, it is important to consider whether the financial support provided by developed nations is deemed fair by those countries that have contributed least to climate change but are most impacted by it, such as the LDCs and SIDS. Selecting the most suitable financial instrument for establishing just and equitable climate finance is context specific. For instance, debt instruments are not necessarily a negative option when they are employed to fund a project with a high likelihood of yielding returns, and/or when the borrower has the capacity and institutions to ensure the debt is sustainable and used productively (Mustapha 2022). However, considering the prevalent debt vulnerabilities and limited fiscal capacity in many developing countries, it is improbable that delivering most of the climate finance via traditional debt instruments would be equitable (Mustapha 2022).
The analysis finds that 63 per cent of all adaptation-specific finance between 2017 and 2021 was provided as debt instruments (loans) and 36 per cent as grants (figure 4.8). Of the total adaptation finance offered as debt instruments, 70 per cent came from MDBs, 26 per cent from bilateral providers, 1 per cent by multilateral climate funds (primarily from the Green Climate Fund) and the remaining 2 per cent by other multilateral funds. Grant-based finance, on the other hand, came predominantly from bilateral sources (61 per cent), followed by MDBs (25 per cent), multilateral climate funds (13 per cent) and other multilateral funds (1 per cent).

Focusing on the share of grants and loans per finance provider type, the majority of MDB adaptation finance (67 per cent) is loans. In contrast, the majority of finance from multilateral climate funds is delivered as grant-funding. For bilateral providers, 57 per cent of total adaptation finance is provided as grants and 42 per cent as loans. On the recipient side, the share of grants in finance for LDCs (52 per cent) is substantially higher than that of non-LDCs (26 per cent) indicating that financial providers prioritize grant-based financing for LDCs. SIDS have an even higher share of grants in their total commitments (67 per cent).

Figure 4.8 Total adaptation-specific finance commitments by finance provider type, financial instruments and LDC/SIDS status of recipient countries, 2017–2021 (US$ billions, constant prices)

Finance flows per capita
Looking at per capita amounts, except for various SIDS and Djibouti, no country was allocated more than US$25 per person per year for adaptation. Of the 132 recipient countries included in the analysis, only 31 were allocated more than US$15 per person per year and 52 countries were allocated less than US$5 per person per year – far below the per capita needs. This is compared with modelled costs and finance needs in the later gap section.

Adaptation finance to the local level
There is growing recognition that local organizations, people and communities need to lead or be meaningfully involved in the response to climate change. Being on the frontlines of climate change impacts, they are often the most engaged and innovative in developing transformative adaptation solutions (GCA and CPI 2021; Castro and Sen 2022). However, they often face a shortage of resources, and the agency required to effectively implement these solutions (GCA and CPI 2021). To guide the promotion of locally led adaptation (LLA), the Global Commission on Adaptation developed the eight LLA Principles.\(^5\)

The knowledge of the flows and quality of adaptation finance remains limited. Previous analysis of international climate funds’ financial commitments for climate shows that less than 10 per cent of their commitments to developing countries for climate change was directed at the local level.

\(^5\) See https://gca.org/programs/locally-led-adaptation/.

(Soanes et al. 2017). In our analysis, we investigate bilateral and multilateral climate finance providers’ reporting to OECD following the methodology by Soanes et al. (2017). There is a lack of data coverage for finance at the local level, in NDCs and NAPs, as well as from developed countries on tracking and reporting. Our analysis uses key search words in the project description of the OECD database and is contingent on the comprehensiveness of the detail provided in each entry.

Based on our estimation, out of the total adaptation finance of about US$95 billion allocated between 2017 and 2021, less than 17 per cent (US$16.5 billion) was reported to climate change adaptation projects with a specific focus on local communities. The global goal on adaptation could present important opportunities to better define LLA efforts, ensuring that social inequalities among local actors and between local and non-local actors are addressed, and ultimately improving the tracking of LLA activities for assessing adaptation progress.

**Adaptation finance disbursement ratios**

The analysis above is based on commitment data. However, while commitments showcase ambition, projects can have an impact only when they get disbursed and implemented. Therefore, investigating the disbursement gap is important (Savvidou et al. 2021, SEforALL 2020, Jain and Bardhan 2023). Assessing the ratio of disbursements to commitments over a specific time frame provides insights into whether approved projects are being implemented as intended or if they are facing challenges during implementation (Savvidou et al. 2021).

Disbursement information with high confidence is reported regularly by bilateral donors since 2007 (OECD, undated). However, most MDBs and some climate funds only report on commitments. In this section, we analyse disbursements focusing on bilateral providers. According to our estimations, disbursements from bilateral providers to developing countries for adaptation are substantially lower than the amounts committed during the period under analysis. 66 per cent of the committed amounts are disbursed during the period. This estimated disbursement ratio for adaptation finance (66 per cent) is much lower than the disbursement ratio for all development finance (98 per cent) (Atteridge et al. 2019) which indicates challenges in disbursing adaptation-specific projects. For more on the disbursement ratio per region and an assessment of barriers associated with low disbursement ratios refer to AFG Update 2023.

**4.3.3 Assessment of private finance flows related to adaptation**

The private sector’s investments in adaptation are limited by barriers and constraints. These include a lack of country-level climate risk and vulnerability data and information services that can be used to guide investment decision-making; market failures (including positive externalities that reduce the return on investment of adaptation activities, but that could have public good benefits); financial challenges, policy and governance barriers and behavioural barriers (Bisaro and Hinkel 2018; Tall et al. 2021; Frontier Economics and Paul Watkiss Associates 2022; Lu 2022; Pauw et al. 2022a; UNFCCC 2022a). Nevertheless, there is fragmented evidence of private-sector adaptation interventions all over the world, including priority sectors such as water and agriculture. However, the reporting of such interventions in adaptation in academic literature continues to be low, in particular when it comes to small business adaptation and developing countries (Berrang-Ford et al. 2021; Harries 2021; Caré and Weber 2023). While companies are increasingly reporting on climate-related issues, the comparability, consistency, comprehensiveness and coherence across the different data sets, as well as the limited information on adaptation actions taken, inhibit meaningful aggregation (Dale et al. 2021). Private adaptation finance that is mobilized through international public climate finance continues to be limited and far below mitigation. For the period 2016–2020, OECD (2022b) reports around US$1.9 billion/year on average. Philanthropy provided an additional US$0.09 billion/year in this period (Savvidou, Dzebo and Atteridge 2019). So while evidence hints at increasing private-sector engagement in adaptation, the related investments – and contribution to closing the adaptation finance gap – remains unclear.

Private-sector financing for adaptation includes ‘internal’ adaptation investments by large corporations: e.g. an analysis of voluntary public disclosures on physical climate change risks by 1959 companies (representing 69 per cent of global market capitalization) demonstrated that 68 per cent reports on implementation of adaptation actions (Goldstein et al. 2019). However, reporting on the related costs are sporadic and inconsistent (ibid.). While small businesses are less likely to plan and finance measures to reduce their vulnerability than larger businesses (Daddi and Iraldo 2016; Harries 2021), empirical research in developing countries demonstrates that SMEs also innovate in response to climate change impacts (Alam et al. 2022). However, adaptation is often done unconsciously (see Hess 2020 on SMEs in tourism in Thailand) and related investments are often unknown.

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6 The key words used for tracking finance flows to the local level are: civic, Indigenous, smallholders, community, local, SMEs, cooperative, municipal, subnational, decentralized, province, town, home, rural, village, household, slums. See Annex 4.C for more on the methodology.
Case study: Adaptation finance – Mobilizing the private sector

Current climate finance flows for adaptation fall short of what is required to meet the Paris Agreement’s targets. However, efficient use of public funds can help facilitate the much-needed private sector investment in adaptation by addressing market imperfections.

A new approach brought together companies and impact investors with a shared interest in investing in climate adaptation and raised US$2 million while developing practical experience in identifying, developing and financing adaptation projects.

The approach allowed an analysis of the investment requirements and risk characteristics of adaptation-related projects through engagement with private actors and finance providers.

The process demonstrated that adaptation investments do not always require grant financing or compensation to be economically and financially viable. Barriers can be overcome by providing expertise and mentorship to facilitate private adaptation investments.

Apart from such internal adaptation investments, the private-sector contribution to adaptation is also driven by financial institutions’ provision of finance for adaptation activities that contribute to adaptation and through companies’ provision of solutions through technology, services and products (Lu 2022; Stout 2022). Examples of the former include loans for sustainable agriculture and property retrofits. However, data on such private adaptation finance are still largely missing, because of challenges associated with context dependency, confidentiality restrictions, uncertain causality and a lack of agreed-on impact metrics (Buchner et al. 2021). At the same time, financial institutions—including commercial banks, insurance companies and bond-rating agencies—understand the shifting landscapes of market risk and are engaged in an “intelligence arms race” to measure climate impacts on investments and steer them to new speculative sites and cities (Shi and Moser 2021).

Public sector actors continue stimulating or mobilizing more private-sector investments in adaptation, including through blending public and private finance. Examples include “monetizing resilience benefits” (International Fund for Agricultural Development); the G20’s Global Partnership for Financial Inclusion’s supporting SMEs to respond to climate change as well as incorporate climate risks into their operations (Csaky 2017); and the Global Environment Facility-funded Adaptation SME Accelerator Project led by Lightsmith and supported by Conservation International and the Inter-American Development Bank (Botero, Brinks and Gonzalez-Ocantos eds. 2022).

It is important to point at the potential of non-finance related private-sector initiatives to reduce vulnerability over time. Standard-setting organizations that oversee, for instance, engineering, design, insurance and lending practices, are moving towards incorporating climate science into their benchmarks, requirements and guidelines (Shi and Moser 2021). For example, in the absence of federal leadership on risk disclosure in the United States of America, private consulting firms (and some NGOs) are growing in-house technical expertise to map future flood risks. This not only directly helps to inform individual homeowner purchasing decisions, but it also indirectly helps via integrating climate risks into the real estate market (Shi and Moser 2021). In another example, also from the United States of America, insurance companies stop selling new policies in areas affected by catastrophic wildfires (California), hurricanes (Louisiana) and storms (Florida) (Joselow 2023). Such private-sector initiatives do not necessarily bring along private investments that help reduce the adaptation finance gap, and in the short term they have a negative effect on, for instance, homeowners that cannot insure their property. In the longer term, however, they will reduce overall vulnerability.

Finally, private-sector finance for adaptation is not a panacea. Investments will gravitate to opportunities with low risk-return ratios and where private interests often outweigh public interests. The most vulnerable people in LDCs or non-market sectors are therefore less likely to be targeted (Pauw 2015; UNEP 2021b). Furthermore, knowledge on the effectiveness of private investments in adaptation is low. Effectiveness could be constrained for example through adaptation being done unconsciously (Pauw 2015; Hess 2020) or with a narrow view of climate change risks. This not only shifts vulnerability to others (Pauw 2021). Finally, it is important to realize that significant amounts of private finance do not take climate change into account at all (UNEP 2022a, 2022b), potentially leading to increased vulnerability in the longer term. For example, property developers can make short-term financial gains.

Note: This case study is not connected to the chapter. The full case study is available online.

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from developing on vulnerable coasts, creating long-term risks for others (Siders 2019). Two important developments are therefore that investors are starting to ask companies to disclose climate change risks (Dale et al. 2021) and that governments are starting to develop policies for sustainable financial systems (Task Force on Climate-related Financial Disclosures 2017, UNEP 2021a).

4.3.4 Assessment of domestic expenditures on adaptation

Domestic expenditure continues to be an underexamined but potentially vitally important and often sustainable source of finance for adaptation (UNFCCC 2022b). Domestic budgets are likely to be the largest source of funds for adaptation in many developing countries (Allan et al. 2019; United Nations Development Programme [UNDP] forthcoming). Domestic expenditure offers a number of comparative advantages that make it particularly well suited for financing adaptation. These include the mainstreaming of adaptation in development activities, such as through climate-proofing routine investments (Allen et al. 2019); addressing domestic adaptation priorities (Kirchofer and Fozzard 2021); higher predictability compared with international adaptation finance and potentially better suitability for financing long-term and recurring adaptation investments (Allan et al. 2019); and leveraging existing institutional structures, potentially improving impact and value for money (Africa Adaptation Initiative 2018). Over longer time periods, tracking climate-related expenditure can also help identify whether countries are shifting public financial flows towards climate-resilient development pathways, thereby implementing article 2.1(c) of the Paris Agreement (see section 6).

Domestic expenditure on adaptation can be measured for example through climate change budget tagging and (regular) tracking. Tagging is the process of defining and applying a tag, while tracking is the process of using the tag to quantify and monitor climate-relevant activities and expenditure (Choi et al. 2023). At present there are no internationally agreed-on tagging methodologies to identify climate-related expenditures in public sector budgets. There are, however, some recognized approaches, such as the OECD Rio marker methodology, the European Union climate action taxonomy, and the Climate Public Expenditures and Institutional Review approach developed by UNDP (Pizarro et al. 2021). Some countries have developed their own criteria (UNDP 2019).

The amount of information on domestic expenditure on adaptation has increased in recent years. A recent review found that 24 national studies had assessed domestic climate expenditures, 14 of which report on adaptation-only expenditure (UNFCCC 2022a). The inconsistency in methods makes direct comparison between country studies difficult, though reported government budgets spent on adaptation ranged from 0.2 per cent to over 5 per cent. These equate to a large range of total GDP (from 0.1 per cent to >3 per cent). Another study shows African countries on average spent 0.95 per cent of their government budget on adaptation in 2019 (with Botswana and Seychelles spending over 4 per cent) (UNDP 2023). This makes government expenditure on adaptation in Africa 10 times larger than international support for adaptation (indicated to be 0.09 per cent of GDP) and also larger than the indicative 0.22 per cent from private adaptation (ibid.).

The main reported benefits of climate budget tagging and tracking are awareness-raising and improvements in transparency and accountability (Kirchofer and Fozzard 2021). However, related expenditure estimates cannot be directly used in the finance gap estimates of the UNEP Adaptation Gap Reports. Data is unreliable and non-comparable because of the diversity of methods and approaches and the inherent subjective analysis and judgment on adaptation-relevance of expenditure (UNFCCC 2022a, Choi et al. 2023). Furthermore, budget tagging is often not systematically applied to subnational government expenditures and mobilized private finance, and ‘negative expenditure’ such as harmful initiatives that may increase vulnerability are typically excluded (Choi et al. 2023). Finally, across different regions, there was limited evidence of formal quality assurance and verification mechanisms (Choi et al. 2023). This carries implications for the knowledge on the effectiveness of adaptation-related expenditure, which often remains limited.

Ethical considerations are also important when analysing to what extent domestic expenditure can help close the adaptation finance gap and in comparison with international support for adaptation (UNFCCC 2022a). This is especially the case in relation to particularly vulnerable countries that have contributed little to global historical greenhouse gas emissions, such as LDCs (Grasso 2010). The potential for domestic expenditure on adaptation also needs to be seen in the context of other challenges facing developing countries, such as the high indebtedness and limited fiscal space (Kozul-Wright 2022).

The challenges faced in aggregating domestic expenditure on adaptation are also reflected in the broader efforts to develop a global goal on adaptation. Some of these challenges include the lack of systematic tracking frameworks and methodological tools (Berrang-Ford et al. 2019), inconsistent metrics (Craft and Fisher 2018) and limited legitimacy of existing global governance initiatives (Persson 2019). The global stocktake process under the Paris Agreement and the global goal on adaptation could present important opportunities to advance efforts and initiatives to measure and track domestic adaptation efforts.

4.4 The adaptation finance gap

The evidence lines above are brought together to provide a revised estimate of the adaptation finance gap. Based on modelled costs of adaptation (section 4.2.2) and adaptation
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finance needs (section 4.2.3), a plausible central range for the adaptation costs/financing needs is US$215 billion/year to US$387 billion/year for developing countries this decade. This equates to 0.6 per cent to 1.0 per cent of GDP (for all developing countries, 2021). The corresponding values for LDCs and SIDS (together) are US$29 billion/year (modelled) and US$41 billion/year (needs-based extrapolation). These new values can be compared with the earlier AGR values. This updated central range is significantly higher than the previous estimate (UNEP 2016b), which was US$170 billion to US$340 billion/year in current prices for the same period.

While the total estimated finance needs (extrapolated from submitted communications) are higher than total modelled costs at the global level, this is not always the case at the individual country level. A direct comparison of the 85 submitted adaptation needs in costed NDCs and NAPs against the modelled costs for the same countries finds that, in many cases, submitted costs are lower than modelled. Further details of the country and sector results are provided in the AFG Update 2023.

The new 2030 values for adaptation costs/financing needs can be compared with the updated estimates of global public finance flows to adaptation (section 4.3.2), which were US$21 billion/year in 2021. This indicates that the adaptation finance gap – the difference between needs/costs and flows – is very large (see table 4.4). The modelled costs/finance needs are 10–18 times as much as current international public finance flows, though this gap will be narrowed by current domestic finance (including unconditional commitments in NDCs) and private-sector adaptation flows, which are not included here.

Table 4.4 Summary of the adaptation finance gap in developing countries, based on AGR evidence

<table>
<thead>
<tr>
<th>Modelled cost of adaptation</th>
<th>Adaptation finance needs</th>
<th>Adaptation finance flows</th>
<th>Adaptation finance gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>US$215 billion/year this decade (central estimate), with a range of US$130–415 billion/year</td>
<td>US$387 billion/year (median), with a range of US$101–975 billion/year (up to 2030)</td>
<td>US$21.3 billion (2021)</td>
<td>The adaptation finance gap is estimated at US$194–366 billion per year (currently) Adaptation costs/finance needs are 10–18 times as much as current flows</td>
</tr>
</tbody>
</table>

When compared to the previous AGR assessments (UNEP 2016b, 2022b), the updated adaptation finance gap is more than 50 per cent greater. There are several reasons for this increase. As highlighted earlier, there are higher modelled costs of adaptation, which reflects the more negative impacts of climate change reported in the literature (see IPCC 2022). There are also more comprehensive studies in submitted NDCs and NAPs, which include more detailed estimates and greater coverage, and thus higher reported adaptation finance needs. This compares with the trends in public international adaptation finance flows, which increased from 2017 to 2020, but declined in 2021.

The comparison of the modelled costs, finance needs and finance flows reveals additional insights. The first comparison is shown by region in figure 4.9. The highest adaptation finance needs (extrapolated) are for East Asia and the Pacific, and for South Asia, while the highest modelled costs are for East Asia and the Pacific, and for Latin America and the Caribbean. In contrast, the highest financial flows, in percentage terms, are to sub-Saharan Africa (though they are far below estimated adaptation finance needs or costs).

It is also noted that given the size of the gap, if the 2021 Glasgow Climate Pact is met (which urges developed country Parties to at least double their collective provision of climate finance for adaptation from 2019 levels by 2025), international adaptation finance flows would reach an estimated US$38 billion per year, but this would only cover only a small share (5–10 per cent) of the current gap.

AGR 2016 estimated the costs of adaptation were in a likely range from US$140–300 billion per year by 2030, rising to US$280 billion to US$490 billion per year by 2050. In current prices (2021), these are equivalent to approximately US$170 billion to US$360 billion per year by 2030, rising to US$340 to US$600 billion per year by 2050.
It is also possible to compare the data by sector, though some caveats are needed. For example, several categories in the finance flows are not yet modelled (business, government, capacity-building). Further, there is not always a direct equivalence in sector categorization e.g. many cross-cutting disaster risk reduction measures are reported differently across the three evidence lines. There are also a relatively small number of costed NDCs and NAPs that include a sectoral breakdown (only 58 countries) and the average of these countries may not represent the global value. Nonetheless, some trends do appear. The highest financial needs are for agriculture, water and infrastructure. These are also three of the largest areas of adaptation finance flows (though flows are much less than needs). The modelled costs also identify water and infrastructure but have a lower proportion for agriculture. This is potentially because of the addition of trade in the modelling studies, which lowers costs. In contrast, national studies prioritize domestic adaptation (not imports) to address productivity losses. Coastal protection is also a higher share of the modelled costs. It is more difficult to compare other sectors, but it is noted that forests and ecosystems are an important share of finance needs, health is an important proportion of modelled costs, and government, social sectors and capacity-building (including local adaptation) are an important share of financial flows.

The final comparison is based on income level, including a focus on LDCs and SIDS as the most vulnerable countries. The analysis of LDCs and SIDS estimates their costs/needs in a central range of USD$29-41 billion/year (reflecting the modelled costs and financing needs, respectively). The comparison of these adaptation costs with finance flows can be seen in figure 4.11, which shows that a higher relative proportion of finance is flowing to the low-income and lower-middle-income countries, and to LDCs and SIDS, as compared with the estimated finance needs and modelled costs. This provides some indication that while the total finance flows are insufficient to meet finance needs or modelled costs, the relative share of total finance flows is higher, and that finance is somewhat prioritized to these more vulnerable countries.
Figure 4.10 Comparison of adaptation finance needs (extrapolated), modelled costs of adaptation, and international public adaptation finance flows for developing countries

Note: Some care is needed in comparing sectors because of differences in classification and omissions of some sectors.

Figure 4.11 Comparison of adaptation finance needs (extrapolated), modelled costs of adaptation, and international public adaptation finance flows for developing countries by country income level (panel A). LDCs’ and SIDS’ share of adaptation finance needs (extrapolated), modelled costs of adaptation, and international public adaptation finance flows (panel B).

Note: Finance flows are the average for the period 2017–2021.
Finally, it is stressed that closing the adaptation gap (by increasing adaptation finance flows) will deliver large benefits, as it will reduce climate impacts (and residual damage). As examples, for the coastal sector, an additional US$1 billion of adaptation investment is estimated to generate a US$14 billion benefit, from the reduction in the economic costs of coastal flooding, while for agriculture, an additional US$16 billion/year in adaptation would prevent approximately 78 million people from chronic hunger due to climate change (Sulser et al. 2021).

4.5 Gender equality and social inclusion

There is recognition that climate change can exacerbate inequality across multiple dimensions of social identity, including gender. Reflecting commitments in the UNFCCC Gender Action Plan and Paris Agreement (among others), the extent to which gender (and social inclusion) is included in the costs of adaptation and in financial flows has been investigated. To do this, the analysis assessed financing needs and international public adaptation finance flows using a modification of the common gender equality and social inclusion (GESI) continuum used widely in the development literature (see figure 4.12). The continuum rates adaptation responses from GESI-blind (where no reference or consideration is made), to GESI-specific (which specifically targets marginalized groups) and GESI-integrative (where opportunities are provided for participation and benefit on the basis of gender and social group), to GESI-responsive (which aims to change policy and structures to address inequality).

Figure 4.12 The modified gender continuum used for the analysis

**GESI-blind**
- No recognition of the need to take into account gender and socially differentiated vulnerabilities. GESI-blind projects typically reinforce existing inequalities.

**GESI-specific**
- Acknowledges gender and social inequality, targets needs of disadvantaged groups to contribute to equality.

**GESI-integrative**
- Acknowledges gender and social differences, ensures targeting provides opportunities for inclusion on the basis of gender and other social identity.

**GESI-responsive**
- Makes explicit attempts to address the root causes of gender and social inequality and contribution to the construction of more equal norms.
The analysis of adaptation cost modelling studies (section 4.2.2) found very few studies of relevance, and none of the modelled cost estimates include consideration of gender or social inclusion aspects. This is therefore a priority for future analysis.

The analysis of adaptation finance needs (section 4.2.3) reviewed the 97 submitted NDCs and NAPs, (from 85 countries) which include adaptation costs. The analysis found that the approach used to consider GESI varies, but 20 per cent of NDC and NAP plans had costed dedicated GESI activities (though it is 33 per cent of the 58 countries that included a sectoral breakdown of costs). The budget share of the total adaptation costs allocated to these GESI activities is generally low at an average of 2.4 per cent (with a range from 0.01 to 12 per cent). Most activities were classified as GESI-specific or -integrative, with only one country having commitments that can be classed as GESI-responsive. The analysis also found that costed adaptation activities in NDCs and NAPs focused almost exclusively on gender, and they did not allocate budgets to other aspects of social inclusion, such as Indigeneity, age, ethnicity, migrant status or disability.

The analysis found that some countries mainstream gender budget statements as part of their medium-term expenditure planning and budget cycles. These offer an alternative to dedicated or ring-fenced budgets. Further discussion is included on these issues in chapter 6 of the AFG Update 2023.

Activities considering the unique needs and contributions of women and men have been linked with higher effectiveness in reaching their adaptation objectives (UNDP 2018; Roy, Tandukar and Bhattarai 2022). Therefore, this report has also analysed the level of gender integration in adaptation finance flows to see what gender-targeted activities are funded. At COP 23, UNFCCC approved a gender action plan, which includes the use of gender-responsive finance as a core tool for implementation (UNFCCC 2017). In 2016, the OECD DAC database introduced a gender equality policy marker, allowing finance providers to tag their commitments on whether transactions support the policy objective of gender equality (though not all finance providers use this marker). Between 2017 and 2021, around 38 per cent of adaptation finance was marked as targeting gender equality, of which 94 per cent was tagged as having a “significant” objective and only 6 per cent as having gender equality as a “principal” objective.

The analysis conducted a further, more in-depth analysis of international public finance tagged as adaptation-related and with the principal objective for the gender marker, again using the gender continuum above. Of the finance tagged as principally targeting gender equality (approximately US$1.7 billion) (figure 4.13, panel A), 3 per cent did not provide adequate project description to allow for an analysis. A further 40 per cent had a project description which did not appear to address climate adaptation. This reinforces the findings of previous AGRs that over one third of activities marked as having adaptation as a principal objective did not meet the respective OECD criteria (UNEP 2022), suggesting a need for more consistency in the reporting of adaptation activities. Of the remaining finance volumes focusing on adaptation (57 per cent) and marked as gender principal, a review of project description (summaries) found that nearly 31 per cent (one third) are gender-blind, 5 per cent gender-specific, 19 per cent gender-integrative, and only 2 per cent gender-responsive.

Of the finance tagged as gender-specific, -integrative or -responsive (US$450 million) (figure 4.13, panel B), 16 per cent addressed intersections of gender with other dimensions of social inclusion: age (8.3 per cent), race (0.3 per cent) and a combination of social identities (7.4 per cent). However, the sample of data analysed is based on the marker of gender equality. Since there is no explicit social inclusion marker, for a complete analysis of social inclusion aspects, an analysis of the entire data set would be required.

Based on the analysis, to align with the UNFCCC Gender Action Plan, as well as commitments in the Paris Agreement, there is a need for greater transparency and consistency in the reporting of gender equality markers. Climate finance providers could also increase their funding of gender- and social inclusion-responsive adaptation projects to support equitable and effective adaptation, as this also contributes to equality by considering the unique needs and capacities on the basis of gender and social identity.
Figure 4.13 International public adaptation-specific finance marked with a principal objective for gender equality marker (panel A) along the gender continuum (panel B).

A.  

Not addressing adaptation 40%  
Addressing adaptation 57%  
No adequate description 3%

B.  

Addressing adaptation  
Gender-blind 31%  
Gender-specific 5%  
Gender-integrative 19%  
Gender-responsive 2%

4.6 Bridging the gap

Ambitious mitigation will mean that fewer hard and soft adaptation limits are hit, therefore making it essential to limit the costs of future adaptation and measures addressing losses and damages. Any further delay in anticipatory global action on mitigation and adaptation “will miss a brief and rapidly closing window of opportunity to secure a liveable and sustainable future for all” (IPCC 2022).

This report identifies seven approaches to bridging the adaptation financing gap (see figure 4.14). The core approaches will continue to be dominated by increasing existing sources of adaptation finance, namely: international adaptation finance, domestic expenditure on adaptation and private-sector finance for adaptation, even though the relative contributions to closing the adaptation finance gap remain uncertain (see sections 4.3.1–4.3.4). Around this core, four additional approaches for unlocking adaptation finance are identified. The further away from the core, the more international cooperation is required to unlock finance at scale. The outer ring is the implementation of article 2.1(c) of the Paris Agreement on shifting finance flows towards low-carbon and climate-resilient development pathways, which encompasses all financial flows in all countries (Zamarioli et al. 2021). It is important to note that these seven approaches offer different opportunities and face different constraints across countries. Section 4.3.1–4.3.3 demonstrated, for example, that LDCs rely heavily on international support, in particular grants. Bridging the adaptation finance gap requires attention to both quantitative and qualitative aspects, such as access to finance and equity (Khan et al. 2020). Further, as the number of institutions and initiatives on adaptation financing as well as the number of actors involved are increasing, enhancing institutional and technical capacity is also key to bridging the adaptation finance gap.

4.6.1 Core approaches

1. Increase international adaptation finance. The 2021 Glasgow Climate Pact urges developed country Parties to at least double their collective provision of climate finance for adaptation from 2019 levels by 2025 (UNFCCC 2021b, para. 18). Furthermore, Parties are negotiating a new collective quantified goal for the post-2025 period. This could safeguard an increase in adaptation finance. First, the goal could increase significantly. While the technical expert dialogue is still discussing the elements required to make informed discussions on the quantum of the goal (UNFCCC 2023c), a correction for inflation would already increase the target from US$100 billion per year to US$139 billion per year (Pauw et al. 2022b). Second, the new collective quantified goal on climate finance should “take into account” the needs and priorities of developing countries (UNFCCC 2016, decision 1/CP.21, para. 53), which could be translated into a larger share of the finance going towards adaptation or a subgoal on adaptation (Pauw et al. 2022b). While an increase in international public adaptation finance will be instrumental in helping to close the adaptation finance gap, especially in the short term, it is unlikely that any such increase will close the gap by itself.
2. **Effective domestic expenditure: Increase and improve budget tagging and tracking.** At the moment, budget tagging and tracking cannot be used to estimate how much domestic expenditure helps to close the adaptation finance gap (see section 4.3), or whether such expenditure is increasing (UNFCCC 2022a). Tagging and tracking increases awareness among policymakers in different ministries for integrating adaptation into budget planning e.g. for long-term adaptation investments, or in recurring expenditures, and to reduce potential negative expenditure (Choi et al. 2023). Increased and improved tagging and tracking can therefore help to spend government funds more consciously and to integrate climate risks more effectively. This helps to make the most of domestic financing and potentially increase domestic expenditure on adaptation, especially when a country also has systems in place to assess how effective those expenditures are. When coupled with other initiatives such as the recommendations by the Task Force on Climate-Related Financial Disclosures (2017), tagging and tracking should also help countries to implement article 2.1(c) of the Paris Agreement to make all finance flows consistent with climate-resilient development pathways.

3. **Mobilize private investments.** From an economic point of view, it should not be the role of the public sector to cover the full costs of adaptation – which would also typically exceed government’s fiscal space (Pauw et al. 2021). Rather, the public sector should set the right conditions for private investments in adaptation, while keeping in mind the overall welfare of society (ibid.). For that purpose, three market imperfections need addressing: positive externalities, imperfect financial markets and incomplete or asymmetric information (Druce et al. 2016; Pauw et al. 2021). These market imperfections may be addressed either by modifying the market environment e.g. by reflecting positive externalities in financing models or by addressing the consequences of the imperfection through market mechanisms. This can be done through the public provision of improved climate risk information (to address asymmetric information) or through government-based financing support or risk sharing (Gardiner et al. 2015; Bisaro and Hinkel 2018; Woodruff, Mullin and Roy 2020; Pauw et al.

For example, the Government of Malaysia developed a mixed-use tunnel allowing for traffic flow under normal circumstances while providing for storm water diversion during heavy rains. Private investments were secured by compensating the positive externality (public benefits of stormwater diversion) by allowing the private investor to toll a portion of the tunnel for traffic (see Gardiner et al. 2015). Various instruments can be used to address market imperfections (Pauw et al. 2022a) and they typically involve blended finance arrangements that bring together concessional public capital and private capital (Gouett, Murphy and Parry 2023). For example, guarantees and insurance can provide protection to private investors. Concessional finance can help encourage or de-risk private-sector investment and to reduce the cost of capital, with the potential to also include technical assistance funds (grants) to help strengthen financial viability or provide support on key issues (UNFCCC 2022a). Other instruments include resilience bonds (Bascunan, Molloy and Sauer 2020) and public-private partnerships in infrastructure or service provision (UNFCCC 2022a).

4.6.2 Additional approaches to bridging the adaptation finance gap

4. Remittances. These are a potential supplementary source of finance for bridging the adaptation gap at the local level, although more discussion is needed on fairness aspects as well as the limitations of nudging recipients to use remittances for adaptation. Remittances – money sent to families and friends in the origin countries by migrants – have potential for three reasons (Bendandi and Pauw 2016). First, the recorded volume of these flows to developing countries has been rising rapidly to US$791 billion in 2021 (Ratha et al. 2023). While the largest flows are to middle-income countries, they are more important in relative terms for LDCs (e.g. at 29 per cent of GDP in the Gambia and 23 per cent in Nepal [ibid.]). Second, remittances directly address the household level that is often hard to reach through public interventions. Third, in contrast to private finance, the motivation to remit is not only based on financial returns but also on personal bonds, which allows for investments where adaptation needs might be high but not have a return on investment. For example, Musah-Surugu et al. (2018) demonstrate that remittances in Ghana allow households to invest in climate resilience over time, can reduce households’ vulnerability by closing their financial exclusion gap, and absorb part of the economic losses owing to climate-related natural disasters, thereby lessening relief service required from local and central government. In Moldova, remittances increase the likelihood of utilization of water-efficient irrigation facilities in dry areas (Pilarova, Kandakov and Bavorova 2021). Governments could help to increase autonomous household adaptation through remittances. Maduekwe and Adesina (2022) find limited differences in exposure and adaptation action taken by Nigerian households that receive remittances compared with those who do not receive remittances but argue that government action to increase climate change literacy could change this. More research is required on the extent to which governments can encourage remittances to support adaptation and on climate justice concerns regarding such government action and the fact that recipients of remittances would use their money to adapt to a problem they might not have contributed to.

5. Increase financing for SMEs. SMEs hold considerable potential in unlocking climate adaptation solutions and engaging the private sector (see also GCA and CPI 2021). Since SMEs constitute the bulk of the economy for many developing (and developed) countries, financing mechanisms should be tailored to meet their particular needs and stimulate their potential to offer adaptation-relevant products and services. Initiatives at the global level, such as the G20’s Global Partnership for Financial Inclusion, can help mobilize and scale adaptation finance for SMEs. Support through the G20 can be enhanced, for example, by working with the regional development banks in developing countries to channel funds through well-established mechanisms. Regional initiatives such as those in Latin America (Botero, Brinks and Gonzalez-Ocantos eds. 2022), Asia (Papadavid 2021), or Africa (African Development Bank 2019) are salient examples. Moreover, financial de-risking mechanisms can be adapted to include the needs of SMEs, such as in financing small-scale energy projects. Although financial de-risking is occurring in various parts of the world, smaller countries with limited financial markets do not have adequate access to financial de-risking instruments (World Bank 2016). Targeted investments in SMEs can also enable them to address priority areas identified in countries’ NDCs, with evidence showing that some SMEs already invest in adaptation in, for example, tourism (Rasul et al. 2020; Hess 2020) and agriculture (Gannon et al. 2021). Local banks are the natural structuring agents and sources of project development funding. By connecting projects to local institutional investors, currency risks can also be mitigated.

6. Reform of the global financial architecture (incl. Bretton-Woods institutions). The Bretton-Woods architecture, which includes the International Monetary Fund (IMF), World Bank and World Trade Organization, was originally designed for the post-World War II era. After the global financial crisis of 2009 and the COVID-19 pandemic, it has...
become evident that this system is no longer fit to address today’s global challenges (Chhibber 2022). This architecture, together with other financing institutions such as MDBs, holds a large and unused potential for helping developing countries to tackle twenty-first century problems, including adaptation (Georgieva and Verkooijen 2021). The Bridgetown Initiative (Barbados 2022) highlighted:

a. Return access by low-income countries to IMF’s rapid credit financing facilities at levels from the COVID-19 crisis period. These financing windows are unconditional, have zero interest rates and can be used particularly after large natural disasters.

b. Debt service suspension clauses, which give temporary relief through the suspension of debt repayment for countries in distress. That way, countries can focus on addressing specific crises or on reconstruction efforts after a climate catastrophe. Debt suspension has already been used to some extent by the G20 members (World Bank 2022), Inter-American Development Bank (2023) and in bilateral cooperation by the United Kingdom Export Finance (2022), and can be coupled with adaptation-related requirements, as in the case of debt-for-climate or debt-for-adaptation swaps (Fuller et al. 2018; Hebbale and Urpelainen 2023).

c. Rechannelling unused special drawing rights (SDR). SDR are unconditional support by the IMF to countries’ foreign reserves, which do not add to the national debt and have significant potential when redesigned for bolstering climate resilience. They can give fiscal space to governments against economic challenges or be exchanged for hard currency, also working to reduce exchange rate risks and borrowing costs (Andrés Arauz, Cashman and Merling 2022).

d. Other proposals include: (i) the operationalization of the IMF’s Resilience and Sustainability Fund, aimed at providing long-term financing; (ii) the expansion of lending by MDBs by US$1 trillion, with a focus on building climate resilience in climate-vulnerable countries through increased risk appetite, guarantees and holding of SDR to expand lending to governments; (iii) a global mechanism for raising reconstruction grants for any country facing climate disasters; and (iv) a multilateral agency that accelerates private investments in the low-carbon transition. Outside the Bridgetown Initiative, a more adaptation-conscious South-South cooperation may also help bridge the gap, such as with the creation and expansion of new multilateral institutions e.g. as the BRICS’ New Development Bank.

7. Implementation of article 2.1(c) of the Paris Agreement. Making finance flows consistent with a pathway towards low-carbon and climate-resilient development (UNFCCC 2016). Although a global goal, its implementation offers developing countries the potential to help to close the adaptation gap (a–c below), though it also brings risks (d) that need addressing by UNFCCC while further developing guidance on how to scale up climate resilience through the financial system:

a. Standardized reporting on article 2.1(c), such as with the Global Resilience Index Initiative and the Risk Information Exchange by the United Nations Office for Disaster Risk Reduction (UNDRR) (UNDRR and CGFI 2022) could create a proxy for monitoring the extent to which climate resilience is integrated in investment decisions in both public and private sectors. While reducing risks in the medium to long term, thus helping to limit the adaptation gap, the alignment of finance flows with climate-resilient development should also uncover private opportunities for climate adaptation, at the company and project levels, and could lead to more investments in adaptation.

b. As jointly agreed in 2021, MDBs are applying Paris alignment methodologies to all their operations and providing useful lessons learned. The aim is to ensure that projects do not contradict countries’ climate strategies, including NAPs. Under the adaptation methodology (“building block BB2”), the focus is to identify and address climate risks. This can both lower material risks for the MDBs by improving the viability of a project over time and seek to improve final beneficiaries’ resilience. The methodology applies to direct operations and policy-lending finance, while guiding MDBs’ work with financial intermediaries and companies. This can cascade down to MDB partners such as public banks, private financial institutions, investment funds and companies. The experiences of MDBs also offer an important lens for understanding the difference and synergies between resilience-building under article 2.1(c) and international adaptation finance. While following similar steps, the latter only accounts for the shares of project costs specifically addressing adaptation (European Investment Bank 2022), while the goal of article 2.1(c), is ultimately to have 100 per cent of operations aligned with the Paris Agreement.

Incorporating climate risks into the financial industry’s decision-making strengthens the signal to companies that they need to build and demonstrate climate preparedness, which in turn could lead to investments in adaptation. Whether for managing creditworthiness, accessing mortgages, holding reasonably priced insurance and so forth, addressing risks related to climate impacts is progressively
attached to the ability of companies to manage their financial health (Choi et al. 2023), as reflected by different credit rating agencies' evaluations of companies, as well as national governments and municipalities (Moody's Investors Service 2017a).

d. The identification and disclosure of climate-related risks should contribute to adaptation, but in the shorter term it could negatively impact on the economies of developing countries. Broadly speaking, the identification of climate-related risks in investment or finance decisions could lead to three scenarios. In the best scenario, measures are taken to address these climate-related risks at low cost or at no cost in design. In the second-best scenario, addressing risks comes at a higher price e.g. through insurance, guarantees or other de-risking instruments. In the worst scenario, the identification of climate-related risks deems investments prohibitively expensive or unprofitable. Because of the latter, advancing article 2.1(c) solely driven by financial materiality might lead to the increase of perceived risks and negative biases against the most vulnerable populations, such as the ones located in islands and LDCs (Moody's Investors Service 2017b; Fitch Ratings 2021), or the most exposed sectors such as agriculture, natural capital and infrastructure. This is an issue of fairness that UNFCCC need to address.
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