UN environment programme

Come hell and high water

As fires and floods hit the poor hardest, it is time for the world to step up adaptation actions

Adaptation Gap Report 2024

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Glossary

The entries in this glossary are primarily taken or modified from definitions provided by reports published by the Intergovernmental Panel on Climate Change (IPCC) or previous Adaptation Gap Reports.

Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC 2022[1]).

Adaptation costs: Costs of planning, preparing for, facilitating and implementing adaptation measures, including transaction costs (IPCC 2007[2]).

Adaptation gap: The difference between actually implemented adaptation and a societally set goal, determined largely by preferences related to tolerated climate change impacts and reflecting resource limitations and competing priorities (UNEP 2014[2]).

Adaptation limits: The point at which an actor's objectives (or system needs) cannot be secured from intolerable risks through adaptive actions (IPCC 2022[1]).

- **Hard adaptation limit:** No adaptive actions are possible to avoid intolerable risks.
- **Soft adaptation limit:** Options are currently not available to avoid intolerable risks through adaptive action.

Adaptive capacity: The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences (IPCC 2022[1]).

Capacity-building: The practice of enhancing the strengths and attributes of, and resources available to, an individual, community, society or organization to respond to change (IPCC 2022[1]).

Exposure: The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected (IPCC 2022[1]).

Hazard: The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (IPCC 2022[1]).

Impacts: The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather and climate events), exposure and vulnerability. Impacts generally refer to effects on lives; livelihoods; health and well-being; ecosystems and species; economic, social and cultural assets; services (including ecosystem services); and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial (IPCC 2022[1]).

Loss and damage: There is no agreed definition for loss and damage. IPCC (2022[1]) distinguishes between Loss and Damage (title case), which is used to refer to political debate under the United Nations Framework Convention on Climate Change (UNFCCC), and losses and damages (sentence case), which is used to refer broadly to harm from (observed) impacts and (projected) risks and can be economic or non-economic. In practice, loss and damage is most commonly understood as the adverse effects of climate change that are not or cannot be avoided by mitigation and adaptation efforts (van der Geest and Warner 2020[3]).

Maladaptation: Actions that may lead to increased risk of adverse climate-related outcomes, including via increased vulnerability to climate change, diminished welfare, or increased greenhouse gas (GHG) emissions, now or in the future. Maladaptation is usually an unintended consequence (IPCC 2022[1]).

Mitigation (of climate change): A human intervention to reduce the sources or enhance the sinks of greenhouse gases (IPCC 2022[1]).

Resilience: The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning and/or transformation (IPCC 2022[1]).

Residual risk: The risk related to climate change impacts that remains following adaptation and mitigation efforts. Adaptation actions can redistribute risk and impacts, with increased risk and impacts in some areas or populations, and decreased risk and impacts in others (IPCC 2022[1]).

Risk: The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards (IPCC 2014[4]; IPCC 2022[1]).

Technology transfer and cooperation: The exchange of knowledge, hardware and associated software, money, and goods among stakeholders, which leads to the spread of technology for adaptation or mitigation. The term encompasses both diffusion of technologies and technological cooperation across and within countries (IPCC 2022[5]).

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and the lack of capacity to cope and adapt (IPCC 2022[1]).

1 https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Annex-II.pdf.

2 https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg2-app-1.pdf.

3 https://doi.org/10.1080/14693062.2019.1704678.

4 https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-AnnexII_FINAL.pdf.

5 https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Annex-I.pdf.

Several vehicles such as trucks, bicycles and cars were trapped by floodwater in Gresik Regency, Indonesia, 21 February 2024.

Photo: © Anzz Media / iStock

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A village swept away by landslides and sands caused by torrential rain in the Yecheon-gun area of Gyeongsangbuk-do, Republic of Korea, in July 2023.

Photo: © Choi Dongsu / iStock

Foreword

Global average temperature rise is still below 1.5°C, yet climate change is already hitting communities across the world hard, particularly the most poor and vulnerable. And it will get much worse: the latest estimates put the world on course for a temperature rise of 2.6–3.1°C this century unless there is urgent and ambitious mitigation. So, it is for good reason that ***UNEP's Adaptation Gap Report 2024: Come hell and high water*** calls on nations to dramatically increase efforts to adapt to climate change, starting with a commitment to act ambitiously on adaptation finance at COP 29.

The enormous gap between adaptation finance needs and flows means that the world is failing to adapt to current impacts – with adaptation planning slowing and implementation falling behind – never mind those that will come if greenhouse gas emissions are not slashed decisively. Everyone must deal with the devastation caused when climate impacts strike. But it is the poor and vulnerable who suffer most from loss and damage, so well-financed and effective adaptation that incorporates fairness and equity is more urgent than ever.

There are some encouraging signs. International public adaptation finance flows to developing countries increased from US$22 billion in 2021 to US$28 billion in 2022 – the largest year-on-year increase since the Paris Agreement. This is progress towards the Glasgow Climate Pact, which urged developed countries to at least double adaptation finance to developing countries from 2019 levels by 2025. However, even achieving this goal would only reduce the adaptation finance gap by about 5 per cent.

Nations must therefore adopt an ambitious new collective quantified goal for climate finance at COP 29 in Azerbaijan and pursue innovative approaches to mobilizing additional financial resources, including by creating the right enabling environment for public and private sector investment. Just as important is making adaptation financing more anticipatory, strategic and transformational, rather than the current reactive and incremental approach. In addition, capacity-building and technology transfer are crucial to enhancing adaptation in developing countries; this report therefore also issues recommendations on how to improve current processes – which are often uncoordinated, expensive and short-term. Adopting stronger adaptation components in the next round of nationally determined contributions, due in early 2025, would be another step in the right direction.

The global goal on adaptation was established to contribute to sustainable development and ensure an adequate adaptation response to the climate crisis. We are endangering this goal if we do not collectively step up adaptation action while climate risks accelerate relentlessly. People and the natural systems upon which our livelihoods depend are increasingly in danger from the hell and high water that climate change is bringing. The world must get serious about adaptation, now.

Inger Andersen
Executive Director
United Nations Environment Programme

Executive summary

As climate impacts intensify, adaptation action continues to fall behind needs. The twenty-ninth Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 29) in Baku provides an important opportunity to alter this trajectory.

Ever more frequent and extreme climate impacts illustrate just how much is at stake as global average temperatures rapidly approach 1.5°C above pre-industrial levels, while mitigation action is woefully underachieving on the scale and ambition needed to keep within the long-term temperature goals of the Paris Agreement. As climate impacts rise with warming, both the costs of reducing risks through adaptation and the likelihood of the residual risks manifesting in the form of losses and damages increase. These climate impacts hit the poor and vulnerable hardest, including women and disadvantaged groups. Effective and adequate adaptation action incorporating elements of fairness and equity is thus more urgent than ever before. By strengthening the adaptation components in their third set of nationally determined contributions (NDCs), due in February 2025, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) can emphasize their adaptation priorities and the means needed to achieve them.

The *Adaptation Gap Report* (AGR) 2024 provides its annual assessment on progress in adaptation planning, implementation and finance. It shows that, while inching forward on adaptation planning, collectively developing countries are falling behind on implementation because of the enormous gap between adaptation finance needs and flows. This is especially relevant in the context of the New Collective Quantified Goal (NCQG) for climate finance, which is to be established during COP 29 in Baku. However, given the scale of the challenge, the NCQG can only be a part of the solution, and bridging the adaptation finance gap will also require innovative approaches and enabling factors to mobilize additional financial resources. In addition to finance, there is a need to strengthen capacity-building and technology transfer, and to enhance the effectiveness of adaptation actions. As the Azerbaijan Presidency has made *means of implementation* a central tenet of COP 29, this year's AGR also provides deeper insights into the status and trends of capacity-building and technology transfer, and how improving them can contribute to enhancing effective adaptation planning and implementation. Lastly, given the AGR's role in providing regular progress updates on metrics relevant to the global goal on adaptation, this year's report also reflects on what can already be said about progress towards several of the targets laid out in the United Arab Emirates Framework for Global Climate Resilience (UAE FGCR) that was agreed at COP 28 in Dubai.

To that end, this executive summary is structured around four headlines that cover main topics of the AGR 2024: 1) progress in adaptation planning, implementation and finance; 2) bridging the adaptation finance gap; 3) enhancing capacity-building and technology transfer to improve the effectiveness of adaptation actions; and 4) insights into aspects of the UAE FGCR.

1. Progress in adaptation planning, implementation and finance

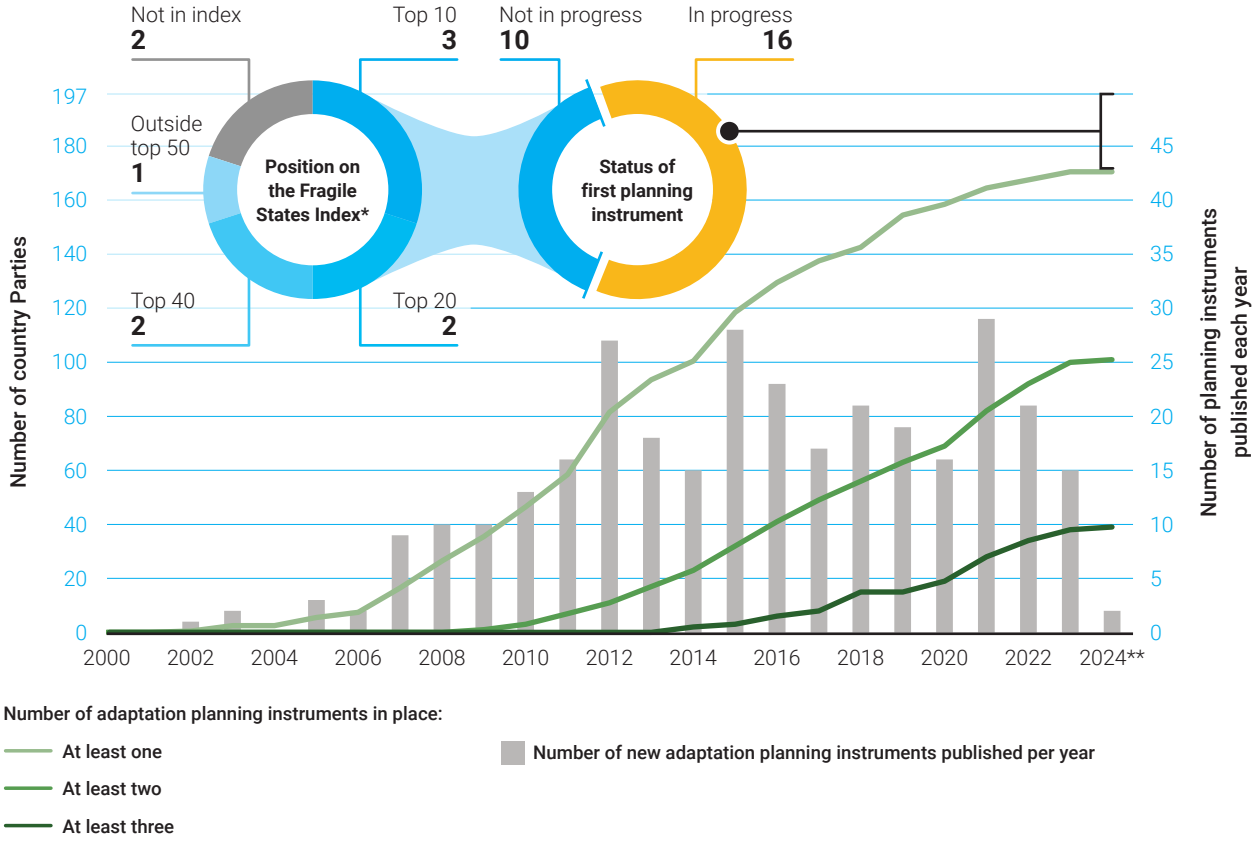
The quality of adaptation planning is improving, but reaching global coverage of national adaptation planning instruments will be difficult.

As a result of the increased attention to and investment in adaptation planning over the past two decades, 171 countries (87 per cent) now have at least one national adaptation planning instrument (policy, strategy or plan) in place. Of these, 51 per cent have a second and 20 per cent have a third instrument (figure ES.1). However, although 16 of the 26 countries without a national planning instrument are in the process of developing one, there remain 10 countries that currently show no indication of developing such an instrument. Seven of these countries rank highly on the Fragile States Index, suggesting that they face internal fragility, conflict or geopolitical tensions. To close the gap and meet the UAE FGCR target on adaptation planning will require increasing quantities of support going to these fragile and conflict-afflicted countries. Further, as these countries are likely to be hindered by weak institutions, the support which is provided will need to include significant and sustained capacity- and institutional-strengthening.

In addition to coverage, the quality of the planning instruments is an important indicator for the likely effectiveness with which they can be implemented. An analysis of the national adaptation plans (NAPs) submitted to the UNFCCC secretariat reveals that the potential effectiveness of adaptation planning is mixed. Most countries identify a mix of priorities that address both specific, sectoral climate risks and enablers of adaptation action, while addressing issues of inclusivity and participation, including of historically disadvantaged groups, such as women, indigenous peoples and local communities. However, there are shortcomings in the robustness of the evidence base and gaps regarding

specific timeframes for and costs of adaptation priorities affecting their implementability. Thus, there is significant scope for improvement as countries introduce new or update existing national adaptation planning instruments. Finally, an analysis of alignment between NAPs and NDCs finds that most countries' NAPs and NDCs are only partially aligned (68 per cent), with a further 16 per cent showing no alignment. As countries update their NDCs, significant emphasis should be placed on ensuring alignment between these two instruments, so that they can mutually reinforce each other, lead to more strategic investments and avoid duplication of effort.

Figure ES.1 Publication of national policy instruments for adaptation over time

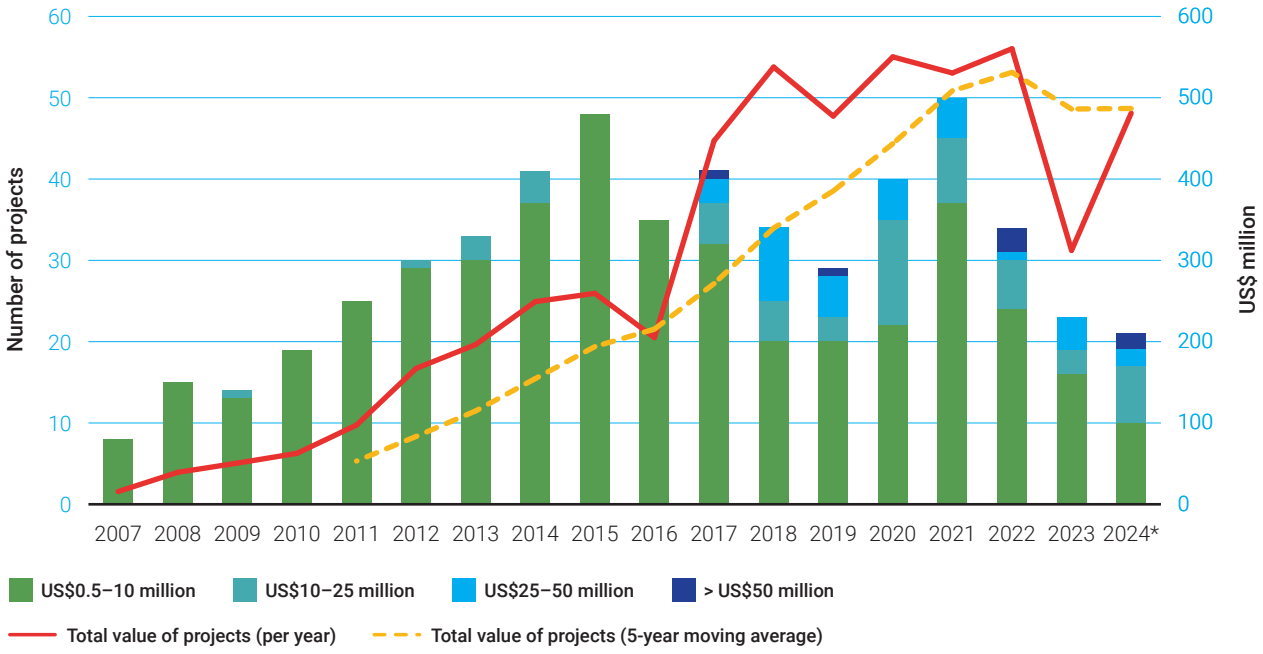


*Average position between 2020 and 2024 **Until 5 August 2024

Progress in adaptation implementation is slow and marred with problems. Countries need to ramp up their ambitions to prepare for increasing climate risks.

Across different data sources, information on the implementation of adaptation actions shows large annual fluctuations but they ultimately result in a slight upward trend over time (figure ES.2). Yet considering the pace of climate change, a boost in support of adaptation implementation is urgently needed. Greater focus on and support provided for adaptation in the next round of NDCs could give credence to strengthened country ambitions and actions. Next to the lack of acceleration in adaptation implementation, final evaluations of adaptation actions implemented with support from the financial mechanisms of the UNFCCC and the Paris Agreement show that approximately half are rated either not satisfactory in their results, or are unlikely to be sustainable without project funds in the longer term. Analysis of NAP implementation progress reports shows mixed results, and reveals a range of institutional, regulatory, financial and capacity-related barriers limiting progress. Countries often overcome initial difficulties and report significant progress regarding the extent of actions that are under implementation. However, data on the results and effectiveness of NAP implementation remains very limited. Of those countries that have assessed the adequacy of their adaptation response, all found it to be insufficient relative to the extent of climate risks.

Figure ES.2 Progress in adaptation projects supported by the financial mechanisms serving the UNFCCC and the Paris Agreement



*Until 31 August 2024

Note: Funding dropped by almost US$250 million in 2023 compared to 2022, but investment until August 2024 is already showing signs of recovery.

The adaptation finance gap remains extremely large, and bridging this gap is a priority for the NCQG for climate finance.

International public adaptation finance flows to developing countries increased from US$22 billion in 2021 to US$28 billion in 2022: the largest absolute and relative year-on-year increase since the Paris Agreement. This reflects progress towards the adaptation component of the Glasgow Climate Pact (figure ES.3), which urged developed country Parties to at least double their collective provision of climate finance for adaptation to developing country Parties from 2019 levels by 2025, though further significant increases are required to achieve this goal. However, even if this doubling is achieved, it would only reduce the adaptation finance gap by about 5 per cent. The adaptation finance gap is relevant in the context of the NCQG for climate finance, which is to be established before 2025. A comparison of adaptation finance needs (estimated at US$215–387 billion/year in the AGR 2023) against 2022 international public finance flows shows that a very large adaptation finance gap still exists. However, the assessment of the gap is constrained by insufficient data on finance flows from domestic public and private sector sources, both of which are important sources of adaptation finance. It is also noted that based on the latest year of available data, debt interest payments of developing countries (excluding China) were larger than estimated adaptation finance needs, potentially providing opportunities for debt reform to contribute to supporting adaptation action.

2. Bridging the adaptation finance gap

Meeting the climate challenge will require a scaling up of adaptation finance, but also a more strategic approach to investment.

The AGR 2024 is further reporting on the current finance gap and the types of adaptation that need financing – and not just the total level of finance. To do this, it has developed a typology of adaptation and financing challenges (figure ES.4). The figure shows that it is generally easier to finance no-regret, reactive and incremental adaptation (top left), and adaptation in market sectors (bottom left). Conversely, it is more challenging to finance anticipatory and transformational adaptation (top right), and adaptation in non-market sectors, especially for the most vulnerable (bottom right). This applies to all financing (including domestic public and international public financial institutions), but it is especially the case for private sector financing. However, to meet the scale of the climate change challenge, adaptation financing needs to shift from the historic focus on reactive, incremental and project-based financing (top left) towards more anticipatory, strategic and transformational adaptation (top centre and right). This requires more action in areas that are harder to finance and more complex to develop. Treating adaptation as if it is similar to mitigation, i.e. focusing on technical options, or concentrating on the easiest-to-finance areas only, will not deliver the scale or types of adaptation needed.

Figure ES.3 Comparison of adaptation financing needs, modelled costs and international public adaptation finance flows in developing countries

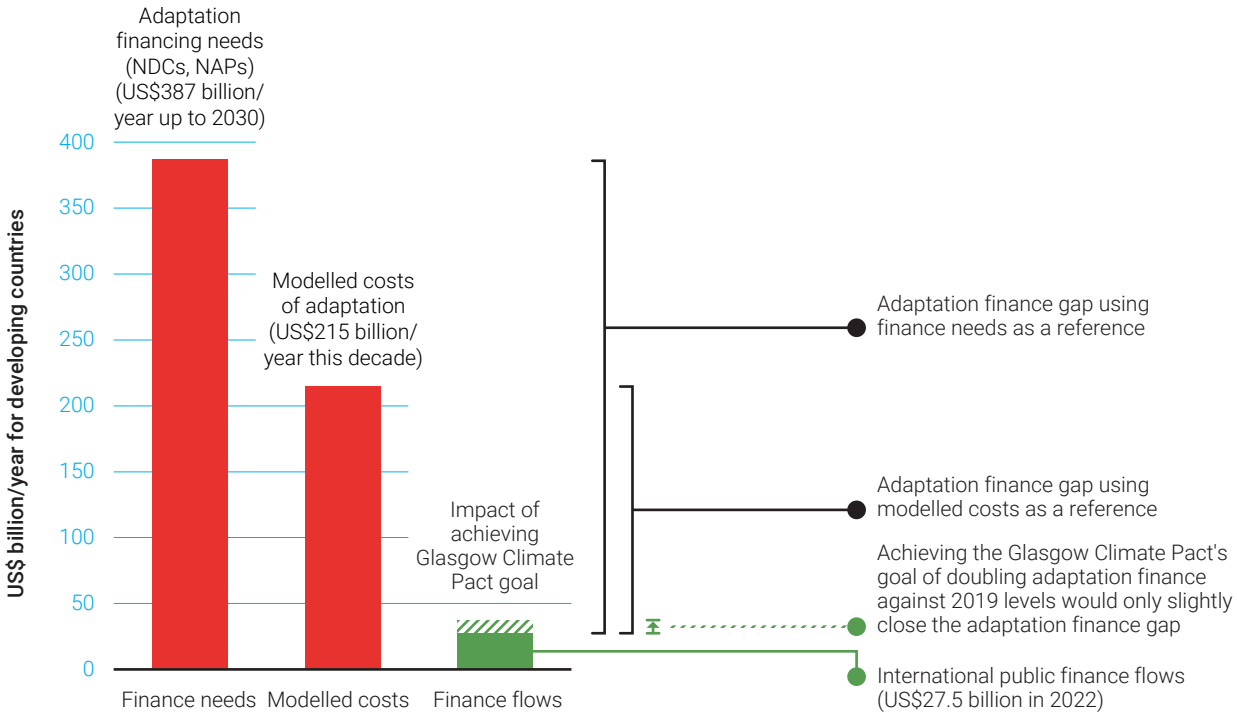
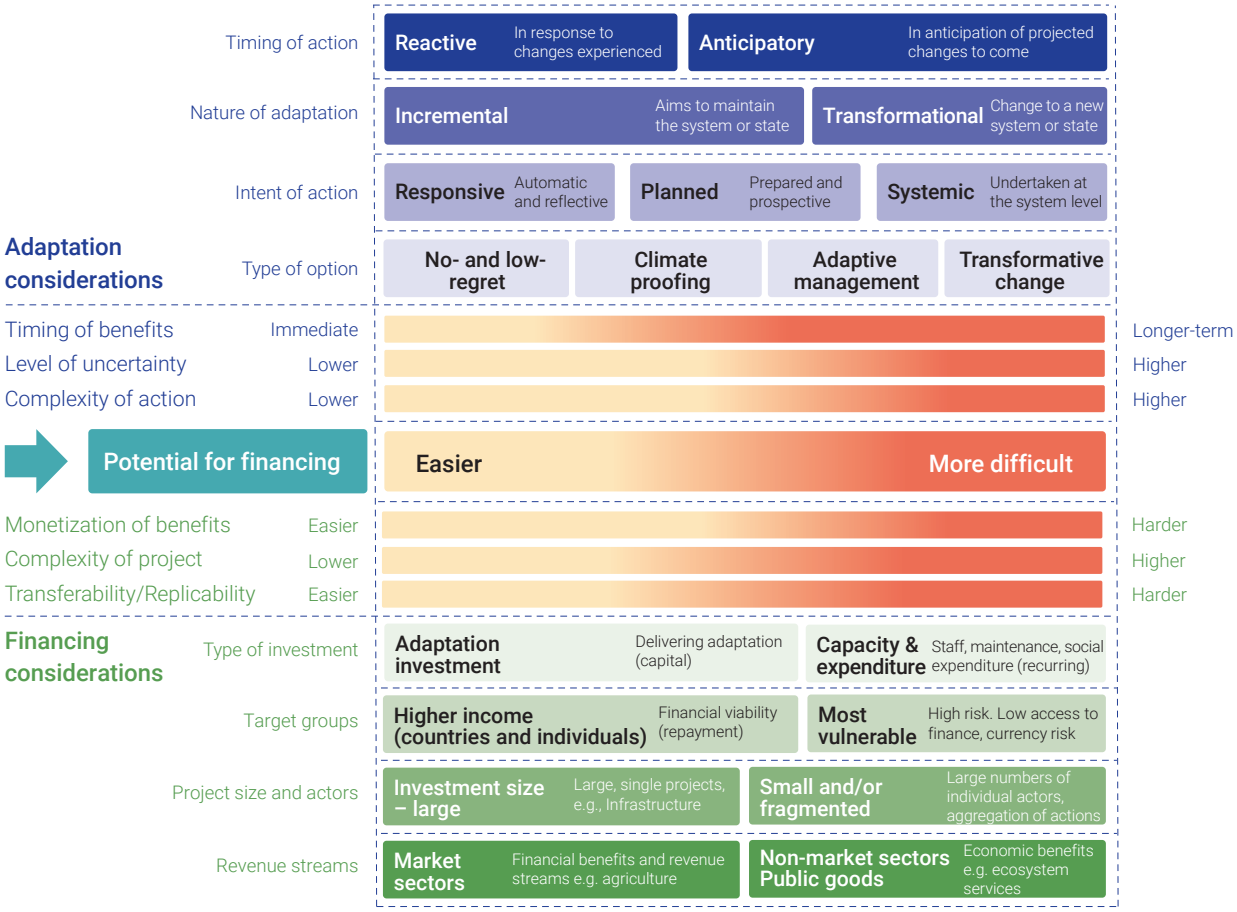


Figure ES.4 Adaptation types and ease of financing to better elucidate the opportunities for private sector engagement



Source: Modified by authors based on Watkiss (2024).

Only around one third of the adaptation finance gap is in areas typically financed by the private sector, but there is still a large opportunity for private sector investments.

Over two thirds of estimated costs/finance needs are in areas that are typically financed by the public sector through international or domestic sources, because they have public good characteristics or are in social or non-market sectors. This means that without more public finance (international and domestic) – or innovative approaches to financing – it will be difficult to deliver the majority of countries' adaptation priorities (as set out in NDCs and NAPs). At the same time, one third of modelled costs/finance needs are in areas that have potential for private financing, such as, for example, in market sectors including commercial agriculture, water and infrastructure. However, even in these cases, there is often a need for the public sector to use public finance to de-risk and unlock private investment. There will also be private sector investment in areas that are not well covered in the current adaptation gap estimates, including private sector infrastructure needs, as well as greater cooling needs and impacts on temperature-related labour productivity.

Enabling factors are key for unlocking adaptation finance, especially for the private sector.

Given the barriers to adaptation, there is a need for enabling factors to help unlock adaptation finance, for both public and private sectors. The AGR 2024 has reviewed and identified a number of the most important enabling factors for finance.

- First, a number of new approaches and financial instruments are emerging which seek to address some of the challenges to adaptation, by better defining adaptation outcomes or creating incentives for adaptation investment, including risk finance; insurance-linked instruments; performance-based climate resilience grants; resilience credits; debt for adaptation swaps; payments for ecosystem services; work for taxation; and resilience bonds.

- Second, for the public sector there are also a number of enabling factors that include the creation of funds and financing facilities; climate fiscal planning and climate budget tagging; mainstreaming in national development planning and medium-term expenditure frameworks; and adaptation investment planning. These could also be supported by various reforms being proposed for international finance institutions and multilateral development banks.

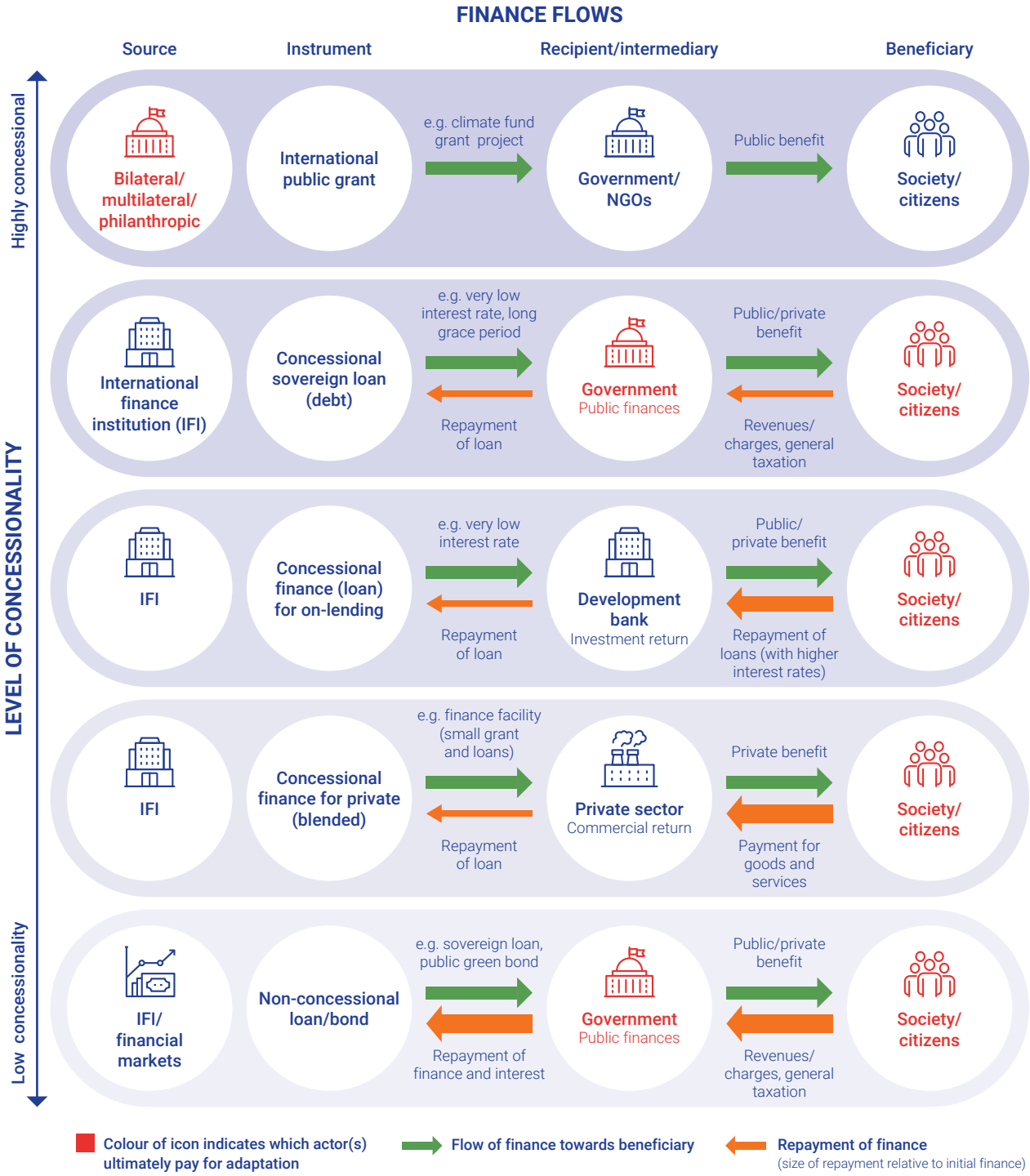
- Third, for the private sector, enabling factors include climate risk disclosure frameworks, transition planning and adaptation taxonomies. They also include new approaches and financial instruments that seek to de-risk private sector finance using public (blended) finance. These can be further supported by adaptation accelerators and platforms, which can catalyse new models and instruments, and help develop bankable projects.

However, all these enabling activities will require capacity to deliver, and also require financing. This also means that there are many demands on the available concessionary public finance, such as delivering more ambitious public adaptation, de-risking private investment, and supporting enablers. Critically, this means that there is a need to use the available international public concessionary finance much more strategically.

The question of who ultimately pays for adaptation is not being adequately addressed in the current discussion on adaptation financing.

Adaptation finance flows have very different profiles at subnational levels for the most vulnerable groups in society. These differences are relevant for the international negotiations around the NCQG and the finance flows from Annex I to developing countries. The AGR 2024 has explored this issue, diving deeper into the question of who pays for and who benefits from adaptation finance, using flow analysis from lender to intermediary recipient (government, bank, private sector) and on to the impacted groups in a hypothetical least developed country (LDC) (figure ES.5). Except for the grant model (top) where the international funder bears all the costs, all other models ultimately lead to the LDC bearing much of the costs of adaptation. Therefore, while additional funding helps close the adaptation finance gap, it is not in line with the principle of common but differentiated responsibilities and respective capabilities – an underlying principle of the UNFCCC – nor with the polluter pays principle. Finally, in this context, it is also important to note that adaptation finance needs to consider gender equality and social inclusion much more strongly to avoid perpetuating existing inequalities.

Figure ES.5 Who ultimately pays for adaptation in LDCs?



3. Enhancing capacity-building and technology transfer to improve the effectiveness of adaptation actions

Capacity-building and technology transfer are central to enhancing adaptation action in developing countries, but there is uncertainty regarding their effectiveness.

In addition to finance, capacity-building and technology transfer are critical to enhance effective adaptation action. However, despite references to capacity and technology needs being nearly ubiquitous in UNFCCC documents, such as NAPs and technology needs assessments, ongoing efforts are often uncoordinated, expensive and short-term, and there is insufficient data to assess their effectiveness. To better understand how these two means of implementation can be strengthened and deployed in a coordinated manner, it is essential to close important knowledge gaps. For instance, the questions of which capacities and technologies are relevant for whom, and how they are to be developed

and transferred, remain under-studied, leading to difficulties in well-grounded recommendations. Better integration, targeted support and greater South-South, North-South and triangular cooperation could go a long way to closing these knowledge gaps, and could be articulated in countries' revised NDCs and NAPs.

Developing countries express needs for more capacity and technology across all aspects of adaptation planning and implementation, with a focus on water, food and agriculture.

Greater capacities are needed for all aspects of adaptation planning and implementation, but there are differences across sectors. Food and agriculture are mentioned in nine out of ten NAPs, followed by capacity needs for sectors related to the environment, water and health. Capacity needs are articulated for sector-specific technologies, but also to enable better planning, implementation, monitoring and evaluation, as well as for a range of underlying enabling factors (figure ES.6). Similarly, by far the greatest technology needs are articulated for agriculture and water, whereas technologies for coastal zone protection, the third largest priority area, are relevant for a significantly smaller number of countries. Analysis of the total support provided to developing countries for technology-related adaptation efforts between 2018 and 2022 shows an increase from US$5.7 billion to 12.7 billion. Over the same period, the share of adaptation-related to total climate-related development finance for technology rose from 26 to 35 per cent. This suggests that there is an increasing focus of climate-related development finance to support adaptation through the introduction of new technologies. This is particularly evident for the agriculture sector, which is receiving on average 31 per cent of adaptation-related development finance per year – almost twice the amount committed to both transport and storage, as well as water and sanitation, which are the next biggest sectors. Hence, while much more funding is necessary to meet countries' needs, the technology needs assessments reveal that the available funding is at least largely going to the priority sectors.

Bridging the gap between capacity and technology needs and levels of action on the ground requires overcoming multifaceted challenges.

There are a number of factors that diminish the effectiveness of the support currently provided. Among the most prevalent are economic and financial constraints related to high upfront investment costs, difficulties in obtaining loans, and uncertainties surrounding the return on investments. These constraints are especially apparent for technologies that require significant capital investment, such as solar-powered irrigation systems where comparatively high installation and maintenance costs often hinder widespread adoption. In addition, legal and regulatory frameworks can pose major challenges, requiring more robust, streamlined and supportive domestic policies to foster the development and transfer of technologies and skills identified as important by developing countries. Moreover, in sectors such as agriculture and water where local conditions are critical, low technical capacity combined with a lack in infrastructure, information and awareness often result in poor adoption rates. Addressing these challenges requires additional funding, some of which could be covered by private sector investments. In addition, it is crucial to increase capacity in planning, implementation and the underlying enabling factors, which necessitates planning and coordinated efforts at the national and subnational levels to maximize the opportunities of making climate technologies and capacities more available for adaptation.

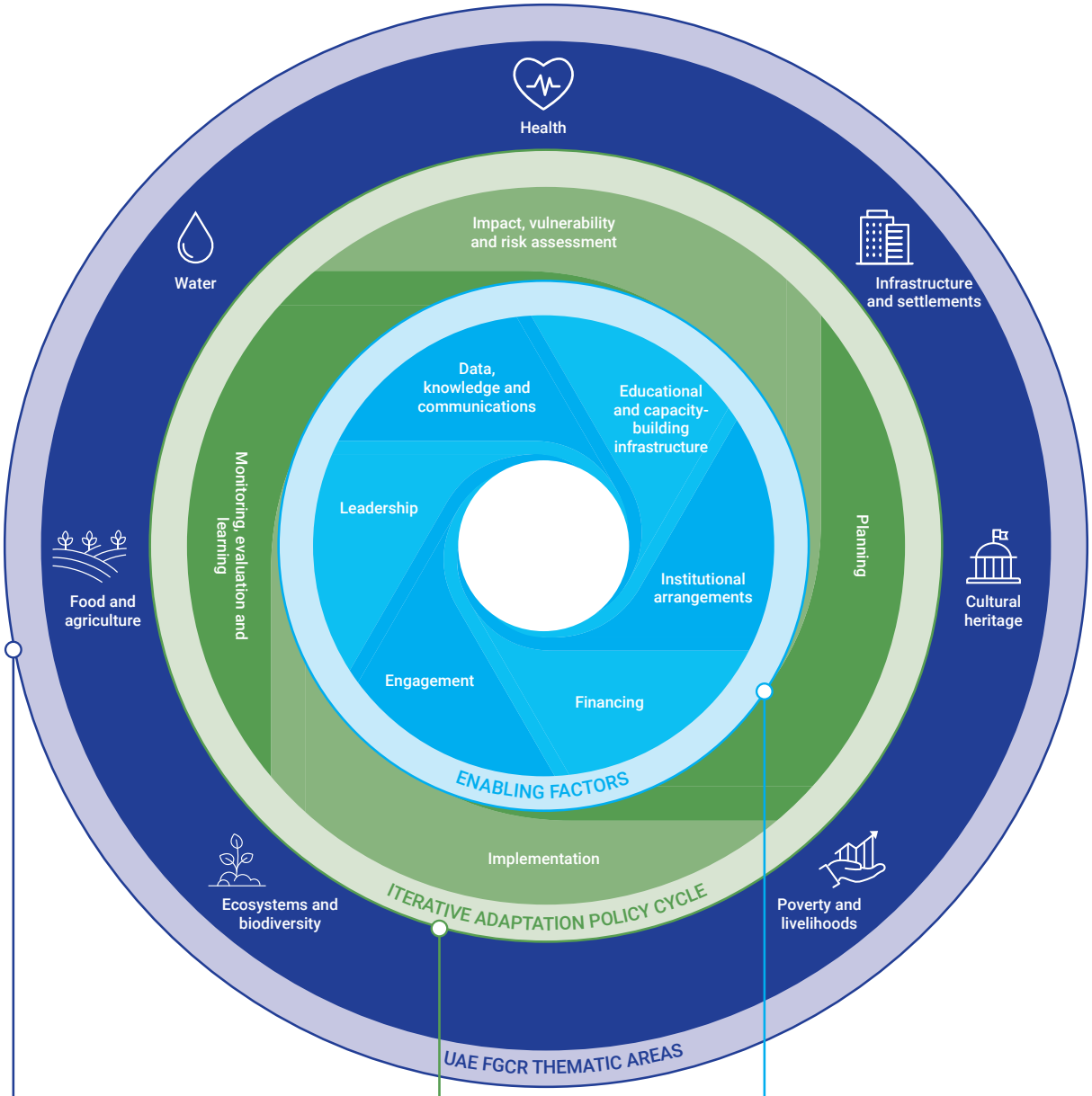
Better capacity-building and technology transfer could accelerate adaptation planning and implementation.

Based on its assessment, the AGR 2024 distills the following key recommendations to enhance the effectiveness of capacity-building and technology transfer:

- First, interventions to support capacity-building should start by identifying and mobilizing endogenous capacities that already exist; provide a balance of emphasis on "hard" (e.g. technologies) and "soft" (e.g. enabling conditions) capacities; and place gender equality and social inclusion considerations at their centre.
- Second, a far more robust evidence base to inform capacity-building interventions and technology transfer priorities is needed. This includes evidence derived from monitoring and evaluation on which approaches work, for whom, and when; on the actual costs of interventions; and on the current level of capacity-building and technology transfer needs.
- Third, capacity-building and technology transfer plans should support adaptation across sectors, scales and development priorities, and build capacity for transformational change. Current priorities are often too narrow, technical, and focused on responding to international commitments or immediate crises, limiting efforts towards deeper change.
- Fourth, the effectiveness of technology transfer relies on it being part of a broader development strategy, and strongly integrated with an associated assessment of capacity-building needs. Adaptation strategies should be developed based on a holistic understanding of the needs, rather than from the perspective of pushing a particular technology.

Considering these recommendations in efforts to enhance capacities and technology transfer would lead to more effective adaptation planning and implementation, particularly in combination with urgently needed additional adaptation finance.

Figure ES.6 Adaptation targets, processes and enabling factors



UAE FGCR THEMATIC AREAS

Health
- Risk assessment and monitoring
- Awareness and communications

Infrastructure and settlements
- Risk assessment and management
- Climate smart infrastructure

Cultural heritage
- Climate proofing
- Community engagement

Poverty and livelihoods
- Diversifying livelihoods
- Reskilling in vulnerable sectors

Ecosystems and biodiversity
- Risk assessment and monitoring
- Ecosystem-based approaches
- Community engagement

Food and agriculture
- Climate smart agriculture (techniques and technologies)
- Climate resilient food systems

Water
- Risk assessment and monitoring
- Community engagement
- Regulations

ITERATIVE ADAPTATION POLICY CYCLE

Impact, vulnerability and risk assessment
- Data collection and access
- Risk and vulnerability assessment

Planning
- Capacity assessments
- Cross-sectoral planning and budgeting

Implementation
- Use of adaptation technologies
- Community engagement

Monitoring, evaluation and learning
- Data collection and monitoring
- Institutional learning

ENABLING FACTORS

Data, knowledge and communications
- Communication and knowledge networks
- Data collection and access

Educational and capacity building infrastructure
- Integrating adaptation into education systems
- Training for public officials

Institutional arrangements
- Mainstreaming gender
- Regulations
- Climate literacy in government

Financing
- Proposal preparation
- Climate risk assessment

Engagement
- Gender-responsive outreach and communication
- Networks for dialogue and exchange

Leadership
- Strategic leadership
- Results-based management

Source: Adapted from NAP Global Network (2023) and UAE GFCR.

4. Insights into aspects of the UAE FGCR

Countries are making progress towards the targets of the UAE FGCR, but increased efforts will be needed to reach them in time.

The UAE FGCR, agreed during COP 28 in Dubai, provides a framework to track progress towards the global goal on adaptation. Considering that the AGR annually reports on progress in adaptation planning and implementation, this year's report takes the opportunity to reflect on what can already be said about the new framework's thematic and dimensional targets, acknowledging that the indicators that will be used to assess progress are yet to be identified and agreed.

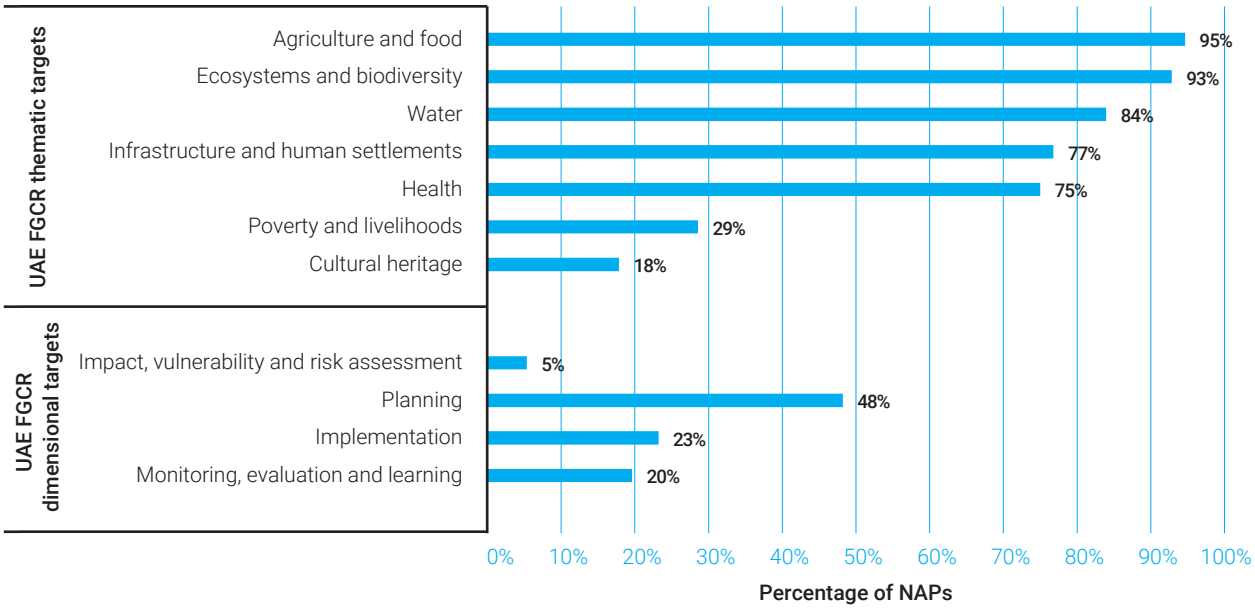
- First, almost all NAPs contain references to at least one of the framework's thematic targets, and about a third reference elements of the dimensional targets. With the exception of poverty eradication and protecting cultural heritage, thematic targets are well covered, whereas the dimensional targets are currently not receiving as much attention or are framed differently (figure ES.7). For instance, while implementation of adaptation actions is mentioned in less than a quarter of NAPs, it is widely described in the context of mainstreaming national and subnational sector development plans and processes, including budgeting. Similarly, while sectoral capacity needs largely map onto the thematic targets, underlying capacity needs are currently not always articulated according to the framework's dimensional targets (figure ES.6).

- Second, the NAP analysis further showed that information about future impacts, vulnerabilities and risks is uneven, frequently covering only a subset of sectors, if at all, and it is often presented in the context of data and knowledge gaps. Lacking capacity and technology to assess the complex nature of climate impacts reduces the ability for robust decision-making. Closing these gaps would therefore be important to support countries in achieving the framework's impact, vulnerability and risk assessment target by 2030. This is also relevant in the context of supporting countries with the establishment of multi-hazard early warning systems, climate information services for risk reduction and systematic observation to support improved climate-related data, information and services.

- Third, while nearly nine out of ten countries have at least one national adaptation planning instrument in place by now, the AGR shows that great efforts will be needed to reach global coverage by 2030, considering the current slow rate of progress towards closing this gap. Moreover, although there is evidence that many countries are in the process of implementing their adaptation priorities, it is too early to assess the rate at which this is occurring, not least because many countries lack monitoring, evaluation and learning frameworks. Lastly, considering that the quality of planning instruments and the levels of implementation are uneven in terms of data robustness, sector coverage, implementability and inclusiveness, it is still unclear whether countries are reducing the social and economic impacts of key climate hazards.

In conclusion, while it is difficult to assess progress towards any of the thematic targets in the absence of specific indicators and metrics, the adoption of clear timeframes for the achievement of the dimensional targets shows that efforts in impacts, vulnerability and risk assessments, planning, implementation, and monitoring, evaluation and learning need to be ramped up if these targets are to be met.

Figure ES.7 Percentage of NAPs with adaptation priorities addressing the thematic and dimensional targets of the UAE FGCR




1

Chapter 1

Policy and scientific state of play

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A giant piece of Ice breaks off the Perito Moreno Glacier in Patagonia, Argentina.

Photo: © DurkTalsma / iStock

1.1 Introduction: the case for climate adaptation and the Adaptation Gap Report

Catastrophic climate impacts are becoming ever more frequent and extreme, and the associated losses and damages are making it unequivocally clear how much is at stake, even in a context where the global average temperature remains within the +1.5°C threshold highlighted under the Paris Agreement. At the same time, progress on mitigating climate change has been too slow, and scientific evidence is showing that we are heading towards global average heating of up to 3.1°C by the end of the century and compared to pre-industrial levels if only current policies are implemented (United Nations Environment Programme [UNEP] 2024). Consequently, all societies around the world are expected to face increasing climate risks and possibly irreversible climate, ecological and societal impacts, as well as adaptation limits in both natural and human systems (see box 1.1). Inevitably, higher costs will be associated with both impacts and responses, though engaging in ambitious adaptation now will limit many future costs (Intergovernmental Panel on Climate Change [IPCC] 2022). Hence, climate adaptation can no longer be considered a future option or a distant concern, but must be seen as one of the greatest priorities for nations and communities worldwide today, alongside efforts to abate greenhouse gas emissions. The upcoming twenty-ninth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) (COP 29) in Baku, Azerbaijan, provides another tremendous opportunity to shape ambitious future climate adaptation action, with the perspective of the second global stocktake (GST) between 2026 and 2028 to allow for a holistic assessment of progress made at the global level.

A major focus of COP 29 will be the negotiation of a new global climate finance target known as the new collective quantified goal on climate finance. This is the first time funding targets will be discussed within the UNFCCC since the sixteenth session of the Conference of the Parties to the UNFCCC (COP 16) in Cancun in 2010 that agreed on mobilizing US$100 billion per year in international public funding for mitigation and adaptation by 2020 – although the goal was only achieved in 2022[1] (see chapter 4). COP 29 is therefore sometimes dubbed the 'finance COP'. Besides agreeing on the amount of climate funding for many years to come, negotiations will also have to clarify critical contextual elements, such as the terms of the new collective quantified goal's provision, the role of diversified financial instruments,[2] how to ensure that the money goes where and to whom it is most needed (i.e. places, sectors and people), and how this relates to the ongoing reform of global financial institutions (Folly and Kauffmann 2024). In relation to this but on a separate negotiation stream, COP 29 will also have to make progress on operationalizing the Fund for responding to Loss and Damage established at the twenty-eighth session of the Conference of the Parties to the UNFCCC (COP 28) in 2023. An important question in this regard is the concern that this new fund might diminish critically needed investments to tackle regular adaptation challenges (see top of panel B in figure 1.1).

Also on the COP 29 agenda are discussions on the first round of biennial transparency reports and the third round of nationally determined contributions (NDCs), which are due in December 2024 and February 2025, respectively. Both biennial transparency reports and NDCs are expected to have adaptation components and will therefore be helpful to feed into the negotiations in Baku as well as in Belém, Brazil (thirtieth session of the Conference of the Parties to the UNFCCC [COP 30] in 2025). Attention will also be devoted to the work on indicators to track adaptation efforts,[3] as well as transformational adaptation as part of the United Arab Emirates Framework for Global Climate Resilience (UAE FGCR) that includes a range of thematic and dimensional targets for climate adaptation and resilience to make progress on the global goal on adaptation (see box 1.2). Member States at COP 29 are expected to devote significant attention to capacity-building and technology transfer, to strengthen support for developing countries' technology priorities as part of the Azerbaijan Presidency's means of implementation package.

The context outlined above raises critical questions, such as, "Are international and national climate policies moving fast enough, and do they address the emerging complexity of accelerating climate risks – especially irreversible impacts and adaptation limits – in a satisfactory way?" The Adaptation Gap Report (AGR) series contributes to addressing these questions by annually assessing progress on adaptation and informing key processes, notably under the UNFCCC. In line with this, the AGR 2024 continues to assess information on planning, implementation and finance (chapters 2, 3 and 4, respectively), to explore whether countries are collectively on track to adapt to the global challenge of climate change. The AGR 2024 extends its assessments in important ways compared with the previous AGRs. First, it includes a topical chapter to discuss the central issue of 'means of implementation' other than

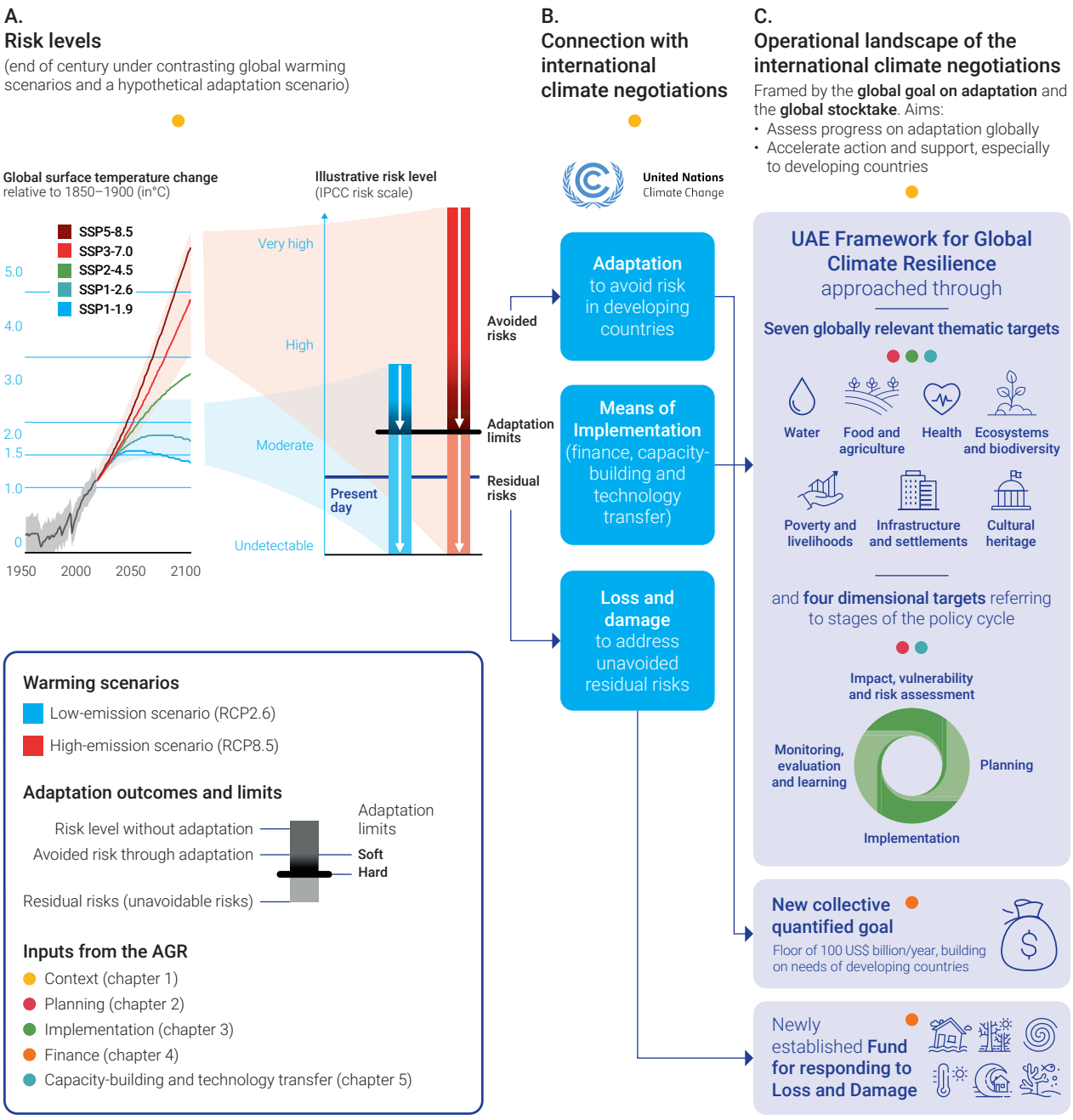
1 In addition to this, developed countries committed in the Glasgow Climate Pact (decided at the twenty-sixth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change [COP 26] in 2021) to doubling adaptation finance by 2025 based on 2019 contributions, and the Standing Committee of Finance recognized the methodological gaps in official reporting under the Paris Agreement to track such a goal of doubling adaptation finance (FCCC/CP/2023/2/Add.1-FCCC/PA/CMA/2023/8/Add.1).

2 As discussed in UNEP (2023), chapter 4 in particular.

3 In addition, the Seventh Assessment cycle of the IPCC plans to revise the IPCC *Technical Guidelines for Assessing Climate Change Impacts and Adaptations* (originally issued in 1994).

finance itself, namely capacity-building and technology transfer (see section 1.2 and chapter 5). Second, it further considers underlying causes and processes behind the numbers, as well as a more downscaled analysis of subnational adaptation action (sporadically using the example of cities).

Figure 1.1 The conceptual landscape of the AGR series: connecting mitigation, adaptation and loss and damage with international climate negotiations and ongoing UNFCCC discussions related to adaptation



Source: Panel A inspired by IPCC (2022, 2023). Panels B and C: Authors' own elaboration.

Note: **Panel A** illustrates two schematized climate risk scenarios contrasting end-of-century warming levels of 2°C and 4°C, and how they translate in terms of risk levels: for both scenarios, adaptation allows avoidance of risks until adaptation limits are reached, but residual risks remain. **Panel B** shows the connection with three major negotiation streams under the UNFCCC: (1) adaptation to address climate risks, (2) means of implementation (finance, technology and capacity-building) to support climate action and (3) and loss and damage to address climate impacts. **Panel C** highlights the operational landscape of these negotiation streams in the context of the global goal on adaptation and the GST, namely the framing of adaptation targets (thematic and relating to the policy cycle), finance-related discussions on the new collective quantified goal (from a floor of US$100 billion per year, taking into account the needs and priorities of developing countries) and the Fund for responding to Loss and Damage, which is currently being operationalized.

Box 1.1 Evidence supporting the need to accelerate adaptation worldwide

- The world is approaching +1.5°C (global mean surface temperature compared to pre-industrial levels) much earlier than even the latest IPCC assessment report estimated, and science is becoming ever more clear on the associated **irreversible observed impacts and projected risks** (e.g. Kotz, Levermann and Wenz 2024; Marbaix *et al.* 2024), starting with the most sensitive natural and social systems, such as women and the poor, who are disproportionately affected by climate impacts) (Lenton *et al.* 2019; Trisos, Merow and Pigot 2020; McKay *et al.* 2022). Climate impacts (extreme events as well as slow-onset events) also have the potential to change the trajectories of societies in fundamental ways (Lam and Majszak 2022; Milkoreit 2023).

- Studies also show that **hard and soft adaptation limits** will be reached as climate impacts intensify, and therefore need to be better understood in order to limit losses and damages to the degree possible while better identifying the costs of crossing these limits (Berkhout and Dow 2022; UNEP 2023).

- More and more scientific studies report on the **complex nature of climate risks** (e.g. Ayanlade *et al.* 2023; Anisimov and Magnan 2023; UNEP 2023). Rather than being based on linear processes (i.e. one hazard leads to specific impacts), climate risks typically show cascading and compounding (i.e. multiple hazards combine to explain multidimensional risks and impacts) as well as iterative properties (including feedback from adaptation-related responses). They also often have transboundary effects, i.e. reflecting the interconnection of biophysical systems across social and jurisdictional boundaries that require coordinated action to be effective and avoid maladaptation (Carter *et al.* 2021; Anisimov and Magnan 2023).

- There is clear evidence of the **benefits of adaptation compared to inaction**. For instance, Sulser *et al.* (2021) report that US$16 billion invested in agriculture per year would prevent about 78 million people from starving or chronic hunger caused by climate change impacts. Similarly, every US$1 billion invested in adaptation against coastal flooding leads to a US$14 billion reduction in economic damages (UNEP 2023). It is also estimated that global climate risk can be halved through ambitious adaptation and under all warming scenarios (Magnan *et al.* 2021).

- Science calls for moving from mostly incremental adaptation strategies to **more transformational** ones (IPCC 2022). Research urgently needs to improve our understanding of how to identify, plan for and implement adaptation options that challenge the attributes of systems critically vulnerable to climate risks (e.g. social justice mechanisms, spatial planning, resource exploitation mechanisms, etc.). Hence, efforts on designing and implementing robust adaptation solutions/pathways need to be scaled up urgently (UNEP 2023).

- In relation to this, science warns that not all solutions or efforts are necessarily going in the right direction, and that attention must be paid to avoiding (often unintentional) side effects to minimize the **risk of maladaptation** across space, time and population groups (e.g. Eriksen *et al.* 2021).

- An increasing number of studies show that **adaptation efforts on the ground are still not at scale** (see evidence from the Global Adaptation Mapping Initiative[4]), with analyses ranging from national-level planning (e.g. Reckien *et al.* 2023) to policy and implementation at the local to global levels (e.g. Olazabal and Ruiz De Gopegui 2021; Magnan *et al.* 2023a).

1.2 The current international adaptation policy landscape

This section provides an overview of key issues related to the adaptation agenda now and ahead of COP 29, such as the global goal on adaptation, the loss and damage institutions, the new finance target, and the progress of technology and capacity-building mechanisms under the UNFCCC, as context for the AGR.

The next steps of the UAE FGCR

There are upcoming tasks and challenges in the context of the UAE FGCR (see box 1.2) in the run-up to COP 29. The most important task is to successfully consolidate the work of compiling and mapping existing local, national and international adaptation indicators relevant for assessing progress towards the adopted targets. This is also a necessary step for the development of new indicators and methodologies mandated in the second year of the work

4 See https://globaladaptation.github.io.

programme, based on gaps identified by Parties, experts and stakeholders.

Assessing progress towards achieving the global goal on adaptation not only requires all countries to have their adaptation planning instruments, but also that those instruments are country-driven, gender-responsive, participatory and fully transparent, covering ecosystems, sectors, people and vulnerable communities (see chapter 2). Similarly, the aim is to build the institutional capacity of countries to implement monitoring, evaluation and learning (MEL) systems, as well as to support countries currently without any operational MEL systems to develop them.

In turn, the operationalization of the framework should contemplate the need to assess the current state of transboundary climate risks, including risks in different contexts and shared ecosystems (Magnan *et al.* 2023b), that require collective action, as recognized in the outcomes of both the GST and the global goal on adaptation in Dubai.[5]

When considering the articulation of targets and indicators in the lead-up to COP 29 in Baku and COP 30 in Belém, Parties and experts could also consider the information contained in the communications and reports that countries submitted to the UNFCCC and the Paris Agreement.[6] This could entail both the adjustment of the guidelines of adaptation-related documents (paragraphs 45 and 47 of Decision 2/CMA.5), capacity-building for improving communication and reporting cycles, and the process of information gathering. Such adjustment will be key not only for the GST, but also as input to the Secretariat's new and regular synthesis reports on adaptation,[7] the first edition of which is to be agreed upon.

Box 1.2 United Arab Emirates Framework for Global Climate Resilience

- The UAE FGCR aims to **assess progress over time** towards achieving the global goal on adaptation of the Paris Agreement, with a view to reducing climate impacts, risks and vulnerabilities, and focusing both on action and the means of implementation.
- A set of **11 global adaptation targets** was agreed, consisting of four dimensional and seven thematic targets that are complementary to other frameworks (the Sustainable Development Goals, the Sendai Framework for Disaster Risk Reduction and the Convention on Biological Diversity).
- The **four dimensional targets** address elements of an iterative adaptation policy cycle – impact, vulnerability and risk assessment; planning; implementation; and MEL – with a 2030 time-horizon.
- The **seven thematic areas** include water, food and agriculture, health, ecosystems and biodiversity, infrastructure, poverty and livelihoods, and cultural heritage.
- The framework recognizes that **cross-cutting considerations** are good practice principles for implementation and review of progress made in adaptation, considering that implementation should be gender-responsive, focused on the most vulnerable populations, science and human rights, and Indigenous and local knowledge, and open to different approaches to adaptation.
- In the decision launching the UAE FGCR (Decision 2/CMA.5), the widening adaptation gap is acknowledged, and a broad call is made to developed countries, international organizations, multilateral funds and the private sector to **strengthen international cooperation** for the timely fulfilment of the targets.
- A **two-year work programme on indicators** has been launched, aiming to identify and develop methodologies and indicators, in line with the targets, to be agreed at COP 30 in Belém.

5 Paragraphs 52 and 156 of Decision 1/CMA.5 and paragraph 18 of Decision 2/CMA.5 in the Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fifth session, held in the United Arab Emirates from 30 November to 13 December 2023, Addendum, Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its fifth session (FCCC/PA/CMA/2023/16/Add.1).

6 The AGR 2023 assessed the information contained in the first round of adaptation communications (see chapter 3 in UNEP 2023).

7 Paragraph 60 of Decision 1/CMA.5 in the Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fifth session, held in the United Arab Emirates from 30 November to 13 December 2023, Addendum, Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its fifth session (FCCC/PA/CMA/2023/16/Add.1).

The expected progress of loss and damage institutions

In Baku, there is expected to be a review of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts, which will consider its performance, structure and usefulness, as well as its coherence with other bodies and entities addressing loss and damage, including the Fund for responding to Loss and Damage. Achieving complementarity between the loss and damage institutions under the UNFCCC and the Paris Agreement is key to fulfilling their purposes, being cost-effective, addressing urgency and avoiding unnecessary overlaps. One dilemma of the last review of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts that occurred at the session of the Conference of the Parties to the UNFCCC (COP 25) in Madrid, and which has not yet been solved, is whether or not the body is guided by, and is accountable to, the Conference of the Parties to the UNFCCC and/or the Paris Agreement. This discussion is currently affecting all bodies established under the UNFCCC and the Paris Agreement, including the Adaptation Committee, whose review has been extended since COP 26.

The full operationalization of the Santiago Network for averting, minimizing, and addressing loss and damage is also an expected critical element of the COP 29 outcome, including decisions on institutional arrangements, the procedural rules of the Advisory Board, and the designation of organizations, bodies, networks and experts as members.

Maintaining political momentum for loss and damage at this Conference of the Parties to the UNFCCC also implies that the Fund for responding to Loss and Damage is fully operationalized and enabled to provide finance as soon as possible, specifically by finalizing the hosting arrangements and ensuring that the pledges made at COP 28 are turned into effective capitalization of the fund.

A 'finance COP' to agree on a financial goal

It was agreed in Paris that the new collective finance goal, in the context of article 9.3 of the Paris Agreement, would have a floor of US$100 billion per year, and should take into account the needs and priorities of developing countries (paragraph 53 of Decision 1/CP.21). The AGR has contributed to the current state of understanding and estimation of the adaptation finance gap based on the developing countries' needs and priorities. The state of play also indicates that in 2022, the US$100 billion target was met for the first time (see chapter 4). However, the share of adaptation finance remained substantially lower than for mitigation (Organization for Economic Co-operation and Development 2024). In addition to public sources, the mobilization of financial resources from other sources, and the contribution of the target to compliance with article 2.1.c of the Paris Agreement on making finance flows consistent with a pathway towards low-carbon and climate-resilient development, are also expected to be discussed.

One option is the establishment of a subgoal for adaptation on a grant equivalent basis, the quantum of which could be based on current estimations such as the AGR (NCQG/2024/TED11 and MAHWP3/C&S/12). The composition of climate finance, considering the share of grants, concessional loans, and other types of loans and instruments, is critical since developing countries claim that they are increasing their debt stocks to finance adaptation actions. However, there is still no consensus among the Parties on this or any other aspect of the global finance goal, including the eligibility criteria for who will receive funding, who will contribute and the time period to be covered by the new target. The possibility of having a three-pillar goal including mitigation, adaptation, and loss and damage at COP 29 is also currently under discussion. Transparency and monitoring arrangements are also key in ensuring that there is no overlap or double counting between adaptation and loss and damage. The extent to which the tabled options could help meet the goals of the UAE FGCR is also part of negotiations at COP 29.

The need to take a closer look at the 'means of implementation'

Besides advances in the provision of finance, the policy arena also acknowledges capacity-building and technology transfer as critical elements in implementing national and global adaptation goals. Under the UNFCCC, the combination of finance, technology and capacity-building is referred to as the 'means of implementation'. Capacity-building needs have been communicated by developing countries at all stages of the iterative adaptation cycle, which contributes to the debate on how to underpin the achievement of the UAE FGCR targets (FCCC/PA/CMA/2023/16/Add.1).

In the context of the first GST, a technology implementation programme was established, aiming to strengthen support for the achievement of technology priorities identified by developing countries (FCCC/SBI/2022/13). In Baku, a decision is expected to be adopted on enhancing technology implementation, as well as on reviewing the capacity-building framework in developing countries, including the identification of areas where support is required, as part of the Azerbaijan Presidency's means of implementation package. In this context, chapter 5 of the AGR 2024 further reflects on what capacity-building and technology transfer mean and imply.

1.3 Some methodological insights

As mentioned above, the AGR series is structured with core chapters on planning, implementation and finance (chapters 2, 3 and 4, respectively), and a special topical chapter (chapter 5). Chapters usually focus on developing countries, but some also include a developed country perspective, and use case studies to provide context and granularity to specific aspects of the different chapters.

From a methodological standpoint, and in line with previous AGRs, the chapters assess information from policy documents submitted under the UNFCCC and the Paris Agreement, international agencies and finance providers (multilateral organizations and the Organisation for Economic Co-operation and Development), and peer-reviewed scientific literature. Detailed methodologies are presented in the annexes.

- **Chapter 2, on planning,** provides updates on the status of preparation of national planning instruments for adaptation, to provide a global status of national adaptation planning and discuss challenges towards achieving the UAE FGCR goal on planning. Through assessing national adaptation plans (NAPs) submitted to the UNFCCC, the chapter also assesses the potential effectiveness of NAPs prepared by developing countries and assesses how NAP processes are aligned with the NDC process.

- **Chapter 3, on implementation,** updates the evolution of adaptation projects from multilateral climate funds that serve the Paris Agreement. It analyses NAP implementation reports, project evaluations and reporting on adaptation actions by city administrations, using the city level as a way to provide more granular, downscaled information on adaptation implementation.

- **Chapter 4, on finance,** develops an updated assessment of international adaptation finance flows, building on the AGR 2023, and undertakes an in-depth exploration of how to close the adaptation finance gap. This includes an analysis of different types of adaptation and their potential for financing. The chapter describes ways through which to incentivize additional finance, in particular from the private sector.

- Finally, **chapter 5, on capacity-building and technology transfer,** uses information provided in technology needs assessments and NAPs. The chapter maps progress in technology transfer and capacity-building needs against the targets under the UAE FGCR, and discusses constraints and opportunities for enhancing technology transfer and capacity-building processes.

2

Chapter 2

Global progress on adaptation planning

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Rising water levels submerging a house as heavy monsoon rains cause major floods in Baco, Oriental Mindoro, Philippines on 23 July 2021.

Key messages

- 87 per cent of countries have a national adaptation planning instrument in place, but progress towards complete global coverage has slowed significantly over the last four years.
- A significant number of countries that have not yet initiated a process for developing a national adaptation planning instrument are facing considerable development challenges such as internal fragility, conflict and geopolitical tensions.
- 51 per cent of countries have developed a second national planning instrument, and 20 per cent have developed a third, demonstrating a growing commitment to continuously updating national adaptation plans, strategies and policies as advocated in the iterative adaptation policy cycle. However, the implementation periods of the most recent adaptation planning instruments of 22 countries have expired, suggesting that some countries are struggling to implement, review and update their national adaptation planning instruments in a timely manner.
- The potential effectiveness of national adaptation plans (NAPs) submitted by developing countries to the United Nations Framework Convention on Climate Change (UNFCCC) is mixed. While countries recognize the need for both sectoral risk management measures and broader investments in the iterative adaptation cycle, and see the importance of gender equality and social inclusion (GESI) for effective adaptation, the robustness of the evidence base informing NAPs is uneven and their implementability is variable.
- All NAPs contained adaptation priorities that addressed at least one of the United Arab Emirates Framework for Global Climate Resilience's (UAE FGCR) thematic targets, with agriculture and food and ecosystems and biodiversity being the most prominent; 59 per cent of NAPs included priorities that addressed at least one of the dimensions of the iterative adaptation policy cycle, with planning being the most frequent.
- To achieve the UAE FGCR target on planning, developing countries without a national planning instrument will likely require greater levels of financial and technical support to accelerate the preparation of these instruments, while those already with an instrument will need ongoing support to address ongoing gaps.
- All countries that have submitted NAPs to the UNFCCC have also included an adaptation component in their nationally determined contribution (NDC), and 68 per cent of such countries demonstrate some level of alignment between the adaptation information contained within each.
- While the differing timelines and policy cycles of NAPs and NDCs challenge their alignment, countries should leverage their NAP processes in preparing their updated NDCs for 2025 to support more effective adaptation action.

2.1 Introduction

Preparing for and dealing with the impacts of climate change requires planning. Given how complex, pervasive and uncertain impacts can be, a solid understanding of evolving and future risks, and a clear set of strategies for managing them, is central to all levels of decision-making.

The importance of adaptation planning is also increasingly recognized in the global policy conversation. It was captured in key decisions at the twenty-eighth session of the Conference of the Parties to the UNFCCC (COP 28), including on the first global stocktake and on the global goal on adaptation. The former emphasizes the importance of long-term planning this decade to close adaptation gaps, and calls on Parties to, "have in place their national adaptation plans, policies and planning processes by 2025 and to have progressed in implementing them by 2030". As noted in chapter 1, on the global goal on adaptation, Parties adopted the UAE FGCR, which includes targets for a range of priority themes and dimensions of the iterative adaptation policy cycle, including planning. The target on planning states that by 2030, all Parties will have "country-driven, gender-responsive, participatory and fully transparent national adaptation plans, policy instruments, and planning processes and/or strategies".

In recognition of this continued momentum around adaptation planning, this chapter will look at three areas: section 2.2 looks at the status and trends in national-level adaptation planning by the 197 country Parties to the UNFCCC (hereinafter referred to as 'countries')[1]; section 2.3 assesses the potential effectiveness of adaptation planning instruments with a focus on NAPs submitted to the UNFCCC, and (in light of the next round of NDCs being submitted in 2025) section 2.4 reviews the alignment between submitted NAPs and NDCs. As with previous years, this analysis is focused on the outputs of adaptation planning – i.e. what is contained in the plans themselves – rather than outcomes associated with their implementation, which are covered in chapter 3. A detailed description of the methodology underlying the analyses presented in this chapter can be found in annex 2.

2.2 Global status of national adaptation planning

This section provides an analysis of the extent to which countries are engaging in adaptation planning at the national level through the preparation of national adaptation planning instruments (defined in box 2.1). While analysis contained within this section does not speak to the potential effectiveness of these planning instruments, it is useful for tracking progress towards the planning-related target under the UAE FGCR, and highlighting challenges and gaps that may prevent this target from being achieved.

Box 2.1 Defining the term 'national planning instruments for adaptation' and its relationship with NAPs submitted to the UNFCCC

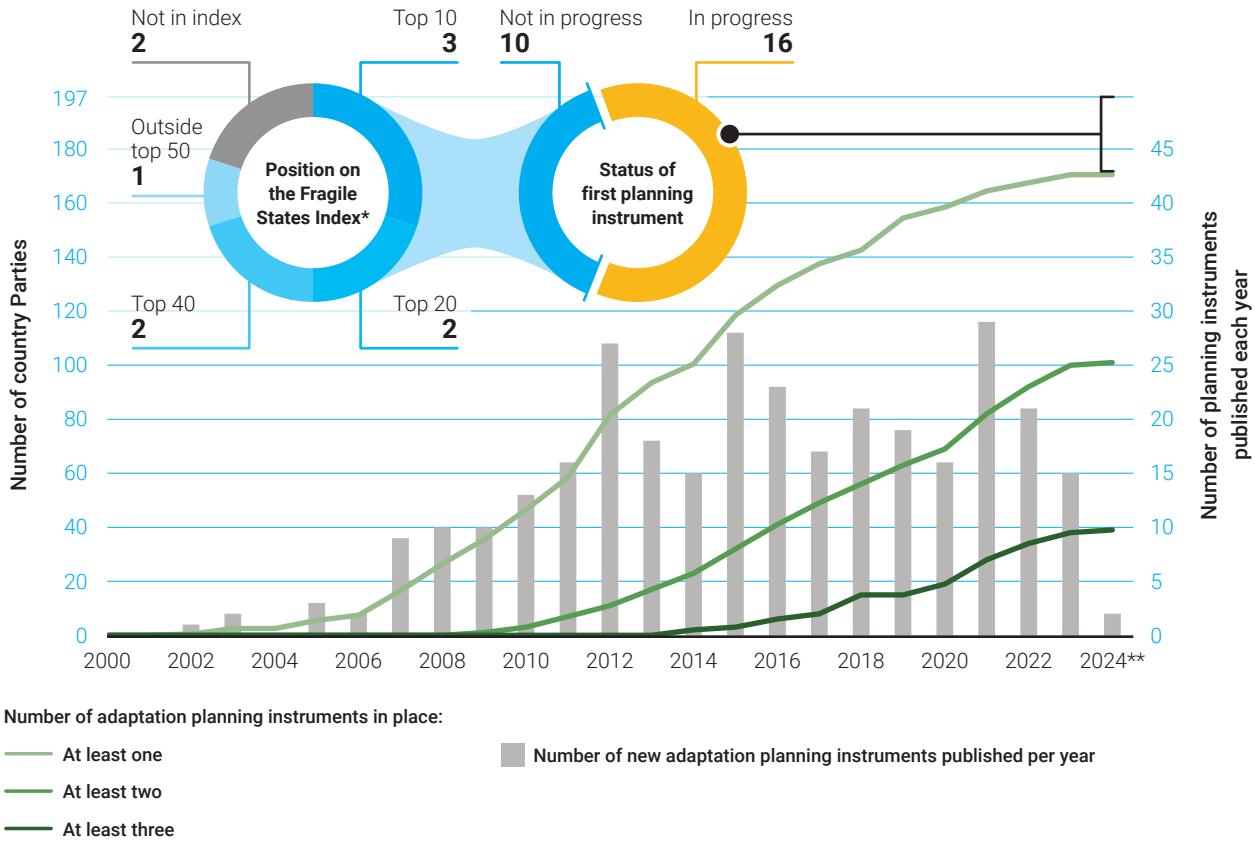
The term 'national planning instrument for adaptation' describes national policies, strategies and plans that are designed to guide/drive a country's national adaptation process. Such instruments can be exclusively adaptation-focused or jointly address adaptation and mitigation. The function of national planning instruments can vary in scope. For example, adaptation strategies (sometimes referred to as policies) often provide countries with a general framework for coordinating adaptation efforts at the national level (e.g. a vision for adaptation, adaptation objectives, and principles for how adaptation should be implemented). Adaptation plans (sometimes referred to as action plans or programmes) are more implementation-focused, translating a country's higher-level strategy into concrete activities. Finally, some instruments perform both of these functions, which is often the case with NAPs developed through the NAP process as defined and mandated by the UNFCCC (Hammill *et al.* 2021).[2]

Meanwhile, 'NAPs submitted to the UNFCCC' are national planning instruments for adaptation that countries have submitted to the UNFCCC, and are subsequently made available on NAP Central – a UNFCCC-hosted database of NAPs. As at 30 June 2024, 57 developing and two developed countries are posted on NAP Central.

1 While the European Union is a Party to the UNFCCC, it is excluded from this analysis, which focuses on national-level adaptation planning.

2 To be counted in this analysis, instruments need to have a cross-sectoral purview (i.e. instruments that focus on single or specific groups of sectors will not be counted) and have a medium- to long-term outlook (meaning that national adaptation programmes of actions [NAPAs] or similar adaptation programmes/investment plans that are intended to be one-off processes, and therefore short-term in nature, are not counted).

Figure 2.1 Publication of national planning instruments for adaptation over time



Note: The combined line and column chart presented in this figure shows (1) how the number of countries with at least one, two or three national adaptation planning instruments in place has changed over time and (2) the number of new adaptation planning instruments published each year. The right-hand pie chart illustrates whether the 26 countries without a first planning instrument in place are in the process of preparing one. The left-hand pie chart illustrates where the 10 countries that do not have a first planning instrument in place and are also not in the process of preparing one rank on the Fragile States Index (average position between 2020 and 2024). The cut-off date for data collection underlying this figure was 5 August 2024.

Progress in preparing national planning instruments for adaptation

Since 2002, countries have increasingly focused on developing national adaptation planning instruments, with a notable acceleration in this effort from 2011 to 2021 (see light green line in figure 2.1). As a result, 87 per cent (171 countries) now have at least one such planning instrument in place. However, the pace of growth in this figure has slowed, with only a 1.5 per cent annual increase between 2020 and 2023, compared to a 5.1 per cent annual increase from 2011 to 2020.

The gap in global coverage

Among the 26 countries still lacking a national planning instrument for adaptation, 16 are in the process of developing one (see right-hand pie chart in figure 2.1), 13 of which are receiving financial support from the Green Climate Fund to do so. Of the 10 countries that have not initiated any such process, notably, only two are classified as least developed countries (LDCs) by the United Nations and none are classified as small island developing States. Similarly, only four are classified as low-income countries by the World Bank. This suggests that levels of development or economic status have not necessarily been the determining factor that has prevented these countries from preparing a national planning instrument for adaptation. Rather, a significant number of the countries that have not initiated such a process are facing significant development challenges such as internal fragility, conflict and geopolitical tensions.

To illustrate this point, five of these 10 countries have been in the top 20 of the Fragile States Index between 2020 and 2024 (see left-hand pie chart in figure 2.1). Similarly, four countries are involved (or have recently been involved) in armed conflicts within their territory. Under such circumstances, adaptation planning is unlikely to be a high political priority and capacities to engage in it will likely be acutely constrained (Crawford, Hammill and Tadgell 2023). The latter is compounded by the reality that fragile

and conflict-affected countries receive significantly less financial support for adaptation compared to other low-income countries (Jones *et al.* 2024).

Meeting the UAE FGCR target on adaptation planning will require not only increased finance going to fragile and conflict-affected contexts, but also specific considerations around quality and emphasis of such support. Specifically, since these contexts are defined by weak institutions, significant and sustained investments in capacity and institutional strengthening to undertake the various elements of adaptation planning processes will be essential (see chapter 5 for a discussion of the efficacy of support). Moreover, support should be flexible and adaptable to changing, sometimes unstable circumstances (Adaptation Fund 2024).

Evidence of iterative adaptation planning

Although the rate of increase in the number of countries with at least one adaptation planning instrument is slowing, the number of new instruments published annually has remained relatively steady since 2011, fluctuating between 16 and 22 instruments per year (see grey bars in figure 2.1). This consistency suggests that many countries are actively engaged in updating or complementing their existing adaptation planning instruments. Currently, 101 countries (51 per cent) have developed a second planning instrument, and 29 countries (20 per cent) have developed a third.

This trend (in tandem with the findings of analysis in chapter 3)[3] indicates that a significant number of countries are refining their national planning instruments for adaptation to incorporate new climate risk information, changes in national contexts and lessons learned from the implementation of previous planning instruments. However, despite this encouraging trend, this analysis also finds that the implementation periods of the most recent adaptation planning instruments of 22 countries have expired. This suggests that some countries are struggling to implement, review and update their adaptation policies, plans and strategies in a timely manner. Given the significant and continuously evolving understanding of climate risks, as well as adaptation needs and practices (see box 1.1 in chapter 1 and IPCC 2022), such iteration is crucial in ensuring that adaptation planning instruments remain relevant and effective over time (Parson and Karwat 2011; UNFCCC Least Developed Countries Expert Group [LEG] 2012; Watkiss, Hunt and Savage 2014; Woodruff 2016; Schinko *et al.* 2017; European Commission 2023; UNFCCC LEG 2023).

2.3 Potential effectiveness of adaptation planning with a focus on NAPs

This section presents the results of an assessment of the potential effectiveness of adaptation planning with a focus on the NAPs submitted by developing countries to the UNFCCC before 30 June 2024.[4] As a specific subset of national adaptation planning instruments reviewed in the previous section, these documents capture the evidence base, approach, priorities and actions for adaptation in a country. They represent an important milestone in the broader NAP process, which was established under the UNFCCC in 2010 to facilitate effective adaptation planning in LDCs and other developing countries (UNFCCC Decision 1/CP.16). In recognition that these countries are disproportionately affected by the impacts of climate change, the NAP process enables them to identify and address their medium- and long-term needs for managing climate risks so they can integrate adaptation into routine decision-making and increase their resilience (Hammill, Dekens and Dazé 2020; UNFCCC Decision 5/CP.17; UNFCCC LEG 2012).

As at 30 September 2023, 142 developing country Parties (of which 46 were LDCs) had a NAP process under way (UNFCCC LEG 2023). As at 30 June 2024, 56 developing country Parties had already submitted their multisectoral NAP documents to the UNFCCC. These documents were reviewed for this section of the chapter.[5]

The NAPs are reviewed against four criteria of potential effectiveness: (1) robustness of the evidence base, (2) sectoral and thematic coverage, (3) implementability and (4) inclusiveness. These criteria build on those used in previous Adaptation Gap Reports (United Nations Environment Programme [UNEP] 2021a; UNEP 2021b; UNEP 2023) and draw from both relevant global guidance or assessments of adaptation planning (UNFCCC LEG 2012; Woodruff and Regan 2019; Garschagen *et al.* 2021) and provisions of the Paris Agreement (articles 7.5 and 7.9), including on GESI. Table 2.1 presents the rationale for selecting these criteria and the indicators that were used to assess the extent to which they were met. Full methodologies for each assessment can be found in annex 2.B.

3 Analysis presented in chapter 3 finds that most progress reports evaluating the implementation of national adaptation plans and strategies contain recommendations for enhancing their content and implementation. This finding follows similar studies (e.g. Hammill and Dekens 2014; Njuguna, Uri and Beauchamp 2024) in demonstrating that some countries are using monitoring, evaluation and learning (MEL) processes to inform future iterations of national adaptation plans, strategies and policies.

4 This assessment looks at cross-government, multisectoral NAPs. As Uruguay's submission to the UNFCCC is comprised of separate sectoral adaptation plans, this submission was not included in this analysis.

5 While New Zealand and Canada had also submitted their respective national adaptation plans and strategies to the UNFCCC before the cut-off date for this analysis, these documents were not included in the present assessment. As the number of plans or strategies submitted by developed countries inevitably grows in future years, the Adaptation Gap Report analysis can be expanded to include all countries.

Table 2.1 Overview of criteria used to assess the potential effectiveness of adaptation planning and its associated indicators

Criteria and rationale	Indicators
1. Robustness of the evidence base Adaptation planning requires information on current and future climate change, as well as on impacts, vulnerability and risks (IVR), to identify and prioritize measures to manage climate risk. The comprehensiveness, reliability and relevance of this information influences the outcomes and, therefore, the effectiveness of adaptation planning.	***Indicators related to climate projections*** 1.1 Have the climate projections informing the preparation of the NAP used multi-model ensembles (MMEs)? 1.2 Does the NAP discuss uncertainty associated with climate projections? ***Indicators related to IVR information*** 1.3 Does information about IVR consider future climate change (at different levels of sophistication)? 1.3a Future IVR discussed in the context of general climate trends 1.3b Future IVR discussed in the context of specific future scenarios 1.3c Future IVR quantified 1.4 Does the NAP mention how vulnerable groups experience IVR? 1.5 Does the NAP consider compound risks? 1.6 Does the NAP consider cascading impacts? 1.7 Does the NAP consider transboundary risks?
2. Coverage National adaptation planning involves the identification of priority measures for reducing vulnerability and building resilience across a range of sectors and/or systems in a country – many of which are captured in the UAE FGCR's thematic and dimensional targets. The suite of measures involves a mix of managing specific climate risks, mainstreaming adaptation into development decision-making, and/or creating an enabling environment for adaptation, which, taken together, offer a comprehensive approach that may lead to greater impact.	2.1 Which UAE FGCR thematic and dimensional targets are addressed by high-level adaptation priorities in each country's NAP? ***UAE FGCR thematic targets:*** • Water • Agriculture and food • Health • Ecosystems and biodiversity • Infrastructure and human settlements • Poverty and livelihoods • Cultural heritage ***UAE FGCR dimensional targets:*** • IVR assessment • Planning • Implementation • Monitoring, evaluation and learning (MEL) 2.2 Which enabling factors are addressed by adaptation priorities in the NAP? • Leadership • Financing • Institutional arrangements • Engagement • Data, research, knowledge and communications • Skills and capacities

Criteria and rationale	Indicators
3. Implementability National adaptation planning can be assumed to be effective if it leads to real implementation. The likelihood of adaptation plans leading to implementation is greater if they include certain elements (e.g. information on implementation arrangements, implementation time frames, indicative costing and sources of finance) and are aligned with or contribute to other domestic and global policy priorities. Similarly, the likelihood of adaptation planning leading to effective outcomes is significantly improved if implementation is monitored and evaluated. Therefore, the likelihood that NAPs will be effective in reducing climate risks will be greater if it possesses elements that facilitate MEL.	***Elements that facilitate implementation:*** 3.1 Are responsible actors for the implementation of adaptation actions identified? 3.2 Are specific time frames assigned to adaptation actions? 3.3 Are the costs of adaptation actions included? 3.4 Are financing sources identified? ***Alignment with domestic and global policy agendas:*** 3.5 Does the NAP refer to the national development plan or planning? 3.6 Does the NAP refer to sectoral development plans or planning? 3.7 Does the NAP refer to subnational adaptation plans or planning? 3.8 Does the NAP refer to other global policy frameworks? ***Elements that facilitate MEL:*** 3.9 Does the NAP include a MEL framework? 3.10 Does the NAP include MEL indicators? 3.11 Does the NAP include a commitment to (regular) progress reporting?
4. Inclusiveness The impacts of climate change are disproportionately felt by people who face discrimination based on their gender, race, age, wealth, disabilities or other socioeconomic factors. Adaptation planning that considers these factors is more likely to lead to successful, cost-effective and equitable outcomes, and avoid maladaptation.	4.1 Is gender mentioned in the body of the NAP? 4.2 In what context do references to gender appear? 4.3 What is the positioning of women in the NAP? 4.4 Which intersectional factors or other particularly vulnerable groups are identified in the NAP?

2.3.1 Robustness of the evidence base

This analysis evaluates the extent to which information on future climate change and impacts, vulnerability and risks (IVR) included in NAPs lends itself to supporting robust decision-making. Specifically, it examines the information on climate projections and IVR contained in NAP documents, using this as a proxy for the evidence that informed NAP formulation. To evaluate this information, the analysis focuses on seven key indicators: two related to information provided about climate projections and five related to information provided about IVR (see table 2.1). These indicators capture key best practices in climate projection development and IVR assessment that are recognized in the literature as enhancing the ability of information generated by these processes to support robust decision-making. Of the 56 NAPs assessed, three were excluded in the analysis of each indicator as they contained insufficient information about either climate projections or IVR.[6]

Just under half of NAPs (49 per cent) included climate projections generated by analysis of large multi-model ensembles (MMEs) – e.g. Coupled Model Intercomparison Project Phase 5 or 6 – while 21 per cent had projections that were generated through analysis of five models or less (the remaining 30 per cent of NAPs provided no information about the number of models used). MMEs

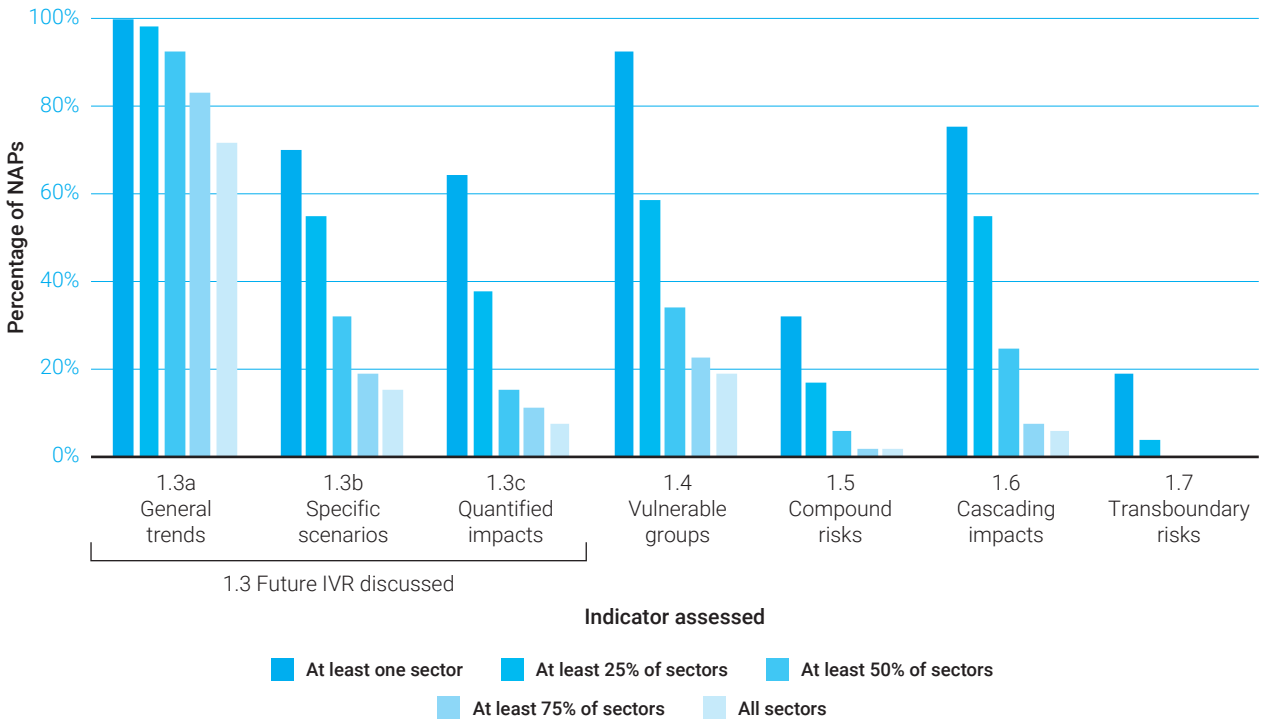
6 The NAPs of Guatemala, Suriname and Tonga are excluded from the results of indicators related to climate projections, as they do not contain information about projected climate change. The NAPs of Armenia, Cambodia and Democratic Republic of the Congo have been excluded from the results of indicators related to IVR as they do not disaggregate IVR information by sector.

provide countries with a wider range of potential future climate conditions and identify the extent to which different models agree about future climate conditions, thereby providing some measure of confidence in consensus (Taylor, Stouffer and Meehl 2012; Dawkins *et al.* 2023). As such, they allow decision makers to develop adaptation strategies that are effective under a broader range of future climate scenarios (United Nations Office for Disaster Risk Reduction [UNDRR]) 2021).

Adaptation strategies must also be informed by some understanding of uncertainty. Indeed, a greater understanding about the level of uncertainty underlying climate projections is important for dissuading decision makers from investing in long-term adaptation solutions when future impacts are highly uncertain (where there is high potential for such solutions to be maladaptive) and instead encouraging dynamic approaches to adaptation planning (as advocated under adaptation pathways approaches [Haasnoot *et al.* 2013; Woodruff 2016; UNDRR 2022]). Of the NAPs reviewed, 53 per cent discussed uncertainties associated with climate projections.

Indicators assessing the robustness of IVR information were found to be mixed. On the one hand, all NAPs were found to discuss at least one impact, vulnerability or risk in the context of future climate change, while 92 per cent identified a vulnerable group as being particularly exposed, vulnerable or at risk of climate impacts. Many NAPs also discuss at least one IVR in the context of specific future scenarios (70 per cent), provide quantified estimations of future IVR (64 per cent) and identify cascading impacts (75 per cent). Significantly fewer NAPs, however, identified compound risks (32 per cent) or transboundary risks (19 per cent).

Figure 2.2 Prevalence of indicators assessing the robustness of IVR information across sectors presented within individual NAPs



In the vast majority of NAPs, information about IVR is presented by sector (i.e. NAPs detail how sectors – presumably priority sectors – are exposed, vulnerable or at risk to climate impacts).[7] In light of this, the extent to which the indicators assessing the robustness of IVR information are met across the different sectors presented within a NAP was also reviewed. Apart from indicator 1.3a, it was found that the percentage of NAPs meeting the criteria for these indicators falls significantly as more sectors are considered (figure 2.2). For example, while 92 per cent of NAPs identified IVR faced by specific vulnerable groups in at least one sector, only 34 per cent of NAPs did this for half of their sectors. This finding demonstrates that the robustness or quality of IVR information is not consistent across sectors within NAPs, and may suggest that some sectors draw from more detailed evidence bases than others, leading to an uneven understanding of IVR and effective adaptation solutions.

The analysis indicates that the robustness of the evidence base informing the current tranche of NAPs is mixed, with the findings suggesting that many of the NAPs have been prepared without the use of MMEs, without accounting for the uncertainty inherent in the available climate projections, or are based upon IVR assessments that do not adequately consider vulnerable groups or the potential for climate impacts to lead to system-wide risks. When this is the case, these represent important gaps in the evidence base that will likely hinder robust decision-making and lead to increased instances of maladaptation (Haasnoot *et al.* 2013; Woodruff 2016; Lawrence, Blackett and Cradock-Henry 2020; UNDRR 2022).

2.3.2 Sectoral and thematic coverage

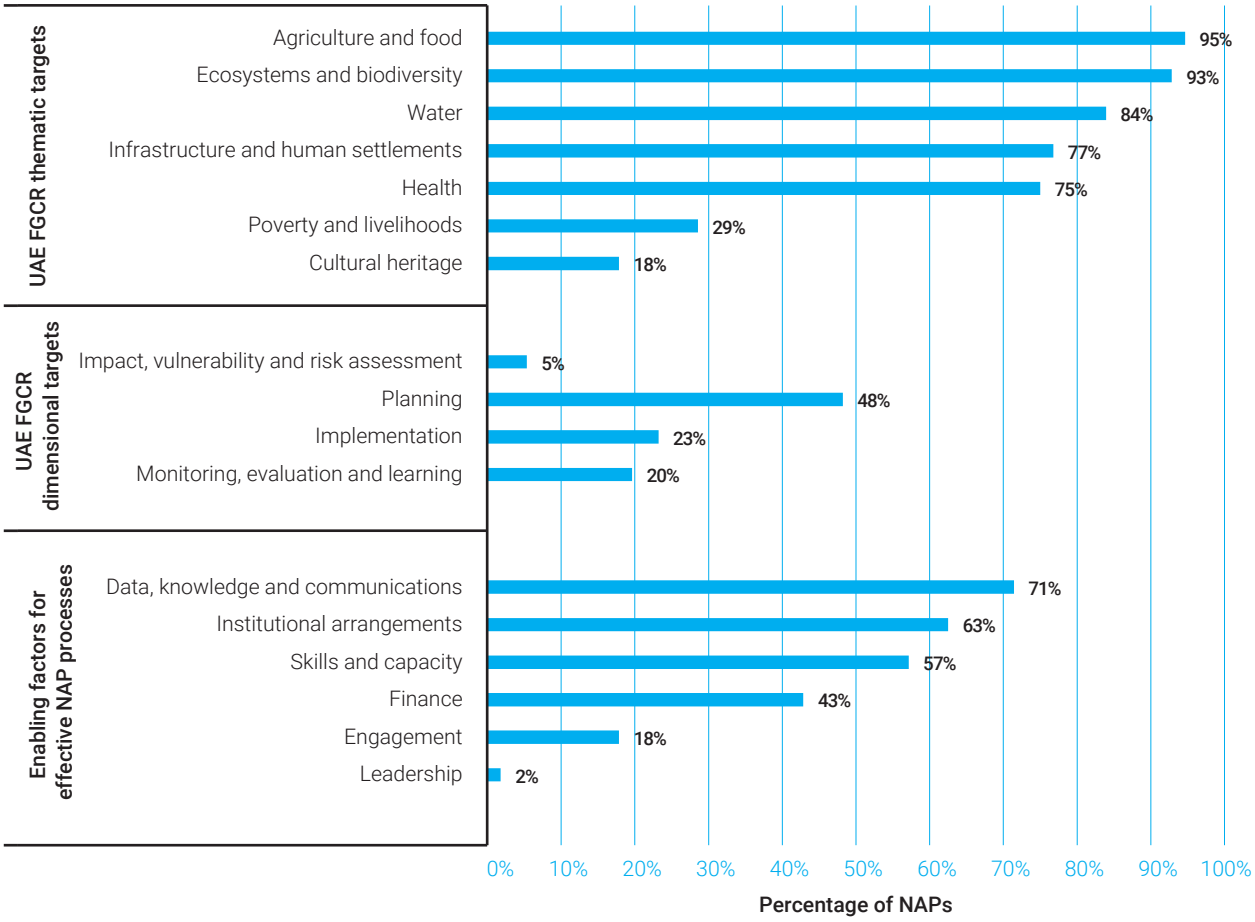
This analysis examined a total of 644 adaptation priorities extracted from the submitted NAPs to understand the sectors and themes around which countries were organizing investments and implementation. Adaptation priorities are higher-level categories of more specific adaptation actions and/or measures to be taken. Since not all NAPs define more detailed actions or measures, the current analysis focuses on these higher-level priorities to allow all countries to be included in the analysis. Each NAP reviewed contained 4–25 priorities. The substantive emphasis of each priority was mapped against the thematic and dimensional targets of the UAE FGCR (FCCC/PA/CMA/2023/16/Add.1), and six enabling factors recognized by NAP Global Network (2023) as playing a key role in supporting effective NAP processes.

Across all the adaptation priorities extracted from the 56 NAPs, about two thirds were focused on sectors – whether captured in the UAE FGCR thematic targets or otherwise – and one third addressed dimensions of the iterative adaptation policy process and its enablers, demonstrating an overall understanding among developing countries that adaptation action involves a mix of thematic or sector-specific adaptation actions and more foundational investments in system change.

In terms of the UAE FGCR thematic targets, almost all countries included adaptation priorities in their NAPs that emphasized agriculture and food (95 per cent) or ecosystems and biodiversity (93 per cent – see figure 2.3). Poverty and livelihoods and cultural heritage did not feature as prominently, with 29 per cent and 18 per cent of countries addressing these themes, respectively. Notably, poverty reduction is more often cited in the overarching vision, goals and/or objectives of NAPs, and livelihood issues appear in more specific actions or measures (which were not reviewed for this analysis). Additionally, 59 per cent of countries included priorities that addressed at least one of the UAE FGCR targets related to the dimensions of the iterative adaptation policy cycle; among these priorities, planning was the most common. Indeed, almost half of the reviewed NAPs (48 per cent) contained priorities for strengthening decision-making to support adaptation, such as integrating adaptation into national, sectoral and subnational development plans and processes, including budgeting. Very few NAPs were found to contain priorities focused on IVR assessment (5 per cent). However, the relative under-representation of this target is likely not a reflection on a lack of need in this area. Instead, it is likely because these priorities are often framed in terms of data and knowledge (see next paragraph), or are mentioned in more detailed descriptions of the specific adaptation actions and measures that flow from the priorities.

7 In addition to presenting IVR by socioeconomic sector, in a handful of cases, NAPs also presented IVR by region. When this occurred, regions were treated as sectors and therefore feature in this analysis.

Figure 2.3 Percentage of NAPs with adaptation priorities addressing the thematic and dimensional targets of the UAE FGCR and the six enabling factors for effective NAP processes



While the UAE FGCR thematic and dimensional targets were well represented in country priorities, this analysis finds that priorities contained within NAPs were not always captured by the thematic targets of the UAE FGCR. Over half (54 per cent) of countries that submitted NAPs identified energy as a priority sector, which points to a clear opportunity to strengthen links between adaptation and mitigation efforts – an important step towards achieving climate-resilient development (OECD 2021; IPCC 2022). The 46 per cent and 27 per cent of countries that included early warning and (disaster) risk management, and GESI, respectively, was likely an under-representation of how these topics appear in NAPs, as countries have increasingly aligned development agendas and integrated these issues across adaptation efforts (NAP Global Network and UNFCCC 2019; UNDRR 2021). Indeed, a look at the indicators under the Sendai Framework for Disaster Risk Reduction points to how disaster risk reduction issues could be captured under the UAE FGCR and the indicators that are eventually elaborated for it. Additionally, the 34 per cent of countries that mention tourism in their adaptation priorities span all regions, and seven are LDCs, demonstrating the importance of the sector in many countries' economies.

Finally, the six categories of enabling factors used in the present review correspond to those identified in the literature (IPCC 2022b; Brullo *et al.* 2024). Across the NAPs reviewed for this analysis, 'data, knowledge and communications' was the most prevalent enabling factor featured in countries' adaptation priorities, with 71 per cent of countries including at least one priority focused on this enabling factor. This may, in part, be due to the range of topics that fall under this category – from data and research needs throughout the adaptation process, to awareness-raising, outreach and education investments for a range of actors. A close second was institutional arrangements, such as the establishment of coordination bodies, and legal and regulatory frameworks for adaptation. Of the NAPs, 63 per cent included at least one priority addressing this enabling factor, indicating that countries recognize that improved governance apparatus is needed to accelerate adaptation efforts within their territories.

An examination of the thousands of more specific adaptation actions and/or measures under higher-level priorities within the NAPs would likely paint a different picture, and reveal the integrated, cross-sectoral nature of adaptation efforts (e.g. risk assessments for specific

ecosystems, adaptation plans for human settlements, livelihood diversification in agriculture, etc.), which often transcend thematic categories such as those captured in the UAE FGCR. This may be an avenue for further investigation in a future Adaptation Gap Report.

2.3.3 Implementability

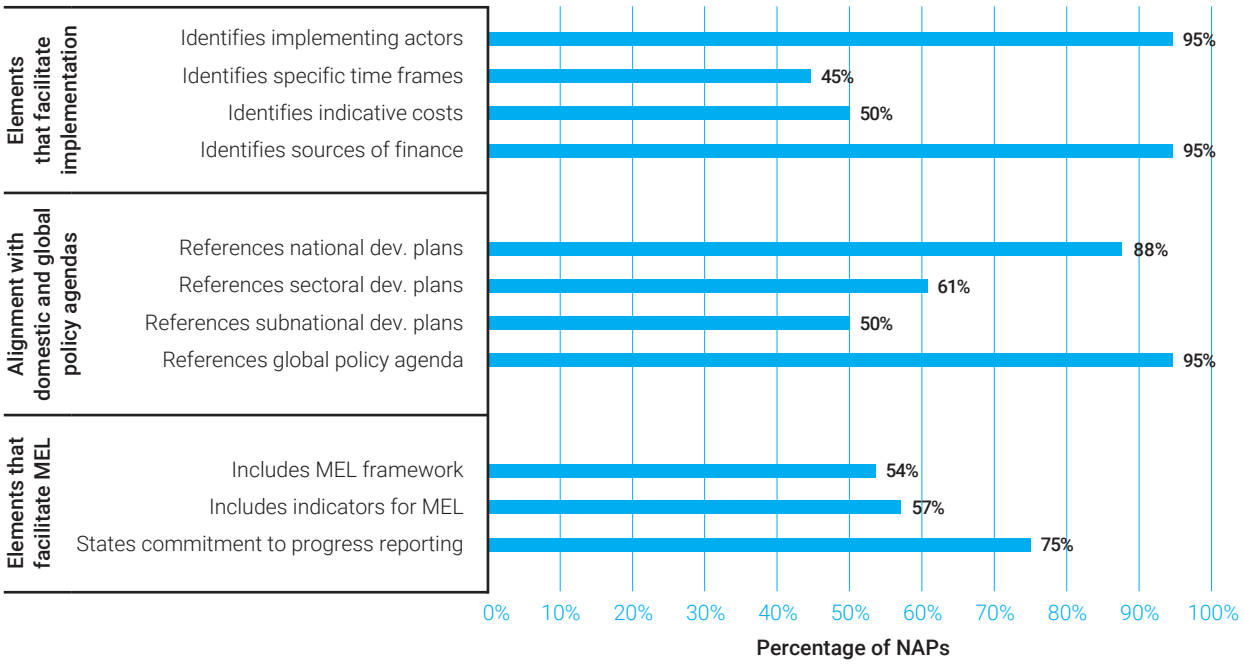
This analysis evaluates the extent to which NAPs submitted to the UNFCCC include elements and qualities that increase the likelihood of these plans being implemented and implemented effectively. The analysis assesses eleven indicators that capture whether plans: (1) possess elements that increase the likelihood that they will be implemented, (2) are aligned with domestic and global policy agendas, and (3) possess elements that enable MEL (see table 2.1). The results of this analysis are illustrated in figure 2.4.

In terms of possessing elements that increase the likelihood of implementation, almost all 56 NAP documents (95 per cent) identify the actors responsible for implementing planned adaptation actions, showing recognition of the importance of defining clear roles and responsibilities for implementation. The same percentage of NAP documents identify sources of financing for implementation, typically drawing on a combination of financing sources (international and domestic, and public and private). However, results for the other indicators assessed demonstrate that the implementability of existing NAPs could be improved. For example, only 46 per cent provide specific time frames for the implementation of adaptation actions, and only 50 per cent of NAP documents include the costs of adaptation actions.

In recognition that adaptation is important for meeting other national goals, the majority of NAP documents provide evidence that adaptation measures are aligned or linked with existing national development plans (88 per cent). A similar dynamic is observed with global policy agendas, with 95 per cent of NAPs including evidence of alignment with one or more prominent global policy agenda: the Sustainable Development Goals (80 per cent), the Sendai Framework for Disaster Risk Reduction (59 per cent), the United Nations Convention on Biological Diversity (52 per cent) and the United Nations Convention to Combat Desertification (41 per cent).[8] Alignment with domestic and international policy agendas can increase the profile of NAPs among a broad range of actors and strengthen incentives for these actors to implement them. However, alignment with sectoral and subnational adaptation plans is not very well evidenced in NAPs, with only 61 per cent and 50 per cent of NAPs referring to sectoral and subnational plans respectively, demonstrating a need to strengthen the extent to which NAPs are horizontally and vertically integrated.

Finally, the majority of NAP documents (75 per cent) include a commitment to progress reporting, reflecting a broad recognition among countries of the need to iteratively improve adaptation planning and the role of MEL within this process. However, many NAP documents do not actually possess elements required to facilitate progress reporting. For example, only 57 per cent include indicators for monitoring and evaluating the implementation of the NAP. Similarly, only 54 per cent include a dedicated MEL framework.

Figure 2.4 Percentage of NAPs addressing indicators for implementability



8 Due to its focus of addressing desertification, it should be noted that the United Nations Convention to Comat Desertification is not universally relevant to all countries.

2.3.4 Inclusiveness

The effectiveness and sustainability of adaptation efforts are increased when these efforts are grounded in considerations of gender, equity and justice (IPCC 2022). This analysis offers insights into ways in which countries are addressing GESI issues as they plan for adaptation via submitted NAPs.

All but two of the 56 NAP documents reviewed include at least one mention of gender within the body of the plan. Among these, 28 per cent contain passing references to gender, mentioning it fewer than 10 times, 68 per cent mention gender between 10 and 100 times, and a small number (6 per cent) mention gender over 100 times. Beyond the number of mentions, gender considerations are addressed in different ways in NAPs – approximately half of the countries reviewed address them as a guiding principle and just over a quarter have an adaptation priority focused on gender.

In recognition that gender inequalities tend to disadvantage women, NAPs were also reviewed to assess how women are positioned in relation to climate adaptation. Most documents that mention women highlight them as a particularly vulnerable group. Approximately 60 per cent identify women as stakeholders in adaptation, and just over half position them as agents of change in adaptation. While there are certainly factors and circumstances that lead to women and girls being disproportionately affected by the impacts of climate change, their knowledge and lived experiences must also be recognized to strengthen the outcomes of adaptation planning (Dazé and Hunter 2022).

Looking beyond gender, our assessment explored the extent to which countries mention other concepts that emphasize equity and justice. In this regard, 76 per cent of the documents mention inclusion in reference to the social dimensions of adaptation, while 50 per cent of NAPs mention human rights. In terms of other social groups focusing on age, disability and indigeneity, 94 per cent of submitted NAPs mention children or youth, while 80 per cent mention older people. Only 71 per cent mention persons with disabilities, including one call to strengthen the participation of persons with disabilities in multi-stakeholder dialogue processes. Indigenous peoples are mentioned in 82 per cent of NAPs.

Ongoing efforts around capacity development (see chapter 5), institutional arrangements, gender-responsive finance and engagement of under-represented groups in adaptation decision-making are needed to follow through on the GESI-related principles and priorities identified in NAPs.

2.3.5 Conclusion and reflections

This review revealed that the potential effectiveness of NAPs submitted to the UNFCCC is mixed, with NAPs demonstrating varying results across all four criteria examined. Most NAPs contain a combination of sectoral, dimensional and enabling priorities, which (if implemented) would not only address specific climate risks but also move countries towards embedding an iterative adaptation policy process in their governance systems. Similarly, most NAPs recognize the importance of GESI in ensuring effective adaptation. However, gaps in the evidence base informing NAP preparation and shortcomings in the implementability of NAP documents highlight the ongoing need for dedicated support for adaptation planning in developing countries.

Specifically, longer-term and flexible funding is needed to support future NAP cycles and the continued strengthening of domestic institutions participating in the planning process. While much capacity-building for NAPs has thus far focused on North-South information transfers (see figure 5.2 in chapter 5), increasing focus should be placed on enabling South-South knowledge exchange and peer-learning, which – when implemented well – can lead to the exchange of knowledge that is more applicable in developing country contexts (Casado-Asensio, Blaquier and Sedemund 2022; Fisher 2022). As more and more developing countries publish their first NAPs, and those who have already done so start to prepare their second, opportunities to learn from each other's approaches and experiences will be important for maintaining momentum in adaptation processes and meeting the UAE FGCA target on planning.

It is expected that the quality of NAPs will improve over time as countries review and update their plans. However, improvement will require countries to monitor and evaluate the implementation of their NAPs and ensure that the findings and lessons identified by such processes are adequately communicated to and applied by those involved in preparing the next NAP (Beauchamp *et al.* 2024).

Finally, results of this assessment should be considered with the understanding that reviewing NAP documents in isolation can only provide a snapshot of a country's adaptation planning. These documents are a milestone in a larger process of identifying, prioritizing and addressing adaptation needs. How this process unfolds – and what it yields – is tied to the nature of policy development cycles, approaches and attitudes to collaborative decision-making and institutional politics, among other factors. Indeed, a political economy analysis of the processes 'behind' a NAP document would enhance understanding of its potential effectiveness.

2.4 Relationship between adaptation planning and NDCs

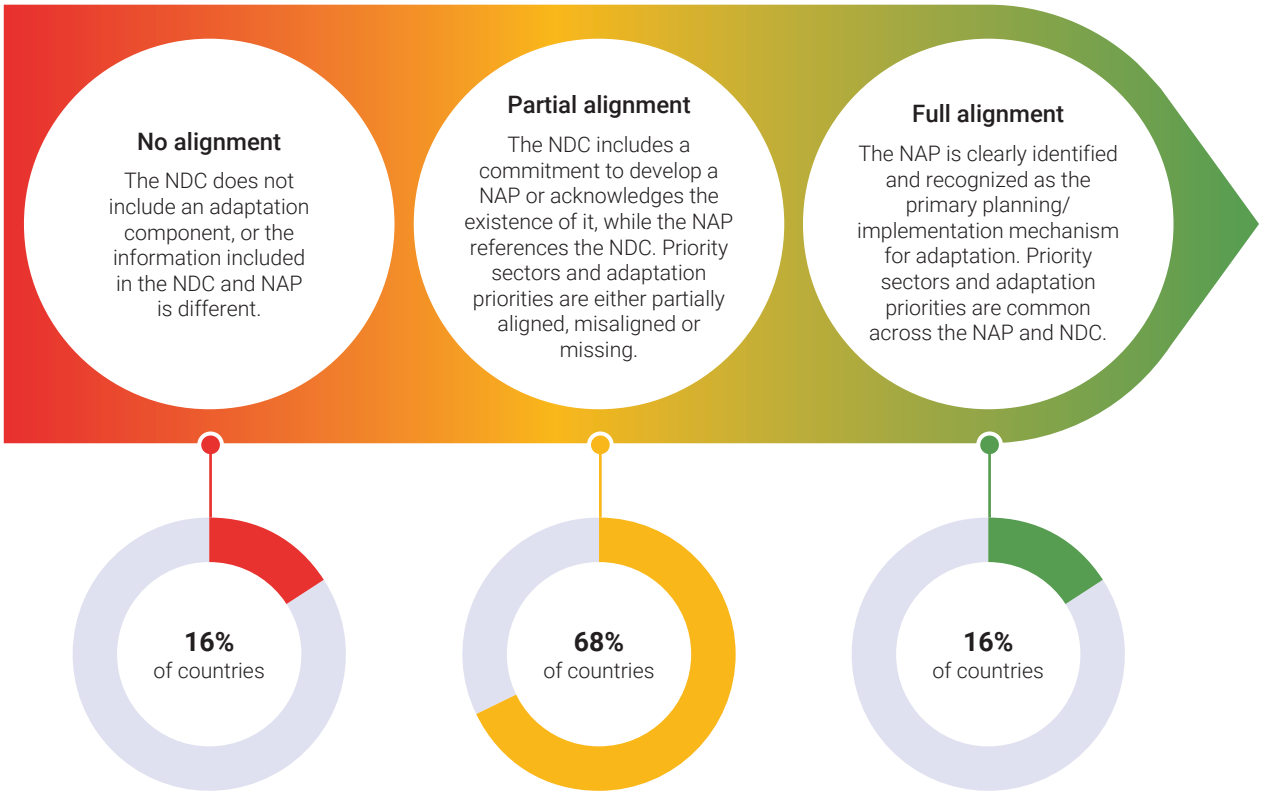
This section assesses the alignment between NAPs and NDCs submitted by developing countries to the UNFCCC. Aligning the process of the NAP with that of the NDC can accelerate adaptation action. NDCs communicate a country's contribution to meeting the goals of the Paris Agreement, including adaptation, while NAPs reflect a domestic planning process to help countries identify and address adaptation priorities (Hammill and Price-Kelly

2017). Though they serve different purposes, NDCs and NAPs can be mutually reinforcing, with NDCs articulating the high-level adaptation goals or objectives (i.e. the 'what') countries commit to achieving, and the NAPs detailing the strategies (i.e. the 'how') for meeting them (ibid.). Having instruments and processes speak to each other can help raise the profile of a country's adaptation priorities across government and internationally, and lead to more strategic investments and effective adaptation action, as well as avoiding duplication of efforts (Dazé, Terton and Maass 2018). To assess alignment between NAPs and NDCs, the NDCs and NAPs of the 56 countries that submitted multisectoral NAPs to the UNFCCC before 30 June 2024 were reviewed.

The analysis shows that countries increasingly view adaptation as a key component of their NDCs, particularly those with an established NAP process. All countries that submitted a NAP to the UNFCCC had also included an adaptation component in their NDC. Among the 56 countries reviewed, 82 per cent specifically reference the NAP process or a commitment to developing one in their NDC, while 87 per cent of NAPs make direct links to their respective NDCs.

However, the adaptation information included in NDCs and NAPs reveal different levels of alignment, captured in the continuum in figure 2.5.[9] The right end of the continuum reflects countries that explicitly use the NAP as the primary mechanism for planning and implementing national adaptation priorities, with consistent adaptation priorities and sectoral information included in both the NAP and the NDC. This consistency decreases towards the left end of the continuum, where information on adaptation differs and/or cross-references between instruments are absent.

Figure 2.5 Distribution of countries across the NAP-NDC alignment continuum



The differing timelines of the NAP and NDC processes affect whether they reference each other and contain similar information. While countries were required to submit their first NDC in 2015, with updates every five years, the NAP process is voluntary and ongoing, with no fixed deadline.

9 For the purposes of this review, adaptation information relates to priority sectors and priority adaptation actions contained in the NDC adaptation component and NAP document.

When a NAP was developed before an NDC, no country fell into the 'no alignment' category. Similarly, when an NDC was developed or updated shortly before a NAP was submitted, countries showed a higher degree of alignment in their adaptation information. Overall, few countries were at either extreme of the continuum, with 68 per cent falling under 'partial alignment'.[10] Of the remainder, 16 per cent exhibited 'no alignment', and 16 per cent showed 'full alignment' (figure 2.5).

The results of this assessment indicate that current NAPs and NDCs are not aligned, which may lead to suboptimal implementation processes that fail to realize synergies between the two processes and result in duplication of efforts. To avoid this, countries should place greater emphasis on leveraging their NAP processes when preparing their updated NDCs for 2025.

10 The 'partial alignment' category encompasses a range of alignment and non-alignment scenarios. For example, some countries included only a subset of their broader adaptation priorities in their NDCs (the full range of scenarios is outlined in table 2.C.1, annex 2.C).

Solar panels produce electricity that runs a submersible water pump for irrigation of an agricultural field.

Photo: © Avijit Baitalik / iStock


3
AYO SELAMATKAN BUMI

Chapter 3

Global progress on adaptation implementation

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Planting mangroves along the coast of Tanjung Pasir, Tangerang, Banten to reduce flood risk.

Photo: © sevenrayzen / iStock

Key messages

- The number of new adaptation projects and their annual funding volume under the Adaptation Fund, the Green Climate Fund (GCF) and the Global Environment Facility (GEF) do not keep pace with increasing climate impacts. Instead of growing, the grant-based funding volume for adaptation projects under these three funds has remained the same for over five years at just below US$500 million per year.
- Evaluations of 168 completed adaptation projects under the Adaptation Fund, GCF and GEF found that about 40 per cent of the projects were rated as satisfactory on their outcomes, and a similar proportion as moderately satisfactory. Just over half were rated moderately likely or likely for its outcomes to be sustained beyond the project's lifetime. This demonstrates a continued need to improve the design and modalities of adaptation projects, while also confirming that achieving lasting adaptation outcomes poses challenges.
- National adaptation planning instruments are partially implemented, but gaps and barriers remain. Countries in the early stages of national adaptation plan (NAP) implementation have low completion rates, while countries that are more than four years into their NAP implementation are reporting significant progress on implementation, albeit with limited data on its outcomes.
- To date, only five countries have assessed the overall depth and breadth of their NAP implementation. Each of them finds that the scale and speed at which adaptation is happening is inadequate relative to the extent of climatic risks.
- Almost 3,500 adaptation actions by ca. 500 city governments were reported in 2023, but consistent and robust information on their outcomes is lacking. Engineered and built environment adaptation actions and ecosystem-based adaptation are the most frequently reported actions, accounting for 32 and 20 per cent respectively, with regional differences. The most commonly perceived co-benefits of urban adaptation are on human health and on ecosystem services.

3.1 Introduction

Since its inception in 2020, the implementation chapter of the Adaptation Gap Report (AGR) has provided an overview of implemented adaptation action worldwide, using various data sources of global and intercontinental coverage. Every year, the chapter updates the evolution of adaptation projects over time, and their annual grant value under the multilateral climate funds that serve the Paris Agreement, i.e. the Adaptation Fund, GEF and GCF (figure 3.1). In addition, three new data sources are analysed for the first time: final evaluations of adaptation projects, implementation reports of NAPs, and a global database of city adaptation actions. These data sources provide novel insights into key aspects of adaptation progress, notably, the outcomes and sustainability of adaptation projects, the degree of implementation of NAPs, and the extent of subnational adaptation actions as demonstrated in self-reported urban adaptation.

The combination of multiple data sources and approaches is regarded by the Intergovernmental Panel on Climate Change (IPCC) as the most robust way of assessing global adaptation progress (Garschagen *et al.* 2022). The chapter adds new data sources and analyses every year to highlight new aspects. Due to space constraints, not all of them can be repeated on an annual basis. Previous editions have examined the content and geographical distribution of adaptation actions (UNEP 2021a; UNEP 2021b), implemented adaptation actions reported in academic literature (UNEP 2021b), adaptation activity data from the Organisation for Economic Co-operation and Development (OECD) (UNEP 2021b; UNEP 2022a), projects that jointly address mitigation and adaptation funded the GCF (UNEP 2022a), and stand-alone adaptation communications under the Paris Agreement (UNEP 2023). An overview of the annual data sources and topics of the annual assessment of global implementation progress is presented in annex 3.A.

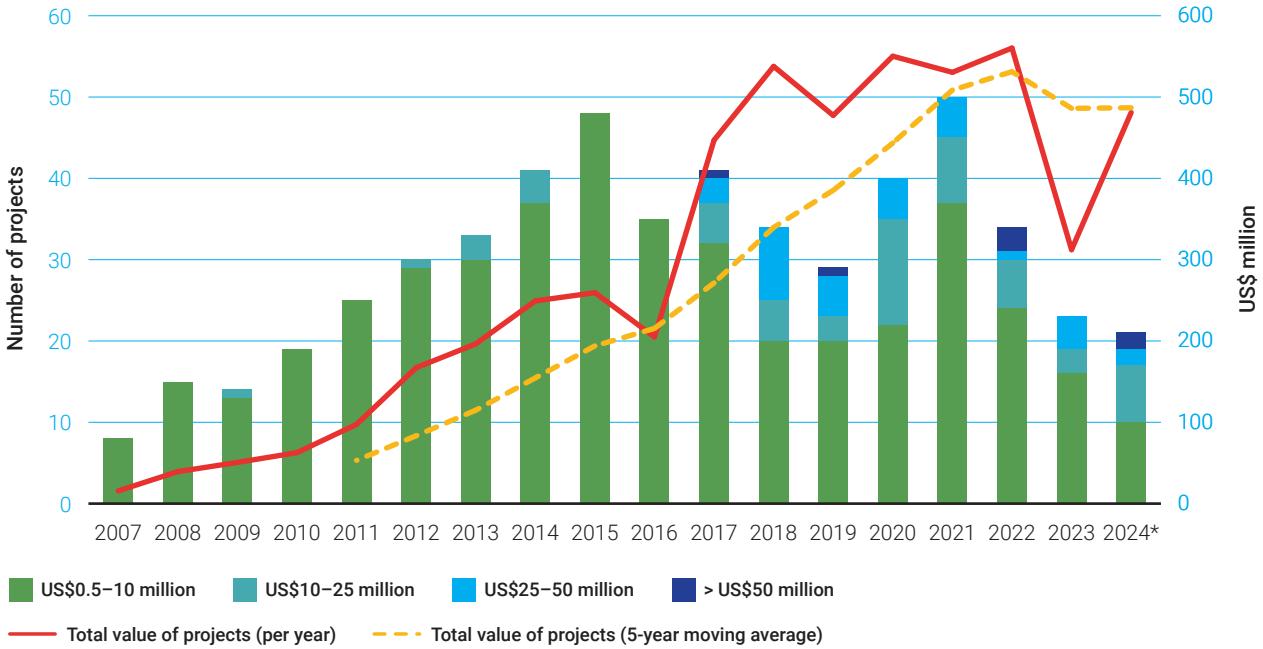
Since adaptation is taking place from the global to the local level, by many different actors and in various forms, the chapter can only present a global overview. It complements the detailed regional and thematic chapters in the IPCC's Sixth Assessment Report (IPCC 2022). The chapter's findings are highly relevant for the negotiations under the global goal on adaptation and to assess progress towards the targets of the United Arab Emirates Global Framework for Climate Resilience (UAE GFCR). Further details on the scope, methodology and data sources are described online in annex 3.B.

3.2 Implemented adaptation projects funded by the Adaptation Fund, GCF and GEF

In 2023, just 23 new adaptation projects started under the Adaptation Fund, the GCF, and the GEF Least Developed Countries Fund (LDCF) and Special Climate Change Fund (SCCF), which is less than half of the peak of 50 new adaptation projects in 2021 (figure 3.1). However, the average funding size per project continues to grow. Almost half of the new projects that started between January and August 2024 were above US$10 million in grants, and almost 20 per cent were above US$25 million. The trend towards larger projects that started in 2017 with the first implemented GCF projects continues. The GCF and the GEF also fund cross-cutting projects that jointly address mitigation and adaptation. These projects are not included in the analysis in this year's implementation chapter, but were examined in detail in the 2022 edition (UNEP 2022a).

The number of new adaptation projects per year, their size, and combined annual funding volume in grants since 2007, are shown in figure 3.1. In 2023, the combined annual funding volume in grants under the Adaptation Fund, GCF and GEF dropped by 44 per cent (almost US$250 million) compared with 2022, the largest absolute and relative reduction recorded between two consecutive years. However, in 2024 the combined grant value recovered during the first nine months, and is likely to exceed the amount in 2022, demonstrating the large annual variability. Moreover, the GCF is increasingly employing other funding instruments in combination with grants such as concessional loans, equity and guarantees. The amount of these funding instruments has not been included in this analysis. Nevertheless, the strong reduction in grants-based funding in 2023 caused its five-year moving average to decrease for the first time (see the yellow dotted line in figure 3.1). For over five years, the combined funding volume in grants has remained at just below US$500m.[1] Neither the number of new adaptation projects, nor the amount of funding available via these three funds, is compatible with the observed acceleration in climate impacts.

Figure 3.1 Number of new adaptation projects per start year, size and combined annual funding value (grants only) under the Adaptation Fund and GCF, and the LDCF and SCCF of the GEF, as at 31 August 2024



*Until 31 August 2024

3.3 Evaluations of completed adaptation projects

Evaluations assess the performance and outcomes of adaptation actions, and provide an important evidence base of what works, why and under what circumstances (Uitto, Puri and van den Berg 2017; van den Berg *et al.* 2022). In contrast to monitoring, which is often focused on accountability, evaluations at the end of a project (final evaluations) or several years after completion (ex-post

1 In 2022, funding to multilateral climate funds constituted just 5 per cent of the concessional international public finance commitments (US$1 billion out of US$20.1 billion) (see chapter 4, figure 4.3). Hence, implementation under the Adaptation Fund, GCF and GEF accounts for just a small part of overall implementation funded by international public adaptation finance, albeit one of special significance, since it represents the financial mechanism that serves the UNFCCC and the Paris Agreement.

evaluations) seek to understand the short- and medium-term results of projects and their sustainability, thereby providing a basis for learning. Final evaluations typically assess the criteria of relevance, effectiveness, efficiency, outcomes and sustainability (OECD 2021; also see box 3.1).

This section analyses 168 final evaluations of adaptation projects funded by the Adaptation Fund (32 completed projects), GCF (2 completed projects),[2] GEF-LDCF (91 completed projects) and GEF-SCCF (43 completed projects),[3] jointly worth almost US$900 million in grants and US$4.8 billion in co-financing (table 3.1). The evaluated projects strongly focus on the priority sectors identified in countries' national adaptation programmes of action (NAPAs)[4] and NAPs, including agriculture, water resource management, diversity in rural livelihoods, climate information and early warning systems, coastal management, and disaster risk reduction (see figure 3.2 and annex 3.C for a breakdown by fund).

While there are differences in approaches for final evaluations, they use similar criteria and are broadly comparable (see box 3.1 and annex 3.C). The following two sections analyse the outcome and sustainability ratings of completed evaluations, and the factors that contribute to good and poor performance, respectively.

Box 3.1 Five of the main criteria used in final evaluations

'Outcomes' are the likely or achieved short-term and medium-term effects of an intervention's outputs. The calculation of the overall outcomes rating of projects combines the three criteria below, of which relevance and effectiveness are critical.

'Effectiveness' typically revolves around the achievement of project or programme objectives, and the generation of intended outcomes towards reducing climate vulnerability, enhancing adaptive capacity and their contribution towards climate-resilient development pathways.

'Efficiency' refers to the relationship between the resources used for an intervention and the results achieved. It assesses how economic resources – such as funds, time and human resources – are converted into results.

'Relevance' is the extent to which the objectives of a project or programme are consistent with the priorities and needs of the target beneficiaries, implementing countries and broader policy context.

6-point rating scale
Highly satisfactory (HS)
Satisfactory (S)
Moderately satisfactory (MS)
Moderately unsatisfactory (MU)
Unsatisfactory (U)
Highly unsatisfactory (HU)

'Sustainability' refers to the likelihood that the outcomes of a project or programme will continue after the funding period has ended. The rating for the likelihood of sustainability is determined by evaluating the probability of a risk occurring and the severity of its impact on the continuation of net benefits and the achievement of long-term project objectives. This assessment should consider internal factors such as resources, partnerships (including exit strategies), capacities and ownership, as well as external factors including sociopolitical, institutional, financial and environmental risks. Financial sustainability is often considered the most critical component, because without a reliable source of ongoing funding, it is challenging to maintain and support the continued operation of a project, or the durability of its outcomes over the long term.

4-point rating scale
Likely (L)
Moderately likely (ML)
Moderately unlikely (MU)
Unlikely (U)

2 Currently, only two evaluations of completed GCF adaptation projects are available, because the first implementation of a GCF adaptation project only started in 2017.

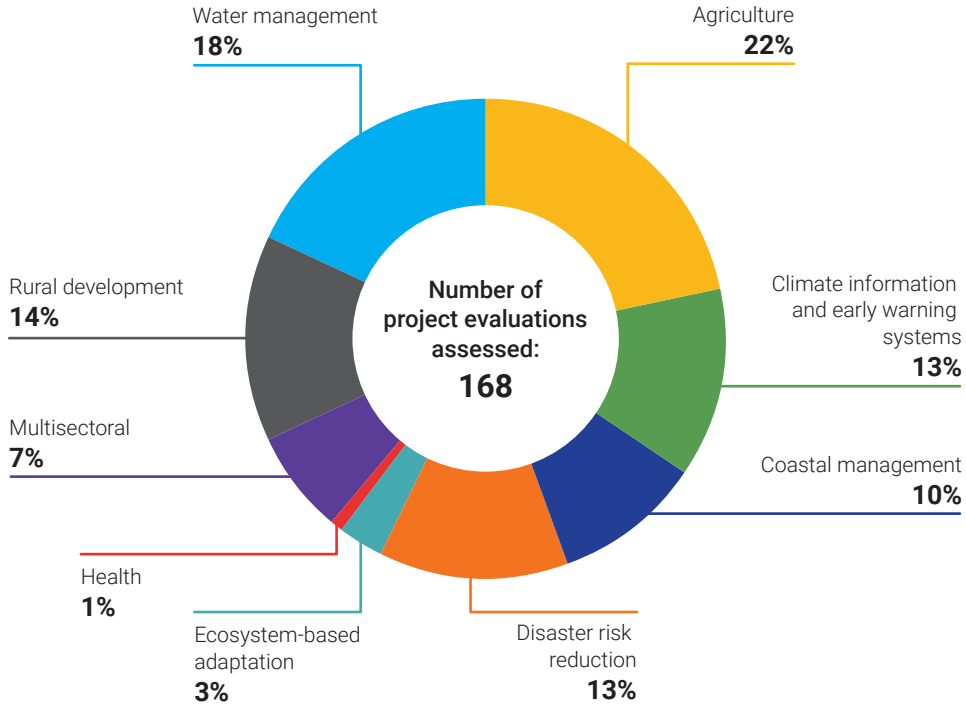
3 The SCCF, managed by the GEF, has four programmatic windows, of which two are actively funded. It covers adaptation through its window A, and supports mitigation activities mainly under window B, which focuses on technology transfer, energy, transport, industry, agriculture, forestry and waste management.

4 NAPAs were established in 2001 for LDCs to identify short-term adaptation priorities. The LDCF was established to fund these priorities. Since NAPAs predated most NAPs, the LDCF portfolio refers predominantly to NAPAs. However, the NAP process has de facto replaced NAPAs. NAPAs are not mentioned in the Paris Agreement, and no new NAPAs have been submitted to the UNFCCC secretariat in over ten years, except one in 2017 from the newly formed country of South Sudan.

Table 3.1 Completed adaptation projects and their funding size per climate fund

	Completed projects with final evaluation available (number)	Funding size (US$)	Co-financing size (US$)
AF	32	180.4 million	108.4 million
GCF	2	33.7 million	100 million
LDCF	91	477.3 million	2,578.7 million
SCCF	43	202.5 million	1,989.1 million
Total	**168**	**893.9 million**	**4,776.2 million**

Figure 3.2 Sectors covered by evaluated adaptation projects



3.3.1 Outcome ratings of completed projects

Of the 166[5] completed adaptation projects, 41 per cent are rated 'satisfactory', and 3.6 per cent 'highly satisfactory'. Almost 40 per cent scored just 'moderately satisfactory', and 17 per cent scored in the unsatisfactory range, which indicates challenges in achieving adaptation results (figure 3.3). The proportion of the six outcome ratings is similar across the three funds (see figure 3.A.2 in annex 3.C). Factors identified in the evaluations as contributing to good or poor performance are summarized in table 3.2. These factors reconfirm the principles for good adaptation practice outlined in the AGR 2022 (UNEP 2022a, box 5.1). They also align with literature about the implementation challenges of adaptation projects (Eriksen *et al.* 2021; Sovacool, Linnér and Klein 2017). Over time, the number of projects in the unsatisfactory range decreased, but a sizeable proportion of projects remained in the 'moderately satisfactory' category (figure 3.A.4 in annex 3.C).

5 The two available evaluations from the GCF were excluded from this analysis, because this low number did not allow for a comparison across the funds. One of the projects was rated as moderately satisfactory in outcome and moderately likely in sustainability, but unlikely in financial sustainability. The other did not have an outcome rating, but would be satisfactory based on its effectiveness rating.

Figure 3.3 Project outcome ratings from final evaluations of completed adaptation projects

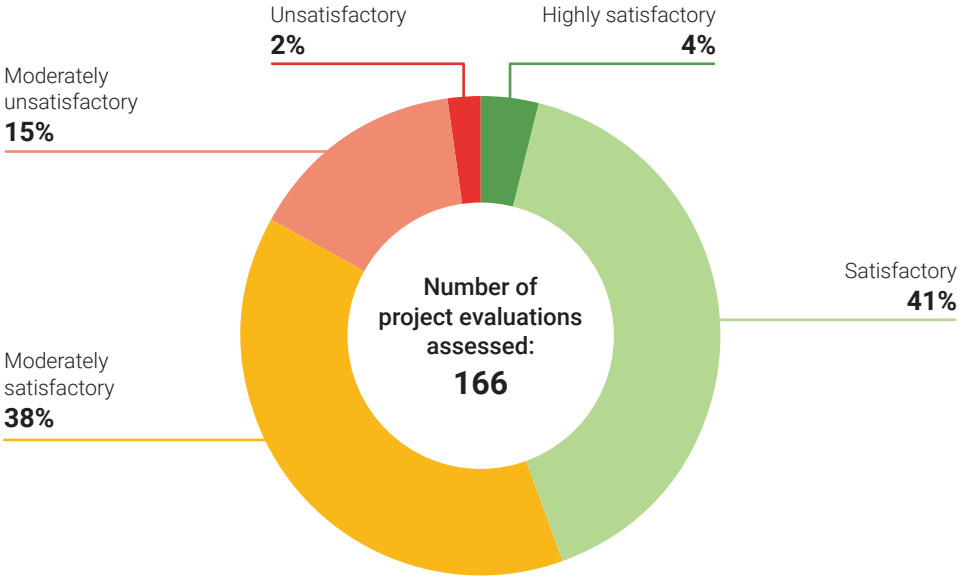


Table 3.2 Key factors influencing project performance

Satisfactory performance		Poor performance	
Based on 138 final evaluation reports of projects rated as either highly satisfactory, satisfactory or moderately satisfactory		Based on 28 final evaluation reports of projects rated as either moderately unsatisfactory or unsatisfactory	
Factor	**Description**	**Factor**	**Description**
Strong stakeholder engagement and participation	Active involvement from a diverse range of partners helped in the smooth execution of project activities and fostered an environment of ownership and accountability, ensuring that all parties remained committed to the project's objectives.	**Design and planning failures**	Projects often lacked clear baselines, specific, measurable, achievable, relevant and time-bound (SMART) indicators or thorough risk assessments, leading to poor initial project implementation structures. In some cases, the project design failed to create synergies among project components, resulting in fragmented outcomes that did not fully address the project's goals.
Effective project management	Clear planning processes, robust monitoring and evaluation (M&E) systems, and embracing adaptive management allowed project teams to make informed adjustments as necessary, ensuring that performance targets were met.	**Inefficient implementation**	Poor decision-making, technical complexities or weak management structures, leading to significant delays and poor performance. Weak M&E frameworks compounded these issues.

Satisfactory performance		Poor performance	
Based on 138 final evaluation reports of projects rated as either highly satisfactory, satisfactory or moderately satisfactory		Based on 28 final evaluation reports of projects rated as either moderately unsatisfactory or unsatisfactory	
Factor	**Description**	**Factor**	**Description**
Institutional strengthening and capacity-building	By enhancing the skills and capacities of local institutions, many projects were able to implement activities more effectively and manage resources efficiently. This often included the training of government officials, establishing knowledge-sharing networks, and providing ongoing technical support, which directly contributed to achieving the intended results.	**Coordination and capacity issues**	Poor coordination between implementing agencies and government counterparts often led to miscommunication, delays and a lack of continuity. In some cases, the project scope was too wide, placing unrealistic demands on local resources and capacities.
Alignment with national strategies and policies	By ensuring that project objectives were in line with NAPs and sectoral policies, projects were more likely to gain government backing, which in turn facilitated smoother implementation and increased the chances of project success.	**Budget overruns and technical mismanagement**	Inadequate financial planning and weak technical oversight contributed to poor outcomes.

3.3.2 Sustainability of project outcomes

Of the 148 projects for which anticipated sustainability of project outcomes was evaluated,[6] almost 40 per cent are rated as 'moderately unlikely', and 4 per cent as 'unlikely', to continue producing benefits after the project's end date (figure 3.4). Compared by fund, 44 per cent of Adaptation Fund projects, 50 per cent of LDCF projects and 30 per cent of SCCF adaptation projects are rated as either moderately unlikely or unlikely to sustain their outcomes after the project's end date (see figure 3.A.3 in annex 3.C). Over time, final evaluations do not show a visible trend towards higher or lower ratings on sustainability (figure 3.A.5 in annex 3.C). Factors identified by the evaluations as influencing projects' long-term success are summarized in table 3.3. Another factor potentially influencing sustainability ratings, as well as project outcomes, is the operational environment in which these projects are implemented. LDCF projects are implemented only in least developed countries (LDCs), where implementation is more challenging due to limited financial resources, weaker institutional capacity and a higher risk of political instability. LDCs often lack the necessary data, technical expertise and infrastructure, making adaptation efforts more complex. In comparison, only 25 per cent of Adaptation Fund projects and 5 per cent of SCCF adaptation projects are implemented in LDCs.

6 In a number of cases the terminal evaluations rate outcome, but not sustainability, or only provide narrative information on sustainability. The Independent Evaluation Office of the GEF validates LDCF and SCCF final evaluations. Of the 91 LDCF terminal evaluations with outcome ratings, 81 have a validated sustainability rating. Of the 43 SCCF terminal evaluations with outcome ratings, 40 have a validated sustainability rating. In the case of the Adaptation Fund, where the terminal evaluations are not reviewed by the independent evaluation unit, if there was a sustainability rating the narrative was checked to verify it supported the rating. If there was no sustainability rating, the narrative was reviewed to see if a rating could be constructed, based on the narrative. Applying this methodology allowed a sustainability rating to be discerned for 27 of the 32 Adaptation Fund projects. The remaining 5 Adaptation Fund projects were excluded from this analysis, along with the two available evaluations from the GCF (see footnote 5).

Figure 3.4 Sustainability rating from final evaluations of completed adaptation projects

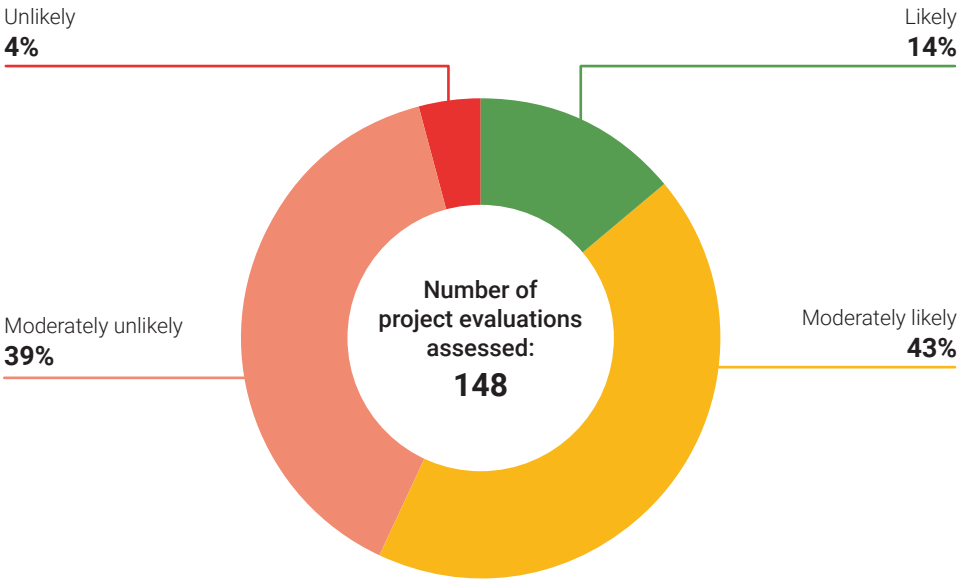


Table 3.3 Key factors influencing sustainability of completed adaptation projects

Sustainability more likely		Sustainability less likely	
Based on 84 final evaluation reports of projects rated as likely or moderately likely on sustainability		Based on 64 final evaluation reports of projects rated as moderately unlikely or unlikely on sustainability	
Factor	**Description**	**Factor**	**Description**
Strong institutional capacities and governance frameworks	Projects that prioritized the development and reinforcement of local and national institutions had a greater likelihood of enduring beyond their initial implementation. When local entities were provided with the necessary training and resources, they could take ownership of project outcomes, ensuring the ability to manage and maintain progress even after external funding ceased. This solid foundation allowed institutions to operate independently, strengthening the sustainability of the initiatives.	**Weak institutional capacity and ownership**	Projects that did not sufficiently strengthen local institutions or establish robust governance mechanisms faced significant challenges in maintaining their outcomes. Without strong local or national authorities capable of managing the project after its completion, the sustainability of even well-designed projects was compromised. In some cases, local institutions lacked the technical or administrative capacity to oversee and continue project activities, resulting in the gradual decline of project benefits.

Sustainability more likely		Sustainability less likely	
Based on 84 final evaluation reports of projects rated as likely or moderately likely on sustainability		Based on 64 final evaluation reports of projects rated as moderately unlikely or unlikely on sustainability	
Factor	**Description**	**Factor**	**Description**
Community ownership and involvement	Projects that actively engaged local communities during both the planning and implementation phases fostered a deep sense of responsibility and commitment among the people they served. When community members, including women and youth, were part of decision-making and execution, they were more likely to maintain the project infrastructure and continue practices that promoted long-term benefits. This broad-based involvement created a sense of collective accountability, ensuring that projects were not just viewed as external interventions but as locally driven initiatives with sustained impact.	**Lack of community engagement**	Projects that did not actively involve local communities in their design and implementation saw limited local buy-in. Without a sense of ownership or understanding of the project's long-term goals, communities were less likely to maintain infrastructure, adhere to new practices, or continue supporting project activities after the formal project period ended. When community involvement was weak, there was often a gap in the operation and maintenance of project systems, which led to rapid degradation or abandonment.
Financial continuity	Projects that managed to secure additional funding through national or local budgets, or that tied their outcomes to economic gains such as improved agricultural productivity or water access, were able to foster sustainability which, in turn, encouraged further investment and self-sustenance.	**Insufficient financial resources**	Projects that lacked clear financial mechanisms to sustain their outputs after the initial funding ended often struggled to continue activities. Poor financial continuity planning and the absence of viable cost-recovery models meant that once external funding ceased, there was little to no support for maintaining project operations.
Alignment with national policies	Projects that were well aligned with national policies or integrated into national development plans and climate strategies were better positioned to receive consistent support from the government, and could become part of longer-term national agendas.	**Limited integration with local policies and governance frameworks**	Projects that were seen as stand-alone efforts, disconnected from national or local development plans, struggled to secure long-term support from governments. When projects were not embedded into existing policy structures, they lacked institutional backing, making it difficult for outcomes to be maintained once external support was withdrawn.

Sustainability more likely		Sustainability less likely	
Based on 84 final evaluation reports of projects rated as likely or moderately likely on sustainability		Based on 64 final evaluation reports of projects rated as moderately unlikely or unlikely on sustainability	
Factor	**Description**	**Factor**	**Description**
Capacity-building and knowledge transfer	By training local stakeholders, including government officials, farmers, and community leaders, projects ensured that expertise and skills were retained at the local level. This empowered individuals and organizations to continue implementing and expanding the project's outcomes independently. These local champions played an important role in ensuring that the knowledge and practices introduced during the project lived on, even in the face of challenges.	**Failure to integrate current and future risks**	Environmental and climate risks were frequently overlooked in the design of projects, posing a threat to sustainability. Some projects failed to account for future environmental changes, such as natural disasters or the impacts of climate change, which left them vulnerable to disruption. This failure to integrate future environmental risks into the project's framework made it difficult for outcomes to be sustained in the face of changing conditions.
		Technical and operational issues	Inadequate technical expertise and the use of poor-quality materials or systems led to operational failures that undermined the sustainability of project outcomes.

3.4 Implementation of NAPs

Assessing progress in the implementation of NAPs is essential to determine whether countries are on track towards achieving their adaptation goals and objectives. The UAE FGCR also includes a target that, by 2030, all countries have progressed in implementing their NAPs, policies and strategies, and, as a result, have reduced the social and economic impacts of climate change (UNFCCC 2023, para. 10[c]). NAP implementation reports (progress reports) monitor efforts to implement the NAP domestically, while also providing information for international reporting and for the global stocktake (Leiter 2021; Guerdat Masud and Beauchamp 2023). They can be complemented by subnational adaptation tracking (box 3.2).

This section assesses the extent of NAP implementation by examining NAP progress reports including the approach taken, achieved progress, implementation barriers and enablers, gender and social inclusion considerations, and recommendations. While the analysis of NAPs in chapter 2 and chapter 5 is based only on NAPs submitted to UNFCCC by developing countries (see sections 2.3 and 5.2), the implementation chapter analyses all available NAP progress reports from any country globally.

3.4.1 National reporting on NAP implementation progress

As of 31 August 2024, at least 21 countries[7] had published a publicly available NAP progress report,[8] and several more have government-internal progress reports (see table 3.D.2 in annex 3.D). More than half of these reports are from non-Annex I countries. While a majority of the reports (53 per cent) represent an initial round of progress assessment, some countries have already published multiple progress reports and gained experiences other countries can learn from. Nevertheless, 9 out of the 11 NAP progress reports from non-Annex I countries were prepared with financial support from partner organizations, underscoring the fundamental need to support the assessment of adaptation progress in developing countries. Such support has been provided by specialist international organizations like the NAP Global Network, the Food and Agriculture Organization

7 Countries whose progress reports were analysed are Albania, Austria, Belgium, Brazil, Burkina Faso, Chile, Finland, France, Germany, Japan, Kenya, Kiribati, New Zealand, Philippines, Republic of Korea, Saint Lucia, South Africa, Spain, Tonga and the United Kingdom. Other countries, such as Grenada, have prepared progress reports, but they are not publicly accessible. Furthermore, countries may choose to document their adaptation efforts and progress through other mandated instruments under the Paris Agreement and the UNFCCC such as stand-alone Adaptation Communications and National Communications, which are not considered in this analysis. For instance, as of August 2024 only 10 of the 35 countries with a stand-alone Adaptation Communications have published a NAP progress report. Last year's implementation chapter analysed information contained in the first round of Adaptation Communications (UNEP 2023, chapter 3).

8 In South Africa and the Philippines, the most recent progress reports are linked to national climate change action plans that preceded their NAPs. These reports therefore include progress in both adaptation and mitigation while specific progress reports on NAP implementation are under development.

of the United Nations (FAO) (for agriculture-related tracking), and by bilateral development partners including Germany's International Development Cooperation Agency (GIZ) on behalf of the German Government.

3.4.2 Approaches to assessing NAP progress

Countries rely on three main evidence sources to prepare progress reports: existing data (collected from implementing entities), literature reviews, and stakeholder consultations through workshops and interviews. While some countries, like France, Tonga, and Kiribati, engage only national government entities, most countries also include non-state actors (e.g. civil society, private sector) and subnational governments when assessing NAP implementation progress. The most common assessment approach is categorizing the implementation status of specific actions into having started, being under way, partially completed or completed. Austria, Kenya, New Zealand and South Africa also document case studies. Nine countries use a combination of two or three data sources, including qualitative data. For example, in Austria, stakeholder surveys were complemented with consultation workshops to gather information while also providing a platform to exchange lessons and learn from experiences.

3.4.3 Status and effectiveness of NAP implementation

Although the proportion of countries with NAP progress reports is limited, available reports indicate that significant progress has been made in implementing NAPs, albeit with variations across strategic objectives, action areas and/or sectors. Implementation progress also varies across countries. This variation reflects the different stages and timelines of NAP implementation among countries, ranging from one year of implementation at the time of the first report (Brazil, New Zealand) to 13 years into the process at the time of the latest report (Spain). Consequently, there are notable variations in the proportion of priority actions that countries report to have commenced or been completed. For example, Albania and Tonga, which are two and three years into their NAP implementation at the time of reporting, report that only a quarter of the adaptation measures outlined in their NAPs have been completed. In comparison, Kiribati and Burkina Faso, both six years into their NAP implementation, report that 60 and 68 per cent of actions respectively are under way or have been completed. Brazil reported that one year into implementing its NAP, activities have started under almost all of the goals articulated in the NAP. The varying levels of detail in reported actions make it difficult to conduct a meaningful comparative assessment of implementation progress. While some countries detail the specific actions and their results, others provide high-level information on projects and programmes relevant to NAP implementation.

In addition to providing information on implemented adaptation measures, an equally important aspect is evaluating how well they enable responses to current and projected climatic risks. Despite progress in NAP implementation, a synthesis of information from countries that assess the effectiveness and adequacy of NAP implementation presents a more concerning outlook. All five countries providing this information conclude that NAP implementation is inadequate and ineffective relative to the extent of climatic risks. This is partly attributed to the design and implementation of adaptation measures (Albania and Finland) and limitations in the scale and speed at which adaptation is happening (New Zealand and the United Kingdom of Great Britain and Northern Ireland).

3.4.4 Gender and social inclusion

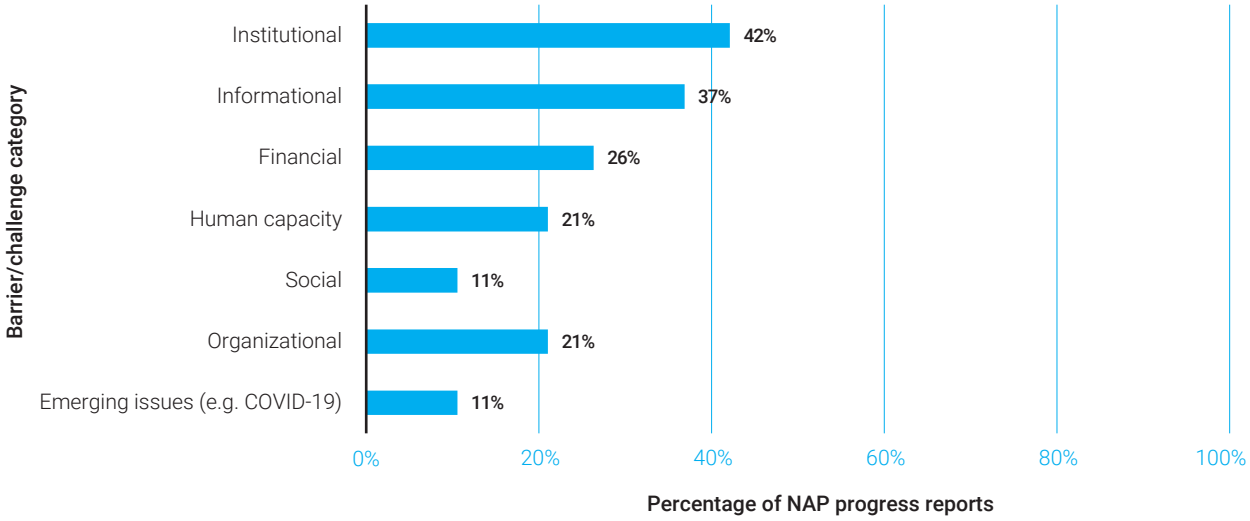
Six of the twenty-one countries with publicly available NAP progress reports provide dedicated information on gender and social inclusion, considering Indigenous knowledge and communities, as well as how adaptation measures benefit women and youth. For example, New Zealand's progress report is centred on Indigenous communities, including consideration of Māori principles and values in the design of the assessment framework, and drawing on the experiences of local communities to assess the effectiveness and adequacy of NAP implementation. Brazil's progress report has a section outlining measures focusing on vulnerable populations, including mainstreaming NAP priorities into the work plan of the Steering Committee of the National Policy for Territorial and Environmental Management of Indigenous Lands, and the launch of a platform designed to provide climate information to Indigenous peoples. The progress reports of Kenya and Burkina Faso highlight how implemented projects and programmes target groups that are known to be highly vulnerable such as women and youth, pastoralists and small-scale farmers. Some countries have implemented assessments to understand the links between gender and climate. However, some progress reports note that the lack of gender-disaggregated data makes it difficult to document the extent to which gender issues are addressed in the implementation of measures relevant to the NAP. Furthermore, even where gender issues are integrated into the themes and objectives of the NAP, implementation often lacks a comprehensive and systematic approach to gender and social inclusion, as stated, for example, in the progress report of the Philippines.

3.4.5 Barriers and enablers of NAP implementation

The barriers and challenges highlighted in NAP progress reports suggest potential areas of improvements to accelerate NAP implementation. Similar to the findings of the analysis of adaptation communications in last year's AGR (UNEP 2023, chapter 3), the top three categories of barriers encountered by countries relate to gaps in policies and frameworks that are fundamental to creating an enabling environment for NAP implementation, lack of sufficient information and knowledge among key stakeholders, and limited financial resources (figure 3.5). In terms of enablers, having a NAP and related implementation guidelines and

frameworks in place has helped improve coordination, as well as mainstreaming of adaptation priorities, underscoring the relevance of the UAE FGCR's target, urging parties to ensure that they have adopted NAPs and other related policy instruments by 2030 (UNFCCC 2023, para. 10[b]). Improving skills and continuously building capacity are also reported as vital enablers, for example by Burkina Faso, Finland and Germany.

Figure 3.5 Barriers and challenges to NAP implementation as mentioned in NAP progress reports



3.4.6 Recommendations for further NAP implementation

A notable component in most progress reports (72 per cent) is the inclusion of recommendations, highlighting the importance of NAP progress reports in offering actionable and country-specific guidance for enhancing NAP implementation. In the United Kingdom, for example, the biennial progress reports compiled by the independent Climate Change Committee provide recommendations to close policy gaps in each of the NAP's priority areas. Among the analysed NAP progress reports, many recommendations relate to necessary improvements in the information basis for NAP implementation including through targeted research, climate risk and vulnerability assessments, better dissemination of relevant research results, and the establishment of tools and data systems to facilitate M&E of adaptation actions. Recommendations related to institutional structures call for efforts to improve policy coherence between NAPs and other regional, national, sectoral and subnational strategic documents while considering key issues in NAP formulation and implementation, including maladaptation.

Box 3.2 Tracking adaptation progress by regional governments

Tracking adaptation actions directly at subnational level can inform adaptation planning where it takes place. It also complements or serves as an input to national adaptation M&E systems (Leiter 2015). Indeed, an increasing number of regional governments are regularly reporting on the implementation of their adaptation actions. At least 15 out of the 75 regional governments that are members of the RegionsAdapt initiative monitor their primary adaptation plans, 12 of them annually (Cran 2023). A pioneer is the Western Cape province of South Africa which has been publishing biennial progress reports of its climate change response strategy since 2015 (Western Cape Government 2020). Seven of Canada's thirteen provinces and territories have published annual adaptation progress reports (Lesnikowski and Leiter 2022). In Québec, for example, the Plan for a Green Economy 2024–2029 includes adaptation targets whose progress will be reported annually.

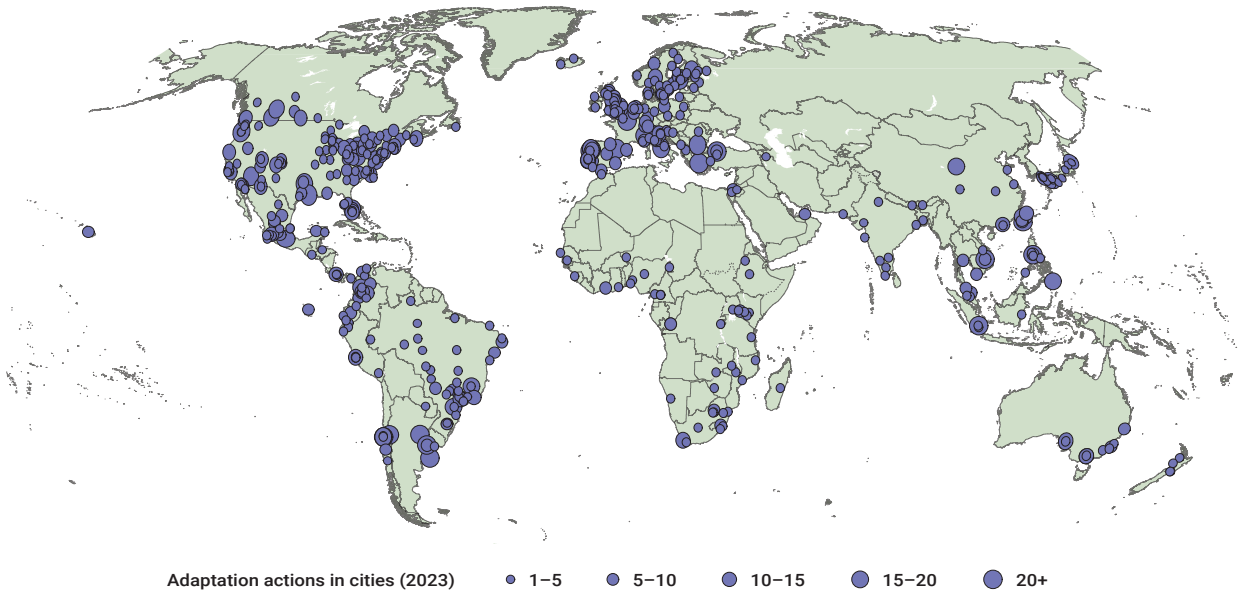
The uptake of subnational adaptation tracking can be facilitated through relevant legal provisions, through the provision of know-how and capacity-building, and financial resources. A persistent gap remains in understanding adaptation outcomes beyond near-term outputs. Only 6 of the 75 regional governments that are members of RegionsAdapt evaluate their main adaptation plans regarding their effectiveness and achieved outcomes. Integrating the findings of subnational adaptation M&E systems into national reporting under the Paris Agreement presents an opportunity to gain a more comprehensive understanding of adaptation for the next global stocktake.

3.5 Adaptation actions by urban governments

Local governments are critical for adaptation implementation, and urban areas account for a sizeable proportion of subnational adaptation action (deConick *et al.* 2018; Dodman *et al.* 2022; OECD 2023; Revi and Ghoge 2024; Rosenzweig *et al.* 2018). Most of the literature on adaptation at the city level has focused on planning rather than implementation (e.g. Olazabal and De Gopegui 2021; Reckien *et al.* 2023). This section therefore analyses the most comprehensive database of urban adaptation actions, the Cities Adaptation Actions database of the Carbon Disclosure Project (2023; see annex 3.E for details). Since its inception in 2017, this dataset has been continuously improved, including the introduction of a unique identity number for every adaptation action in 2023 to avoid double counting. The following analysis is therefore focusing on 2023 data, the most robust available to date (see annex 3.E). The analysis examines what hazards are addressed, what type of adaptation actions are reported and what perceived co-benefits they have.

In 2023, 3,501 adaptation actions were self-reported by 536 cities. The world map in figure 3.6 shows the location of the reporting cities, and the frequency of actions per location. The distribution of cities that report under this database is not proportional to the global distribution of cities/inhabitants. For example, a disproportionate number of cities from Latin America are reporting compared to cities from Asia. The world map should therefore not be interpreted as indicating the total amount of adaptation actions by cities worldwide. However, the 536 cities that have self-reported adaptation actions to this database in 2023 represent almost a quarter of all cities worldwide with over a million inhabitants. The data therefore provides quantitative insights into the types of actions taken by a large sample, and which co-benefits were realized (see further discussion in annex 3.E).

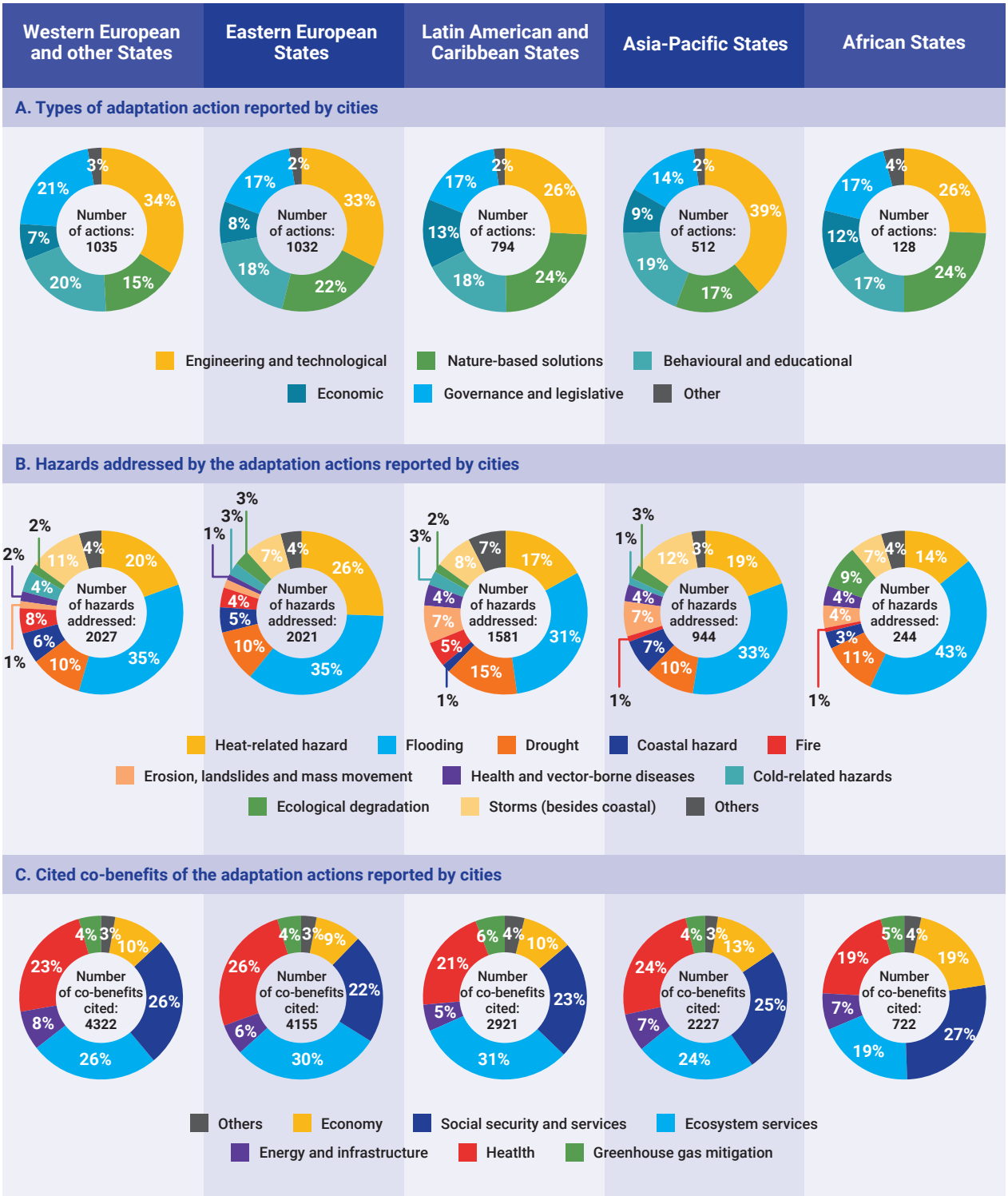
Figure 3.6 Distribution of self-reporting cities and number of adaptation actions reported per city



The most common self-reported type of adaptation actions are engineering and technological actions (1,127 reported actions, 32 per cent of the total) such as flood levees or cooling centres for protection from extreme heat; ecosystem-based adaptation (687 actions, 20 per cent of the total) such as afforestation and demarcating ecological corridors; and behavioural and educational actions (651 actions, 19 per cent of the total) such as community engagement in hazard monitoring or emergency preparedness drills (figure 3.7, panel A). The least commonly reported actions were economic actions (e.g. payment for ecosystem services, water tariffs, index-based weather insurance schemes) with just over 300 actions combined, reflecting lower investments and attention to financial instruments that facilitate adaptation.

The most common hazards responded to are flood-related hazards (2,411 actions), heat-related hazards (1,453) and coastal hazards (978) (see figure 3.7, panel B). While most reported hazards are attenuated by climate change, vulnerability to these hazards has roots in social inequality, urban planning and resource management (e.g. unequal resource access, poor stormwater drainage management, and urban flooding exacerbated by solid waste accumulation).

Figure 3.7 Frequency of self-reported types of adaptation actions (panel A), hazards addressed by adaptation actions (panel B), and adaptation co-benefits (panel C) and their distribution per United Nations region



Across the regions, cities self-report perceived co-benefits of adaptation actions through benefits for mitigation (greenhouse gas emissions reduction) and sustainable development (e.g. human health, social security and services, ecosystem services). Health co-benefits through reduced diseases, and ecosystem co-benefits through improved/protected ecosystem services and biodiversity, were most reported (figure 3.7, panel C). Mitigation co-benefits were regionally differentiated: of the 650 times mitigation benefits were reported, 28 per cent were from

the Western European and Others Region, while 5 per cent were from Africa, and 12.7 per cent from Asia-Pacific. Crucially, across all regions, cities report economic co-benefits through improved labour productivity and labour conditions or increased revenue and job creation, demonstrating the potential economic benefits of adaptation, including on several Sustainable Development Goals (SDGs), such as SDG 11, Sustainable Cities, and SDG 9, Decent Work.

Overall, adaptation implementation in cities is visible across all regions of the world (figure 3.6), and across all adaptation types. As other adaptation assessments have found (Reckien *et al.* 2023; Dodman *et al.* 2022), most reported strategies focus on engineering and technological solutions, continuing dominant conceptualizations of adaptation as infrastructure. For adaptation to be holistic, a similar focus on social vulnerability and on incentivizing behaviour change for adaptation is needed (Clayton *et al.* 2015; Dodman *et al.* 2022; Whistmarsh, Poortinga and Capstick 2021). For example, adaptive social protection can play an important role for adaptation, especially for the most vulnerable (Tenzing 2020). While implemented adaptation at subnational scales is increasing, issues of inadequate funding remain, as communities exposed to risks continue to grow in numbers.

Fire-fighting helicopter dropping water to extinguish a forest fire in Thailand, February 2024.

Photo: © Toa55 / iStock

4

Chapter 4

Adaptation finance gap

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Contributing authors: Pieter Sayer (independent)

Mozambican villagers wait for help at a collapsed bridge after Cyclone Freddy, Mandimba, Mozambique, in March 2023.

Photo: © Roy Gilham / iStock

Key messages

- International public adaptation finance flows to developing countries increased from US$22 billion in 2021 to US$27.5 billion in 2022, the largest absolute and relative year-on-year increase since the Paris Agreement. This increase is in line with progress towards the Glasgow Climate Pact – which aims to double adaptation finance between 2019 and 2025 – although further significant increases in future years will be required to meet the goal.

- While the amount of grants (in total US$ and as a percentage of international public adaptation finance) has increased, these flows are still dominated by loans (62 per cent, of which around a quarter are non-concessional). International public flows are also increasing to the most vulnerable countries (least developed countries [LDCs] and small island developing States [SIDS]), but while much of this is grant finance (51 per cent and 64 per cent respectively), the use of non-concessional loans has also increased.

- A comparison of adaptation finance needs (estimated at US$215 to US$387 billion/year in last year's Adaptation Gap Report [AGR]) against 2022 international public finance flows shows that a very large adaptation finance gap still exists, though there are still not enough data on finance flows from domestic public and private sector sources (both of which are important sources of finance). More positively, the targeting of finance to vulnerable countries means they have a lower adaptation finance gap than developing countries overall, though further increasing flows to these countries is crucial.

- The AGR 2024 has further investigated the finance gap to assess the types of adaptation. It concludes that financing needs to shift from the historic focus on reactive and early adaptation to more strategic programming. Treating adaptation in a similar way to mitigation by focusing on technical options, or only concentrating on the easiest-to-finance areas, will not deliver the scale or types of adaptation needed.

- An analysis of the adaptation gap finds that over two thirds of needs are in areas that are typically financed by the public sector. This means that without more public finance, or innovative approaches to financing, it will be difficult to deliver the majority of countries' adaptation priorities (as set out in nationally determined contributions [NDCs] and national adaptation plans [NAPs]). It also means we must be realistic about the potential for the private sector to bridge the adaptation gap.

- Estimates of private sector finance needs are currently under-represented in modelled adaptation costs and financing needs, and private sector finance flows are unclear. The private sector has a key role in adaptation financing, though its priority will be to adapt to its own needs and where there are opportunities for adaptation goods and services, predominantly in market sectors.

- There will be competing pressures on the available concessionary public finance. This finance will be important in delivering more anticipatory adaptation, for areas typically financed by public investment, as well as for de-risking private investment. Critically, there is a need to use the available international public concessionary finance more strategically.

- Enabling factors will be key to unlocking adaptation finance, especially for the private sector. This includes opportunities for countries to use financing facilities, information, taxonomies, domestic and international financial institutions' reform, incentives, planning and legislation. However, these enabling activities will require the capacity to deliver, as well as financing.

- The question of who ultimately pays for adaptation is not being adequately addressed in the current discussion on financing. The AGR 2024 finds that many proposed financing arrangements are borne by the most vulnerable households in the poorest countries. While this helps close the adaptation finance gap, it is not in line with the notion of common but differentiated responsibilities, nor the polluter pays principle. There is also a need for greater consideration of gender equality and social dimensions for adaptation finance.

4.1 Introduction

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). In practice, estimating this gap is challenging, both conceptually and quantitatively (UNEP 2016; UNEP 2023a). Furthermore, while a monetary metric helps communicate the scale and urgency of the gap, finance is a means rather than an end, and does not guarantee efficient and effective adaptation (see chapter 3). Nevertheless, a widening adaptation finance gap indicates a deepening climate crisis and will mean higher losses and damages.

The AGR estimates the adaptation finance gap for developing countries[1] using the following evidence lines:

1. The estimated needs (in US$) for adaptation, which are derived from two different methods:
   - A modelled estimate of the costs of adaptation for all developing counties, based on global sectoral models that analyse adaptation at the national level
   - An analysis of adaptation finance needs as reported in developing countries' NAPs and NDCs, extrapolating these data to all developing counties
2. An analysis of global international public adaptation finance flows (in US$) to developing countries, aggregated from country-level data.

The modelled costs and finance needs (1) are compared with the current adaptation finance flows (2) to estimate the size of the adaptation finance gap for developing countries. Note that while in theory the modelled costs and finance needs should be similar, in practice they vary, in part due to the methods used.[2]

Chapter 4 of the AGR 2023 (UNEP 2023a) and the supporting Adaptation Finance Gap (AFG) Update (UNEP 2023b) undertook a new and comprehensive analysis to estimate the costs of adaptation and the adaptation finance needs for developing countries. This value is highly relevant for discussions on the new collective quantified goal (NCQG) for climate finance,[3] which is to be established before 2025. The AGR 2024 has not updated these values, but it does include discussion on new information (sections 4.2 and 4.3).

The AGR 2024[4] has updated the analysis of adaptation finance flows (section 4.4) using the latest data available. This provides insights on the progress towards the Glasgow Climate Pact, which urged developed country Parties to at least double their collective provision of climate finance for adaptation to developing country Parties from 2019 levels by 2025 (FCCC/PA/CMA/2021/10/Add.3). These updated finance flows are also used to provide an updated adaptation finance gap (section 4.5).

Finally, the AGR 2024 has undertaken a more in-depth analysis of the nature of the adaptation finance gap and discusses initiatives that might help close the gap (section 4.6).

4.2 The modelled costs of adaptation

The AGR 2023 used global sectoral models to estimate adaptation costs. These models first estimate the economic impacts of climate change (in US$), then assess the costs of adaptation to reduce these impacts. This analysis was published in the AFG Update 2023 (UNEP 2023b).

The analysis estimated the aggregated costs of adaptation at US$215 billion/year for all developing countries this decade (undiscounted annual cost for

1 Defined here as the non-Annex I countries under the United Nations Framework Convention on Climate Change [UNFCCC]). See www.unfccc.int/process/parties-non-party-stakeholders/parties-convention-and-observer-states.

2 The modelled costs of adaptation (US$) are based on an analysis of the adaptation needed to reduce projected incremental climate risks, relative to a reference period, without consideration of how this is financed. The country adaptation finance needs (US$) refer to the estimated financial resources required by countries from international and domestic sources to implement their identified domestic adaptation priorities, which are influenced by adaptation ambition and socioeconomic circumstances. The two approaches use different methods (climate and impact models versus programme and project level costing), and they include different definitions, as well as different risks. See the AGR 2023 for further details.

3 At the twenty-first session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 21) in Paris, the decision was taken to establish a new collective quantified goal for climate finance before 2025. This new goal, which will be set by end of 2024, has a floor of US$100 billion per year and must account for the needs and priorities of developing nations.

4 This chapter was co-financed by: i) The ECONOGENESIS project funded by UK aid from the UK Government and by the International Development Research Centre (IDRC), Ottawa, Canada as part of the Climate Adaptation and Resilience (CLARE) research programme (Note that the views expressed herein do not necessarily represent those of the UK Government, IDRC or its Board of Governors); ii) the Assessing Climate Change Risk in Europe project (ACCREU), funded by the European Union through the Horizon Europe Research and Innovation Action (RIA) under grant agreement 101081358 and by UK Research and Innovation (UKRI) under the UK Government's Horizon Europe Guarantee (reference number: 10073932) (Note that the views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them); iii) the core funding to the Stockholm Environment Institute by the Swedish International Development Cooperation Agency (Sida) (Note that the views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the Swedish Government).

the period up to 2030, in 2021 prices [5,6]), with a range of US$130 billion/year to US$415 billion/year.[7] These costs are 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 range reported reflects different representative concentration pathways (RCPs) and climate models, but it is also stressed that the costs of adaptation vary significantly depending on the adaptation objective set and the trade-off with residual damage. The breakdown of these numbers is presented in annex 4.A.

The modelled costs of adaptation were also projected to rise over future decades towards 2050, though costs will vary with progress towards global mitigation. As reported in the Emissions Gap Report (UNEP 2024), current policies and pledges indicate the world will need to adapt to warming in excess of 2°C (above pre-industrial levels). Indeed, even with full implementation of both unconditional and conditional NDCs, this would only reduce expected emissions in 2030 by 10 per cent, leading to projections of up to 2.6°C of warming, and implementing only current policies would lead to up to 3.1°C of warming. Higher warming levels are associated with higher adaptation costs, including due to the limits to adaptation, and will require more urgent and earlier adaptation action.

It is noted that since the AGR 2023, there have been new global studies on the economic impacts of climate change that indicate higher damages than earlier literature (e.g. Coronese 2024). In turn, these higher economic impacts imply that higher levels of adaptation, and thus higher adaptation costs, are needed.

Finally, it is stressed that the modelled costs of adaptation from the AGR 2023 do not cover all sectors and risks. In particular, they underestimate the costs of adaptation for the private sector, which is relevant for the later discussion on filling the gap (see section 4.6). The modelled estimates do not include the costs of adapting (most) private sector infrastructure and assets, the costs of increased cooling associated with higher temperatures, or the costs of adaptation to address the impacts of climate change on labour productivity. The latter heat-related issues are becoming increasingly important: 2023 was the warmest year on record by a large margin (World Meteorological Organization [WMO] 2024), with annual average global temperatures 1.45°C above pre-industrial levels, and temperatures have been even higher over the past 12 months.

4.3 Adaptation finance needs

Developing countries have assessed their domestic adaptation priorities and finance needs and submitted these to the United Nations Framework Convention on Climate Change (UNFCCC) in their NAPs and NDCs. The AGR 2023 undertook a comprehensive assessment and analysis of these adaptation finance needs, extrapolating them to all countries. This analysis was published in the AFG Update 2023 (UNEP 2023b).

Among all developing countries, 85 countries (55 per cent) had specified their adaptation finance needs for 2021–2030 in at least one of their NDC or NAP submissions as at 31 July 2023. After excluding double counting, these submissions total US$105 billion per year for 2021–2030 (in 2021 prices). This amount is equivalent to 1.5 per cent of these countries' GDP. The AGR 2023 used the annual per capita adaptation finance needs (median and interquartile range) from these submitted NDCs and NAPs, by income group, as extrapolation factors to estimate the total global adaptation finance needs of all developing countries. The resulting average annual adaptation finance needs for developing countries for 2021–2030 were estimated at US$387 billion (in 2021 prices), with a range of US$101 billion to US$975 billion.[8] This amount is equivalent to 1 per cent of developing countries' GDP, with a range of 0.25 per cent to 2.50 per cent.

The estimated financing needs for all LDCs and SIDS were estimated in the AGR 2023 at US$41 billion per year, with a range of US$16 billion to US$83 billion. However, when expressed as a percentage of their GDP, adaptation finance needs are higher for these vulnerable countries. The finance needs for SIDS were estimated at 3.4 per cent of GDP and for LDCs at 2.5 per cent of GDP, as compared with 1.4 per cent of GDP for other developing countries.

Since the AGR 2023, around 10 countries have updated their adaptation finance needs. While these new estimates are valuable, they do not significantly affect the global finance needs estimated in the AGR 2023, so the AGR 2024 has not produced an updated global value. However, countries are due to update their NDCs in 2025, and several are currently finalizing NAPs, so a major update of finance needs will be undertaken in a future AGR, once these are available.

5 The adaptation cost estimates reported in the main text are the same as those in the AGR 2023. However, these have also been updated from 2021 US$ to 2022 US$ to allow comparability with the finance flows. This used the World Bank's global GDP deflator series and applied the ratio of the global price level at the end of 2022 relative to the global price level at the end of 2021 to the 2021 US$ values (World Bank 2024). This methodology is consistent with the methodology used in the AGR 2023.

6 Updating to current (2022) prices, these modelled costs would be US$231 billion/year.

7 Updating to current (2022) prices, the range would be US$140 billion to US$446 billion/year.

8 This is equivalent to US$416/year in 2022 prices.

It is highlighted that the adaptation finance needs costed in NDCs and NAPs (above) do not fully represent all adaptation needs of developing countries. The needs determination report (NDR) of the Standing Committee on Finance identifies the relevance of both quantitative and qualitative expressions of needs in national reports of Parties under the Convention and the Paris Agreement (UNFCCC Standing Committee on Finance 2024). In the second NDR, 112 NDCs reported 2,643 adaptation needs and 51 NAPs reported 4,148 adaptation needs. However, financial needs (US$) were estimated for only 53 per cent of the identified adaptation needs in NDCs and 62 per cent in NAPs (UNFCCC Standing Committee on Finance 2024). This implies that the finance needs for approximately half of the identified adaptation actions in countries' plans have not been costed. Regarding total reported needs, around 31 per cent in NAPs and 11 per cent in NDCs are for capacity-building, while 12 per cent in NAPs and 8 per cent in NDCs are for technology development and transfer (UNFCCC Standing Committee on Finance 2024), but many of these are not costed (see box 5.3 in chapter 5 for further detail). It is also highlighted that NAPs and NDCs do not fully capture private sector adaptation finance needs, as a later discussion on the role of the private sector examines.

4.4 International public adaptation finance flows

A comprehensive assessment and analysis was made of the self-reported public international adaptation finance flows from bilateral and multilateral finance providers to developing countries. This was published in detail in the AFG Update 2023 (UNEP 2023b).

The AGR 2024 has updated this analysis, covering finance flows from 2018 to the most recent year for which data are available (2022). The flows analysed include only providers and recipient Parties to the UNFCCC. For details on data sources and methodology, see annex 4.B.

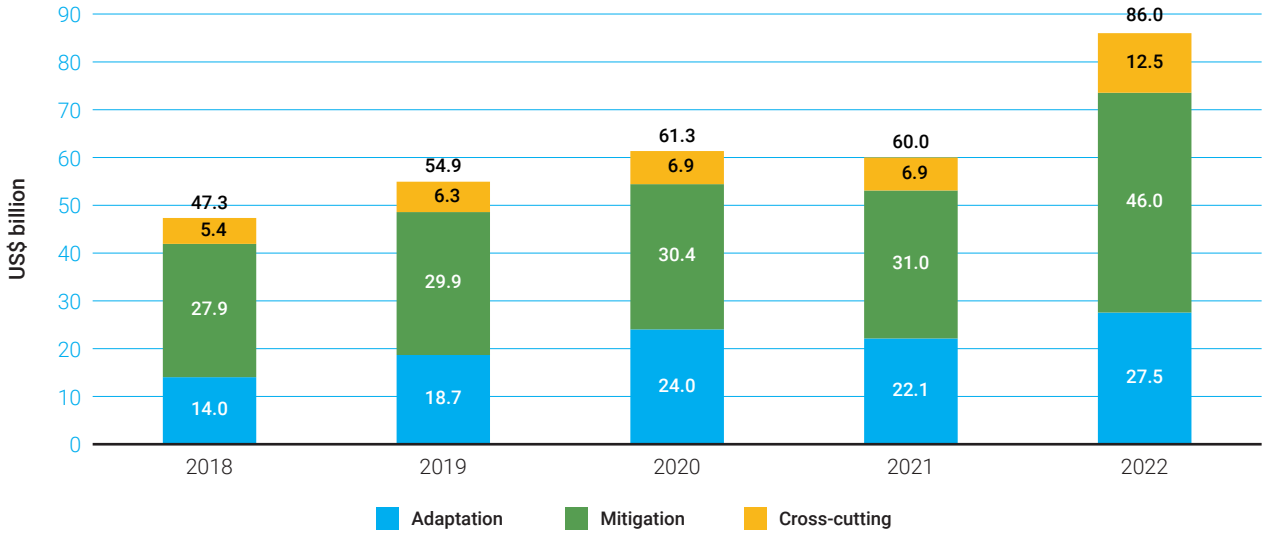
International public finance from developed to developing countries is not the only source of climate finance, as climate action is also financed through public domestic and private financial flows, as well as other financial instruments (e.g. guarantees). However, data are only consistently collected for commitments from multilateral organizations and bilateral finance providers (UNEP 2023b). In contrast, only 2 per cent of tracked adaptation finance during 2021–2022 came from private providers (Global Center on Adaptation and Climate Policy Initiative 2024). While public domestic expenditures have been assessed in some countries, these use diverse methodologies and varied definitions of adaptation, making data analysis challenging (UNFCCC 2022b).

4.4.1 Total international public climate finance for developing countries

The mobilized climate finance commitments (public and private) towards developing countries reached the US$100 billion per year goal in 2022 for the first time, according to the best optimistic accounts (Mitchell and Wickstead 2024; Organisation for Economic Co-operation and Development [OECD] 2024). Considering only bilateral and multilateral commitment flows from Annex II to non-Annex I Parties to the UNFCCC (see providers and recipients included in annex 4.B), 2022 reached a historical high of US$86 billion (constant 2022 prices), driven mainly by a 49 per cent increase in the commitments to mitigation (figure 4.1). Whereas annual variations are influenced by individual projects and changes in accounting methodologies, the increase in 2022 is significant also for adaptation and cross-cutting commitments, which increased by 24 per cent and 80 per cent, respectively.

Over the period from 2018 to 2022, (overall) adaptation finance increased. This is in line with the greater prominence of adaptation in the UNFCCC negotiations (Barrett 2022), expanded screening for climate objectives within official development assistance (ODA) flows (Ritchie 2024) and the increased use of loans for adaptation (UNEP 2023b; Weikmans 2023). However – and despite the acknowledged urgency of adaptation – international public finance continued to prioritize mitigation, at 53 per cent of flows (average over 2018–2022), with adaptation at 34 per cent and cross-cutting activities at 13 per cent. Climate finance is more balanced for specific country groups, with 54 per cent of LDCs' climate finance focused on adaptation. Meanwhile, 53 per cent of SIDS' climate finance and 47 per cent of African States' climate finance is focused on adaptation.

Figure 4.1 Climate finance commitments from Annex II to non-Annex I countries per year for the period 2018–2022 (US$ billions, constant 2022 prices)

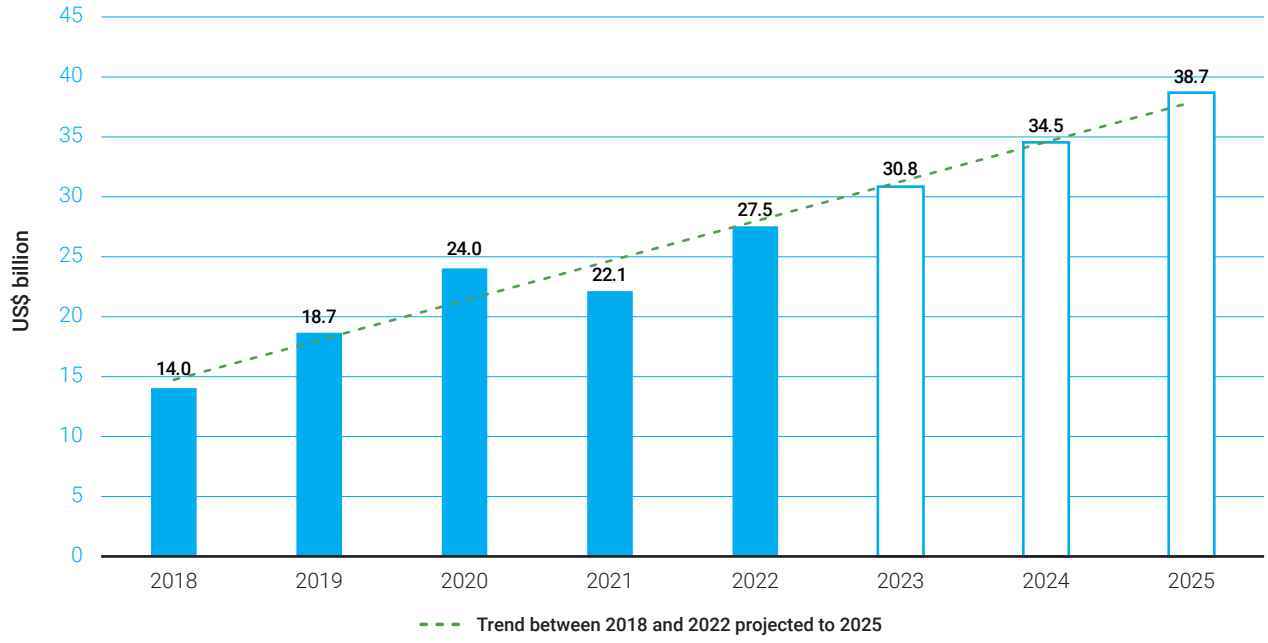


Note: Small errors in some totals are due to rounding of numbers.

4.4.2 International public adaptation finance commitments over time and by finance provider

International public adaptation finance, which excludes cross-cutting flows, grew at an average annual rate of 20 per cent from 2018 to 2022, reaching a historical high of US$27.5 billion in 2022 (in constant 2022 prices), thus reversing the 2020 to 2021 decline reported in the AGR 2023. This increase is aligned with the Glasgow Climate Pact's goal[9] to double the 2019 level of adaptation finance by 2025. However, a future annual increase of at least 12 per cent is still needed to meet the Glasgow Climate Pact's goal (figure 4.2).

Figure 4.2 International public adaptation finance commitments from Annex II to non-Annex I countries per year for the period 2018–2022 and annual increase required to reach the Glasgow Climate Pact's goal (US$ billions, constant 2022 prices)



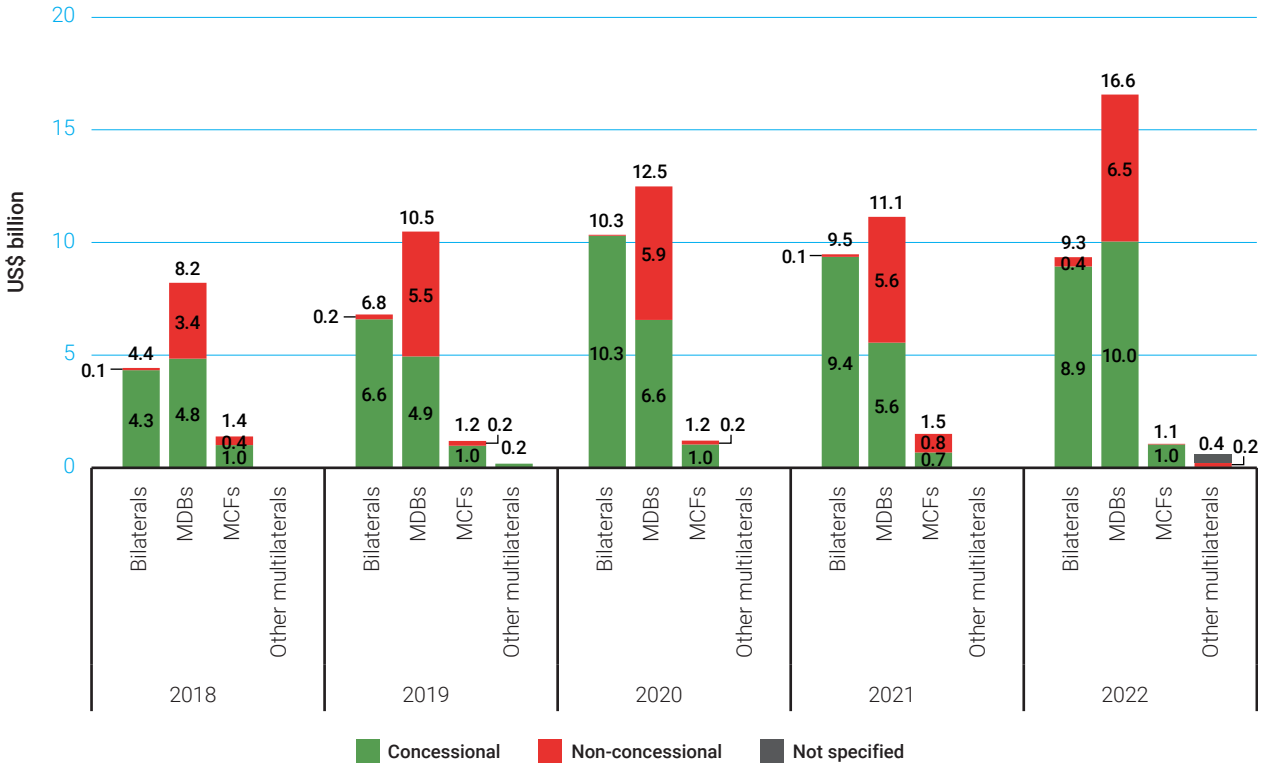
Note: White columns show annual increase required to achieve the Glasgow Climate Pact's goal of doubling 2019 adaptation levels by 2025.

9 In the Glasgow Climate Pact (FCCC/PA/CMA/2021/10/Add.3), paragraph 18 of Decision 1/CMA.3 "urges developed country Parties to at least double their collective provision of climate finance for adaptation to developing country Parties from 2019 levels by 2025". We note that this is not a formal goal, but we use this term here to refer to the doubling of adaptation finance.

In absolute (total US$) terms, international public adaptation finance has been allocated mainly to middle-income countries, especially lower-middle-income ones. The total (US$) flows to SIDS were low, reflecting the number and size of these countries, but SIDS received the highest average per capita allocations at US$51. Similarly, the per capita flows to LDCs were higher, at US$11 per capita, compared with US$7 per capita for middle-income countries (excluding SIDS). This indicates that the Paris Agreement's subtle differentiation of responsibilities and capabilities towards LDCs and SIDS (see Pauw, Mbeva and Asselt 2019) is working in the context of adaptation.

Multilateral development banks (MDBs) were the largest provider of adaptation finance over the 2018–2022 period, with a steep increase of 52 per cent from 2021 to 2022. Bilaterals provided 38 per cent on average over the same period (figure 4.3). The finance from multilateral climate funds decreased by 29 per cent in 2022 compared to the previous year. This is explained by the reduced number of adaptation projects (three) approved in 2022 by the Green Climate Fund (Watson *et al.* 2023). 2022 was also the first year that MDBs approved more concessional financing than bilateral providers. On average, 98 per cent of bilateral contributions were concessional, while MDBs' concessional finance reached 53 per cent. MDBs are the main providers of non-concessional adaptation finance, which represents 44 per cent of their portfolio. Non-concessional finance by MDBs still offers better terms than the market, including preferential service payment and repayment conditions (OECD 2024).

Figure 4.3 International public adaptation finance commitments from Annex II to non-Annex I countries by finance provider type over time and disaggregated by concessional and non-concessional finance



Note: MDBs = multilateral development banks. MCFs = multilateral climate funds. The "Other multilaterals" category includes four providers reporting to the OECD Common Reporting Standard (CRS) that are multilateral organizations, but not a development bank or a climate fund. For a list of providers, see annex 4.B.

4.4.3 International public adaptation finance commitments per instrument

International public adaptation finance is supplied using diverse instruments, including grants, concessional and non-concessional loans, equity (concessional and non-concessional), and mezzanine finance.[10] The use of innovative instruments in adaptation – including insurance, bonds, and results-based financing – has been encouraged, in order to mobilize private finance for adaptation (NAP Global Network undated). However, the lion's share of

10 Mezzanine finance instruments include senior subordinated debt, convertible to equity debt and preferred stock. These do not require readily marketable collateral, and they have higher interest rates than traditional loans.

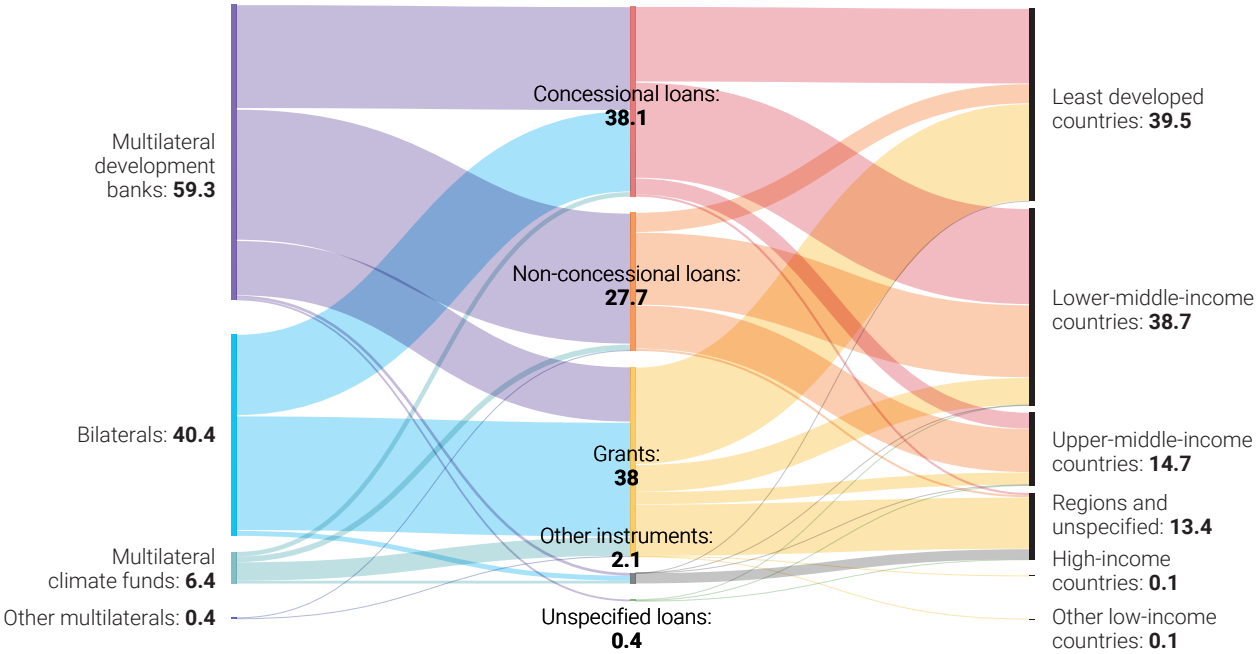
adaptation finance is still provided through standard loans (both concessional and non-concessional) and standard grants, representing 62 per cent and 36 per cent on average per year, respectively. The increasing predominance of loans in adaptation finance has been questioned, as debt service will be high for low-income and several lower-middle-income countries through 2024 and 2025 (United Nations, Inter-agency Task Force on Financing for Development 2024), which is expected to exacerbate the already-high vulnerabilities to climate change in these contexts (United Nations Conference on Trade and Development 2023).

Figure 4.4 shows providers, instruments and recipient country groups for international public adaptation finance to non-Annex I countries for the period 2018–2022. **LDCs** received their adaptation finance mainly through concessional instruments; mostly grants (51 per cent) and concessional loans (38 per cent). The remaining 10 per cent was allocated through non-concessional loans. **Lower-middle-income countries** obtained most of their international public adaptation finance through loans, both concessional (47 per cent) and non-concessional (39 per cent). In **upper-middle-income countries**, most adaptation finance (64 per cent) was provided through non-concessional instruments.

International public adaptation finance in **SIDS** was provided mainly through grants (64 per cent), though loans are still an important source (37 per cent). Non-concessional adaptation finance in SIDS averaged 14 per cent per year during 2018–2022. This share of non-concessional finance can be explained partially by the ineligibility of countries with high gross national income per capita (several of which are SIDS) to access concessional financing through MDBs; this is a significant barrier to affordable adaptation finance for SIDS (United Nations Office for Project Services 2024). However, non-concessional finance for adaptation was also allocated to low-income SIDS (e.g. Timor-Leste) during the period and may increase in future years for SIDS, as up to 12 States are expected to graduate from ODA eligibility by 2030 (Piemonte 2024).

In **African States**, debt instruments (standard loans) were the most common instrument for adaptation finance (57 per cent). This share has been increasing (53 per cent on average for 2017–2021) and is important given the rapid growth of external debt in Africa, which has increased faster than GDP since 2010 (United Nations Conference on Trade and Development 2024). Concessional terms dominated (69 per cent of debt instruments), while non-concessional loans were mainly used to provide finance to middle-income countries in the region. However, LDCs within Africa have also received non-concessional debt for adaptation.

Figure 4.4 Total adaptation finance commitments by finance provider type, financial instrument and recipient countries' World Bank income group, 2018–2022 (US$ billions, constant 2022 prices)



Note: Flow colours change from the second node (financial instruments) to the third (recipient country groups), indicating that it is only possible to follow the flows from the first node to the second, and from the second to the third node.

4.5 The adaptation finance gap

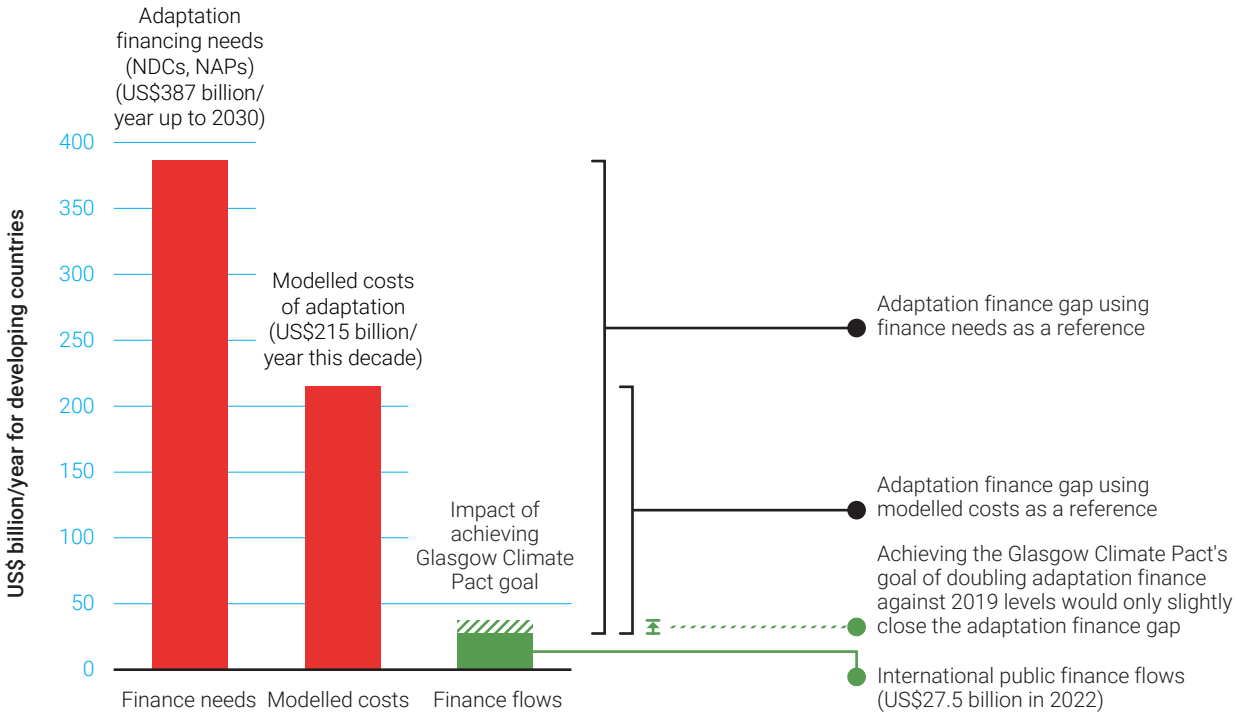
The evidence lines have been combined to provide a revised estimate of the adaptation finance gap: this is relevant for discussion on the new collective quantified goal for climate finance.

4.5.1 The global adaptation finance gap for developing countries

The AGR 2023 estimated the plausible central range for the adaptation costs and financing needs at US$215 billion/year to US$387 billion/year for developing countries this decade[11] (in 2021 prices, see sections 4.2 and 4.3). This equates to 0.6 per cent to 1.0 per cent of GDP (for all developing countries, 2021).[12] These costs/needs are a similar order of magnitude to current total ODA, which was US$224 billion in 2023 (OECD 2024). Based on the latest year of available data (United Nations Conference on Trade and Development 2024), debt interest payments of developing countries (excluding China) were 2.4 per cent of GDP: this is larger than the estimated adaptation finance needs.

These adaptation cost/finance needs can be compared with the updated international public adaptation finance flows to developing countries (section 4.4), which were US$27.5 billion/year in 2022. Therefore, while international public finance flows have increased, a very large adaptation finance gap still exists, as shown in figure 4.5 (noting that the exact adaptation finance gap is determined by the years compared,[13] and that the gap estimate only includes international public adaptation finance flows as there are insufficient data on finance flows from domestic public and private sector sources). A large adaptation finance gap will mean higher losses and damages for developing countries, but will also impact on developed countries through international and transboundary risk cascades (Anisimov and Magnan 2023).

Figure 4.5 Comparison of adaptation financing needs, modelled costs and international public adaptation finance flows in developing countries



Note: Values for needs and flows are for this decade (2021 prices), while international public finance flows are for 2022 (2022 prices). Domestic and private finance flows are excluded.

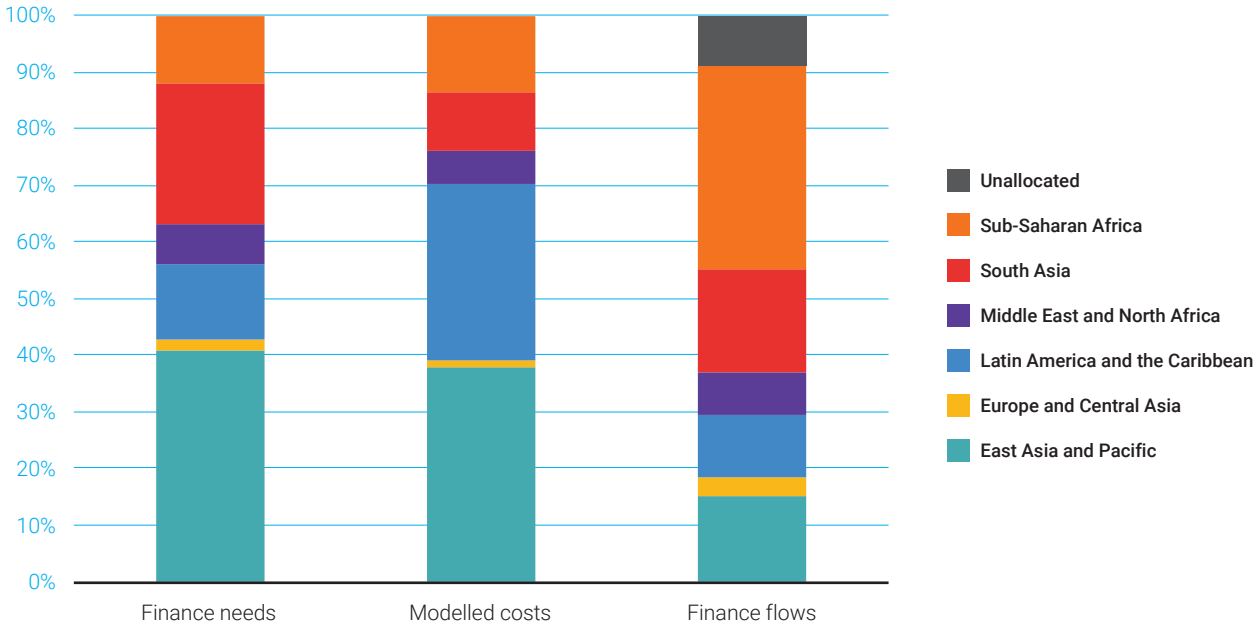
A comparison of the modelled costs, finance needs and finance flows reveals additional insights. The first comparison is shown by region in figure 4.6. The highest adaptation finance needs (extrapolated) are for East Asia and the Pacific, and for South Asia, while the highest modelled costs are for East 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 the estimated adaptation finance needs or costs). Full values are presented in annex 4.A.

11 Equivalent to US$231 billion/year to US$416 billion/year in 2022 prices.

12 Note that in general, modelled adaptation costs are lower than financial needs, but for some sectors and countries, the opposite is true. A detailed analysis of this issue was presented in the AGR 2023.

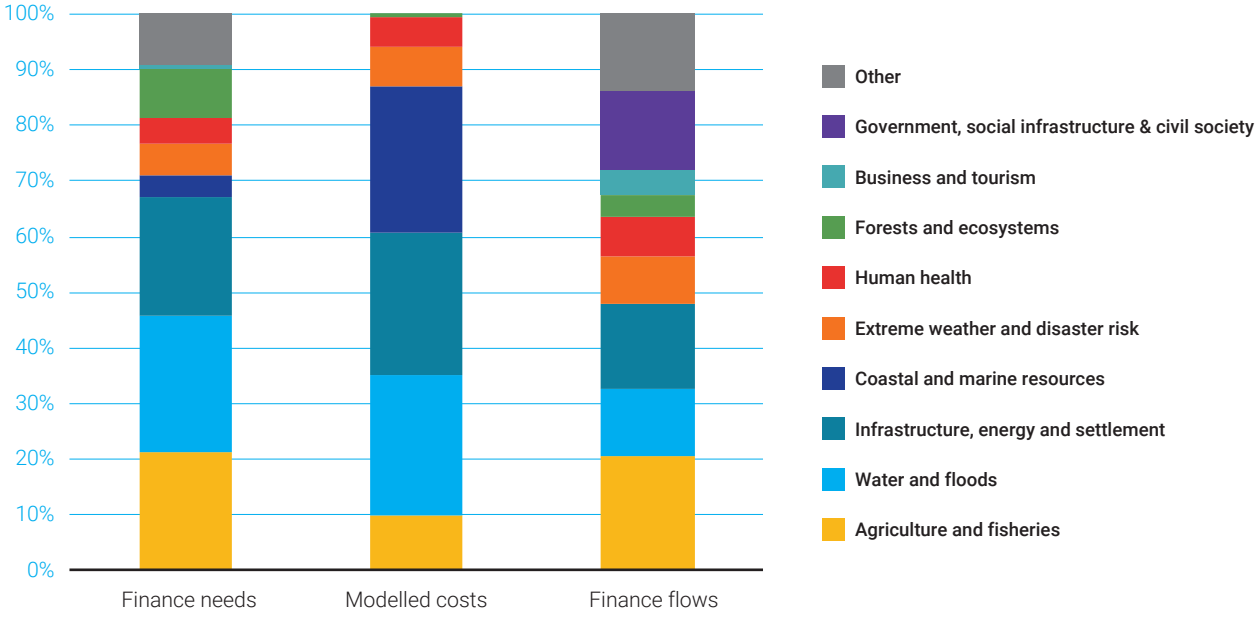
13 The gap is US$187 billion/year to US$359 billion/year when comparing 2021 cost/needs with 2022 flows but US$203 billion/year to US$388 billion/year when cost/needs and flows are compared in consistent 2022 prices.

Figure 4.6 Comparison of adaptation finance needs (extrapolated), modelled costs of adaptation (annual to 2030), and international public adaptation finance flows (2018–2022 average) for developing countries by region



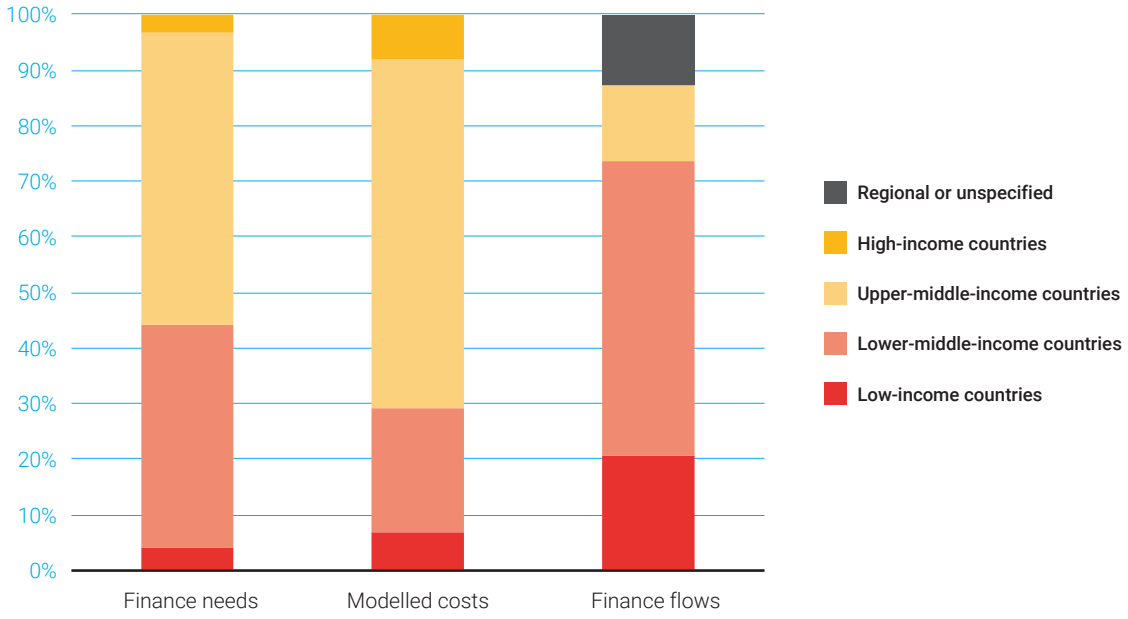
It is more challenging to compare results by sector, as there is not always a direct equivalence in sector categorization, and because a relatively small number of costed NDCs and NAPs include a sectoral breakdown. Nevertheless, as figure 4.7 shows, the highest financial needs are identified for agriculture, water and infrastructure. These are also three of the largest areas of adaptation finance flows (though flows in US$ terms are much lower than needs). The modelled costs also identify water and infrastructure as high sectoral priorities, and have a high proportion for coastal protection, but have a lower estimated proportion for agriculture. It is more difficult to compare other sectors, but we note that forests and ecosystems account for an important share of finance needs, health is an important proportion of modelled costs, and government, social sectors and capacity-building (including local adaptation) account for an important share of financial flows. As noted above, the modelled costs and finance needs exclude a number of private sector adaptation needs (including private infrastructure, cooling and labour productivity).

Figure 4.7 Comparison of adaptation finance needs (extrapolated) and modelled costs of adaptation (annual to 2030) and international public adaptation finance flows (2018–2022 average) for developing countries by sector



Note: Absolute US$ levels are different.

Figure 4.8 Comparison of adaptation finance needs (extrapolated), modelled costs of adaptation (annual to 2030), and international public adaptation finance flows (2018–2022 average) for developing countries by country income level



4.5.2 The adaptation finance gap for highly vulnerable countries

It is also useful to compare the gap in terms of country income level. This is presented in figure 4.8, which shows that a higher relative proportion of finance is flowing to low-income and lower-middle-income countries.

Complementing this, it is also useful to capture the special needs of highly vulnerable country groups (LDCs and SIDS), as recognized in the UNFCCC process and the Paris Agreement.

- The **modelled costs** of adaptation are estimated at US$5.1 billion/year for SIDS, US$26.6 billion/year for LDCs (noting that some SIDS are also LDCs) and US$36.3 billion/year for Africa (2022 prices) (noting that many African countries are LDCs and some are SIDS).
- The estimated adaptation **finance needs** (extrapolated from NDCs and NAPs) are estimated at US$4.8 billion per year for SIDS, US$40 billion/year for LDCs and US$61 billion/year for Africa (2022 prices).
- The international public adaptation **finance flows** to these groupings reached US$1.4 billion/year for SIDS, US$11.0 billion/year for LDCs and US$13 billion/year for Africa in 2022.

This shows that the annual adaptation costs/needs for SIDS and LDCs alone are broadly equivalent to total current international public adaptation finance flows for all developing countries. However, more positively, international public adaptation finance is prioritizing vulnerable countries. In turn, this means these vulnerable countries have a lower adaptation finance gap than developing countries overall. Current finance flows are equivalent to between 21 per cent and 36 per cent of the estimated finance needs/adaptation costs for Africa, between 27 per cent and 41 per cent for LDCs, and between 27 per cent and 28 per cent for SIDS, as compared to between 7 per cent and 12 per cent of estimated finance needs/adaptation costs for all developing countries. However, it is important to note that the relative adaptation finance needs and modelled costs, as compared to the size of their economies, are significantly higher in these vulnerable countries. This underscores the critical role of continued international public finance in bridging the gap in these countries. An additional discussion of mountainous developing countries is included in box 4.1.

Box 4.1 Mountainous developing countries

Mountainous developing countries (MDCs) are characterized by the high vulnerability to climate change that affects not only their populations and natural systems, but also a much larger downstream population that depends on the ecosystem services (such as water) that they provide (Adler *et al.* 2022). Critically, these mountain regions are experiencing higher warmer trends (than the global average); this amplifies impacts and thus makes adaptation needs more urgent (Pepin *et al.* 2015).

They are already experiencing reductions in snow cover, retreat of glacier mass, increases in the number and size of glacier lakes, and increased permafrost thaw (Adler *et al.* 2022). Adaptation in mountain regions faces additional barriers due to geographic complexity, poor infrastructure and limited accessibility. As a result, these regions are receiving increased attention in international negotiations; for example, the United Nations General Assembly in 2022 declared 2025 as the International Year of Glaciers' Preservation.

The AGR 2024 has assessed the adaptation finance gap for the MDCs grouping, which includes 55 of the 67 countries in the United Nations Mountain Partnership.[14] The adaptation finance needs for MDCs are estimated at US$187 billion per year (2021 prices), equivalent to 1.3 per cent of their GDP, while the estimated modelled costs of adaptation are estimated at US$92 billion/year (2021 prices). These can be compared with the international public finance flow to MDCs, which was only US$13.8 billion in 2022, indicating a significant adaptation finance gap.

An analysis of the sectoral breakdown of adaptation finance needs (in NDCs and NAPs) indicates high needs for the infrastructure and buildings sector (14 per cent), followed by agriculture and food (12 per cent), health and sanitation (8 per cent), water supply (7 per cent), energy (6 per cent), forestry, ecosystem and biodiversity (6 per cent), disasters (4 per cent) and others (6 per cent). Notably, 37 per cent of their adaptation finance needs are cross-cutting, including climate services, research, capacity-building, and technology development and transfer. The flow of international finance to MDCs has focused on agriculture, forestry and fishing (18 per cent), water supply and sanitation (17 per cent), transport and storage (12 per cent) and disaster management (8 per cent), indicating that finance is broadly matched to needs, though with less attention on infrastructure and buildings.

4.6 Bridging the adaptation finance gap

As set out in section 4.4, adaptation finance flows remain low and are dominated by the public sector, meaning there is a large adaptation finance gap (section 4.5). The AGR 2023 looked at how to bridge this gap, and there are a growing number of initiatives and publications in this area (e.g. Druce *et al.* 2016; Bisaro and Hinkel 2018; Mortimer, Whelan and Lee 2020; United Nations Environment Programme Finance Initiative 2019; Chau *et al.* 2023; OECD 2023).

The AGR 2024 builds upon this evidence base, and uses the AGR data, as well as new analysis, to address a set of key questions:

- What types of adaptation are we trying to finance?
- What are the public and private financing opportunities for adaptation?
- What are the sources and instruments for financing adaptation?
- What are the enabling factors for adaptation finance?
- Who pays for adaptation and how can we encourage equitable and socially inclusive financing?

14 A voluntary alliance of partners dedicated to improving the lives of mountain communities and protecting mountain environments worldwide. See https://www.fao.org/mountain-partnership/members/en/.

4.6.1 What types of adaptation are we trying to finance?

Adaptation is often thought of as a process that requires capacity-building, planning and delivery of multiple types of activities (often in portfolios), implemented iteratively over time. This is very different to climate change (greenhouse gas [GHG]) mitigation, which is typically centred on a set of technical options to reduce GHG emissions cost-effectively (primarily in market sectors), and which is measured using a common metric of emission reduction in tonnes of carbon dioxide equivalent (tCO_2e) and $\$/tCO_2e$.

It is therefore useful to identify the types of adaptation that are in the finance gap, and that require financing.[15] The AGR 2024 has developed an adaptation finance typology to address this question (presented in figure 4.9). This starts at the top (in blue) with the general types of adaptation, building from the typology of Burton (2009) and its categorization of intent (autonomous or planned) and timing (reactive to the changing climate being experienced or in anticipation of future changes). This is expanded to consider incremental and transformational action (Intergovernmental Panel on Climate Change [IPCC] 2022), project-based versus strategic or systemic approaches (including multi-hazard risks) (Watkiss, Wilby and Rodgers 2020; European Investment Bank 2022) and different forms of adaptation (Watkiss and Betts 2021).

While figure 4.9 is a generalization, these characteristics influence (left to right) when the benefits of adaptation arise (now versus in the future), an increasing level of uncertainty around benefits, and increasing complexity of analysis and action. It is therefore easier to finance activities on the left, because benefits arise earlier, are more certain and involve simpler actions. Conversely, it is more difficult to finance anticipatory and transformational adaptation on the right. We note that adaptive management or adaptation pathway approaches usually combine these actions e.g. starting with no-regret actions as part of a planned scale-up over time, alongside early anticipatory action to reduce future lock-in and to enhance future learning.

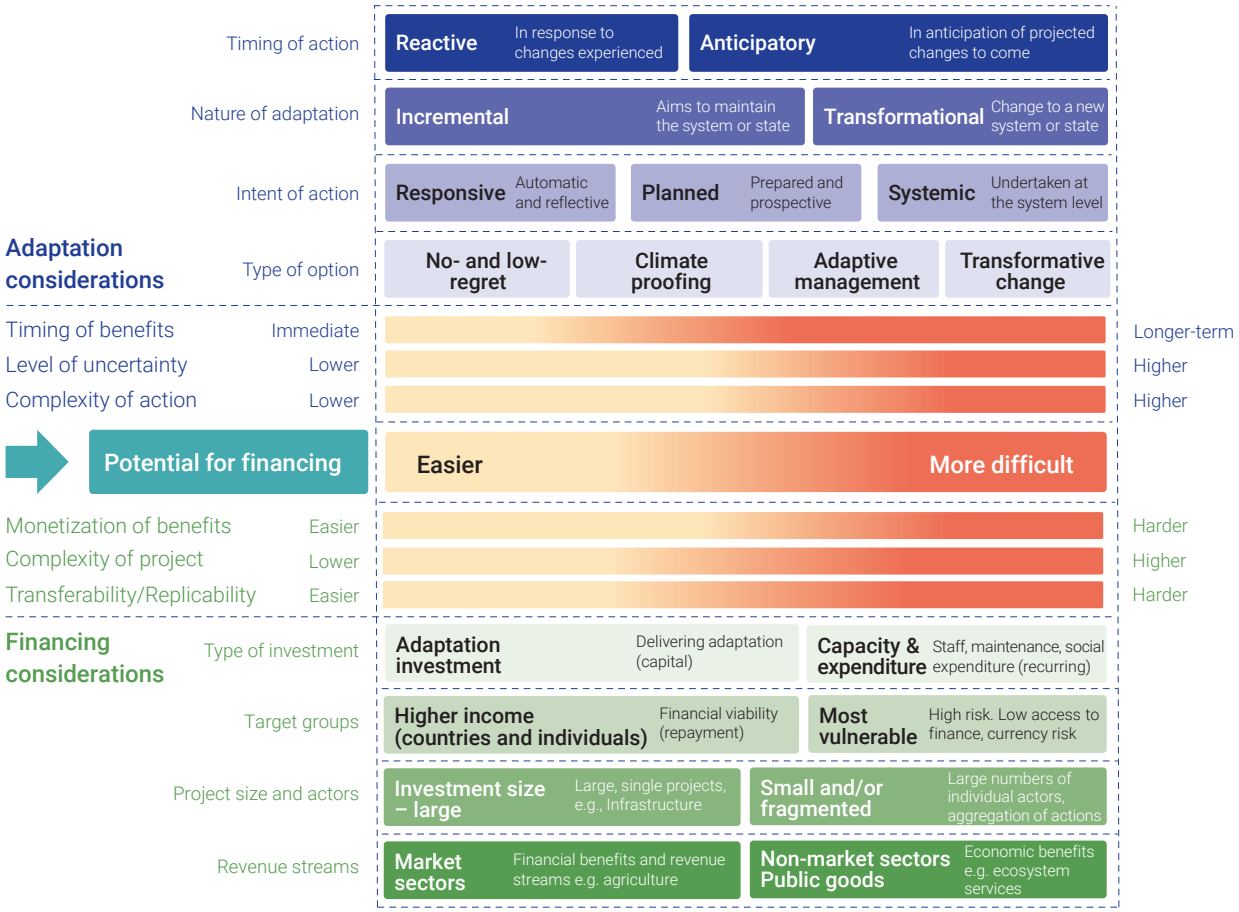
Complementing this is a separate analysis of the financing characteristics of adaptation (bottom, in green). The challenges to financing adaptation are often framed around a set of barriers (United Nations Environment Programme Finance Initiative 2019; Frontier Economics and Paul Watkiss Associates 2022), including market failures such as information failures and asymmetries, positive externalities and imperfect financial markets (Pauw *et al.* 2022), as well as wider bankability challenges, including policy, regulatory and governance barriers.

However, a key issue for financing is whether adaptation generates revenue streams (positive revenue generation or cost savings) or if the co-benefits of adaptation can be monetized (Climate Change Committee 2023). It is easier to finance activities in market sectors (left) where there is the potential to generate revenue streams, rather than non-market sectors / for public goods (right). Financing is simpler for large projects, especially capital investments (left), and more challenging for small and fragmented projects (right), especially if there a large number of individual actors, or if it involves recurring costs or social expenditure.

The key issue is that for both the top and bottom of the figure, it becomes more difficult to finance adaptation as one moves from left to right. It is generally easier to finance no-regret, reactive and incremental adaptation (top left) and adaptation in market sectors (bottom left). Conversely, it is more challenging to finance anticipatory and transformational adaptation (top right) and non-market sectors, especially for the most vulnerable (bottom right). This applies to all financing (including domestic public and public financial institutions), but it is especially true for private sector financing.

15 'Funding' is sometimes defined as money (especially grants) that is provided by government/the public sector, while 'finance' is often defined as capital raised from financial institutions or other lenders (such as debt) which requires repayment. In this section of the gap report, we use 'finance' as a term to cover all flows.

Figure 4.9 Adaptation types and ease of financing



Source: Watkiss (2024).
Note: The figure addresses adaptation primarily from a financing perspective, not an economic (public or societal) perspective. The figure is a generalization – see text for full description and caveats. Note that the adaptation considerations at the top should be viewed separately from the financing considerations at the bottom.

However, to meet the scale of the climate change challenge, adaptation financing needs to shift from the historic focus on the top left (reactive, incremental, etc.) towards the centre and right to support more anticipatory, strategic and even transformational adaptation. This requires more action in areas that are harder to finance and more complex to develop, which also means government actors have an important role. To put this more starkly, adaptation involves very different issues to mitigation, and focusing adaptation financing on technical no-regret options[16] alone will fail.

Similarly, looking at the financing considerations (bottom), it is also clear that focusing on the easier-to-finance areas only, such as market sectors and larger capital investment, will not deliver most countries' adaptation priorities.

It should be noted that the figure is primarily focused on the financing of adaptation and not the economic benefits (public or societal) of adaptation. Adaptation investments that are justified from an economic perspective are often not made because financing returns are unsuitable (see box 4.2).

16 Adaptation that generates net-positive social (economic) benefits under the current climate as well as a range of future climate change scenarios.

Box 4.2 Adaptation return on investment

Adaptation has economic benefits because it reduces the risks of climate change, but naturally it has costs associated with planning and implementation. Assessing these costs and benefits is key to building the case for adaptation, and for assessing alternatives, but such analysis is challenging (see AFG Update 2023 [UNEP 2023b]). This is because adaptation is a response to site and context-specific risks (determined by hazard, vulnerability and exposure) that change dynamically over time and involve high uncertainty (and multiple metrics), which in turn affect the level of adaptation needed and the level and timing of its benefits.

Nonetheless, there is growing evidence that adaptation can deliver net-positive economic (societal) benefits. This comes from two complementary areas. First, impact assessments of future climate change identify that adaptation is net-beneficial, with positive net present values or benefit-to-cost ratios (BCRs) e.g. as identified in modelling studies on coastal protection (Hinkel *et al.* 2018) and river flood protection (Ward *et al.* 2017). Second, economic assessments of short-term options or projects identify that many (though not all) options deliver BCRs typically above 2:1 and often as high as 10:1 (OECD 2015; Global Commission on Adaptation 2019; Global Center on Adaptation 2021a; Climate Change Committee 2021). These also identify that in some cases, adaptation can generate cost savings. For example, water efficiency can reduce costs and increase resilience to water scarcity, and drip irrigation can generate positive financial returns (though only some options deliver positive benefits, not just avoided losses, and these options alone cannot address all risks of climate change).

There is also some evidence that private firms can benefit from investing in adaptation that is in their self-interest (e.g. to protect their assets or supply chains), and in emerging adaptation goods and services, which may offer new business opportunities. However, in line with the discussion on figure 4.9, simple economic metrics such as BCRs or returns on investment – on their own – should not be used to prioritize adaptation, as this is likely to focus only on existing development options and no-regret reactive adaptation (those areas at the top left), and will deprioritize planned adaptation and adaptive management or pathway approaches. These metrics will also tend to focus on technical options, which are easier to undertake economic analysis on, and to underinvest in capacity-building and soft options, which are often more difficult to quantify. Further, these metrics will gravitate towards options that focus on market sectors, and will not give sufficient weight to the most vulnerable.

Finally, there is almost always a difference between the economic (societal) and the financial (private) return on investment for adaptation. There is often a strong economic case, due to the high potential to improve social welfare or societal well-being. However, from an investor perspective, there is often a lower financial case, as adaptation often does not generate positive cash flows or revenues. This does not mean that adaptation is not a priority, but it does require new narratives, as have been advanced for value creation (e.g. Mazzucato *et al.* 2019).

4.6.2 What are the public and private financing opportunities for adaptation?

The second question that is investigated is around the opportunities for bridging the adaptation finance gap, and the potential for the public and the private sector. The AGR 2024 has taken the modelled adaptation costs and finance needs above, and their sectoral composition (see figure 4.7) and supporting detail, and investigated their suitability for public and private investment.

While indicative, this indicates that for the modelled adaptation costs (estimated at US$231 billion/year, 2022 prices), 71 per cent of these costs (US$164 billion/year) are associated with activities that are typically financed by the public sector, because they have public-good characteristics or are in social or non-market sectors (e.g. coastal and river flood protection, public infrastructure, social protection, disaster risk management, health, ecosystem protection).

Similarly for the adaptation finance needs (extrapolated from NDCs and NAPs, estimated at US$415 billion/year), 67 per cent of these needs (US$280 billion/year) are associated with activities that are typically financed by the public sector.

The conclusion of this analysis is that slightly **more than two thirds of the adaptation finance gap is in areas typically financed by the public sector** (whether international or domestic sources). This means that without more public finance (international and domestic) – or innovative approaches to financing – it will be difficult to deliver most countries' adaptation priorities (as set out in NDCs and NAPs). It also means we must be realistic about the potential of the private sector.

Nevertheless, this does also mean that slightly less than one third of modelled costs and finance needs (US$67 billion/

year to US$135 billion/year) are in areas that have some potential for private financing. The majority of these are in agriculture,[17] though it also includes some infrastructure. Moreover, there will be additional potential for private sector financing of adaptation, as both the modelled costs and finance needs underestimate private sector adaptation (see sections 4.2 and 4.3).

4.6.3 What are the sources and instruments for financing adaptation?

The different **sources** of finance – including international public, domestic public, private, philanthropic, non-governmental organizations (NGOs) and voluntary and community organizations – have varying potential for financing different types of adaptation. There are greater opportunities for private businesses and private financial institutions in market sectors, and where adaptation goods and services generate financial returns. However, even in these cases, there is often a need for the public sector to use public finance to de-risk and unlock private investment (blended finance). There are also a range of different financial **instruments** as set out in section 4.4 (e.g. grants, concessionary loans, equity, guarantees) that can be used for adaptation. These also have differing potential for the types of adaptation highlighted above. For example, loans have more potential for large infrastructure investments, while grants are likely to be more relevant for non-market sectors as well as for catalysing transformational adaptation.

The AGR 2024 has reviewed the potential sources and instruments for adaptation (presented in annex 4.C). As the range of sources (and respective actors) working on adaptation becomes broader, strategically tailoring and targeting sources and instruments to the types of adaptation and context of projects is becoming increasingly important. This is being advanced by several initiatives and by the development of bespoke financing strategies and business models (e.g. Stoll *et al.* 2021; Wise *et al.* 2022; American Society of Adaptation Professionals undated; Gouett, Murphy and Parry 2023). These approaches also tend to be more inclusive – involving more stakeholders who stand to benefit, or may benefit, to increase the benefits and co-benefits available, and structuring financial models in a way that aligns risk ownership and/or adaptation costs with adaptation benefits and co-benefits (England *et al.* 2023; NAP Global Network undated; Global Center on Adaptation 2021; Wise *et al.* 2022).

However, the traditional set of financial instruments is unlikely to be enough to scale up adaptation. Therefore, **new and innovative approaches and financial instruments are needed**, and are being developed for adaptation. The AGR 2024 has explored these to see how they might help bridge the adaptation finance gap. Some of the promising approaches and instruments are summarized in box 4.3. While these have potential, they can be challenging to develop, as they are more complex and require more capacity than traditional instruments. They are often specific, and require local and site/context information, which can hamper replicability and aggregation, alongside the common challenges of quantifying adaptation effectiveness and outcomes. This suggests that they will be most applicable for specific cases, particularly when traditional sources and instruments will not work.

Box 4.3 Innovative approaches and financial instruments for adaptation

A number of new approaches and financial instruments are emerging that seek to address some of the challenges to adaptation, for example, by better defining adaptation outcomes or creating incentives for adaptation investment. These include:

- **Timing of risk finance**. There are climate- and weather-linked instruments that can correlate impacts to payments, and adapt disaster risk reduction processes to address more frequent and extreme weather events to speed up recovery. There are also contingency financing instruments, which provide pre-agreed lines of credit that become available when an extreme weather event or disaster strikes.
- **Insurance-linked instruments.** Insurance premiums (for households or city infrastructure) can be reduced to reflect investments in adaptation and resilience, or insurance payouts can be increased to cover investments in resilience (Global Innovation Lab for Climate Finance 2022). There are also innovative insurance instruments, such as the parametric insurance scheme for Mexico's Quintana Roo reef, which uses a trust fund for reef restoration (following a specified tropical cyclone event), with a portion of premiums covered through local taxes from the hospitality district, which is situated behind the reef, and thus protected by it.

17 Note that significant flows of international public finance flows are still going to financing adaptation in the agriculture sector (ca. 20 per cent). This suggests that scaling up adaptation in this area is still likely to require significant public finance.

- **Performance-based climate resilience grants.** These are a form of intergovernmental transfer which provide a financial top-up to cover the additional costs of making investments climate resilient and can be channelled through existing fiscal transfer systems. Future finance payments depend on the delivery of adaptation actions (hence 'performance-based').
- **Resilience credits.** These initiatives aim to develop and operationalize resilience credits, for use within existing financial instruments, to reward investment in adaptation and resilience. These could (in theory) generate a new asset class for investors to trade and exchange (Al-Mashat *et al.* 2024).
- **Debt-for-adaptation swaps.** This concept is similar to debt-for-nature swaps; countries with high levels of sovereign debt could have this forgiven in return for investments in adaptation (Hebbale and Urpelainen 2023).
- **Payments for ecosystem services (PES).** These approaches look to set up arrangements between buyers and sellers of environmental goods and services, and could be relevant for adaptation.
- **Work for taxes.** Pilot schemes in Peru and Cambodia have explored the use of private companies to undertake public works (e.g. construction and maintenance of infrastructure) in lieu of taxes (NAP Global Network undated). Such approaches could help deliver adaptation.
- **Resilience bonds.** These were originally a form of catastrophe bonds, but with insurance premiums linked to resilience projects to monetize avoided losses through a rebate structure (Coalition for Private Investment in Conservation 2019). A broader set of resilience bonds has now also emerged, similar to green bonds, but with investments directed towards adaptation.

There are also a range of new funds and facilities that seek to blend public and private sector finance, for example, the Catalytic Climate Finance Facility,[18] the Landscape Resilience Fund[19] and CRAFT.[20] These support investment in companies providing goods and services for adaptation, as well as direct adaptation (alongside mitigation and other development objectives). They still require public-sector finance and, to date, only a small proportion of climate-blended finance deals have a purely adaptation focus (Convergence 2023). These funds are important catalysts for adaptation technology and can provide a model for adaptation finance instruments, but to date they are small, and their potential to mobilize finance at scale is unclear.

This leads to a key finding of the AGR 2024, which is that while private sector flows will increase for adaptation, the amount of (concessionary) public finance will also need to increase to de-risk and catalyse this private investment. This also means that there will be competing pressures on the available concessionary public finance. This public finance will be important in delivering more anticipatory and transformational adaptation (see section 4.6.1) in areas that are typically financed with public investment (see section 4.6.2), as well as for de-risking private investment. This means that, critically, there is a need to use the available international public concessionary finance more strategically. In other words, targeting 'low-hanging fruit' – whether this is the use of public finance for direct grants or to support private adaptation options that are already financially viable – is unlikely to deliver the scale and breadth of adaptation needed.

4.6.4 What are the enabling factors for enhancing adaptation finance?

Given the barriers to adaptation, there is a need for enabling factors (World Bank 2021) to help bridge the adaptation finance gap, for both the public and private sectors. The capacity-building and technology transfer and cooperation chapter (chapter 5) identifies six general enabling factors for adaptation (NAP Global Network undated): leadership; institutional arrangements; engagement; data, knowledge and communications; educational and capacity-building infrastructure; as well as finance. Brullo *et al.* (2024) also identify important enabling factors, notably awareness of climate risks and responses, leadership, bridging and bonding social capital, and the support of higher-level institutions. A key question, however, is which additional enabling factors and enabling conditions are key for enhancing investment and mobilizing adaptation finance. The AGR 2024 has investigated this issue and sets out promising areas below. More details are presented in annex 4.D.

National funds and financing facilities. Several countries have set up national adaptation funds or financing facilities (see UNFCCC 2022b) to help mobilize public adaptation finance more strategically and at scale. These initiatives have been nationally driven but supported by capacity-building

18 See www.ccfacility.org/.
19 See https://landscaperesiliencefund.org/about-us/.
20 See https://lightsmithgp.com/craft/.

and technical assistance from international financial institutions and development partners (who sometimes act as interim fund or facility managers). These national adaptation funds and financing facilities have concentrated on international public finance, but a number are now targeting private and blended finance.

Climate fiscal planning and climate budget tagging. Climate change is now recognized as a fiscal risk for countries, with the potential to reduce government revenues, increase government expenditure and contingent liabilities, alter external performance and even influence sovereign credit ratings and the cost of debt (Buhr *et al.* 2018; International Monetary Fund [IMF] 2020). In response, countries are increasingly undertaking climate fiscal risk assessments, which identify the potential impacts of climate change on a country's fiscal position. Examples include the Asian Development Bank's [ADB] climate-responsive fiscal management and the IMF Climate-Public Investment Management Assessment.[21] These raise awareness of the fiscal risks of climate change and can help in allocating domestic finance (or in justifying borrowing) for adaptation. Related activities include climate budget tagging (green budgeting) and climate public investment expenditure reviews, which assess current allocations of domestic public finance to adaptation (see section 4.4).

Mainstreaming in national development and financial planning. Many countries are now integrating adaptation into their medium-term national development plans (e.g. five-year national plans) as well as into corresponding sector and decentralized development plans. Such activities can help deliver adaptation at scale. They can also mobilize adaptation finance (domestic spending and external finance) by prioritizing it in government spending and investment decisions within national medium-term expenditure frameworks and annual budgeting processes. There is also a set of policy, regulatory and legal levers that can be used in these national contexts to create the enabling conditions for adaptation. Public funding (including national development banks) can also be used strategically to leverage private sector finance.

Adaptation investment planning. Several initiatives are supporting countries to take identified adaptation priorities in NDCs and NAPs and to develop these towards investment-ready pipelines to unlock finance. These include the ADB Climate Adaptation Investment Planning Programme (Asian Development Bank 2023), the UNDP adaptation accelerator (UNFCCC 2024) and the NDC Partnership. These develop strategic (programmatic) investments in adaptation by identifying adaptation benefits and financing opportunities, and then assess and target relevant sources of finance and instruments.

Reform of international financial institutions and MDBs. There is a debate around the international finance architecture, including MDB reform. This includes the Bridgetown Initiative[22] and updates[23] and the review of MDBs' capital adequacy frameworks (Independent Expert Panel convened by the G20 2022). It also includes the consideration of vulnerability as part of lending criteria (Climate Policy Initiative 2023), new concessionary instruments for adaptation (i.e. very long tenure loans, highly concessional rates and long grace periods), prioritization of adaptation over mitigation, increasing fiscal headroom for adaptation (debt forgiveness or suspension for climate shocks), the use of concessional loans for all adaptation (even middle-income countries), and adaptation swaps. Other studies have highlighted the potential for reform of credit rating agencies. While it is beyond the scope of the AGR 2024 to make specific recommendations, the initiatives being considered could help overcome challenges associated with mobilizing adaptation finance. This also highlights the need to bring development and adaptation objectives together.

There are also a number of enabling factors and conditions for private sector adaptation and finance.

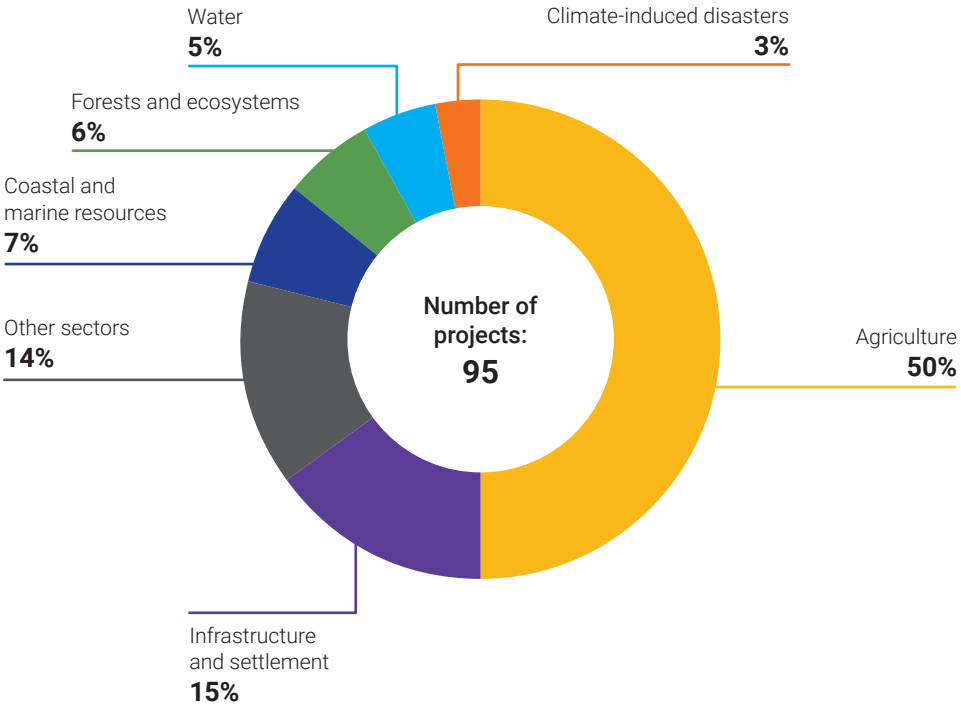
Financing facilities, accelerators and platforms. There is a set of other adaptation (and resilience) financing facilities, including accelerators and incubators, run by public, non-governmental or private organizations that target private or blended adaptation projects. These provide support for adaptation project development, for new adaptation goods and services, and for the development of new business models and financial instruments. They typically include a central facility to provide early-stage support e.g. with technical assistance and sometimes innovation grants, alongside offers of concessional lending, guarantees or equity to de-risk investment. These are being complemented with adaptation platforms that help connect developers and potential investors. While welcome, these private/blended facilities will gravitate towards certain types of adaptation investments. As evidence of this, the AGR 2024 has reviewed the portfolios of six key adaptation accelerators, shown in figure 4.10. Of the 95 projects in these accelerators, 50 per cent are in the agriculture sector. This confirms that while these private sector facilities have an important role for market sectors, they are unlikely to address the bulk of the adaptation finance gap.

21 See https://infrastructuregovern.imf.org/content/PIMA/Home/PimaTool/C-PIMA.html.

22 See www.bridgetown-initiative.org.

23 See https://www.bridgetown-initiative.org/bridgetown-initiative-3-0/.

Figure 4.10 Sectoral breakdown (as a percentage) for projects/instruments in a selection of adaptation accelerators



Sustainable finance frameworks including disclosures. Recent sustainable finance reforms aim to increase the availability of finance for green investment (for mitigation, adaptation and nature). This includes regulations (mandatory or voluntary) for disclosures by companies and financial institutions. These initiatives support the identification and disclosure of climate risks and can help encourage private sector adaptation, though they could also lead to detrimental impacts for vulnerable counties (see the AGR 2023).

Green (adaptation) taxonomies. Sustainable finance taxonomies have been developed to provide guidance on activities, assets and/or project categories that can be counted as adaptation (International Capital Markets Association 2021). These can identify activities that qualify for sustainable investment funds and can be used to provide tailored packages of support (e.g. access to concessionary finance for qualifying adaptation activities). The number of countries covered by such taxonomies has increased in recent years and there are now 24 with adaptation as an explicit objective. However, analysis (Martín, Ranger and England 2024) has found that these vary in terms of principles, sector coverage and reference activities, and that these differences risk compromising the original objectives of clarifying what counts as 'adaptation'.

Methodological innovations. A number of initiatives focus on information, methods or processes to enhance the bankability (i.e. investment attractiveness) of adaptation projects. These include adjusting the scope of projects (i.e. what they aim to achieve or the benefits they provide) to help projects meet likely financing requirements (Wise *et al.* 2022), inclusive approaches to development focused on maximizing participation of stakeholders and beneficiaries (Machiels *et al.* 2024), improvements in project viability by modelling climate effects in cash flows (Coalition for Climate Resilient Investment 2021; ADB and Global Center on Adaptation 2021; Institutional Investors Group on Climate Change 2024), and efforts to help monetize avoided losses (Resilience Valuation Initiative, Australian Institute for Disaster Resilience and Queensland Government 2023).

Overall, these enabling conditions have the potential to help scale up finance and bridge the gap, though the most relevant factors will vary with country and context. However, these enabling activities also require financial support. For example, delivering the enabling conditions for adaptation may require technical assistance and also financial support for governments (noting that similar development financing is already provided in the form of policy-based loans). Similarly, financing facilities and accelerators often require grant funding for management and concessionary finance for development (e.g. concessionary on-lending). The costs of these enabling activities are not included in the adaptation finance gap estimates above and need to be factored into financing needs.

4.6.5 Who pays for adaptation and how can we encourage equitable and socially inclusive financing?

The final area considered regards the distributional issues of adaptation finance, including equality and social inclusion. This is related to the concept of climate justice, which was reported in the Intergovernmental Panel on Climate Change Working Group II Sixth Assessment Report (IPCC WGII

AR6) (Pörtner *et al.* 2022) with respect to three principles: distributive justice (the allocation of burdens and benefits among individuals, nations and generations); procedural justice (who decides and participates in decision-making); and recognition (basic respect and robust engagement with, and fair consideration of, diverse cultures and perspectives).

There is an issue of whether adaptation finance flows equitably to different countries (see section 4.4), but also to different groups within these countries. The latter will be influenced by the source and instruments involved; for example, concessionary public finance has greater potential to have more positive distributional aspects or to target the most vulnerable (Patel *et al.* 2023).

This leads to the question of who (ultimately) pays for adaptation and who benefits from it. Adaptation finance flows may come from international public sources, domestic public sources (from public budgets or sovereign borrowing from MDBs or the financial markets) or from the private sector, but these have very different profiles at the subnational level for the most vulnerable groups in society. These differences are relevant for the international negotiations around the new collective quantified goal and the finance flows from Annex I countries to developing countries. The AGR 2024 has explored this issue by looking at the nature of finance flows from investors to beneficiaries (e.g. see Atteridge and Dzebo 2015).

The issue is illustrated in figure 4.11, which shows the flows of finance (green arrows) for different sources and instruments, and looks at the repayment of this finance (red arrows) and who ultimately pays for adaptation (signified by red icon) in a hypothetical LDC. At the top of the figure is the simple grant model, where the international funder (developed country) bears all the costs of adaptation and the most vulnerable people in the LDC receive all the benefits.

Moving to the second line, a concessionary sovereign loan can increase domestic public finance for domestic adaptation, providing benefits, but unless revenues are generated, it will increase government borrowing or require additional taxation or charges. Therefore, the LDC government and the LDC population ultimately pay for adaptation. As an example, investments in resilient infrastructure could be delivered though a loan to public, state-owned companies or private utilities, but this loan will be repaid through higher LDC public spending or through charges to LDC consumers (e.g. increased water bills).

The third example is the use of concessionary finance to on-lend at lower interest rates than commercial borrowing, for example, through national development banks. However, while on-lending provides finance below the market rate (e.g. with lower interest rates), the burden of repayment is still on LDC actors. Fourth, there is significant interest in de-risking the private sector to provide new adaptation goods and services. These can include early-stage support, e.g. with grant based technical assistance, and sometimes innovation grants, alongside concessional finance to de-risk investment (see facilities discussion in section 4.6.4). This is positive as it can provide new and efficient ways to reduce climate-related losses, but the payment for these services falls to the LDC groups impacted.[24] Finally, for a non-concessionary loan or bond,[25] the LDC will bear the cost of the adaptation investment.

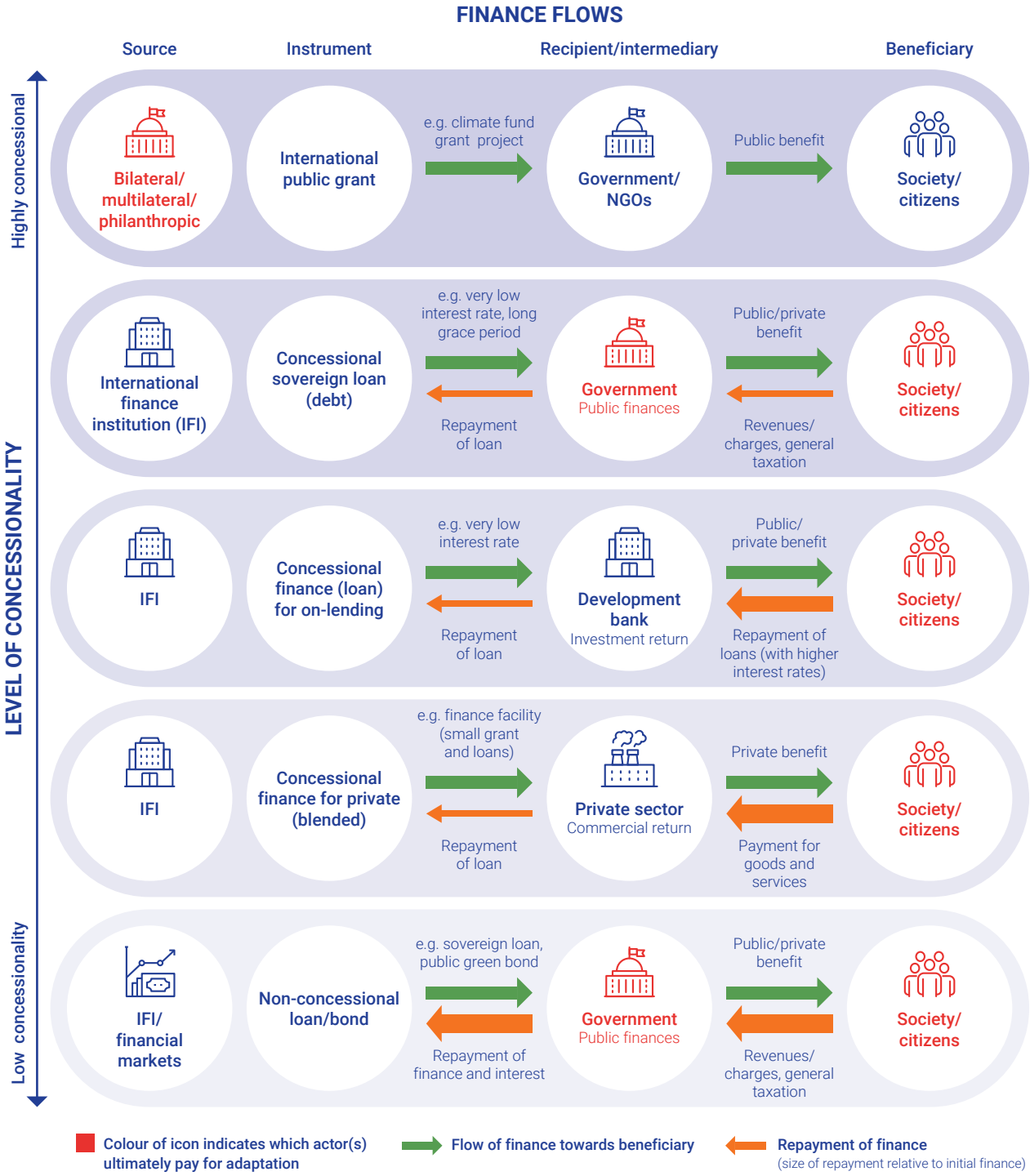
The key point is that while alternative sources and financial instruments (to grants) might increase the finance available for adaptation, and can help reduce losses that would otherwise occur, the impacted groups within the LDC ultimately bear the costs of adaptation. While this might help close the adaptation finance gap, it is not in line with the notion of common but differentiated responsibilities, nor with the polluter pays principle (given LDCs' low contribution to GHG emissions).

A final issue is whether adaptation finance takes account of gender equality and social inclusion (GESI). The AGR 2023 reviewed the progress on integrating GESI into NAPs and NDCs and analysed the level of integration into adaptation finance flows, using the GESI continuum (see the AGR 2023). The AGR 2024 has investigated these issues further to look at financial instruments: these are not gender-neutral and they may contain gender biases that can perpetuate inequalities. Therefore, while there is an opportunity to enhance GESI-positive programming when financing adaptation, this requires targeted actions.

24 This is a particular issue where adaptation is required to address increasing losses, as this additional (defensive) expenditure has the potential to reduce income or available household expenditure, as compared with the counterfactual without climate change. There is a more positive case if adaptation finance delivers net-positive benefits in addition to reducing losses (e.g. enhancing household incomes) but this will not apply for many cases, and also begs the question as to why, if these actions are so beneficial, they not happening already.

25 Non-concessional finance by MDBs still offers better terms than the market, including preferential service payment and repayment conditions.

Figure 4.11 Who ultimately pays for adaptation in LDCs?



Grants provide the most obvious opportunity to integrate GESI considerations, as they allow explicit support in specific areas, including for activities (or to specific groups) that do not generate financial returns. It can be more challenging to include these in other financial instruments (such as loans) or when seeking private finance, though there are some opportunities. For example, equity investment, though less common than other financial instruments, can offer support to early-stage enterprises, and could be directed towards more GESI-positive support, such as women-owned micro, small and medium-sized enterprises (MSMEs) (International Development Research Centre 2023). However, the progress in integrating these specific aspects is at an early stage. The AGR 2024 has reviewed the public information on adaptation accelerator facilities (which aim to de-risk private sector investment) and the projects in their portfolios to look at the level of GESI integration. While indicative, the analysis does indicate a relatively low level of integration and highlights that there is scope for more explicit actions to support GESI-positive programming.

5

Chapter 5

Capacity-building and technology transfer and cooperation

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In Rwanda, UNEP and partners are helping people adapt to climate change by restoring land with climate-resilient species that offer numerous benefits for local people.

Photo: © UNEP / Miranda Tasker

Key messages

- Capacity-building and technology transfer are often treated separately under the United Nations Framework Convention on Climate Change (UNFCCC), but are in fact deeply interdependent. This interdependence makes it essential to better understand how these two means of implementation can be strengthened and deployed in a coordinated manner.
- Water, food and agriculture are the sectors most frequently cited by developing countries as key sectors for investment in both capacity-building and technology transfer for addressing climate change adaptation.
- Effective interventions to support capacity-building should start by identifying and mobilizing existing endogenous capacities; provide a balance of emphasis on 'hard' (e.g. technologies) and 'soft' (e.g. enabling conditions) capacities; and place gender equity and social inclusion (GESI) considerations at their centre.
- We need a far more robust evidence base to inform capacity-building interventions and technology transfer priorities. This includes evidence from monitoring and evaluation (M&E) on which approaches work, for whom, and when; on the actual costs of interventions; and on the current level of capacity-building needs (particularly in priority sectors).
- Capacity-building and technology transfer plans should support adaptation across sectors, scales and development priorities, and build capacity for transformational change. Current priorities are often too narrow, technical, and focused on responding to international commitments or immediate crises, limiting efforts towards deeper change.
- The effectiveness of technology transfer relies on it being part of a broader strategy, and strongly integrated with an associated assessment of capacity-building needs. Adaptation strategies should be developed based on an understanding of what needs are, rather than from the perspective of pushing a particular technology.
- Most adaptation technologies prioritized by developing countries can be evaluated as 'modern', and are therefore already at a mature or near-mature stage, indicating that the key barriers to uptake are access (not availability) to the technology itself, and technology adoption capacity (i.e. the individual and institutional capacities necessary to use it).

5.1 Introduction

Technology transfer and capacity-building have long been understood as important means of implementation for action on climate change under the UNFCCC.[1] They are grounded in the principle of common but differentiated responsibilities and respective capabilities set out in the United Nations Framework Convention on Climate Change (UNFCCC 1992), which calls on developed country Parties to "support the development and enhancement of endogenous capacities and technologies of developing country Parties" (p. 8). These concepts have remained mainstays of investment and international cooperation, though the way they have been defined and approached has evolved considerably over time.

The twenty-ninth United Climate Change Conference of the Parties (COP 29) Presidency has made enabling action on climate change one of its two central pillars, emphasizing that

> "Enabling action involves putting in place the means of implementation and support – finance, technology and capacity-building – and the wider enabling conditions at a national, regional and global level spanning across all stakeholders." (Babayev 2024)

1 While we recognize that both terms are subject to critique, we use the terms "technology transfer and cooperation" and "capacity-building" in this chapter in line with the commonly used terminology within the UNFCCC negotiations processes.

It has also stated that knowledge-sharing, technology transfer, and cooperation are central to advancing global adaptation priorities, and emphasized the importance of collaborative networks for furthering those aims. At COP 29 in Baku, Parties will continue their deliberations on the linkages between the Technology Mechanism and the Financial Mechanism, and will initiate discussions on the establishment of a Technology Implementation Programme and its modalities.

This chapter aims to inform these discussions by distilling much-needed evidence on the status of capacity-building and technology transfer for adaptation. As means of implementation, capacity-building and technology transfer are deeply interdependent (Dove, Jinnah and Talati 2024). This interdependence makes it particularly appropriate to address the two under the same chapter.

The chapter is organized in two main sections. The first describes recent trends in capacity-building for adaptation then reviews the capacity-building needs and practices set out in national adaptation plans (NAP) submitted to the UNFCCC. NAPs submitted by Parties to the UNFCCC represent their broad strategies for addressing the complex national process of adapting to the impacts of climate change. The section then offers recommendations for strengthening the planning and practice of capacity-building for adaptation. The second section reviews the status of technology transfer and cooperation in support of adaptation, providing an overview of technology planning, implementation and financing through a review of NAPs submitted to the UNFCCC and Technology Needs Assessments (TNAs). It then proposes possible ways forward for overcoming key challenges and enhancing current practices. The chapter concludes with cross-cutting recommendations that may help to strengthen both means of implementation.

5.2 Capacity-building

5.2.1 What is capacity and how is it mobilized?

At its most fundamental level, *capacity* describes people's ability to set and pursue their own agendas in response to the growing challenges of climate change (Klinsky and Sagar 2023). Capacity-building has long been seen as a central priority for international cooperation and climate policy, and calls for capacity-building as a means to support adaptation planning and implementation are widespread in project and policy documents. Recent research has found that 90 per cent of proposals funded by the Adaptation Fund included reference to capacity-building (Alpízar *et al.* 2019), while the analysis of 56 NAP documents submitted to the UNFCCC undertaken for this chapter found references to capacity-building in all 56. Despite this near-universal attention within adaptation policy, approaches to capacity-building are far from uniform and are constantly evolving.

Several important trends shape how capacity-building is understood in the context of climate change. First, many argue that we have entered the era of adaptation implementation (Klein *et al.* 2017). Governments are rapidly shifting from an emphasis on taking stock of climate risks and vulnerabilities and planning adaptation, to implementing large-scale adaptation actions, resulting in a rapid growth in the range and scales of capacities needed (Pauw and Klein 2020; Williams *et al.* 2020). This is happening at different speeds of progress around the world, owing to varying country contexts and circumstances, which makes capacity needs even more heterogeneous (see chapter 2). Second, the agreement of the United Arab Emirates Framework for Global Climate Resilience (UAE FGCR) has provided greater clarity on the priority areas for adaptation action, and the stages involved in implementing these actions. At the same time, the principles of locally led adaptation remind us that for initiatives to be effective and sustainable, they must be grounded in local contexts and realities, with leadership coming from local actors and institutions (Soanes *et al.* 2021). They must also ensure the inclusion of historically marginalized groups as part of the planning process, beneficiaries of intervention, and sources of knowledge. This focus on local leadership and ownership is reflected in many descriptions of capacity-building, including Sokona's (2022) assertion that "capacity is not the ability to implement someone else's agenda but the ability to set and pursue your own agenda" (p.672) (box 5.1). We consider the implications of these trends in this chapter.

In line with these trends, this section addresses four questions:

1. Which capacity-building priorities are countries identifying as important to them?
2. Which stages of the adaptation process are focused on by capacity needs identified by countries?
3. Which enabling conditions for adaptation are being targeted for capacity-building in NAP submissions?
4. How are countries proposing to undertake capacity-building activities, and are these strategies in line with latest thinking on effective approaches to capacity-strengthening for adaptation?

It does so by mapping the capacity-building needs and priorities identified in 56 NAP documents submitted to the UNFCCC by 30 June 2024, in line with the thematic areas and stages of iterative adaptation policy cycle captured respectively by the seven thematic and four dimensional targets of the UAE FGCR (see box 1.2, chapter one for an overview of the UAE FGCR), and the six enabling factors for effective national adaptation processes identified by the NAP Global Network (2023). Additional details on the countries studied, the methods used, and more detailed case examples can be found in annex 5.A.

Box 5.1 Defining capacity-building

Definitions of capacity-building tend to share an emphasis on local ownership; cross-scale and whole-of-system orientations; an anchoring in long-term processes, investments and institutions; and a commitment to ongoing learning and adaptation (Khan *et al.* 2018). These emphases can be clearly seen in the UNEP and World Bank definitions below.

"Capacity development (or capacity-building) is a locally driven process of learning by leaders, coalitions and other agents of change that brings about changes in socio-political, policy-related, and organizational factors to enhance local ownership for and the effectiveness and efficiency of efforts to achieve a development goal." (Otoo, Agapitova and Behrens 2009)

"Capacity-building is a holistic enterprise that includes building abilities, relationships and values that will enable organizations, groups and individuals to improve their performance and achieve their development objectives. It includes strengthening the processes, systems and rules that influence collective and individual behaviour and performance and enhancing people's technical ability and willingness to play new roles and adapt to new demands and situations." (adapted from UNEP 2002)

Box 5.2 Timeline of action on capacity-building under the UNFCCC

- The UNFCCC (1992) called on developed country parties to "support the development and enhancement of endogenous capacities and technologies of developing country Parties" (art. 4.5).
- In 2001, agreement was reached on two frameworks guiding capacity-building, one for developing (non-Annex I) countries, and a second for economies in transition. Central to this agreement was the view that capacity-building is essential to ensuring countries' ability "to participate fully in, and to implement effectively their commitments under, the Convention" (UNFCCC 2002, decision 2/CP.7).
- In 2012 the Durban Forum on Capacity-building was established, which provided a space for parties and partners to the UNFCCC to meet annually to monitor and review the effectiveness of capacity-building.
- Progress on capacity-building under the UNFCCC has been reviewed periodically since 2004. These reviews have underscored the ongoing challenge of financing capacity-building, ensuring alignment with national processes and coordination between the wide range of partners and agencies engaged in capacity-building support activities. Forums for network-building and evidence-sharing have regularly been cited as critical for the success of these efforts.
- In 2015 the Paris Agreement on Climate Change included article 11, which established the Paris Committee on Capacity-building (PCCB) and positioned capacity-building as one of the key means to enhance climate action in developing countries. Capacity-building, as described under article 11, should be country-driven and country-owned, be informed by experiences of past capacity-building activities undertaken through the UNFCCC, and should cover, among other things, "technology development, dissemination and deployment, access to climate finance, relevant aspects of education, training and public awareness, and the transparent, timely and accurate communication of information". Further, article 11 specifies that "capacity-building should be guided by lessons learned, including those from capacity-building activities under the Convention, and should be an effective, iterative process that is participatory, cross-cutting and gender-responsive."

5.2.1.1 Capacity-building in the UNFCCC

Capacity-building has long been a central element of action on climate change under the UNFCCC. Box 5.2 sets out some of the key milestones since 1992.

Despite this concerted effort, analyses of the effectiveness of capacity-building under the international climate regime have often been critical. For instance, despite language advocating a coordinated and country-owned approach, Khan *et al.* (2018) found that efforts have instead tended to be uncoordinated, ineffective, expensive and short-term in nature. Three key factors have contributed to the disjuncture between the level of demand for capacity-building and what has been done to date: a lack of scholarship that provides guidance on how best to approach capacity-building; the deeply context-specific nature of climate action that prevents easily scalable or transferrable solutions; and skepticism around the value and effectiveness of investments into capacity-building (Klinsky and Sagar 2022). Further, while discussions of capacity-building within the UNFCCC have evolved to take into account more diverse forms and sources of knowledge, such as Indigenous knowledge, narrower technical and managerial approaches continue to dominate and receive the most investment (Nautiyal and Klinsky 2022).

Many of these critiques are acknowledged within the UNFCCC's own stock-taking exercises on capacity-building. The second review of the PCCB, for example, highlights the need for increased country ownership; coordination; documentation and knowledge-sharing on best practices; attention to the inclusion of marginalized groups, particularly Indigenous knowledge holders; and better access to financing, among other needs (UNFCCC 2024).

5.2.1.2 Capacity-building principles and good practices

Originally understood as a one-directional flow of resources and know-how, from the global North to the global South, by technical experts to address largely technical problems, recent studies of capacity-building propose more dynamic, multidirectional and critical models of practice. Some of these new principles of good practice can be summarized as follows.

Moving away from deficit framings. 'Deficit' models of capacity, which assume an absence of capacity in developing countries tend to be misguided, inappropriate and ultimately harmful. They often ignore endogenous capacities which are poorly linked, or somehow deemed inferior to those located elsewhere (Boule *et al.* 2020). They also tend to disregard the historical factors, such as colonialism, that have contributed to high levels of vulnerability in many parts of the global South (Lezak 2024). Capacity-building actions based on these deficit models are criticized as primarily benefiting 'fly-in, fly-out' professionals from the global North, who deliver isolated capacity-building interventions to targeted groups. Evidence from the Congo Basin, for instance, shows that these kinds of interventions may be theoretically robust, but fail to gain sustained use due to misunderstandings about local capacities and contexts (Nago and Krott 2022). Processes of knowledge co-production, where endogenous and exogenous expertise from across a range of perspectives are brought together, may hold particularly strong potential for breaking out of deficit models of capacity-building, and helping bring new capacities into action (Ziervogel *et al.* 2022).

Tailoring and targeting for under-represented communities. Effective capacity-building, much like effective adaptation planning, must take into account the particular needs, challenges, and knowledge of groups who have been historically under-represented on the basis of gender, age, disability, ethnicity, etc. (del Pozo *et al.* 2024; Mataya, Vincent and Dougill 2020). This means that 'one-size-fits-all' approaches to capacity-building, such as massive open online courses (MOOCs) may fail to bring insufficient contextualized attention to GESI considerations. Instead, capacity-building for GESI-responsive adaptation planning should ensure differentiated data is available on stakeholder needs and vulnerabilities; ensure there is representation of these groups in planning and decision-making; identify specific needs that these groups may have; and enable closer engagement between gender and adaptation specialists (Dazé and Church 2019; Dazé and Dekens 2018).

Adopting more integrated and system-wide approaches. Investments into the capacity of individuals through training, workshops and public awareness-raising without accompanying support for the wider systems in which these individuals are operating are unlikely to have the desired levels of impact (Harvey *et al.* 2022). High levels of staff turnover, inappropriate staff selection for capacity-building, and lack of structural support after training, are frequently highlighted challenges (Cid and Lerner 2023; Mataya, Vincent and Dougill 2020). Some researchers have proposed that these limitations call for a shift from focusing on building *stocks* of capacity, where one-way interventions are intended to transfer knowledge and resources to targeted beneficiaries, towards a focus on the *mobilization* and *transfer* or *sharing* of capacity, which brings existing capacities into action, and ensures they are better connected and embedded in local systems (Elrick-Barr, Plummer and Smith 2023; Lezak 2024). This shift calls for more multidirectional and multiscalar interventions that take into account the institutional environments in which people are working. Network-building, peer-to-peer learning and other forms of knowledge exchange are capacity-building approaches that reflect this shift (Fisher 2022).

Towards more transformative outcomes. Capacity-building tends to emphasize incremental progress towards *conforming* with existing norms of practice, including norms imposed by international processes such as reporting requirements under the UNFCCC. Less emphasis has been placed on capacities for *transforming* systems and practices, though it is increasingly recognized that this

is what is needed in response to the pace and severity of climate change (Nautiyal and Klinsky 2022). These more transformative outcomes may be pursued through novel partnerships, interdisciplinary co-creation and experimentation (Ziervogel *et al.* 2022).

Important knowledge gaps remain. While there appears to be considerable consensus on the importance of capacity-building for effective responses to climate change, questions related to *which* capacities are most important, *for whom*, and *how* they are to be built, remain understudied and poorly evidenced. This leads to difficulty in forming well-grounded recommendations on how to fund, undertake, or assess the outcomes of capacity-building interventions (Casado-Asensio, Blaquier and Sedemund 2022; Khan *et al.* 2018). This has led to calls from both within and outside of the UNFCCC process for more investment into understanding what works, for whom, and under which conditions (Klinsky and Sagar 2023; Ortiz and Taylor 2009). Research on the limited attention to capacity-building in the Intergovernmental Panel on Climate Change (IPCC)'s *Sixth Assessment Report* also concludes that more robust and detailed documentation of capacity-building needs and practices is needed. The authors conclude that future assessment reports should address capacity-building explicitly, in line with other means of implementation (Klinsky and Sagar 2024).

5.2.2 The status of capacity needs, enabling conditions and practices

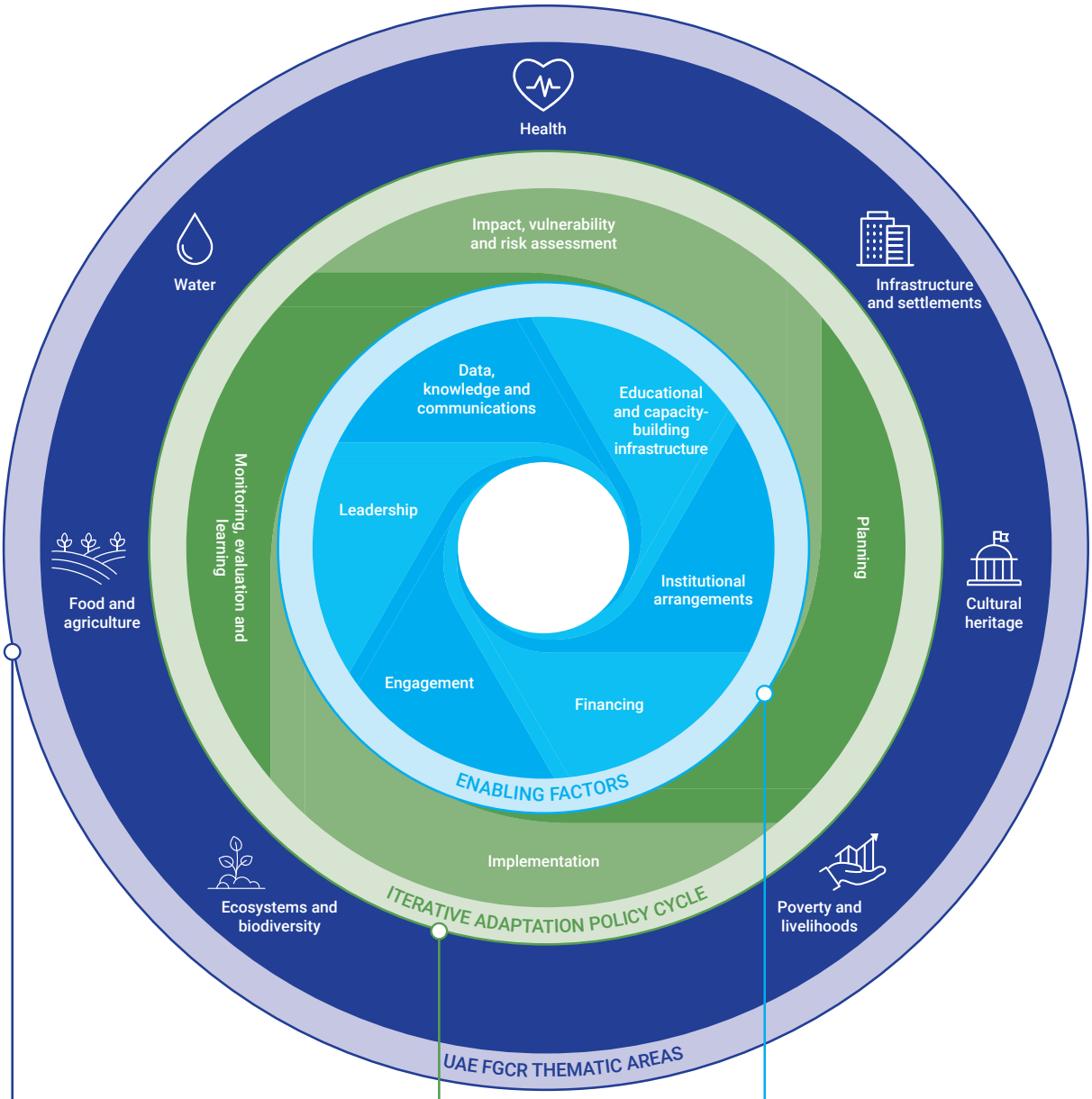
This section uses figure 5.1, which combines the thematic areas and elements of the iterative adaptation policy cycle captured by the thematic and dimensional targets of the UAE FGCR, with the NAP Global Network's (2023) six enabling factors for effective national adaptation planning, as a conceptual guide to present the findings.[2] We begin by mapping country priorities onto the framework's seven thematic target areas , and then consider country priorities against the four stages of the iterative adaptation policy cycle. The section then maps the adaptation capacity needs expressed in NAPs submitted to the UNFCCC against enabling factors.

With funding from the Global Environment Facility, UNEP and the Government of Rwanda are working to restore the natural landscape to provide ecosystem services to climate-vulnerable communities.

Photo: © UNEP / Miranda Tasker

2 For the purposes of this analysis, we have adapted the enabling factor identified as 'capacity-building' in the original NAP Global Network diagram to 'education and capacity-building infrastructure', to distinguish between the enabling capacity-building infrastructure and the processes of capacity-building being studied in this chapter.

Figure 5.1 Thematic areas and stages of the adaptation policy cycle captured by the targets of the UAE FGCR, and enabling factors for effective national adaptation planning



UAE FGCR THEMATIC AREAS

Health
- Risk assessment and monitoring
- Awareness and communications

Infrastructure and settlements
- Risk assessment and management
- Climate smart infrastructure

Cultural heritage
- Climate proofing
- Community engagement

Poverty and livelihoods
- Diversifying livelihoods
- Reskilling in vulnerable sectors

Ecosystems and biodiversity
- Risk assessment and monitoring
- Ecosystem-based approaches
- Community engagement

Food and agriculture
- Climate smart agriculture (techniques and technologies)
- Climate resilient food systems

Water
- Risk assessment and monitoring
- Community engagement
- Regulations

ITERATIVE ADAPTATION POLICY CYCLE

Impact, vulnerability and risk assessment
- Data collection and access
- Risk and vulnerability assessment

Planning
- Capacity assessments
- Cross-sectoral planning and budgeting

Implementation
- Use of adaptation technologies
- Community engagement

Monitoring, evaluation and learning
- Data collection and monitoring
- Institutional learning

ENABLING FACTORS

Data, knowledge and communications
- Communication and knowledge networks
- Data collection and access

Educational and capacity building infrastructure
- Integrating adaptation into education systems
- Training for public officials

Institutional arrangements
- Mainstreaming gender
- Regulations
- Climate literacy in government

Financing
- Proposal preparation
- Climate risk assessment

Engagement
- Gender-responsive outreach and communication
- Networks for dialogue and exchange

Leadership
- Strategic leadership
- Results-based management

Source: Adapted from NAP Global Network (2023) and the UAE FGCR.

It is worth noting upfront that while our analysis focuses specifically on NAPs submitted to the UNFCCC, past analyses of nationally determined contributions (NDCs) have highlighted similar trends to those presented here. For example, 67 per cent of NDCs made capacity-building a condition of NDC implementation (Pauw *et al.* 2019), and many of the thematic priorities presented here are also reflected in the NDCs (Khan, Mfitumukiza and Huq 2020). Key recommendations emerging from these earlier studies of NDCs include the need for strengthened civil society networks and partnerships, the potential of universities in developing countries to serve as hubs for capacity-building and broader educational systems support, the importance of long-term financing for capacity-building, and the need for a capacity-building hub to coordinate action under the UNFCCC (Khan, Mfitumukiza and Huq 2020).

5.2.2.1 Mapping capacity gaps and trends across thematic areas

In looking at the key thematic areas prioritized for capacity-building in NAPs submitted to the UNFCCC, the most frequently identified capacity needs are related to food and agriculture (mentioned in 91 per cent of NAPs), ecosystems and biodiversity (71 per cent), and water (68 per cent). More specific capacity-strengthening needs identified by countries in their NAPs are summarized in table 5.1.

Table 5.1 Key capacity needs identified in NAPs, categorized by a ranked list of UAE FGCR thematic target areas

UAE FGCR thematic target areas (ranked*)	Examples of key capacity-building needs identified in NAPs
1. Food and agriculture (mentioned in 91 per cent of NAPs)	• Climate-smart agriculture (techniques and varietals) • Natural resource monitoring (e.g. fisheries) • Creating more climate-resilient food systems • Integrating traditional and Indigenous knowledge and technologies into food production
2. Ecosystems and Biodiversity (mentioned in 71 per cent of NAPs)	• Data collection and monitoring tools for assessment risks and vulnerabilities of ecosystems • Nature- and ecosystem-based approaches to adaptation • Community engagement and support to community leadership in ecosystem management, restoration and other areas
3. Water (mentioned in 68 per cent of NAPs)	• Monitoring climate impacts on water resources • Community engagement in safeguarding water resources • Institutional capacity for developing and implementing regulatory instruments for water resources management
4. Health (mentioned in 64 per cent of NAPs)	• Capacity of technical personnel to implement actions to adapt to health-related climate risks • Public health awareness and communications to raise awareness of climate change-related health risks • Risk assessment and ongoing monitoring risks in the health sector
5. Infrastructure and settlements (mentioned in 55 per cent of NAPs)	• Risk management and disaster risk reduction approaches • Improved vulnerability and risk assessments • Developing criteria and codes for climate-smart infrastructure
6. Poverty and livelihoods (mentioned in 43 per cent of NAPs)	• Diversifying livelihoods in context • Approaches to prioritizing sectors and socioeconomic groups that are most vulnerable to climate impacts • Reskilling of workers in phased-out industries towards green jobs
7. Cultural heritage (mentioned in 11 per cent of NAPs)	• Developing and enforcing regulatory frameworks to climate-proof cultural heritage • Community-engaged processes to raise awareness and to identify assets of cultural importance • De-risking tourism investments of cultural importance

Note: The thematic areas set out in the UAE FGCR's thematic targets are ranked in order of frequency of mentions in NAPs. Percentage indicated refers to the frequency of NAPs submitted to the UNFCCC that identify a given thematic area as an area requiring capacity-building (N = 56).

Looking at these thematic priorities, a number of insights and questions emerge. First, it is difficult to discern whether the prioritization of specific thematic areas within NAPs suggests that they have the most acute capacity needs, are the areas deemed most important to national development priorities, or both. Indeed, concerns have been raised that the lack of data on existing investment flows for capacity-building, and specific sector-based capacity-building needs, may lead to ineffective investment, and overlook important gaps for capacity-strengthening (Casado-Asensio, Blaquier and Sedemund 2022; Khan, Mfitumukiza and Huq 2020).

Second, mapping capacity needs according to UAE FGCR thematic target areas reveals potential areas of concern. There appears to be limited emphasis on culture and cultural heritage in adaptation planning to date, though some noteworthy examples can be found. Additionally, the limited specific emphasis on poverty and livelihoods may suggest that activities to support this target are in fact embedded into other target areas, namely strengthening food and agricultural systems, and reducing vulnerability to climate risks related to health, housing and water availability, among others. This underscores the deeply interlinked nature of climate risks to one another, and to broader development priorities. Those designing capacity interventions must therefore approach the task systemically (as opposed to, for instance, on a sector-by-sector basis) to take these interlinkages into account.

Along similar lines, many of the specific priorities identified around these target areas (table 5.1) focus on building the capacity to undertake discrete adaptation-related tasks (e.g. conducting risk assessments, developing regulatory frameworks and adopting specific technical practices). While these are indeed important functions under specific ministries or sectors, they must be accompanied by broader competencies that enable the pursuit of those specific actions (see 5.2.2.3 below).

Box 5.3 The financing of capacity-building and technology development

Modelling studies of adaptation costs tend to omit capacity-building activities (and their costs) and this represents an important gap. Looking specifically at NDCs and NAPs submitted to the UNFCCC, costing of capacity-building is limited. Only about 37 per cent of 648 capacity-building needs in NDCs were costed, totaling US$ 10.29 billion, while only around 24 per cent of capacity-building needs in NAPs had been costed, totaling US$ 1.3 billion (UNFCCC Standing Committee on Finance 2024). Furthermore, around 8 per cent of needs reported in NDCs and 3 per cent in NAPs are cross-cutting between mitigation and adaptation, mainly involving capacity-building and technology development and transfer. This complexity highlights that accurately determining the finance needs for capacity-building and technology development and transfer is extremely difficult and is likely significantly underestimated.

As highlighted in chapter 4, capacity-building tends to be financed by public flows, and often involves grants or concessionary loans, because these interventions do not generate direct revenues (though they do lead to economic benefits by improving effectiveness). Financing of capacity-building at scale remains challenging, because it usually involves longer-term, recurring costs and/or staff increases, rather than capital, though there are opportunities to borrow for such actions though policy-based loans.

5.2.2.2 Mapping capacity needs along the different stages of the iterative adaptation policy cycle

Adaptation is an iterative process, unfolding through cycles of assessing, planning, acting and reflecting on outcomes, as depicted in figure 5.1. As the focus of national adaptation policy increasingly shifts from identifying adaptation needs and developing plans towards implementing those plans and assessing their effectiveness, a wider range of capacity development needs are growing in prominence. Not all capacity needs identified in NAP documents can be mapped according to this cycle, however. Some needs, such as financing, cut across many stages of the cycle, while other statements of need contain very limited specific detail, as noted above. Nonetheless, our analysis still reveals that countries face specific capacity needs in relation to different stages of the adaptation cycle, as illustrated in table 5.2.

Table 5.2 Key capacity needs identified in NAPs submitted to the UNFCCC by stage of the iterative adaptation policy cycle

Stage of adaptation policy cycle	Key capacity-building needs identified in NAPs
Impact, vulnerability and risk assessment	• Improved access to and collection of data on climate-related risks and vulnerabilities • Risk and vulnerability assessments for vulnerable target groups (e.g. women, elderly people, Indigenous people, youth) • Increased quality and availability of climatic, hydrometeorological and socioeconomic data at national and subnational scales
Planning	• Capacity assessments (e.g. performance indicators, skills gap assessments) for capacity-building planning and prioritization • Integration of cross-cutting and cross-sectoral issues (e.g. gender) into adaptation planning • Cost-benefit assessments for budget planning of adaptation activities
Implementation	• Strengthening of capacity of local governments to implement adaptation measures • Developing, understanding needs for, and using appropriate adaptation technologies • Engagement of diverse stakeholders and groups (particularly vulnerable groups) in implementation of adaptation activities
Monitoring, evaluation and learning	• Improved technical capacity for collecting data for M&E activities • Improved progress monitoring on adaptation actions and objectives • Increased mobilization of learning and lessons from M&E within institutions and with various stakeholders

It is important to note that countries' adaptation planning is never entirely at one point of the adaptation policy cycle. Certain activities may be in the early assessment and planning phases while others are in full implementation. This means that countries may need to draw on a range of these capacities simultaneously. This makes more distributed forms of capacity mobilization and sharing particularly useful for meeting diverse and concurrent needs.

5.2.2.3 Mapping capacity needs against enabling factors for adaptation

The impact of investments into capacity-building depends in part on countries' ability to put these strengthened capacities into practice. The enabling factors identified for this to happen (table 5.3) reflect a combination of what some term 'hard' (i.e. specific and technical) and 'soft' (i.e. broad and enabling) competencies and conditions.[3] These align with other analyses (e.g. Cox *et al.* 2021), which have found that the capacity to undertake effective adaptation depends on more than technical knowledge and solutions, though the importance of robust climate-related data and information systems is acknowledged (Nightingale *et al.* 2021). This section investigates how strengthening these enabling conditions supports the effective use of new technologies and capacities.

Enabling factors for national adaptation planning have been identified as key areas for capacity-building in the overwhelming majority of NAPs submitted to the UNFCCC, signaling the importance of paying attention to these factors when striving to achieve the Paris Agreement's global goal on adaptation. Specific capacity needs identified for each of these enabling factors are summarized in table 5.3. The widespread mention of most of these factors as capacity needs within NAP documents can be viewed as a positive rather than concerning signal. Investing in these enabling conditions is crucial to the longer-term success of more specific adaptation interventions. Further, we see considerable attention to equity and inclusion dimensions of capacity-building (particularly related to gender) in terms of institutional arrangements and engagement practices (box 5.5). There is a relative absence of focus on leadership dimensions, which may be attributable to the fact that the needs emerge from plans that are part of government processes with highly formalized leadership roles. However, this may overlook non-formal and strategic forms of leadership that can be important for effective climate action (Meijerink and Stiller 2013).

The data, knowledge and communications needs identified include capacity for, and access to more extensive climate and hydrometeorological data and data processing.

3 More detailed descriptions of each of these enabling factors can be found at NAP Global Network (2023).

The needs also include capacities for translating and communicating these and other data to different stakeholders, including the public. Addressing these needs may require support for intermediary and brokering institutions, educational programming, and more, thus highlighting the interconnected nature of these enabling conditions (Dookie 2024; Harvey *et al.* 2021).

It is worth noting the international orientation of finance-related capacity needs, which focus largely on access to national and international sources of climate finance, and on support to navigate funding application processes. Addressing these gaps could thus free up time and attention for more locally focused areas for action (box 5.4). However, with capacity-building investments largely uncosted in most modelling of adaptation, and in many national planning documents (box 5.3), the scale of these finance-related capacity needs is highly uncertain.

Box 5.4 Needs-based finance training

The Needs-based Finance (NBF) project, launched by the United Nations Climate Change Secretariat, aims to facilitate developing countries' access to climate finance for priority regional mitigation and adaptation projects. The project achieves this by generating political buy-in at regional and national levels, providing technical support for creating tangible climate finance programmes, and fostering early-stage engagement with accredited entities, support partners, and major climate funds. The Climate and Development Knowledge Network, in collaboration with the UNFCCC and major climate funds, also led trainings for member states of regional economic commissions to conceptualize ambitious and regionally relevant climate action programmes. These trainings emphasized peer-to-peer learning, leveraging the experience and technical expertise of participating countries and stakeholders. The NBF project, which has supported 112 countries, has led to significant developments in regional climate finance pipelines across the participating regions (full case description in annex 5.B).

Table 5.3 Key capacity needs identified in NAPs submitted to the UNFCCC, categorized by enabling factors identified by the NAP Global Network (2023)

Enabling factors (ranked*)	Key capacity-building needs identified in NAPs
1. Data, knowledge and communications (mentioned in 96 per cent of NAPs)	• Bridging communication gaps for improved dialogue and knowledge transfer • Taking advantage of, and participating in, existing knowledge networks on climate change • Collection and processing of data, and capacity to share and access data between sectors, actors and countries
2. Educational and capacity-building infrastructure (mentioned in 96 per cent of NAPs)	• Integrating adaptation into education systems, from primary and secondary school curricula to higher education programmes • Improved and expanded training for public officials on climate change adaptation planning and action • Developing and implementing effective public awareness-raising campaigns
3. Institutional arrangements (mentioned in 95 per cent of NAPs)	• Ensuring that institutions are responsive to vulnerable groups, mainstreaming gender considerations in policies, planning and implementation • Need for new governing bodies tasked with overseeing adaptation actions • Capacity to create new regulations to standardize methods and tools
4. Financing (mentioned in 77 per cent of NAPs)	• Capacity to prepare funding proposals and applications, including project design and writing and presenting applications • Climate risk assessment, both in proposal development and also the teams assessing proposals, especially in the private sector • Capacity to identify and access national and international funding sources
5. Engagement (mentioned in 75 per cent of NAPs)	• Developing outreach and communications programmes in consultation and partnership with communities and civil society • Creating and sustaining grass-roots, civil society, public sector and higher education networks for dialogue and knowledge exchange • Developing gender-responsive and socially inclusive engagement plans

Enabling factors (ranked*)	Key capacity-building needs identified in NAPs
6. Leadership (mentioned in 11 per cent of NAPs)	• Strategic climate change leadership • Results-based management for public sector managers • Vertical integration of traditional leaders into climate change adaptation planning and implementation

** Ranked in order of frequency of mentions in NAPs. Percentage indicated refers to the frequency of NAPs submitted to the UNFCCC that identify a given UAE FGCR target as an area requiring capacity-building (N = 56).*

Box 5.5 GESI in national capacity-building

Evidence suggests that countries have made considerable strides in integrating gender considerations into their overall NAP processes. However, only about a third of NAPs submitted to the UNFCCC contain specific provisions for capacity-building on gender and climate change (Dazé and Hunter 2022). Capacity-building interventions themselves should be designed in a GESI-responsive manner, but there is insufficient evidence available to assess the extent to which this is happening within the context of the NAPs. Evidence does reveal, however, that fewer than 50 per cent of NAPs have integrated gender considerations into the M&E practices – evidence that could be crucial for informing future GESI-responsive capacity-building interventions (Dazé and Hunter 2022). Specific examples of GESI-related capacity-building needs identified in NAPs in this analysis include calls for:

- developing and implementing gender-inclusive consultation and planning processes (Democratic Republic of the Congo)
- undertaking sex-disaggregated assessments of needs and capacities (Papua New Guinea)
- creating specific capacity development programmes on gender and climate change (Marshall Islands)
- ensuring all curricula and trainings acknowledge differentiated climate impacts across social groups (Fiji)
- capacity-building activities specifically offered to women and under-represented groups (Bangladesh)

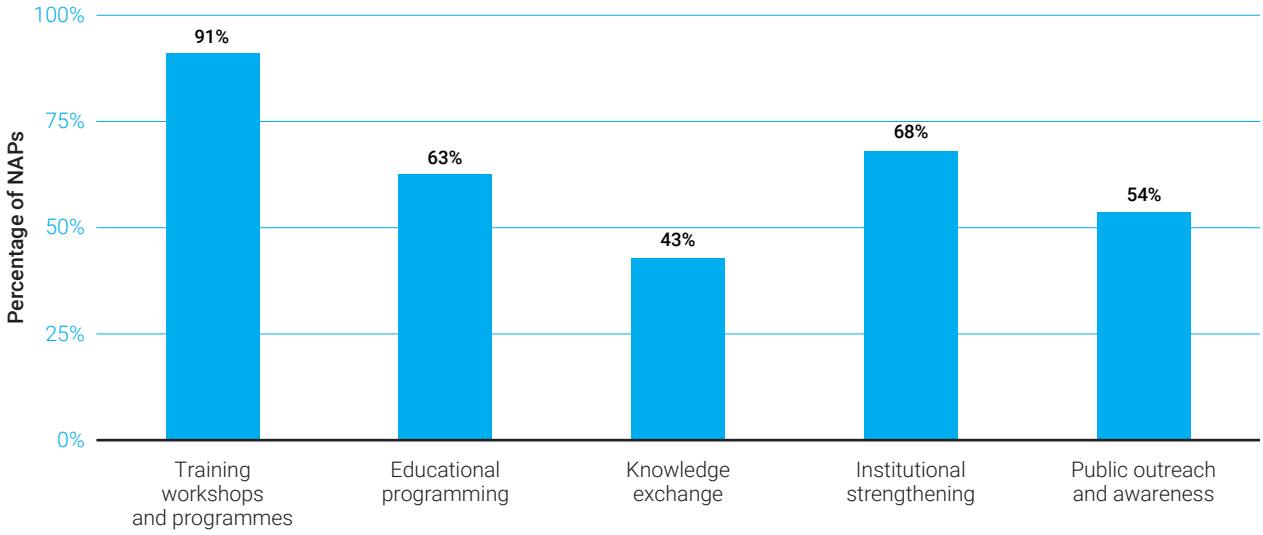
These examples highlight the growing influence of GESI-responsive programming on capacity-building needs, though we note that in many instances, the practices are only being implemented by a small minority of countries.

5.2.2.4 Mapping capacity-building interventions undertaken by countries

Our analysis reveals a diverse range of interventions being proposed to address capacity needs. These include more one-way transfers of information through trainings and workshops (for example, on M&E of adaptation) or awareness-raising campaigns (e.g. raising public literacy on climate change); two-way dialogues and knowledge exchanges (e.g. country-to-country knowledge exchange through adaptation site visits); and activities aimed at institutional strengthening (e.g. establishing new agencies or committees to oversee work on adaptation) (figure 5.2).

Despite growing recognition of the need to connect and mobilize existing capacities, to think systemically and longer-term, and to avoid an over-emphasis on individual-level capacities, there continues to be a strong prevalence of workshops and training programmes targeting individuals as the primary means of capacity-building on adaptation within the NAPs. This is in line with past analysis of NDCs (Khan *et al.* 2018) and of practices in the field of adaptation in general (Alpízar *et al.* 2019). With this said, alternative forms of practice are emerging, including growing emphasis on investing in institutional capacity. We also see a number of countries proposing more interactive and multidirectional models of knowledge exchange as part of their capacity-building plans, practices that reflect a growing recognition that peer-to-peer learning can be empowering and informative for adaptation decision makers and practitioners (Casado-Asensio, Blaquier and Sedemund 2022; Fisher 2022) (box 5.6).

Figure 5.2 Percentage of NAPs submitted to the UNFCCC that propose specific categories of capacity-building interventions



Box 5.6 Capacity-building through facilitated knowledge exchange – IMPACT

The Improved Municipal Planning in African Cities (IMPACT) project aimed to enhance collaboration between all tiers of government and their social partners, to support climate-resilient development in African cities. IMPACT began by co-producing an understanding of what critical capacity and/or knowledge gaps existed in Malawi and Zimbabwe, which were hindering collaboration between tiers of government, and their social partners. The project then sought to help address these gaps by developing tools requested by project partners in the two project countries. This led to the creation of a comprehensive toolkit on multilevel governance collaboration, including *A Guide to Collaborative Multi-level Governance for Climate Resilient Development* and an accompanying online learning course. The co-production processes undertaken to understand how multilevel governance could be improved in both countries, and to co-develop the tools to respond to such, led to improved understanding and capacity among stakeholders about the importance of multilevel governance and climate-resilient development, as well as how improvement of the former can enhance climate resilience outcomes (full case description in annex 5.2).

5.2.3 Key practices for advancing capacity-building

This chapter has presented capacity-building needs as expressed by national governments for adaptation to climate change, as well as the approaches being used to address them. Our analysis reveals some significant gaps between the capacity-building priorities and practices recommended in recent academic and practice literature, and those found in NAP submissions from many countries. This isn't entirely surprising, as national policies and practices tend to take some time to adapt, but it does point to important opportunities for improving practice. Drawing on the evidence set out in this chapter, we conclude by highlighting ways that approaches to capacity-building can be strengthened, in order to improve adaptation planning and practice.

1. **Recognize and mobilize existing capacities.** Capacity-building interventions too often start from an assumption that capacity is 'absent'. Identifying, connecting, and supporting the work of existing institutions and networks is a key to developing context-relevant and sustainable responses. Harnessing the potential of national universities as centres of excellence is one way this might be pursued (box 5.7). Taking this action may require investing in intermediary or brokering organizations that can build connections between adaptation actors, as well as funding that supports more interaction and network-building between these actors.

Box 5.7 Universities as centres of excellence for capacity-building – LUCCC in Bangladesh

The Least Developed Countries Universities Consortium on Climate Change (LUCCC), an official programme of the governments of the 45 least developed countries (LDCS), aims to capacitate all stakeholders in their countries to effectively address climate change. Capacity-building, which includes climate education and training, is the most important need for this group of countries, which make the least contribution to the problem of climate change, but are most affected by its increasingly runaway impacts. LUCCC works with universities in their countries as the most sustainable institutions to take the lead in building endogenous capacity to achieve a low-carbon and climate-resilient development.

2. **Place GESI at the centre of capacity-building plans.** Robust national adaptation action requires the full participation of a wide range of actors, including those who have historically been under-represented or marginalized. While many NAPs make reference to engaging women and other under-represented groups, capacity-building plans should also address other specific considerations. GESI considerations should inform the prioritization of capacity-building needs, both in terms of the participants in any given process and in terms of the content of the activity or process; GESI considerations should influence the selection and design of capacity-building approaches to ensure that processes are inclusive; and GESI considerations should guide the assessment of capacity-building effectiveness. GESI-informed adaptation planning requires gender disaggregated data on capacity-building needs, though currently there is limited evidence that this is being collected systematically.

3. **Ensure capacity-building plans support adaptation across sectors, scales and development priorities.** Evidence from recent research and our analysis of the NAPs shows that capacity-building which addresses cross-cutting needs such as improved planning and engagement approaches tends to be more impactful than narrow, stand-alone interventions. This underscores the need for holistic capacity-building plans that look across sectors and scales, and that address individual, institutional and system-level capacity needs.

4. **Balance investment into 'soft' and 'hard' adaptation capacity-building needs.** Our analysis of the enabling factors for adaptation planning confirms that so-called 'soft skills', like leadership and stakeholder engagement, are important. However, analysis of the financing flows for capacity-building reveals a bias towards 'harder' interventions like strengthening farming technologies and climate information systems. Both these intervention priorities require attention.

5. **Identify more diverse and evidence-informed capacity-building practices.** While traditional "knowledge transfer" models of capacity-building such as workshops and public engagement campaigns continue to dominate in NAPs (figure 5.2), there is a growing diversity of approaches to capacity-building being documented through the PCCB and other forums (box 5.8). Evidence on how countries are selecting the most appropriate capacity-building approaches to meet stakeholder needs and contexts is limited, yet this alignment is critical to its effectiveness. Best practice suggests that decision-support tools be developed to help countries assess and select among the wide range of capacity-building options available to them (Virji, Padgham and Seipt 2012).

Box 5.8 Combining capacity-building approaches to address urban climate risks

The Future Resilience for African Cities and Lands (FRACTAL) project was implemented across nine Southern African cities between 2015 and 2021. The project partners and stakeholders worked together to build capacities to understand the complex drivers and differential impacts of urban climate risks from multiple perspectives, and produce and draw relevant climate science information into key urban decision-making processes to strengthen climate resilience. Mutual learning was at the heart of the project design, and a diverse range of skills and competencies were targeted, from climate information literacy, to relational capacities, to competencies to undertake climate risk assessment. Key modalities for capacity-strengthening included convening a series of learning labs in three cities; facilitating city exchange visits between teams of researchers, policymakers and practitioners; embedding junior researchers in the operations of city governments through co-hosting arrangements; convening thematic working groups across the project teams; and co-authoring diverse types of publications (full case description in annex 2).

6. **Assess and share what works, for whom, and when.** The M&E of adaptation capacity-building effectiveness remains a persistent point of weakness. This leads to uncertainty on how to develop national capacity-building plans, and to difficulties in mobilizing sustained financing for capacity-building. This M&E of effectiveness should assess benefits across different forms of social difference (see point 3 above in this list), as well as the sustainability of impacts over time. Regional and global forums like the PCCB should offer a platform for the exchange of experiences and evidence from these assessments.

7. **Base assessments of capacity-building needs on a stock-taking of current capacities.** Our analysis confirms that calls for investment into capacity-building are ubiquitous in national planning documents like the NAPs. However, it is often impossible to determine whether the identification of needs in particular sectors or processes reflects a particularly acute capacity gap, or the relative importance of the sector or process. A more thorough and robust assessment of current capacities alongside calls for further support would contribute greatly to clarifying the nature and the extent of these needs; however, this requires improved monitoring and assessment of investments into capacity-building (see point 6).

8. **Build capacity for transformative change.** Capacity-building interventions are currently targeting incremental and sometimes procedural change. This includes capacity-building for collecting and submitting reporting data, for fulfilling commitments under various intergovernmental bodies, and more. More challenging, yet more important, are forms of capacity-building that can support more transformative forms of change that depart from existing systems and norms.

5.3 Technology transfer and cooperation

5.3.1 What is technology transfer and cooperation?

Technology plays a crucial role as a means of implementation for adaptation. As an outcome of the first Global Stocktake and part of the COP 28 decision 1/CMA.5, Parties decided to create a Technology Implementation Programme, backed by entities such as the operating bodies of the Financial Mechanism, to enhance support for the technology priorities identified by developing countries (UNFCCC 2023).

This section seeks to provide insights into the current status of technology transfer and cooperation in support of climate change adaptation. It aims to provide an overview of technology planning, implementation and financing, including insights into what the technology needs are (type of technologies), what type of projects are implemented, where (geography and sector) and by whom (funders). These insights are further exemplified with the help of case studies that present global experiences and show how actions related to technology transfer and cooperation for climate change adaptation can unfold on the ground.

Technology can play a crucial role in enabling communities to adapt to and reduce the harmful impacts of climate change, either by averting or reducing the potential negative consequences, while optimizing the advantages from possibly favorable outcomes. Nonetheless, the effectiveness of technology relies on it being part of a broader strategy that (a) acknowledges uncertainty and addresses the underlying drivers of people's current and future vulnerability (Klein 2011), (b) acknowledges the needs and desires of the intended users of the technology (Douthwaite 2002), and (c) guarantees careful consideration to ensure that the 'transfer' process does not increase vulnerability instead of reducing it (Kuhl 2020). Moreover, due to the increasing recognition of the redundancy and flexibility required for building resilience, vulnerability reduction is better pursued through a focus on a set of technologies rather than any individual technology (Kuhl 2020). Additionally, the importance of examining technology transfer and cooperation through a gender lens is highlighted, as it is essential to ensure that both women and men benefit equally from technological advancement, and that gender-specific needs and perspectives are adequately considered (De Groot 2018).

Article 10 of the Paris Agreement sets the scene for technology transfer and cooperation: "Promoting and facilitating enhanced action on technology development and transfer in order to support the implementation of the Paris Agreement." The term 'technology transfer' has become common language in discussions and agreements related to the UNFCCC.[4] However, over the years, there has been some discussion of the implied connotations of this term. Therefore, an understanding of the use of terminologies related to technology and technology transfer is critical for further exploring its importance to climate change adaptation, and how this importance is evolving. A summary of this understanding, which shows the close relationship between technology transfer and capacity-strengthening as understood in this chapter, is provided in box 5.9.

4 The history of the use of term technology transfer within the United Nations Secretariat dates as far back as the 1970s, where it was referred to in relation to matters of transnational corporation carried out by the United Nations Centre on Transnational Corporations (1975–1992) and the Transnational Corporations and Management Division of the United Nations Department of Economic and Social Development (1992–1993). In 1993, the Programme was transferred to the United Nations Conference on Trade and Development (United Nations Conference on Trade and Development 2001).

Box 5.9: Understanding concepts of 'technology', 'technology transfer' and 'technology cooperation'

Technology is understood as a combination of 'hardware', 'software' and 'orgware', encompassing tangible technology, as well as implicit knowledge on how to deliver/acquire, modify, produce, use and eventually improve on previous technology to match the conditions of the new context (Audretsch *et al.* 2019; Biagini *et al.* 2014; Christiansen *et al.* eds. 2011; Kuhl 2020). Technologies that help us to reduce greenhouse gas emissions, or adapt to the adverse effects of climate change, are known as 'climate technologies'.

While the term 'technology transfer' was introduced in the IPCC's *First Assessment Report* (Houghton, Jenkins and Ephraums eds. 1990), this chapter follows the definition of technology transfer put forward in the IPCC's *Special Report on Methodological and Technological Issues in Technology Transfer* (Metz *et al.* eds. 2000), which was reiterated in the IPCC Special Report *Global Warming of 1.5°C* (de Coninck *et al.* 2018) as:

"a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organizations (NGOs) and research/education institutions. The broad and inclusive term 'transfer' encompasses diffusion of technologies and technology cooperation across and within countries. It covers technology transfer processes between developed countries, developing countries and countries with economies in transition, amongst developed countries, amongst developing countries and amongst countries with economies in transition. It comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose it and adapt it to local conditions and integrate it with Indigenous technologies."

The notion of 'technology cooperation' includes information exchange, research, development and demonstration cooperation, access to financial instruments and intellectual property rights, as well as promotion of domestic capacities and capacity-building, which is covered in the earlier sections of this chapter.

This section is structured around an analysis of planning, implementation and development finance for climate-related technology transfer and cooperation. Under planning the focus is on assessing the extent to which technology transfer and cooperation is addressed or incorporated into countries' strategies for building resilience and adapting to the impacts of climate change. We draw evidence from the results of the Global TNA Project,[5] as well as the NAPs submitted to the UNFCCC and NDCs submitted to the UNFCCC. The subsection on implementation analyses the trends observed in the implementation of technology-oriented adaptation projects, highlighting opportunities and challenges to scaling up the implementation of adaptation technologies. The subsection on finance provides some specific insight on the role of climate change-related financial institutions in supporting technology transfer and cooperation, using data gathered by the OECD. This adds to the more general analysis of finance presented in chapter 4 of this report, which focuses on the financing of climate change adaptation more broadly.

5.3.2 The current status of technology transfer in relation to adaptation planning, implementation and finance

5.3.2.1 Planning

The role of technology (and technology transfer and cooperation) features as a crucial element in adaptation planning, aligning with both UNFCCC and IPCC emphasis on technology (de Coninck *et al.* 2018; Paris Agreement 2015, art. 10). This can be illustrated through the formulation of NAPs and other adaptation planning instruments (e.g. policies and strategies). In fact, the NAP technical guidelines encourage considering technology needs and opportunities, while the IPCC highlights NAPs as vehicles for identifying and implementing adaptation technologies (de Coninck *et al.* 2018; LDC Expert Group 2012).

As an essential first step in planning technology transfer and cooperation, countries identify and articulate their climate technology needs, as well as the enabling frameworks required to create conditions for technologies to be implemented, taken up and used. Under the UNFCCC, developing countries are invited to report on their climate technology needs through TNAs, "a set of country-driven activities that identify and determine the mitigation and adaptation technology priorities of Parties" and "particularly developing Parties".

5 Information related to the global TNA project can be accessed at UNEP-CCC (2024).

Through TNAs conducted under the Global TNA Project, nearly 100 countries have now assessed their climate technology needs. The results provide a good understanding of core sectors and technologies prioritized for adaptation by developing countries. See annex 5.C.1 for an overview of the TNA data, and the methodology guiding the analyses conducted.

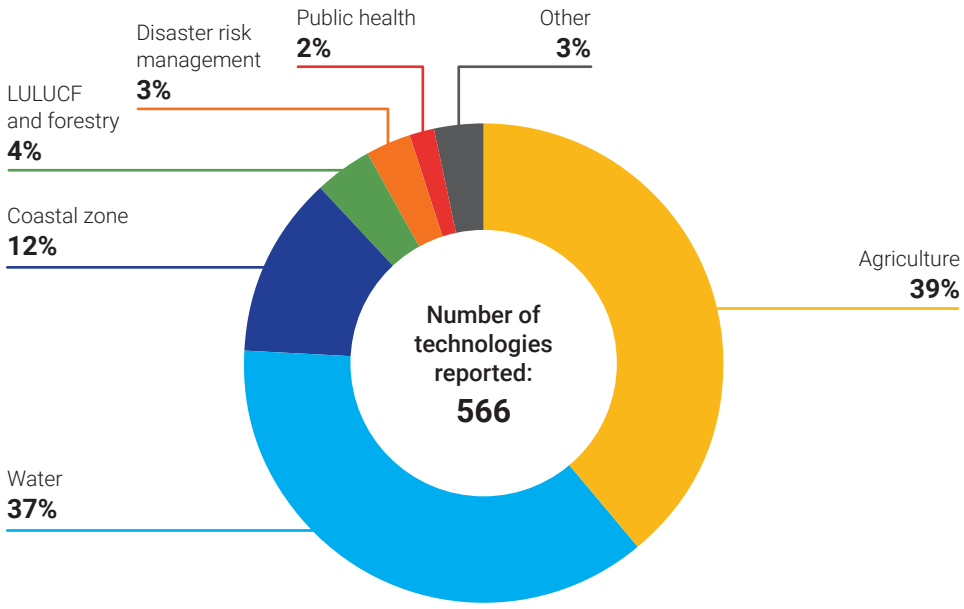
The majority of adaptation technologies are identified for water and agriculture sectors

Water and agriculture are the most prioritized sectors with more than 76 per cent of the prioritized adaptation technologies coming from these two sectors (39 per cent agriculture and 37 per cent water) indicating them as priority areas (see figure 5.3).[6] This aligns closely to the experiences from the work of the UNFCCC CTCN in providing technical assistance to countries in its role as the implementing arm of the UNFCCC Technology Executive Committee (TEC) (box 5.10).

The NAP technical guidelines also highlight water and agriculture as priority sectors for adaptation actions and technology transfer in developing countries (LDC Expert Group 2012), aligning with multiple IPCC reports (Core Writing Team, Pachauri and Meyer eds. 2014; de Conicnk *et al.* 2018; Pörtner *et al.* eds. 2022) which consistently identify these two sectors as highly climate-sensitive and facing significant risks, emphasizing the need for adaptation technologies. It is important to note that they are comprehensive sectors and play a vital role in adaptation strategies on a large scale. In contrast, the scale of other sectors tends to be relatively limited and may not hold the same significance as agriculture and water across multiple dimensions. Therefore, this should be taken into consideration when interpreting the related conclusions.

The most prioritized technologies in the adaptation component include irrigation systems, storm surge barriers for coastal protection, crop and soil management technologies, crop diversification and using new varieties, water storage, and water harvesting technologies.

Figure 5.3 Sectoral distribution of adaptation technologies reported by 90 developing countries (2011–2023) in their UNFCCC TNAs



6 Of the sectors included in the analyses, 'other' includes waste management, transport, energy, education, and housing and infrastructure.

Box 5.10 Experiences from the work of the Climate Technology Centre & Network

Since the establishment of the Technology Mechanism in 2010, and the launch of the UNFCCC CTCN as its implementation arm at COP 19 in November 2013, the UNFCCC CTCN has been responding to a growing number of requests from developing countries for climate technology development and transfer in a demand-driven manner.

Over the past decade, the UNFCCC CTCN has received over 500 requests for technical assistance, with over 400 projects at various stages of implementation, including 39 per cent completed. More than 110 developing countries are benefiting from this technical assistance, of which 38 per cent are LDCs and 16 per cent are Small Island Developing States. Of the technical assistance requests received, 30 per cent relate to adaptation, 28 per cent have both mitigation and adaptation objectives, and the remaining 42 per cent are focused on mitigation.

The largest sectoral distribution of adaptation-related requests indicates that 35 per cent are in the water sector, followed by agriculture and forestry (15.5 per cent), and coastal zones (14.6 per cent). While requests were historically more focused on mitigation, there has been an increasing number of adaptation requests submitted to the UNFCCC CTCN, aligning with national adaptation priorities. These requests leverage technologies for disaster risk reduction, community resilience, and the testing or scaling up of both innovative/emerging and existing/mature technologies in their respective contexts. Examples of these developments include:

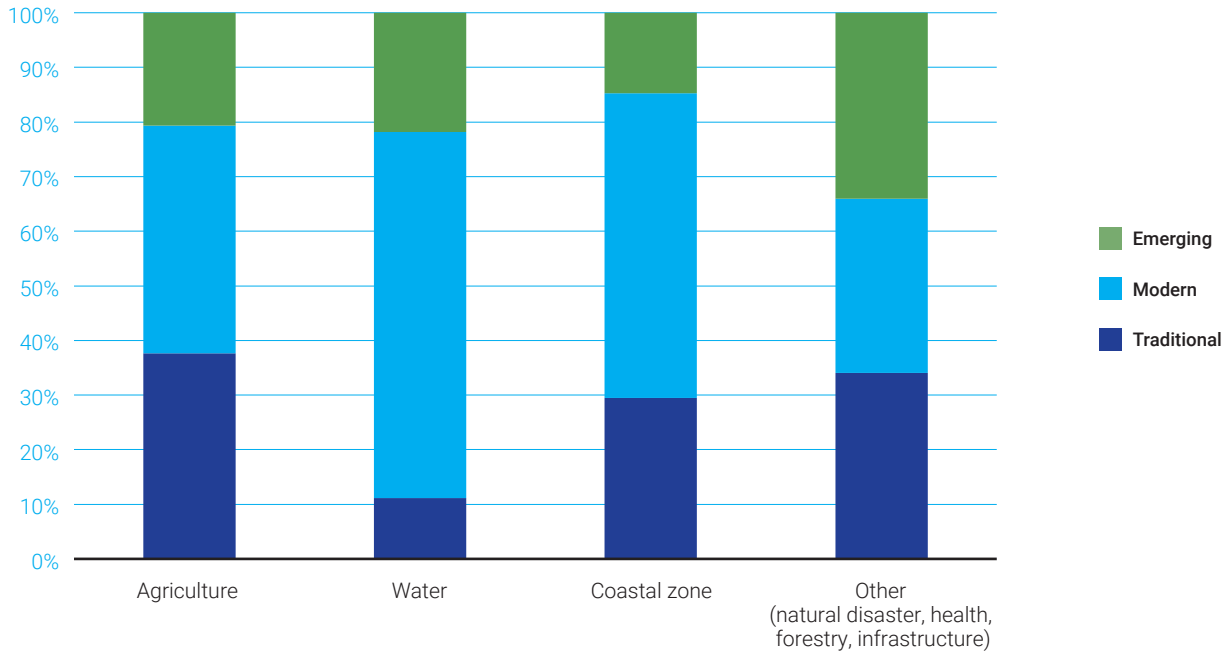
- climate information systems (e.g. agrometeorological information systems, early warning systems, disaster risk assessment tools, multi-hazard platforms and climate change vulnerability assessments), with a notable growth in locally led or community-run systems
- integrated water resource management, such as enhancing sustainable groundwater management practices
- coastal zone management
- leveraging traditional or Indigenous technologies through nature-based solutions
- adaptation finance pilots, such as climate risk insurance systems

Most prioritized adaptation technologies are not emerging but already mature

Most adaptation technologies prioritized by developing countries can be evaluated as 'modern', and are therefore already at a mature or near-mature stage, indicating that the key barriers to uptake are access (not availability) to the technology itself, and technology adoption capacity (i.e. the individual and institutional capacities necessary to use it). However, developing countries also articulate the need for emerging technologies, especially in domains such as climate information services, early warning systems and disaster risk reduction (Pörtner *et al.* eds. 2022). This is also supported by the experiences from the work of the UNFCCC CTCN (box 5.10). Within the context of the UNFCCC, climate technologies have been categorized as traditional technologies, modern technologies and emerging technologies based on the level of maturity[7] (annex 5.C.2). According to TNAs, developing countries' prioritized adaptation technologies are mainly modern or traditional technologies (see figure 5.4). Coastal zone management, for instance, is characterized by a low share of emerging technologies that are prioritized at 15 per cent, while for agriculture and water emerging technologies represent 21 per cent and 22 per cent respectively of the total. The importance or greater prioritization associated with the more 'mature' technologies in developing countries may be due to the lack of local trials and testing of emerging technologies, leading to lower levels of awareness of the potential of these newer technologies. Therefore, while mature technologies are important, developing countries also need access to and assistance with emerging technology to tackle specific adaptation obstacles.

7 It should be noted that the relative importance of 'mature' versus 'emerging' technologies may vary greatly depending on the unique circumstances, such as the level of development of the country, the nature of climate-related hazards, and the current capacities. This should be taken into consideration when interpreting the results and discussions presented.

Figure 5.4 Technology maturity among prioritized adaptation technologies reported by 90 developing countries (2011–2023) in their UNFCCC TNAs



Technology considerations are included in the majority of NAPs

As at 30 June 2024, a total of 56 NAPs had been submitted to the UNFCCC by developing countries. While this is less than one third of the total number of Parties that have ratified the convention,[8] it represents a sizable share of the most vulnerable Parties, and provides an account of their efforts towards building resilience and adapting to climate change. A review of these 56 NAPs shows that countries prioritize or relate to technology to varying extents in their national adaptation planning. This can be demonstrated through an analysis of the 'impact significance' of technology-related information within the NAPs. A three-level grading scale of 'mild', 'moderate' and 'high' was used in an attempt to quantify the extent to which each country's NAP presented and acknowledged information (both quantitative and qualitative) related to technology transfer and cooperation as an integral part of their strategy (see annex 5.C.3 for a full explanation of the methodology for conducting the analysis of the NAPs). Results from this impact significance analysis show that 43 per cent of the reviewed NAPs extensively cover aspects related to technology, whether quantitatively and/or qualitatively, indicating a strong emphasis. Meanwhile, 27 per cent of NAPs provide moderate coverage, and 30 per cent offer minimal coverage. This differentiation highlights the range of approaches countries take in addressing the concept of technology within their national adaptation strategies.

Countries with a high score frequently referenced the role of technology and the need for technology transfer and cooperation in the context of improving options for adapting to climate change. Their NAPs emphasize the need for advanced technologies, especially in areas such as enhancing data collection and improving climate modelling. The integration of technology into their NAPs is supported by the identification of specific adaptation technologies that are already available, and the ways they can play a role in assisting their climate change adaptation process. On the other hand, countries with a mild score made minimal reference to the need for technology, refraining from making it an integral part of their strategy, and with minimal coverage as to the information provided in terms of possible technologies that could assist their process of adapting to climate change.

The contrast between countries receiving a 'high' score of and those receiving a 'mild' score could be attributed to numerous factors that might merit further investigation. One such factor could be associated with limitations of our analysis, as it pertains to the reliance of the use of specific terminology associated with technology. Though unlikely, it could be the case that some countries did not use any of the specific terminology assessed in the analysis, even though they were presenting information in their NAPs that is related to technology transfer and adoption. We endeavored to minimize the chance of overlooking this information by closely reviewing all information presented that also addressed capacity-building for the implementation of new actions and ideas, as this may capture such information. Another factor could be limitations in the impact, vulnerability and risk assessments conducted for

8 A total of 198 Parties have ratified the UNFCCC.

informing the development of the NAPs in the latter group of countries. Nonetheless, given the established importance of technology in the process of adapting to the impacts of climate change, these findings illustrate that there is much room for improvement in the information compiled in the NAPs. Countries should probably be better guided on including key information in the planning process which is documented/reported on in their NAPs, as well as in other strategies for adapting to climate change.

Technology transfer and cooperation supports NDC implementation

As is the case with NAPs submitted to the UNFCCC, technology transfer and cooperation is increasingly becoming an integral component of updated NDCs. A recently compiled report by the UNFCCC TEC and UNFCCC CTCN (2023) showed that 52 per cent of Parties[9] made reference to adaptation technologies in their most updated NDCs. This is especially the case as Parties focus on the implementation of their climate promises, even though there is no provision requesting such information in the Paris Agreement or related COP or CMA decisions. While the level of detail of information on technology transfer and cooperation provided in the NDCs varies considerably (as is the case with NAPs), it is seen as very useful in terms of helping Parties plan the successful implementation of their NDC targets. Other studies examining the substance of NDCs frequently observe that the extent of information and specific strategies pertaining to technology transfer, development and implementation differ greatly among countries (UNFCCC 2016; UNFCCC 2021; Weikmans, van Asselt and Roberts 2021).

5.3.2.2 Implementation

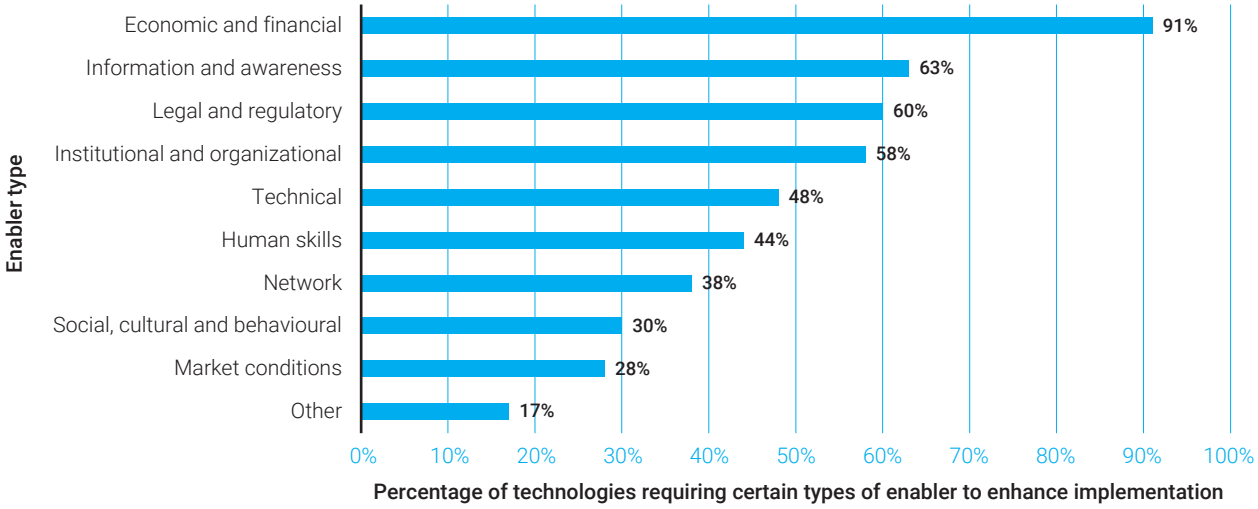
This section provides an overview of trends in implementing technology-oriented adaptation projects[10] that in particular address the adaptation technology needs identified and reported by developing countries in their TNAs, and information on what developing countries identify as key to scale up implementation of adaptation technologies. An explanation of the methodology guiding the analyses in this section is presented in annex 5.C.4.

The project portfolios of the global funds under the UNFCCC, namely the Adaptation Fund, Green Climate Fund and the Global Environment Facility, indicate that between 2016 and 2023, a total of 42 technology-oriented projects were implemented, with a funding volume of over US$443 million. While this is a signaling progress, there is still a significant gap to reach the estimate of US$4.4 billion reported by 57 developing countries through their adaptation components of TNAs to the UNFCCC from 2009 to 2017 (UNFCCC 2020).

Challenges hindering implementation cut across technologies

In addition to taking stock of the implementation of technology inclusive adaptation projects, it is also useful to explore which actions are required to be implemented to enhance the enabling framework conditions for technologies. Based on an analysis of the TNAs, figure 5.5 shows an overview of which type of enablers are required to enhance technology implementation. Economic and financial factors stand out prominently. A total of 90 per cent of adaptation technologies require the implementation of measures within this category.

Figure 5.5 Analysis of 1,918 enablers identified for 402 prioritized adaptation technologies reported by 90 developing countries (2011–2023) in their UNFCCC TNAs



9 193 Parties to the Paris Agreement had communicated updated NDCs by the time the report was compiled.

10 Technology-oriented adaptation projects include the adaptation projects with a clearly stated focus on technology transfer and implementation (i.e. projects framed around technology terminology), either in the title of the project (in the case of projects funded by the Adaptation Fund) or through reference to the TNA in the project proposal (in the case of projects funded by the Green Climate Fund [GCF] and the Global Environment Facility [GEF]). Annex 5.C.4 explains the difference between the approaches for identifying technology-oriented projects for the Adaptation Fund versus those for the GCF and GEF.

This implies that under the existing frameworks in developing countries, there is a struggle to overcome barriers related to economic and financial constraining factors. However, it is not just about financial incentives; structural factors are equally vital. Developing countries recognize the need to raise awareness, enhance human skills and strengthen institutions to improve technology implementation. Most of these can be appreciated through the case of the Republic of Moldova (box 5.11), which illustrates how the TNA was used as a catalyst to help overcome a range of challenges for implementing adaptation technologies in their agriculture sector. These challenges cut across various technologies for adaptation, also emphasizing the importance of capacity-building efforts.

Box 5.11 Conservation agriculture technologies for enhancing climate resilience: The case of the Republic of Moldova's agriculture sector

The Republic of Moldova completed a first TNA for the agriculture sector in 2013. Here, conservation agriculture emerged as an innovative and environmentally friendly technological pathway, with significant potential for climate change adaptation. Conservation agriculture was seen as a solution to address the compounding impact of climate change and outdated agricultural practices, which had already led to a substantial loss of soil fertility (estimated at 30–50 per cent).

Based on the growing evidence of the potential of conservation agriculture to reduce climate vulnerability in the Republic of Moldova, the country has over the last 10 years received substantial international support to implement these technologies. Projects such as IFAD VI-VIII, the Special Accession Programme for Agriculture and Rural Development, and Competitive Agriculture in the Republic of Moldova provided capacity-building that allowed farmers to test various components of conservation agriculture.

Consequently, approximately 500 farmers covering 150,000 hectares have successfully implemented conservation agriculture. During the years 2015–2023, the governmental financial support to implement conservation agriculture has increased through subsidies of up to US$57,000 (50 per cent of costs) per farmer for the procurement of equipment.

Through a Food and Agriculture Organization of the United Nations (FAO)/GCF Project (2021–2024), the Republic of Moldova has updated its adaptation-focused TNA for agriculture. The updated TNA identified 60 innovative technologies across aquaculture, cereals, livestock, and horticulture subsectors, and also highlighted the usefulness of taking a holistic approach to conservation agriculture through combining it with precision agriculture tools. Further, the TNA identified inadequate information flow and knowledge gaps as major barriers to widespread adoption of climate technologies in the agriculture sector.

To address this challenge, the Community of Practice in Climate-Smart Agriculture (CSA) was established with local farmers through the FAO/GCF Project. The Community of Practice online platform (www.cop.cstsp.md) serves as a space for farmers to convene, discuss common issues, share experiences and access customized information on implementing CSA technologies. Through 17 workshops and webinars, experts have enhanced farmers' analytical capacity and built technological competence. The Community of Practice has 330 active members who practice conservation agriculture in a systematic manner on 50,000 hectares, and 1,504 followers on Facebook and Viber forums, and hence has made significant strides in promoting conservation agriculture in the Republic of Moldova.

5.3.2.3 Development finance for adaptation-related technology transfer

In 2022, climate finance provided and mobilized for developing countries surpassed the US$100 billion objective for the first time. Development finance constitutes the vast majority of international climate finance in developing countries, and supporting technology transfer and cooperation is an important dimension of development cooperation activities, given the essential role of technology for both social and economic development. International development cooperation is a key lever that developing countries can use to address the financial and capacity constraints that slow down the implementation of climate technologies (OECD 2021). Further, many developing countries possess valuable knowledge, practices, and climate technologies that could benefit others via South-South and triangular cooperation. However, limited financial resources hinder their ability to sufficiently engage without involvement of international development cooperation institutions (United Nations Executive Office of the Secretary-General and UNFCCC 2017; UNFCCC TEC and United Nations Office for South-South Cooperation 2018).

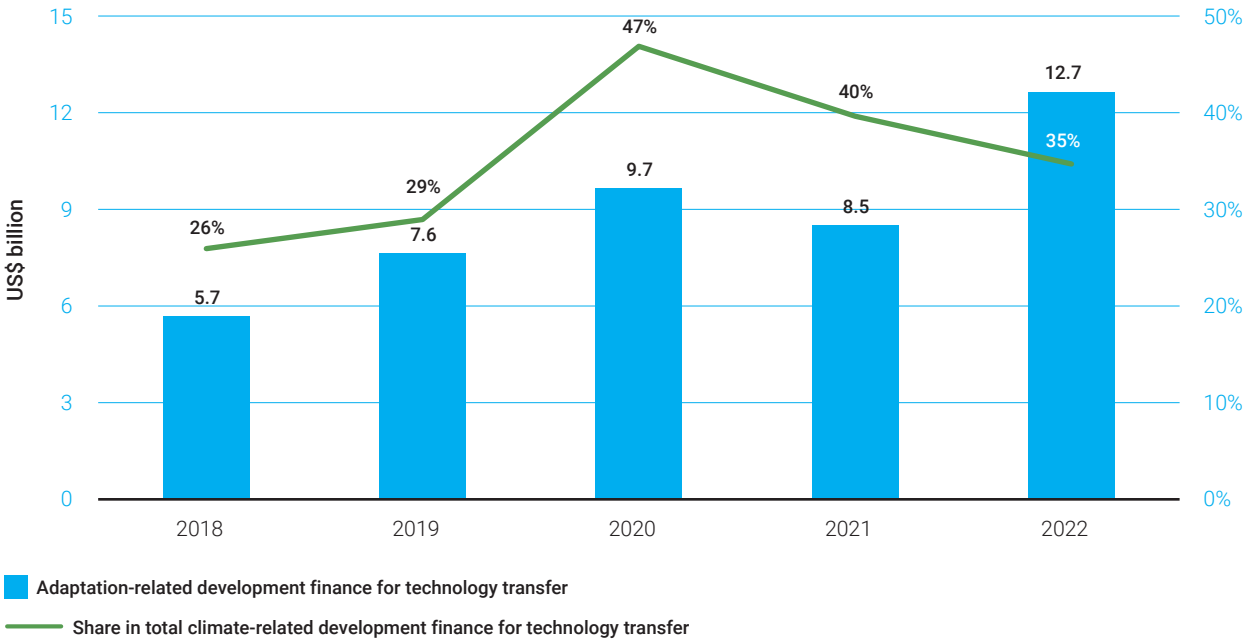
This subsection maps adaptation-related development finance activities specifically related to technology transfer. To do so, it builds on the methodology used in a previous report of the UNEP-CCC (Trærup *et al.* 2022) which is based on the analysis of activity level data submitted by bilateral

and multilateral finance providers to the Creditor Reporting System of the OECD, using data-mining techniques. The figures represent estimates of the value of activities (for bilateral finance providers) or components (for multilateral development banks and other multilateral institutions) which are reported as targeting climate change adaptation, and that are – according to this analysis – also related to technology transfer. See annex 5.D for the methodology guiding this subsection and further details and limitations.

Adaptation-related development finance for technology transfer is rising

In 2018–2022, estimates for adaptation-related development finance for technology transfer point to an increase from US$5.7 billion to US$12.7 billion. This occurred despite a drop in 2021, and was particularly driven by an increase of US$4.2 billion from 2021 to 2022 (figure 5.6). Consequently, the share of adaptation-related development finance for technology over total climate-related development finance for technology rose from 26 per cent in 2018 to 35 per cent in 2022 (with a peak of 47 per cent in 2020).

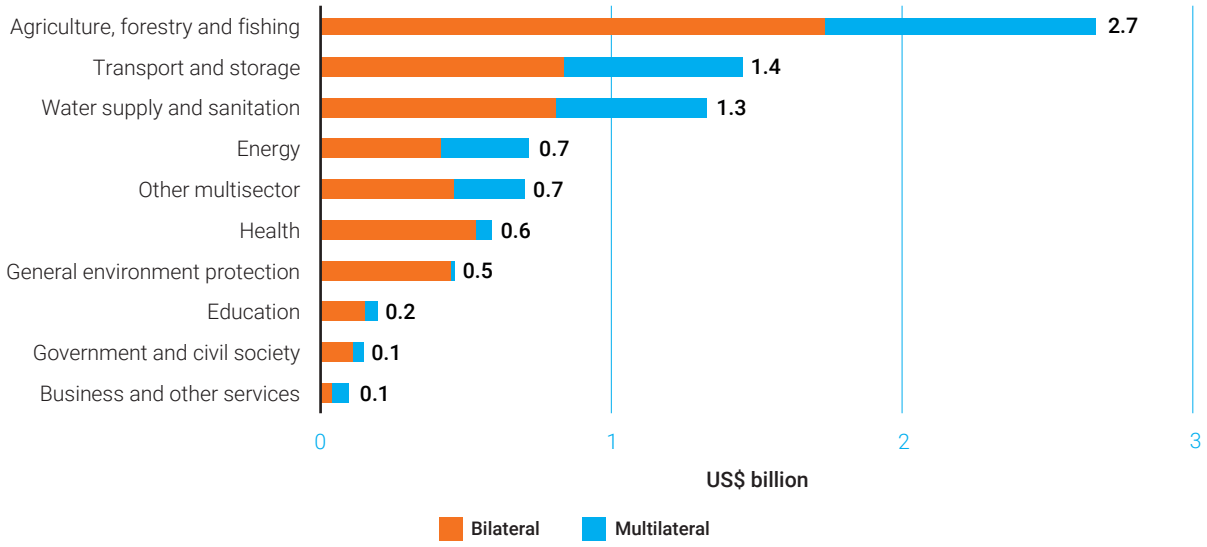
Figure 5.6 Estimates of adaptation-related development finance for technology transfer 2018–2022 from bilateral and multilateral providers (US$ billions, constant 2022 prices)



The sectoral allocation of adaptation-related development finance for technology transfer concentrates on the agriculture sector.

There is a strong focus of climate-related development finance on supporting adaptation through the introduction of new technologies and farming practices in the agriculture sector. Between 2018 and 2022, estimates for climate-related development finance in support of technology cooperation for adaptation in the agriculture, forestry and fishing sector averaged at US$2.7 billion per year (figure 5.7). This is almost twice the amount committed to the second biggest sector, transport and storage, and about 31 per cent of adaptation-related development finance for technology on average per year.

Figure 5.7 Top 10 sectors of adaptation-related development finance for technology transfer in 2018–2022, estimated annual averages disaggregated by bilateral and multilateral providers (US$ billions, constant 2022 prices)



While both bilateral and multilateral providers play important roles in contributing to the implementation of climate technologies via development cooperation, two thirds of adaptation-related development finance for technology in 2018–2022 were provided by bilateral finance providers (figure 5.7). This is particularly evident in certain sectors such as health or general environment protection, where bilateral providers represent the large majority of commitments. On the other hand, most of the multilateral support is concentrated in three sectors: agriculture, forestry and fishing; transport and storage; and water and sanitation.

5.3.3 What can be done to improve technology transfer?

Technology transfer as a means of supporting climate change adaptation faces a range of challenges that can limit its effectiveness. This subsection provides a summarized overview of some of these key challenges and how they can be addressed.

Planning

Obsolete and ineffective legal and regulatory frameworks can pose significant challenges to successful technology transfer for climate change adaptation (UNFCCC TEC 2021). Many countries identify a need for more robust, streamlined and supportive domestic policies to foster the development and transfer of new technologies. These regulatory challenges can differ by sector, with some sectors facing issues related to outdated or insufficient legal frameworks, while in other sectors there may be an absence of any legal framework, which impedes the adoption of new and innovative technologies. Addressing these challenges can begin with improvements to the planning process for facilitating technology transfer. A robust planning process will allow decision makers to identify and address existing legal and regulatory frameworks that create obstacles to successful technology transfer. Therefore, it is recommended that the planning process includes a robust process of identifying and analysing barriers, followed by a process of mapping out the actions needed to overcome any identified barriers.

Current planning processes for facilitating technology transfer in developing countries, as indicated in NAPs and other national adaptation strategies, need to be improved to match current and future demand. While support and guidance for improving the planning process can come from external sources (through South-South cooperation, triangular cooperation and even North-South cooperation), the country-driven nature of developing national policies for improved legal and regulatory frameworks places the responsibility on national decision makers. The availability of contextually reliable data to support the decision-making process is also a key factor which requires more focus, including the availability of climate and meteorological data, as noted in relation to capacity needs above.

Implementation

In sectors such as agriculture and water, where the adaptation of technology to local conditions is crucial, the complexity of these technologies, combined with the lack of technical expertise and infrastructure can often result in slow implementation and limited impact. Furthermore, a lack of information and awareness exacerbates these challenges, particularly in areas where the benefits and functionality of new technology are inadequately understood or articulated. Therefore, it is crucial that the necessary human and infrastructural resources and capabilities are identified and developed as an integral element of the broader technology transfer process. It is increasingly recognized that exploring South-South cooperation, with examples from similar contextual settings as discussed in the above section on capacity-building, can help overcome these challenges.

Finance

One of the most prevalent difficulties affecting technology transfer for climate change adaptation is economic and financial constraints (UNFCCC TEC 2021). High upfront investment costs, difficulties in obtaining loans and uncertainties surrounding the return on investment all offer substantial challenges across various sectors. These financial challenges are especially apparent for technologies that require significant capital investment, such as solar powered irrigation systems, where high installation and maintenance costs often hinder widespread adoption, despite technological advancements and price reductions. Local and national governmental support to stakeholders faced with these economic and financial constraints can help bridge the gap. However, as identified by developing countries through their conditional commitments of their NDCs, significant additional support from global funding entities is needed. Such support can help these countries improve the level of ambition in the national commitments through the implementation of climate-friendly technologies, to both mitigate and adapt to the inevitable impacts of climate change.

Conclusions

Overall, the challenges in technology transfer are multifaceted, including economic, legal, technical and informational limitations that must be addressed holistically. Overcoming these challenges requires planning and coordinated efforts at the national and international levels, including but not limited to the development and implementation of supportive policies, increased financial investment, and focused or sector-specific capacity-building activities (UNFCCC TEC 2021; Trærup *et al.* 2023). Supportive policies should straddle all dimensions of cooperation, including North-South, South-South and triangular cooperation, allowing for an enhanced chance of success in making technologies available where they can have the greatest impact on adaptation to climate change in vulnerable societies.

5.4 Cross-cutting issues and opportunities

As noted at the outset of this chapter, capacity-building and technology transfer, as key means of implementation of the Paris Agreement and of climate action more broadly, will be key issues for discussion at the COP 29 climate talks in Baku. The analyses in this chapter have revealed important areas of interdependence and common concern between these two issues which often get discussed separately within the negotiations process. We conclude this chapter by highlighting some of these cross-cutting issues and opportunities.

1. **Coordinating planning and action.** While capacity-building and technology transfer are often treated separately under the UNFCCC, the analysis from this chapter reveals that they are deeply interdependent. For example, the effective implementation of new technologies often hinges on the presence of enabling human and institutional capacities. At the same time, countries regularly prioritize climate information and agricultural technologies (among others) among their top capacity-building needs for adaptation. This interdependence suggests that it is important to better understand how these two means of implementation can be strengthened and deployed in a coordinated manner.

2. **Contextualizing and differentiating needs and avenues for action.** Capacity-building and technology transfer are both means of implementation whose effectiveness depends on a clear understanding of evolving national and local contexts, national and local development challenges, resources and priorities, and the ways that these differ according to key forms of social difference, like gender. This means that interventions aimed at strengthening these means of implementation must be informed by an understanding of these factors. Working through national institutions, such as universities (box 5.7), is one way of ensuring this. It is important that in the drive to scale up action through larger and more global programming, this step of contextualizing is not missed.

3. **Finance is critical to progress, but remains underestimated and difficult to secure.** Accurately determining the finance needs for capacity-building and technology development and transfer is extremely difficult, and is likely significantly underestimated. Finance for capacity-building and technology transfer tends to be covered by public flows, and often involves grants or concessionary loans, because these interventions do not generate direct revenues. Borrowing for such actions against policy-based loans remains a feasible option. An analysis of the source and regional distribution of development finance for adaptation-related technology transfer and cooperation is presented in annex 5.D.2.

4. **Supporting South-South networking and cooperation.** While capacity-building and technology transfer have both long been associated with one-directional transfers of skills and knowledge from global North to global South countries or regions, change is under way. South-South and networked forms of exchange are growing in prominence and may help to catalyse more contextually appropriate and sustainable adaptation practices (boxes 5.4, 5.6, 5.7). Scaling up investments into supporting these forms of exchange represents an important avenue for supporting climate action.

5. **Refining our understanding of adaptation needs and priorities.** NAPs have emerged as an important means of communicating and comparing both capacity-building and technology transfer needs and priorities as they relate to adaptation. However, the highly variable nature of NAPs (in terms of specificity, focus, etc.) makes robust analysis across countries challenging. While the country-led and context-driven nature of the NAP process is one of its strengths, it does present limitations for the plans as a resource for taking stock of current needs and capacities for adaptation. At the same time, TNAs provide efficient means for reporting on adaptation technology needs and also includes capacity-building elements. Additionally, the upcoming Biennial Transparency Reporting process has the potential to be an efficient tool for countries to supplement current reporting on such needs.

Building resilience of communities living in degraded forests, savannahs and wetlands of Rwanda.

Photo: © UNEP / Miranda Tasker

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Chapter 1

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Chapter 5

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Rwanda's natural wetland, forest, and savannah ecosystems provide a wide range of services that increase the climate resilience of local communities, such as erosion control and flood mitigation.

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