A Typology of Climate Change Adaptation Benefits: Exposure, Sensitivity, and Adaptive Capacity

A STAP Information Document

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STAP SCIENTIFIC AND TECHNICAL ADVISORY PANEL

An independent group of scientists that advises the Global Environment Facility

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Executive Summary

The estimated costs of climate change adaptation in developing countries greatly exceed available public financing, and this gap between needs and resources is projected to widen over the next several decades.[1] In addition, the Intergovernmental Panel on Climate Change (IPCC) has characterized current adaptation action as fragmented and incremental at a time when transformational change is needed.[2] Shifting adaptation practice to achieve transformational impacts and meet growing adaptation needs requires **clear adaptation rationales** that inform theories of change. These rationales should clearly connect adaptation goals at institutional or policy levels to specific projects and interventions to operationalize those goals and deliver enduring adaptation benefits.

A barrier to creating clear adaptation rationales is the absence of a broad **shared foundational typology of adaptation benefits** that captures locally-specific adaptation measures but provides enough structure to connect project priorities, actions, and outcomes. These rationales, when aggregated using this typology, can inform decision-making at the level of a multi-project portfolio.

STAP proposes the following typology or classification of adaptation benefits:

1. Exposure Benefits – a reduction in the frequency and/or magnitude of one or more climate impacts on the person, population, activity, or resource targeted by the project
2. Sensitivity Benefits – a reduction in the impact of a climate-related event on a person, population, or system
3. Adaptive Capacity Benefits – an increase in the ability of a person, population, or system to manage climate impacts or realize an opportunity emerging from climate change, including by transforming how they live

Using this typology to clarify the intended outcomes of a project and/or a portfolio of projects makes it possible to assess 1) whether the envisaged actions are **necessary and sufficient** to deliver benefits, 2) how and to what extent a portfolio is **aligned to institutional priorities**, and 3) whether and how institutional priorities enable **meaningful and enduring adaptation benefits**. Adaptation rationales constructed on this shared foundation allow institutions to recognize and avoid piecemeal and duplicative adaptation portfolios and, instead, support enduring and coherent adaptation approaches that benefit people and the environment.

Introduction

Even under moderate greenhouse gas emissions scenarios, the estimated costs of supporting developing countries in their efforts to adapt to climate-related risks and impacts are five to ten times greater than current public adaptation finance flows.[3] By 2050, costs are estimated to reach US$315–$565 billion, and the adaptation finance gap is widening.[4] Multilateral climate funds, including the Global Environment Facility's (GEF) Least Developed Country Fund (LDCF) and the Special Climate Change Fund (SCCF), along with other funds like the Adaptation Fund, the Green Climate Fund, and the Climate Investment Fund, are critical to meeting these adaptation needs.

The LDCF supports countries[5] that are the most vulnerable to the impacts of climate change.[6] To date, the LDCF has financed over 310 projects and 53 enabling activities with approximately $1.7 billion in grants, directly benefiting over 50 million people and strengthening management of over 7 million hectares of land for climate resilience at regional, national, and sub-national levels.[7]

As the IPCC recently noted, "most observed adaptation is fragmented, small in scale, incremental, sector-specific, designed to respond to current impacts or near-term risks, and focused more on planning rather than implementation."[8] Moreover, observed adaptation is unequally distributed across regions.[9] To shift adaptation practice to achieve the transformational impacts called for by the IPCC,[10] the LDCF and other multilateral adaptation funds should develop clear adaptation rationales that inform theories of change linking institutional adaptation policies and priorities with specific actions and their intended outcomes. These adaptation rationales require a shared foundation: a typology of adaptation benefits. This typology should be broad enough to capture the many locally-specific actions taken to adapt to climate change impacts but have enough structure to organize outcomes, enabling connections between priorities, actions, and benefits that inform decision-making.

A typology that clarifies the intended adaptation benefits of a project and/or a portfolio of projects enables construction of clear adaptation rationales at project, portfolio, or institutional levels. Such rationales clarify whether envisaged actions are sufficient and required to deliver intended benefits. These rationales also increase understanding of how and to what extent a portfolio aligns with institutional priorities. The adaptation rationales facilitate portfolio reviews that determine whether and how priorities lead to meaningful and enduring adaptation benefits. For example, which adaptation benefits are delivered by a priority focus on coastal zone management? Adaptation rationales constructed on this shared foundation could help institutions recognize and avoid piecemeal and potentially duplicative adaptation portfolios and, instead, support enduring and coherent adaptation approaches, resulting in lasting benefits for people and the environment.[11]

Climate change adaptation benefits: a simple typology[12]

The benefits of adaptation interventions and investments can be broadly characterized into three basic categories[13] (**Figure 1**) operationalized via specific questions:

1. Exposure Benefits – Does the action reduce *the frequency and/or magnitude* of one or more climate impacts on the person, population, activity, or resource targeted by the project? For

example, moving a transportation corridor further from the coast to avoid existing or projected flooding will deliver an exposure benefit.

2. Sensitivity Benefits – Does the action reduce *the impact* of a climate-related event on a person, population, or system? For example, building a roadway out of more durable, permeable material to allow increasingly frequent floodwaters to pass and recede quickly with minimal damage will deliver a sensitivity benefit.
3. Adaptive Capacity Benefits – Does the action *increase the ability* of a person, population, or system to manage climate impacts or realize an opportunity emerging from climate change, including by transforming how they live? For example, extending services or local planning will deliver an adaptive capacity benefit.

Notably, every type of benefit invokes issues of governance and justice, and benefits are rarely distributed evenly among the stakeholders of a given project. These issues emerge during construction of adaptation rationales that inform project design and implementation by linking institutional preferences and policy to specific interventions and their intended outcomes.

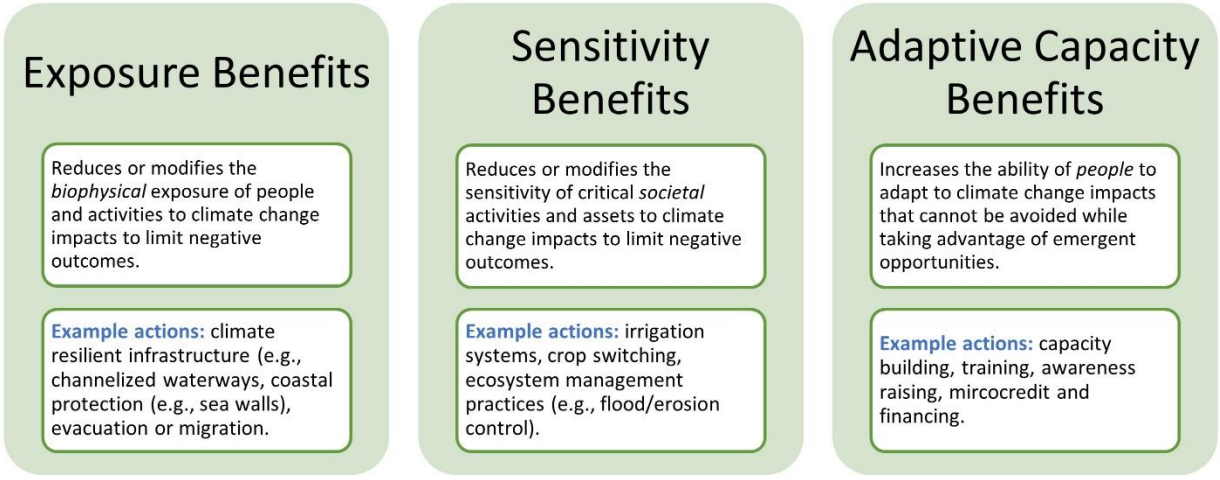

Figure 1: Typology of climate change adaptation benefits and examples of actions that may achieve them.

Understanding the path from policy to impact

Efforts to assess the impacts of adaptation actions have tended to track alignment between adaptation interventions and country or institutional policies and priorities.[14] Attempts to capture intervention outcomes often measure outputs, such as hectares of land impacted or number of people receiving benefits, but these outputs do not directly capture the adaptation benefits of an intervention or project. The implicit assumption is that actions aligned with national adaptation policies and goals achieve those goals, and therefore tracking outputs is a reasonable proxy for tracking adaptation benefits. However, the IPCC's assessment of adaptation progress,[15] as well as other efforts to measure adaptation needs and progress,[16] suggests that this assumption does not bear out in practice.

In contrast, the proposed typology (**Figure 1**) facilitates the development of meaningful adaptation rationales that could be articulated during project design, particularly when developing theories of change that inform selection of interventions and indicators for

monitoring implementation and impact. These adaptation rationales link adaptation goals at an institutional or policy level both to specific projects and interventions that operationalize those goals, and to the outcomes of those projects and interventions in terms of the adaptation benefits they deliver. Adaptation rationales can facilitate development of projects with clear adaptation goals, while enabling the monitoring, evaluation, and learning of everything from policy impacts on adaptation outcomes to the efficacy of specific interventions in a particular location.

Illustration using a hypothetical project example

Construction of an adaptation rationale for a hypothetical project must first identify the challenge. In this hypothetical example, an agricultural area along a coast is suffering from occasional but more frequent flooding due to sea level rise. At the same time, agricultural practices are increasingly challenged by irregular precipitation. These problems fall under five GEF-8 LDCF priority themes: coastal zone management, nature-based solutions, agriculture and food security, water, and land and forest management. These five themes "build on areas of high impact, articulated national priorities, and experiences of the two funds, with potential for trans-disciplinary interventions that can catalyze change and enable systemic shifts."[17]

Two broad sets of interventions are proposed to address these challenges. First, mangroves will be planted to mitigate coastal flooding in agricultural areas, reflecting GEF's institutional emphasis on coastal zone management, nature-based solutions, and agriculture and food security. Doing so will deliver an **exposure benefit** (i.e., reduced exposure of agriculture areas to flooding).

Second, the project will improve soil and crop management practices in those areas to increase food availability in the context of fluctuating precipitation. Improved soil and crop management practices support four themes identified in the GEF-8 LDCF strategy:[18] nature-based solutions, water, agriculture and food security, and land and forest management. This set of interventions primarily delivers a **sensitivity benefit** (i.e., reduced sensitivity of agricultural production to irregular precipitation). However, these interventions also deliver an **adaptive capacity co-benefit**, as the implementation of these practices will likely support farmer learning and uptake which furthers their capacity to adapt to climate change outside the project context.

Figure 2 illustrates the project's adaptation rationale. LDCF priority themes are implemented via specific interventions to deliver one or more adaptation benefits and co-benefits, and there are clear pathways from goals and priorities to interventions to adaptation benefits and co-benefits. This enables project designers to identify the assumptions and evidence guiding project design and implementation.

For example, in this hypothetical project, designers and stakeholders identified mangrove planting as a means of coastal zone management because it delivers an exposure benefit for agricultural production and food security. Framed in this manner, the project designer, working with stakeholders, can make two explicit decisions about this intervention. First, is mangrove planting the most appropriate and effective means of providing that benefit within this context? Second, is an exposure benefit an effective means of adapting agriculture to a changing climate within the project context?

This approach similarly enables project designers to see that addressing agriculture and food security challenges through improved soil management interventions will deliver a sensitivity

benefit and an adaptive capacity co-benefit. Designers and stakeholders are then prompted to evaluate whether the sensitivity benefit will meaningfully address either flooding or irregular precipitation. They may also evaluate whether achieving the adaptive capacity co-benefit requires additional programming or planning and, if so, build that into the project design.

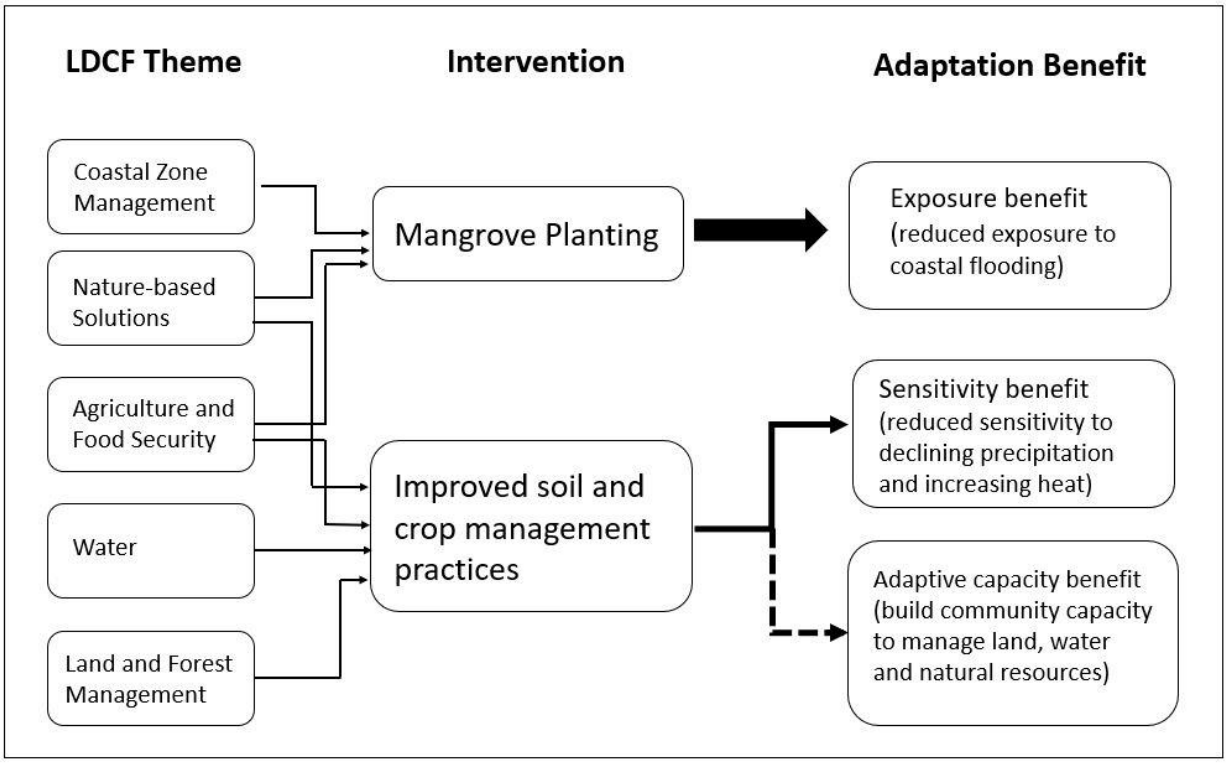

Figure 2: An example of a project-level adaptation rationale linking policy preferences under GEF-8 LDCF themes to specific implementation as interventions and finally to the adaptation benefits they deliver. Mangrove planting delivers an exposure benefit (solid line, regular text), while improved soil and crop management practices deliver a sensitivity benefit (solid line, regular text), and an adaptive capacity co-benefit (dashed line, italic text).

When aggregated, the adaptation rationales associated with these projects can offer important insights at a portfolio level. An analysis of the GEF-7 cycle of the LDCF illustrates such insights; the examples below reflect the cycle's themes and interventions.

1. What institutional or country adaptation priorities are promoted by projects and wider portfolios?

With clear adaptation rationales in each project, it is possible to assess how a portfolio of projects relates to the adaptation priorities of a donor institution or country. For example, the GEF-7 cycle of the LDCF included ten priority themes (**Table 1**).

Table 1: Priority themes for the GEF-7 cycle of the LDCF.

GEF-7 LDCF Themes
Agriculture
Climate Information Systems
Sustainable Land and Forest Management
Water
Coastal Zone Management
Health
Disaster Risk Management
Urban Development and Infrastructure, Energy
Sustainable Rural Livelihoods
Tourism

The Project Identification Forms (PIFs) associated with this cycle of projects indicate a clear tendency towards agriculture and water themes (**Figure 3**). In contrast, relatively few projects focused on urban systems, coastal zone management, and health. These results can help inform portfolio managers' decisions about future programming directions.

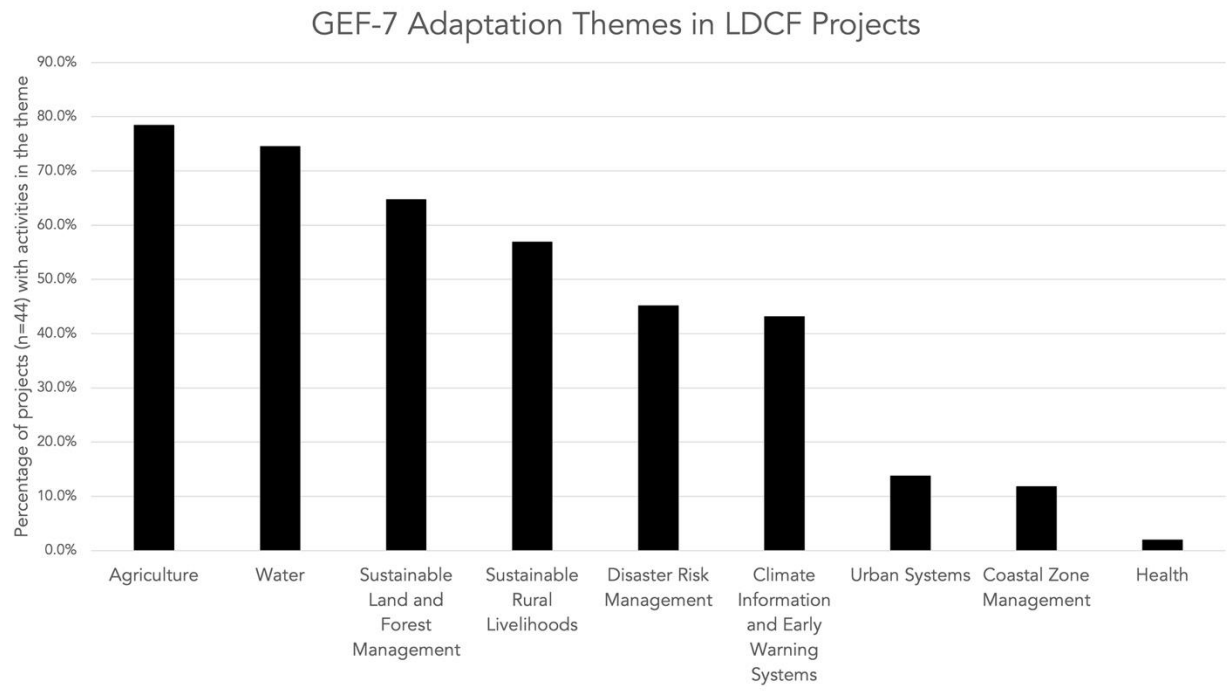

Figure 3: Percentage of GEF-7 LDCF projects with activities related to GEF-7 LDCF themes.

2. How are institutional or country adaptation goals translated into actions on the ground?

Clear adaptation rationales at the project level can help illuminate how institutional-level or country-level adaptation priorities have been implemented in practice. **Figure 4** summarizes the interventions used to implement the coastal zone management priority of the LDCF during the GEF-7 cycle. The chart indicates that more than half of all coastal zone management projects were implemented through capacity-building interventions such as support for planning, forecasting, and data analysis. This view of implementation enables portfolio managers to consider whether a heavy focus on capacity building is the most effective way to achieve adaptation benefits, or if a discussion is warranted regarding the rebalancing of interventions toward other LDCF priorities, such as sustainable rural livelihoods (6.3%) or access to finance (3.1%).

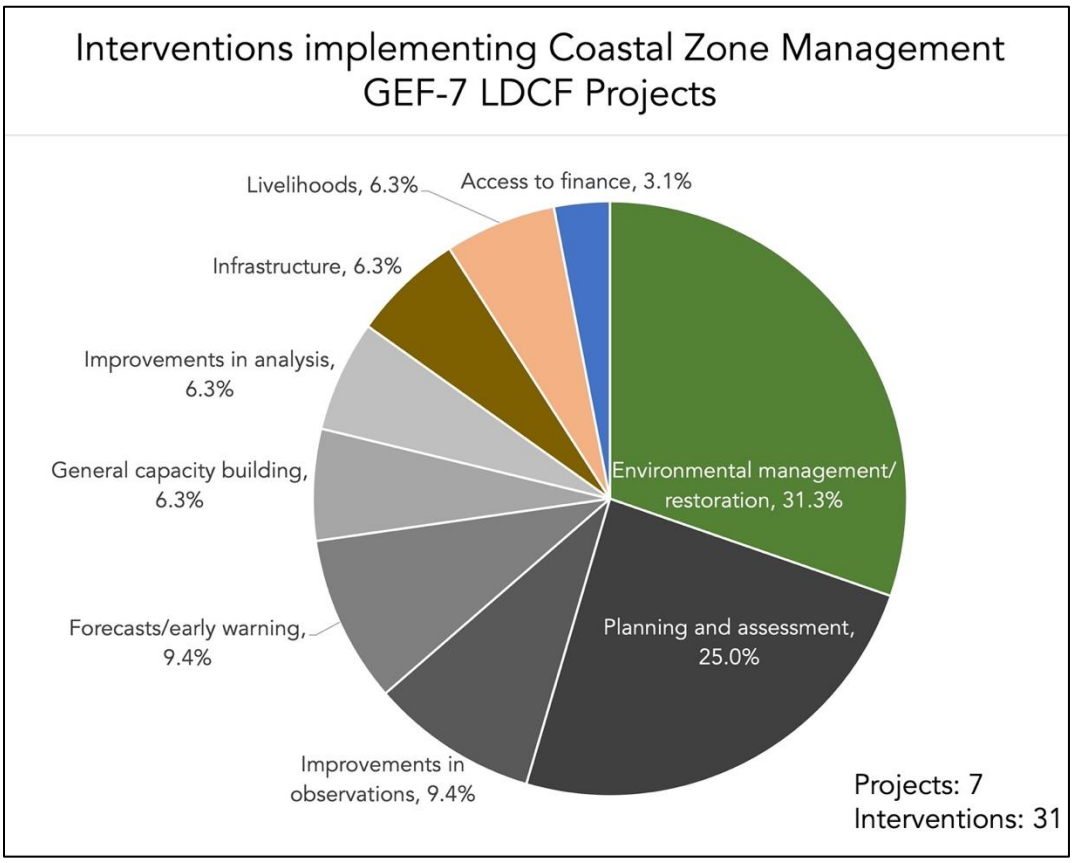

Figure 4: Interventions implementing coastal zone management in GEF-7 LDCF projects

3. What adaptation benefits do the portfolio deliver?

Project-level adaptation rationales make clear what adaptation benefits are meant to be delivered at the project level. This information can then be aggregated to the portfolio level. This understanding enables policymakers and portfolio managers to better assess which types of adaptation benefits are being achieved based on their priorities or stated themes (**Figure 4**). Such information can, for example, facilitate the alignment of projects and portfolios with National Adaptation Plans (NAPs).

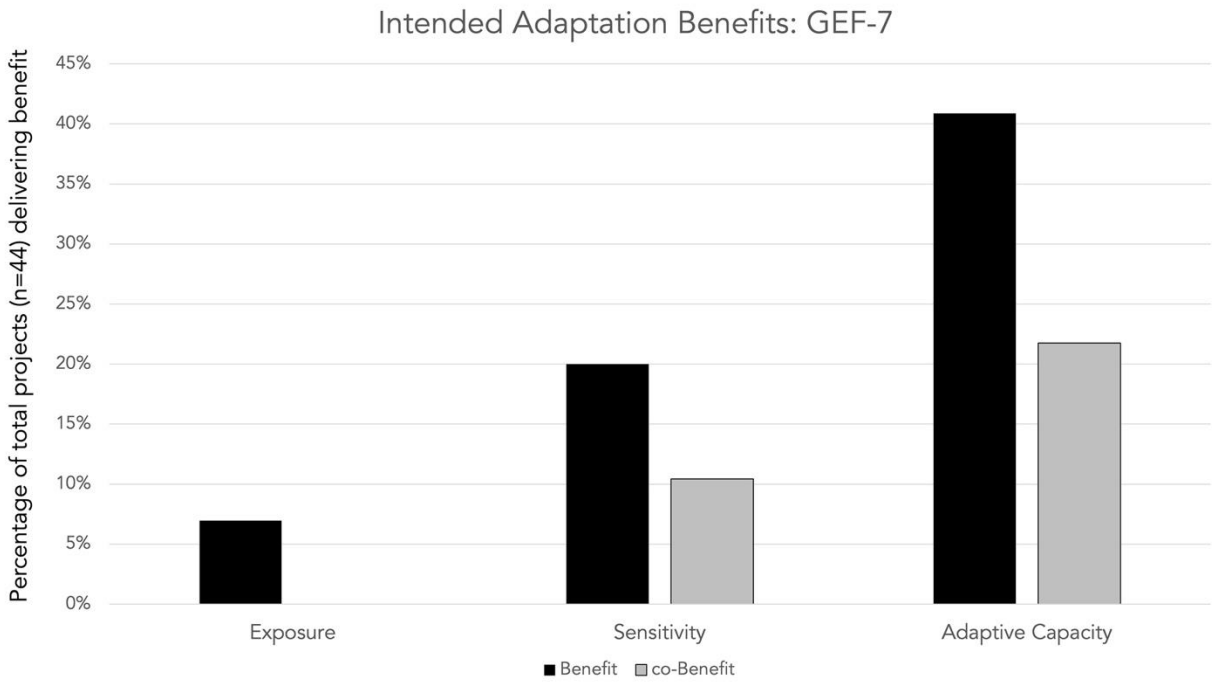

Figure 5: Intended adaptation benefits of GEF-7 LDCF projects, as represented in their PIFs. An assessment of the benefits delivered by these projects is pending their completion.

Discussion

Understanding adaptation action as an intent to deliver one or more adaptation benefits enables the construction of clear adaptation rationales (i.e., causal pathways within a theory of change) at the project and intervention level. These rationales link institutional or country adaptation priorities to specific adaptation actions and their intended adaptation benefits. Constructing these rationales facilitates better understanding of whether these connections effectively deliver desired adaptation benefits.

For an institution like the GEF, or within a national government, adaptation rationales informed by this typology also set a framework for reviewing entire portfolios of projects. These reviews enable a fuller understanding of whether a portfolio aligns with adaptation policies and priorities and whether assumptions about which activities deliver desired adaptation outcomes prove accurate.

Finally, donor organizations and their in-country partners that better understand the benefits delivered by a particular institutional portfolio will be better equipped to coordinate projects that ensure delivery of an appropriate mix of adaptation benefits. Such information is critical to the development and implementation of adaptation action that avoids piecemeal, incremental, and potentially duplicative outcomes.

[1] United Nations Environment Programme (2022) Adaptation Gap Report 2022: Too Little, Too Slow: Climate adaptation failure puts world at risk. Nairobi.
[2] IPCC, 2022: Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.
[3] United Nations Environment Programme (2022) Adaptation Gap Report 2022: Too Little, Too Slow: Climate adaptation failure puts world at risk. Nairobi.
[4] United Nations Environment Programme (2022) Adaptation Gap Report 2022: Too Little, Too Slow: Climate adaptation failure puts world at risk. Nairobi.
[5] There are currently 46 economies designated by the United Nations as the least developed countries (LDCs), entitling them to preferential market access, aid, special technical assistance, and capacity-building on technology among other concessions. See https://unctad.org/topic/least-developed-countries/list.
[6] IPCC, 2022: Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press. p.20.
[7] See https://www.thegef.org/what-we-do/topics/least-developed-countries-fund-ldcf. *accessed July 14, 2022.*
[8] IPCC, 2022: Summary for Policymakers, p.20.
[9] IPCC, 2022: Summary for Policymakers.
[10] IPCC, 2022: Summary for Policymakers
[11] While documents such as NAPs exist to prioritize climate actions broadly, and adaptation actions specifically, at the country level, these documents do not inform regional or global-level views of adaptation action that might also play into prioritization processes.
[12] There have been numerous efforts to create typologies of adaptation action. These efforts, which have been heavily focused on describing types or forms of adaptation action rather than the goals of that action, are usefully reviewed in Biagini, Bonizella, Rosina Bierbaum, Missy Stults, Saliha Dobardzic, and Shannon M. McNeeley. "A Typology of Adaptation Actions: A Global Look at Climate Adaptation Actions Financed through the Global Environment Facility." *Global Environmental Change* 25 (March 2014): 97–108. https://doi.org/10.1016/j.gloenvcha.2014.01.003.
[13] For a more detailed explanation of this typology, including examples, see Carr, E.R. and J. Nalau. (2022). Adaptation Services: A typology for prioritizing, designing, and measuring the impact of adaptation programs and projects (forthcoming).
[14] For example: Berrang-Ford, L., *et al,* 2021. A systematic global stocktake of evidence on human adaptation to climate change. *Nat. Clim. Chang.* 11, 989–1000. doi:10.1038/s41558-021-01170-y.
[15] IPCC, 2022: Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.
[16] For example: UNEP. Adaptation Gap Report 2021 The Gathering Storm - Adapting to Climate Change in a Post-Pandemic World. Nairobi: United Nations, 2021.
[17] See GEF programming strategy on adaptation to climate change for the LDCF and SCCF and operational improvements: July 2022 to June 2026. GEF/LDCF.SCCF/SM.03/01.
[18] See GEF programming strategy on adaptation to climate change for the LDCF and SCCF and operational improvements: July 2022 to June 2026. GEF/LDCF.SCCF/SM.03/01.