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PERSPECTIVES:
Adequacy and Effectiveness of Adaptation in the Global Stocktake

Perspectives: Adequacy and Effectiveness of Adaptation in the Global Stocktake

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About the independent Global Stocktake (iGST)

The Independent Global Stocktake (iGST) is a consortium of civil society actors working together to support the Global Stocktake (GST), the formal process established under the Paris Agreement to periodically take stock of collective progress toward its long term goals.

The iGST aligns the independent community — from modelers and analysts, to campaigners and advocates — so we can push together for a robust GST that empowers countries to take greater climate action. www.independentgst.org

The **Adaptation Working Group (AWG)** of the iGST was created in 2019, with the objective to support the GST by providing a scientifically sound assessment of progress made on adaptation in relation to the Global Goal on Adaptation. The AWG 2022-2023 program is co-chaired by UNEP Copenhagen Climate Centre and Indian Institute of Management Ahmedabad.

DISCLAIMERS

The findings, suggestions, and conclusions presented in this publication are entirely those of the authors and should not be attributed in any manner to any of the organisations.

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Editorial

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1. INTRODUCTION

The Paris Agreement, for the first time, has defined a global goal on adaptation (GGA) consisting of three key elements: *'enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal'*. The agreement further establishes that progress towards its long-term goals, including the global goal on adaptation, will be assessed in a Global Stocktake (GST), to be conducted in 2023 and every five years thereafter through its three components: information collection and preparation, technical assessment, and consideration of outputs. The Paris Agreement specifies four main adaptation-related functions of GST: (a) recognize adaptation efforts of developing country Parties, (b) Enhance the implementation of adaptation action taking into account the adaptation communication, (c) Review the adequacy and effectiveness of adaptation, and the support provided for adaptation, (d) Review the overall progress made in achieving the global goal on adaptation. However, in terms of the third function, neither a clear and commonly accepted definition of the concepts of 'adequacy' and 'effectiveness', nor a practice for operationalizing them in UNFCCC reporting have yet been established. As a result, and as stated in the recent 'Synthesis report for the technical assessment component of the first global stocktake' prepared by the UNFCCC secretariat: ' *[…] the indirect nature of assessments, along with the significant methodological work still needed, makes it difficult to produce a conclusive finding on the state of adequacy and effectiveness of adaptation*' (UNFCCC 2022). The synthesis report therefore stops short of attempting to provide a comprehensive global assessment of the adequacy and effectiveness (A&E) of the adaptation efforts made to date. While it is unlikely that such an assessment will be included in the first GST, it is critical that additional methodological and operational clarity is achieved ahead of the second GST to effectively include all four of its anticipated adaptation-related functions.

This publication, a product of the Adaptation Working Group of the independent Global Stocktake (iGST),[1] aims to advance conceptual and operational discussions of the A&E of adaptation in the context of the GST by bringing together the perspectives of a multitude of stakeholders, including academia, practitioners and policy-makers, all organized around one fundamental question:

'*How can the concepts of adequacy and effectiveness of adaptation be operationalized in assessments of global progress on adaptation?*' [2]

2. FRAMEWORK FOR THE DISCUSSION PERSPECTIVES

With a view to identifying possible methodological approaches for the review of the A&E of adaptation under the GST, the Adaptation Committee (AC) and the Least Developed Countries Expert Group (LEG), together with the Standing Committee on Finance (SCF), reviewed existing methodologies for assessing the A&E of adaptation and support at various scales and in different contexts (Adaptation Committee, 2021a). In their report, they discuss the limitations of applying input/output-based approaches[3] in assessing adaptation and the lessons from and persisting challenges associated with the application of outcome-based approaches.[4] Their review points out that the definitions and criteria for reviewing the A&E of adaptation and its support depend on the perspective and objectives of the respective stakeholders involved and hence require a clear understanding of the assessments' scope and purpose. Moreover, the report argues that, in order to assess adaptation effectiveness, there is a need to establish a cause and effect relationship between adaptation inputs and outcomes. Finally, the review concludes that the global review of the A&E of adaptation under the GST will need to derive information from various individual assessments at different scales by applying a broad range of methodologies. These findings point to the need for some further conceptual and operational clarity regarding the review of the A&E of adaptation and its support in the context of the GST, which is echoed in a recent OECD report (Jeudy-Hugo, Errendal and Kotani, 2022). Furthermore, as reviewing the A&E of adaptation and its support can inform individual Parties about updating and enhancing their adaptation actions and support (Adaptation Committee, 2021b), it would also be relevant to explore the role that Parties' reporting will need to play in this regard.

1 The iGST (https://www.climateworks.org/independent-global-stocktake/) is a consortium of civil-society actors working together to support a more robust and inclusive GST. The iGST consists of four working groups (Adaptation, Mitigation, Finance and Equity) and three cross-cutting regional hubs (Latin America, West Africa and South Asia).

2 This approach of offering a publication space for a diversity of stakeholders to provide unique perspectives and ideas on a critical and often underdeveloped question in the science-policy-practice interface is part of a longstanding 'perspectives series' published by the UNEP Copenhagen Climate Centre (https://unepccc.org/perspectives-series/).

3 Adaptation inputs refer to what has been done to adapt (e.g., development of adaptation plans), while immediate outputs refer to what has been achieved (e.g. the number of beneficiaries) (source: Adaptation Committee, 2021a. Methodologies for reviewing the adequacy and effectiveness of adaptation and support).

4 Adaptation outcomes refer to what has changed, e.g. increased institutional capacity or societal wellbeing (source: Adaptation Committee, 2021a. Methodologies for reviewing the adequacy and effectiveness of adaptation and support).

While the UNFCCC community is still in the process of finding a suitable way forward regarding these issues, it seems pertinent to contribute some perspectives from the science–policy interface. The scientific dimension emphasizes the contributions of experts and professionals and the importance of understanding the two concepts based on sound theoretical foundations. The scientific dimension can thus address questions such as: *what should be considered as adequate and effective adaptation and support (and for whom, when and why)?* The political dimension, on the other hand, acknowledges and involves values, norms, diplomacy and communicational considerations in the implementation and operation, and can therefore address questions such as: *how to operationalize, through the GST's three components, the assessment of adaptation A&E towards the GGA, and what general approaches could be applied (top down vs. bottom up, quantitative vs. qualitative)?*

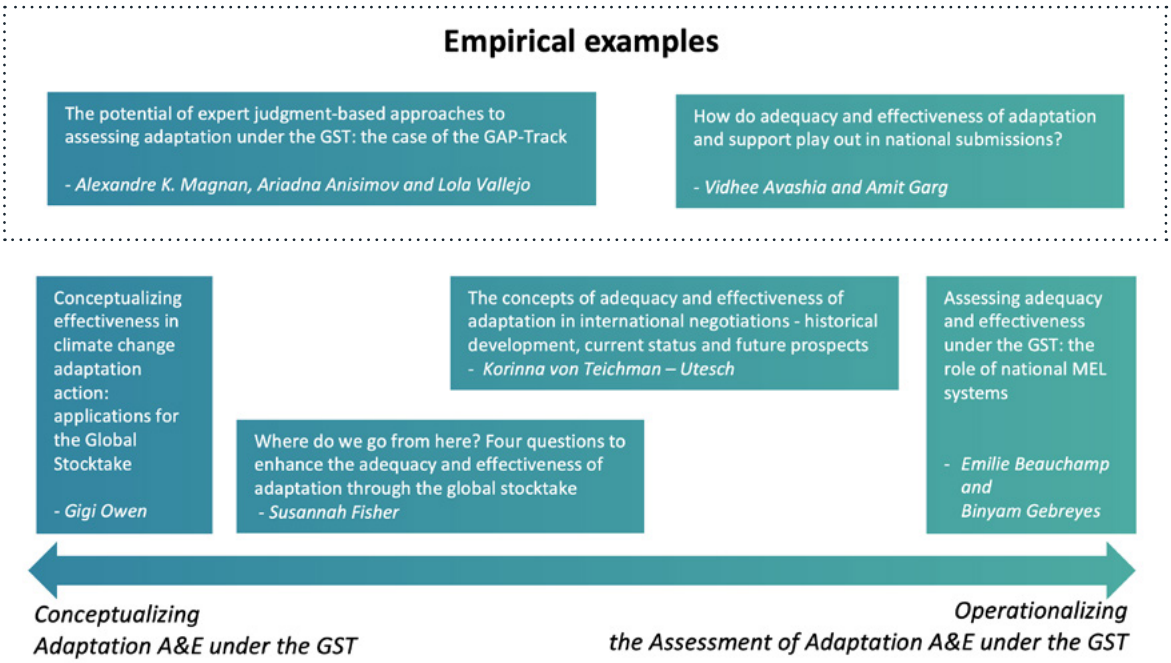
This volume attempts to advance the discussion on the conceptualization and operationalization of the concepts of adaptation A&E in the GST from the two perspectives shown in Figure 1. The two perspectives are addressed by individual papers, among which some focus on either the conceptualization or operationalization perspective, while some touch on both. The volume also presents papers that share specific ideas on how to operationalize adaptation A&E assessments based on practical experience and application. It should be noted that some papers address both adaption actions and support, while others mainly discuss adaptation actions. To avoid being misleading, this editorial uses the 'A&E of adaptation' to refer to both cases.

2.1. Conceptualizing A&E of adaptation under the GST

For the GST to be able to assess the A&E of adaptation on a global level, it is helpful to take a step back to understand the two concepts of A&E on a fundamental level. In the climate change research field, 'adequacy' has been referred to as the capacity to satisfy the need to respond to climate change (Lawrence, 2015). 'Effectiveness', on the other hand, and depending on the context, has been interpreted in relation to notions such as quality, procedure, process, efficiency, goal, output or outcome (Zhang, 2012). In the field of climate change particularly, effectiveness is recognized as closely related to the context and scale at which it is considered (Singh et.al., 2022). This interpretation is also reflected by the UNFCCC's Adaptation Committee, which pointed out that understanding the A&E of adaptation depends on the objectives, scope and purpose of the review (Adaptation Committee, 2021a). Based upon these understandings, this volume explores possible directions for conceptualizing the A&E of adaptation and support under the GST by means of the discussions included in its papers.

Von Teichman– Utesch's paper points out that the two concepts have been discussed and developed in the arena of the UNFCCC since the establishment of the Convention in the early 1990s. By reviewing the way in which they have been approached in the context of the UNFCCC both prior to and since the Paris Agreement, the paper offers insights into their conceptualization by the Parties, different constituted bodies and the IPCC. ***Fisher's*** paper argues the necessity of clarifying fundamental questions before the concepts of A&E of adapta-

Figure 1. The overall discussion framework



tion can be meaningfully applied in a global assessment such as the GST. These questions try to clarify for whom, when and why the GST should be carried out, and by reflecting the 'relative' or 'dependent' nature of the A&E of adaptation, they help define the boundaries and objectives for conceptualizing the A&E for adaptation. Particularly, to set up the objectives of the A&E of adaptation requires a shared understanding of what adequate and effective adaptation looks like (adaptation goals). To address this need, ***Fisher****'s* paper further introduces the potential for applying the concept of 'future visioning' in building a common understanding of adaptation goals across global contexts. Although we recognize that there is still a long way to go from a visioned future to an applicable conceptualized framework of adaptation A&E, this concept of 'future visioning' still provides a solid theoretical foundation for how to frame adaptation goals. ***Fisher***'s paper relates this discussion further to the UNFCCC's on-going work on developing methodologies for reviewing adaptation and argues that the conceptualization of the A&E of adaptation should take into consideration how the measurement of results can provide meaningful feedback to a country's adaptation practice and eventually facilitate better adaptation actions.

This discussion of the importance of setting up adaptation goals points toward the need for a better understanding of the concept of 'assessment'. The purpose of assessing the implementation of polices or actions and their outcomes is to support policy-making by distinguishing what works and what doesn't (Vedung, 2017). To carry out the assessments and communicate the results, the classic goals-targets-indicators system plays a useful role. Goals and targets (e.g. the GGA) provide references against which assessments can measure the level of success to inform policy-making, while indicators or indices communicate complex realities in a simplified way and thus have both a scientific and communicational role (Gao, 2013; Gao *et al*., 2013; Magnan *et al.*, 2021). Although the application of indicators in adaptation assessments is often criticized because it is applied at the cost of the granularity of information, as a global-level assessment exercise, GST will inevitably need to aggregate and generalize information. However, this begs the question: how much granularity do we actually need for the purposes of GST?

While ***Fisher's*** discussion takes one step back to explore the theoretical foundations for conceptualizing the A&E of adaptation, ***Owen*** attempts to explore a possible way to translate the complex understanding of adaptation effectiveness into a conceptualized framework. Based on a review of case studies in the literature assessing effective adaptation, the paper proposes a framework for conceptualizing effective adaptation characteristics through two perspectives: the effectiveness of adaptation support and process, and the effectiveness of adaptation outputs and outcomes. The first perspective refers to the sustainability, legitimacy, efficiency, flexibility and equity of adaptation, while the second looks into whether adaptation actions are actually reducing risk and vulnerability, enhancing social well-being, improving environments, increasing economic benefits or strengthening institutions. Especially the second perspective well addresses the strong emphasis on the adaptation results and outcomes by the GST. The paper further discusses the potential for conceptualizing adaptation effectiveness towards the GGA and provides a simplified sample framework illustrating how effectiveness could be conceptualized against the GGA's three elements.

Beyond the theoretical discussions, this volume also looks at existing empirical cases in conceptualizing adaptation actions and support to explore any practical attempts to conceptualize the A&E of adaptation that could potentially be taken up by the GST. Two papers discuss methodologies for conceptualizing adaptation and emerging practice at country levels. ***Magnan, Anisimov and Vallejo*** share experiences in applying a conceptualized framework (GAP-Track tool) for assessing adaptation efforts at different scales, including the global scale. The tool applies a core framework which consists of six overarching aspects of adaptation (knowledge, planning, actions, capacities, evidence, and forecasting). The framework has already been piloted at the country level and is currently being tested on a global level. Although its global application is yet to be evaluated, the paper explores the potential of applying the GAP-Track tool in the GST to conceptualize the GGA's three elements. Encouragingly, through an exercise in linking the overarching aspects of the GAP-Track tool to the GGA, the paper finds that those overarching aspects seems to provide a good reflection and representation of the GGA's three elements, implying great potential to contribute to the conceptualization of the A&E of adaptation under the GST. Moving to the country experience, ***Avashia and Garg*** review the available Adaptation Communications (ADCOMs) and National Adaptation Plans (NAPs) submitted by the Parties and find that only a few have included adequacy- and effectiveness-related information, with no clear difference between Annex I and non-Annex I Parties. Citing a more in-depth case study from Nigeria and Ghana, the paper finds that Ghana has established a monitoring framework for collecting data on adaptation programs and actions regarding their objectives, outputs and outcomes, though it is not included in their ADCOM. These findings point further to the need for top-down guidance for Parties' reporting, as well as for bottom-up support from the Parties in defining what the A&E of adaptation means to them.

2.2. Operationalizing the A&E of adaptation under the GST

Beyond the question of how the A&E of adaptation is understood conceptually, an equally critical question is how their conceptual understanding is then translated into operational assessment, especially at the global aggregate level as is needed in the GST. The papers included in this volume point to two critical methodological directions that need to be resolved when deciding on the approach to be followed in a global assessment of the A&E of adaptation.

2.2.1. Top-down approach vs. bottom-up approach

A critical decision when deciding on a framework for global assessment of A&E of adaptation is whether or not it should be conducted 'top-down,' i.e. by establishing standardized global-level methodologies[5] and indicators (with local assessments applying such standardized methodologies and feeding standardized data upwards) and with analysis primarily happening at a central location. The alternative is a 'bottom-up' approach, i.e. using multiple local assessments, likely with different locally adapted methodologies and indicators, which are only later combined into an aggregate global-level conclusion. Each approach has its advantages and disadvantages. A 'bottom-up' approach will give a more accurate reflection of local realities and adaptation priorities by using indicators and data calibrated and collected by national and local stakeholders. However, the metrics and methodologies used in individual assessments can be so diverse and context-specific that aggregation becomes practically impossible, at least in a quantitative sense (see section 2.2.2). A 'top-down' approach, on the other hand, through its central definition of indicators, metrics and methodologies, can provide an operational solution that allows for more comparable data across assessment contexts, and thus more 'fit for purpose' global conclusions. However, as adaptation is an inherently localized process, the generic methodologies and data needed in 'top-down' approaches can significantly decrease the representativeness of its results, making them too high a level to provide a meaningful picture of a broad palette of local realities. Also, national and local ownership, an important element in Monitoring and Evaluation for adaptation, is unavoidably reduced in such approaches.

Several of this volume's papers suggest that 'top-down' and 'bottom-up' approaches are more complementary than contradictory. They therefore discuss how the GST will need to find a workable balance if it is to successfully assess the A&E of adaptation. ***Von Teichman– Utesch*** highlights how the actual methodologies and definitions to be applied in the assessment of the A&E for adaptation remains unclear, despite more than two decades of political discussion, as well as technical work mandated by the COP. It then goes on to conclude that the solution to this gridlock can only lie in a framework that works at multiple scales in parallel, specifically by defining a set of globally applicable review criteria tracked across countries, but also 'complemented by context-specific (self-) assessments of the adequacy and effectiveness of adaptation and support'. Though not made specific, this line of thinking also seems consistent with the formally defined GST process and sources of information (Decision 19/CMA1), which indeed foresees the need for both 'bottom-up' and 'top-down' approaches. The former through the key role that is expected to be played by national reports like Adaptation Communications (which for the time being are not guided by specific mandatory methodologies or indicators to be applied). The latter by the role to be played by global assessments and reports such as the Adaptation Gap Report and others (Christiansen, Olhoff and Dale, 2020), which are generally based on globally defined indicators and centralized analysis. Recognizing the same problem of 'how to reconcile a diversity of data and meaning from assessments at different scales into a global, understandable set of findings', the paper by ***Beauchamp and Gebreyes*** suggests that the way forward for a productive and meaningful GST must ultimately be country-driven and thus should be designed to be capable of accommodating a diversity of metrics rather than narrowing down methodological pathways (defined top-down). They go on to suggest that national monitoring, evaluation and learning (MEL) systems are ideally placed to bridge the gap and reconcile various data from local to global (GST) levels through its UNFCCC communications and reporting. Global guidelines, processes and frameworks such as the GST (and the GGA) should embrace this as an opportunity to actively support and promote these systems and the learning opportunities they represent – including at the global level – rather than confining them through a set of predetermined metrics. At the more 'top-down' end of the spectrum, the GAP-Track tool suggested by ***Magnan, Anisimov and Vallejo*** applies a standardized analytical process and scoring system to reflect whether adaptation is happening or not. Each GAP-Track question is scored on a simple scale by a group of experts supported by a longer qualitative narrative allowing it to reflect some of the context-specific information that is typically lost in 'top-down' approaches. Local-scale real-world case studies are used to support the scoring exercise and are then aggregated to provide a more global picture, which leads this paper to suggests that reconciling top-down and bottom-up approaches is doable to a certain extent. ***Owen*** provides another instructive

5 In principle, at a later time when methodologies are stronger, it could also consist of one unifying methodology. However, an approach applying meta-analysis of multiple global-level assessments would have the advantage of evening out the strengths and weakness of individual assessments and thus providing a more scientifically balanced foundation for the conclusions.

example of how highly heterogenous datasets on effectiveness can be meaningfully assessed and aggregated at a global level. It goes on to suggest that the GST could potentially be based on a similar framework as the one used for the UN's Sustainable Development Goals (SDGs), e.g. by subdividing the still vaguely defined Global Goal on Adaptation into a larger number of more tangible sub-goals organized by, e.g., climate impact, geographical location or categories of adaptation action, each with its own targets and indicators of the effectiveness of inputs, processes, outputs and outcomes.

2.2.2. Aggregation/quantitative approaches vs. perception based/qualitative approaches

Another fundamental decision on which approach to adopt concerns whether the results of a global assessment of A&E of adaptation should be primarily quantitative or qualitative. Quantitative approaches will typically aggregate data from local, sectoral and national scales (e.g. national reporting to the UNFCCC) into one or more global indicators that can be tracked and compared over time. Such an approach seems to fit best with the objectives of the GST, which should, presumably, aim to have some sort of quantitative and actionable 'conclusion' at the global (or at least regional/national) level: '*Is the world on track to achieve adequate and effective adaptation (under current warming scenarios) – yes or no?*' However, a key challenge with a quantitative approach relates to the lack of one or more unifying universal adaptation outcome metric(s) that can be aggregated and compared in meaningful manner across a wide range of contexts (Christiansen et al, 2018). Quantitative global metrics currently applied at the aggregate level (e.g. by global climate funds[6]) thus tend to be output- and process- focused, rather than results- and outcomes- focused, thus limiting the extent to which they can be usefully applied to document the A&E of global adaptation efforts. Alternatively, assessments of adaptation results and their A&E can take a more qualitative approach.

This can take the form of semi-quantitative approaches (e.g. a scoring based on qualitative data, such as the above-mentioned GAP-track tool, or through perception-based surveys and scoring by relevant stakeholders), or more narrative qualitative assessments.

Qualitative approaches have the advantage of catching better the contextual complexities and nuances of adaptation on the ground (something which is difficult to do with a simple metric figure), while sacrificing, to some extent at least, the objectivity and comparability of data. This makes it difficult to aggregate the results to a global level, even for semi-quantitative approaches.

The choice of quantification versus qualification is also directly and indirectly referred to in the perspectives offered in this volume. ***Beauchamp and Gebreyes***, as already mentioned above, refer to literature warning of the risk of a 'tyranny of metrics' in which the GST could potentially get bogged down by a hunt for aggregable and quantitative metrics that are rarely meaningful in the local context. Instead, they suggest that the GST should focus on ways to conduct flexible meta-analysis and global assessments of the varied national and sub-national evidence, which can be both qualitative and quantitative, into meaningful global statements and focus on how these can contribute to learning and improvements to national adaptation efforts. Similarly, both ***Magnan, Anisimov and Vallejo*** and ***Owen*** suggest practical semi-quantitative frameworks capable of pulling together heterogenous data both qualitative and quantitative in nature from a range of contexts and using various methodologies into meaningful global statements on the status of global adaptation efforts. In both papers, a group of expert evaluators and coders would be the mediators in terms of conducting the assessment through a pre-defined analytical framework and subsequently coding them to allow for quantified outputs that can be replicated and tracked over time. While such approaches may not, for now at least, offer a fully satisfactory operational model for the GST, they underline the need expressed by most of this volume's authors for a definition of a GST framework that maintains some degree of quantitative output that can be aggregated globally, while still retaining the flexibility to adjust assessments to specific contexts and the availability of data.

While current discussions within the formal process of the UNFCCC acknowledges that both quantitative and qualitative approaches will have a role to play in the GST (as documented in ***von Teichman– Utesch***'s paper), it seems clear that at least the 1st GST will be based heavily on formal UNFCCC country submissions. As such, ***Avashia and Garg*** have reviewed available Adaptation Communications and NAPs, including an in-depth investigation of two case studies in Nigeria and Ghana, finding, as mentioned above, that only a few discuss A&E, and those that do generally include very limited information on the specific methodology used. In other words, it seems increasingly unlikely that UNFCCC country submissions, such as Adaptation Communications, at least in the context of the 1st GST, will contain data to support meaningful global conclusions in either quantitative or qualitative terms.

6 For example, the Green Climate Fund (GCF), in its Integrated results management framework (IRMF) adopted in 2021, identifies four core indicators for climate results across mitigation and adaptation. Only one of these is exclusively targeted to adaptation ('Direct and indirect beneficiaries reached'). It is supported by seven supplementary indicators, all based on the overarching metric of counting the number of beneficiaries (e.g. 'number of beneficiaries adopting innovations that strengthen climate change resilience') rather than a measure of the level of reduction in climate risk to those beneficiaries. A full overview of the GCF IRMF can be found here: https://www.greenclimate.fund/document/integrated-results-management-framework

3. LOOKING FORWARD

As the first GST is being carried out while this volume is in press, it is still unclear how the outstanding components of the GST process will be conducted. However, based on the available information, it is unlikely that a commonly accepted methodology assessing the A&E of adaptation and support is or will be in place. What has been commonly accepted is that conducting the GST will be a learning by doing process, as argued by ***Fisher:*** "*recognizing the limits to what can be known at this point*". Accepting this limitation allows us to move away from the idea of a perfect solution to address the 'mission impossible' of quantifying progress on the adaptation of A&E to a more realistic road map. Based on the discussions in this volume around the science–policy interface, there are a few directions for the future GST to consider when developing methodologies for assessing these two concepts.

From the conceptual perspective, it is endorsed by almost all the papers in this volume that future GSTs needs to carefully define their objectives, scopes and goals for assessing the A&E of adaptation, and here the GGA could play a key role. Translating this into practice can be done by further conceptualizing the three elements of the GGA into measurable goals and targets, either qualitatively or quantitatively or both, e.g., by defining what is considered as adequate or effective for enhancing adaptive capacity, strengthening resilience and reducing vulnerability respectively. A few papers include attempts at discussing both the objectives and scopes of GST (***Fisher***) and the conceptualization of the three elements of the GGA (***Owen, Fisher and Magnan, Anisimov and Vallejo***). Further in-depth studies along these lines could contribute to defining the goals for assessing A&E of adaptation in the GST.

From the operational perspective, the GST could, based on the currently available experience, explore further what is the most feasible pathway for carrying out the three components of GST: information collection and preparation, technical assessment and consideration of outputs, and (more critically) defining further the role of key actors for each component. For example, should the GST take a top-down or a bottom-up approach during the stage of information collection and preparation, technical assessment, and consideration of outputs? The current discussion on top-down versus bottom-up approaches implies that both approaches have their pros and cons. Rather than arguing further about which one fits the GST best, why not see this as an advantage? The implementation of each of the three components of the GST on adaptation will likely require different methodologies. For example, to ensure a comparable assessment of the A&E of adaptation at a global level, a top-down approach to data-collecting through a commonly applied technical guideline might be required by the UNFCCC. However, in order to obtain the necessary granularity in understanding adaptation efforts and results in a given context, and to inform the Parties on how to enhance their adaptation planning and implementation, a bottom-up approach would allow the Parties and sub-national actors to add more value to the process.

The above recommendations suggest a few directions that the GST could take in developing approaches for assessing the A&E of adaptation. As climate changes, so will the adaptation goals. Understanding, assessing and communicating climate risks and how human society is coping with them is a challenging task, which requires both scientific knowledge and political will, as well as actions in developing conceptualized frameworks and operationalizing them.

REFERENCES

Adaptation Committee, UNFCCC (2021a) Methodologies for reviewing the adequacy and effectiveness of adaptation and support.

Adaptation Committee, UNFCCC (2021b) Approaches to reviewing the overall progress made in achieving the global goal on adaptation.

Christiansen L, Martinez G., and Naswa P. (eds.) (2018) *Adaptation Metrics, perspectives on measuring, aggregating and comparing adaptation results.* UNEP DTU Partnership, Copenhagen.

Christiansen L., Olhoff A., and Dale T. (2020) *Understanding adaptation in the Global Stocktake. UNEP DTU Partnership.* Part of the iGST Designing a Robust Stocktake Discussion Series.

Gao J. (2013) *The role of indicators in strategic environmental assessment*. Alborg University. ISBN 978-87-91404-41-2.

Gao J., Kørnøv L., and Christensen P. (2013) Do Indicators Influence Communication in SEA? *Environmental Impact Assessment Review*, 43, 121-128.

Jeudy-Hugo S., Errendal S., and Kotani I. (2022) Adaptation in the global stocktake: options to deliver on its mandate. OECD Climate Change Expert Group Paper No.2022(4)

Lawrence J. H. (2015) *The adequacy of institutional frameworks and practice for climate change adaptation decision making*. Wellington: Victoria University.

Magnan A.K. *et al.* (2021) Estimating the global risk of anthropogenic climate change. *Nature Climate Change,* 11, 879–885.

Singh C. et.al. (2022) Interrogating 'effectiveness' in climate change adaptation: 11 guiding principles for adaptation research and practice. *Climate and Development*, 14:7, 650-664.

Vedung E. (2017) *Public Policy and Program Evaluation*. Taylor and Francis.

United Nations Framework Convention on Climate Change (2022) Synthesis report for the technical assessment component of the first global stocktake: state of adaptation efforts, experiences and priorities.

Zhang J. (2012) *Searching for cumulative understanding of effectiveness.* Alborg University. ISBN 978-87-91404-37-5

Photo: UNEP

The concepts of the adequacy and effectiveness of adaptation in international negotiations: historical development, current status and future prospects

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1. INTRODUCTION

The global stocktake (GST), which it has been agreed should take place every five years starting in 2023 to assess progress made with the implementation of the Paris Agreement, will, inter alia, review the adequacy and effectiveness of adaptation and support provided for adaptation (Art. 7.14 (c) of the Paris Agreement). Although the idea is not new, it is the first time that the Parties have agreed to take a holistic look at the impact of global adaptation and whether it is sufficient in the context of the temperature goal of holding average global warming well below 2°C. This is a complex undertaking, and the Parties continue to struggle with the "what" (= which areas of adaptation and support to look at and which sources of evidence to use) and the "how" (= which criteria for adequacy and effectiveness to apply and by whom).

In the pursuit of outlining prospects on the way forward towards the review under the first and subsequent GSTs, this article summarizes the methodological and conceptual ideas and approaches which have emerged under the Convention and the Paris Agreement to date. It examines whether and how the two concepts have been approached under the UNFCCC prior to the adoption of the Paris Agreement (historical development), the methodological and conceptual progress that has been made post-Paris (current status) and how the global review could unfold over time (future prospects).

2. HISTORICAL DEVELOPMENT: APPROACHES TO THE CONCEPTS OF THE ADEQUACY AND EFFECTIVENESS OF ADAPTATION AND ITS SUPPORT UNDER THE UNFCCC PRIOR TO THE ADOPTION OF THE PARIS AGREEMENT

The terms "adequacy" and "effectiveness" in relation to adaptation are not an invention of the Paris Agreement but already appear in the Convention text itself in provisions that relate to adaptation actions, their support and the review of progress made by the Parties towards the objectives of the Convention (see Box 1). In simple terms, the Parties have committed themselves to implementing measures to facilitate adequate adaptation (Art. 4.1 (b)), developing country Parties are supposed to receive adequate support for doing so (Art. 4.3), and it is acknowledged that the effective implementation of their commitments depends on the effective provision of support (Art. 4.7). The Convention text also states that the Conference of the Parties (COP) should review the cumulative impacts of the measures taken and the extent to which progress towards the Convention's objectives is being made (Art. 7).

This does not seem to be very different from what the Parties have agreed to undertake as part of the Paris Agreement and the GST. However, as the negotiations in the early years of the Convention focused on how to mitigate greenhouse gases, adaptation received very limited attention, and the questions of what adequate and effective adaptation and its support and progress towards the adaptation-related objectives of the Convention actually entailed remained largely undefined. The question is thus whether subsequent processes and institutional arrangements on adaptation and its support, as developed and implemented by the COP and by the Parties, can provide insights into how the two concepts were approached over time (see Figure 1).

Approaches to the concepts of adequacy and effectiveness in relation to adaptation actions

The first attempt by the COP to learn about adequate and effective adaptation actions was to invite the Parties to report on their experience. The first guidelines for national communications, which initially represented the core instrument for assisting the Parties in planning implementation of their adaptation-related commitments under the Convention and in communicating their intended and implemented actions to the COP, requested both Annex I and non-Annex I Parties[1] to provide information on the expected impacts of climate change. They were also asked to outline the measures they were planning or had already implemented to facilitate adequate adaptation (Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, 1994; UNFCCC, 1996). The guidelines for non-Annex I Parties also encouraged them to provide information on their specific needs and concerns arising from the adverse effects of climate change. However, in their first national communications, the Parties hardly reported on the adaptation measures they had actually implemented. Instead, they pointed to the significant challenges they had faced in assessing their vulnerability and climate change impacts and in identifying specific adaptation measures and their anticipated effectiveness (Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, 1994a; UNFCCC, 1999a).

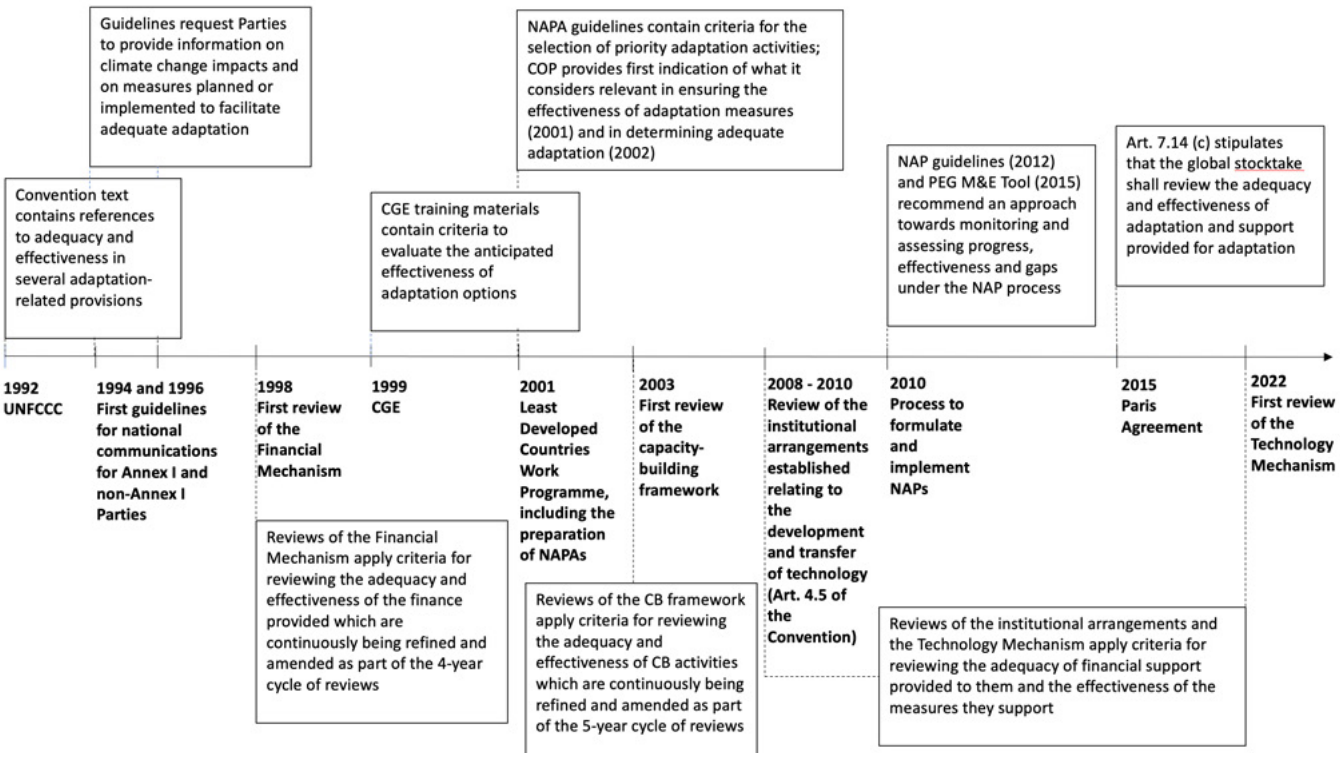
In response, in subsequent reporting guidelines for Annex I Parties, the COP provided further guidance for undertaking vulnerability and impact assessments without requiring such Parties to provide any information on the effects of implemented adaptation measures (UNFCCC, 1999).

1 The Convention divides countries into different groups according to their different commitments. Annex I Parties include the industrialized countries that were members of the OECD in 1992, plus countries with economies in transition, including the Russian Federation, the Baltic States and several Central and Eastern European States. These Parties have more commitments, e.g. regarding mitigation, than non-Annex I Parties. Non-Annex I Parties are mostly developing country Parties.

Box 1. The concepts of adequacy and effectiveness in the Convention text (UNFCCC, 1992)

- As part of the Convention Parties have committed "to formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change […] and to **facilitate adequate adaptation to climate change**" (Art. 4.1 (b)).
- Developed country Parties and other developed Parties included in Annex II are obliged to provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties when implementing measures to meet their commitments under the Convention. In fulfilling these obligations developed country Parties "shall take into account the need for **adequacy and predictability in the flow of funds**" (Art. 4.3).
- Art. 4.7 states that "the extent to which developing country Parties will **effectively implement** their commitments under the Convention will depend on the **effective implementation** by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology…"
- Art. 7 of the Convention lays out that the Conference of the Parties (COP) "shall keep under regular review the implementation of the Convention […] and shall make, within its mandate, the decisions necessary to **promote the effective implementation of the Convention**." In subparagraph (e) of the same Article, it is stated that the COP shall "assess, on the basis of all information made available to it in accordance with the provisions of the Convention, the implementation of the Convention by the Parties, **the overall effects of the measures taken** pursuant to the Convention, in particular environmental, economic and social effects as well as **their cumulative impacts** and **the extent to which progress towards the objective of the Convention is being achieved**."

Figure 1. Processes and institutional arrangements that have addressed the adequacy and effectiveness of adaptation and support prior to the adoption of the Paris Agreement



CB = capacity-building; CGE = Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention; NAP = national adaptation plan; NAPA = national adaptation programme of action; PEG M&E Tool = tool to monitor and assess progress, effectiveness and gaps under the process to formulate and implement NAPs

As a result, until the adoption of the Paris Agreement the COP was unable to review the overall effects, cumulative impacts or adequacy of adaptation measures that had been implemented by these Parties (UNFCCC, 1998; UNFCCC, 2003a; UNFCCC, 2007; UNFCCC, 2011; UNFCCC, 2014).

In the case of non-Annex I Parties, the reported challenges and needs resulted in several technical processes and institutional arrangements that were established under the Convention with a view to supporting these Parties, particularly the most vulnerable and least developed country Parties, in improving their vulnerability and adaptation assessments and in evaluating the effectiveness of adaptation options. Over the years, several guidelines and tools have been developed for or by these processes and arrangements. Some of them contain initial proposals of criteria and approaches for determining adaptation progress and effectiveness (see Table 1).

In 2001, when establishing the first set of the processes and arrangements mentioned above, the COP itself went one step further in indicating what it considered relevant in ensuring the effectiveness of adaptation measures. In paragraph 2 of decision 5/CP.7, it insisted that "action related to adaptation follow an assessment and evaluation process, […], so as to **prevent maladaptation** and to ensure that adaptation actions are environmentally sound and will produce **real benefits in support of sustainable development**."

In terms of further defining the adequacy of adaptation, in 2002 the COP revised the guidelines for the preparation of national communications from non-Annex I Parties and requested them, for the first time, to "**provide information on their vulnerability to the adverse effects of climate change, and on adaptation measures being taken to meet their specific needs and concerns arising from these adverse effects**", thus comparing needs with actual actions for determining "adequate" adaptation (UNFCCC, 2002). However, subsequent national communications again fell short of information on implemented adaptation measures and on the evaluation, prioritization or costing of adaptation options due to persistent data and capacity gaps (UNFCCC, 2003; UNFCCC, 2005). This further prevented the COP from enhancing understanding of the adequacy and effectiveness of adaptation.

In the specific case of progress made in adaptation through the formulation and implementation of national adaptation plans, the COP invited the SBI to monitor and evaluate that progress. Accordingly, since 2014 it has received annual reports on the progress of developing country Parties, as summarized by the secretariat from country reports and other relevant sources. The information has been compiled along several of the essential functions of the NAP process as proposed in the LEG's PEG M&E tool (see Table 1).[2] However, the information so far only provides insights on process and output-related progress by the Parties and not on the actual outcomes of the implemented measures. Consequently, the COP has acknowledged that it has not been in a position to assess how the NAP process has contributed towards reducing vulnerability or enhancing adaptive capacity. Consequently it has encouraged further reporting by developing country Parties on relevant outputs and outcomes related to the process (UNFCCC, 2015a; UNFCCC, 2016; UNFCCC, 2018).

Approaches to the concepts of adequacy and effectiveness in relation to adaptation support

Under the Convention, adaptation support is channelled through several mechanisms and institutional arrangements that also provide support for mitigation. This support is delivered in the form of finance, technology development and transfer, as well as capacity-building. Review processes have been established to assess the performance of each of the mechanisms and arrangements by the COP, including with regard to the adequacy and effectiveness of the support they provide (see Table 2).

As is evident from Table 2, much more time and resources have been invested by the COP, as well as by constituted bodies and institutional arrangements over the years, to determine what adequacy and effectiveness mean in relation to the support provided and how to assess them. As a result, they have continuously improved the assessment processes over time by refining and amending the review areas, criteria, sources of information and stakeholders involved in the review and by incorporating lessons from previous reviews.

Findings from the historical development

By examining historical developments, the following can be learned in terms of the "how" and the "what" regarding reviews of the adequacy and effectiveness of adaptation and support:

- Some progress has been made in terms of conceptualizing the adequacy and effectiveness of adaptation and support prior to the adoption of the Paris Agreement, though more in relation to adaptation support than regarding adaptation action;

2 These have been compiled by the UNFCCC secretariat and are available at https://unfccc.int/topics/adaptation-and-resilience/workstreams/national-adaptation-plans-naps/compilation-of-information-for-the-assessment-of-progress-made-in-the-process-to-formulate-and.

Table 1. Initial proposals for criteria and approaches for determining adaptation progress and effectiveness

Process or institutional arrangement	Function	Guideline or tool	Proposed criteria and approaches for determining adaptation progress and effectiveness
Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE) (established 1999)	Improving national communications from non-Annex I Parties	CGE Training Materials for Vulnerability and Adaptation Assessment (CGE, 2021 (updated version), chapter 9)	Criteria to evaluate the anticipated effectiveness of adaptation options: (i) benefits; (ii) costs and (iii) feasibility
Least Developed Countries (LDC) Work Programme, including the preparation of national adaptation programmes of action (NAPAs) (established 2001)	NAPAs were to be undertaken by LDCs as a first step in the preparation of initial national communications, without the requirement to undertake in-depth assessments	Guidelines for the preparation of NAPAs (UNFCCC, 2001)	Criteria for the selection of priority adaptation activities: (i) degree of adverse climate effects; (ii) potential to enhance adaptive capacity through poverty reduction; (iii) synergy with other multilateral environmental agreements; (iv) cost-effectiveness
The process to formulate and implement national adaptation plans (NAPs) (established 2010)	To facilitate the identification of adaptation needs and the development and implementation of strategies and programmes to address those needs by developing-country Parties	Technical guidelines for the process to formulate and implement NAPs (UNFCCC, 2012) and the "Tool to monitor and assess progress, effectiveness and gaps under the process to formulate and implement national adaptation plans" (PEG M&E tool) developed by the Least Developed Countries Expert Group (LEG) (UNFCCC, 2015)	Approach towards monitoring and assessing progress, effectiveness and gaps under the NAP process: countries to identify a few areas, or essential functions, of the NAP process and assess progress made on them via qualitative and quantitative performance measures. Essential functions could relate to e.g. governance, knowledge generation, assessments of vulnerability and adaptation options, implementation of adaptation, review and reporting

- Adequacy and effectiveness are conceptually linked and are sometimes considered indicators of one another;
- The review of the adequacy and effectiveness of both adaptation and support requires the assessment of adaptation outcomes (= what has changed), in addition to outputs (= what has been done). The review of support also requires an assessment of the way the support was provided (e.g. organizational or management effectiveness);
- Reviewing adequacy and effectiveness requires a sufficient level of reporting by the Parties on adaptation implementation and outcomes of which there has been a lack to date, particularly regarding adaptation actions;
- Reasons that have been brought forward for the lack of reporting include the existence of conceptual, methodological, resource and capacity constraints on adaptation planning, implementation and the reporting of them. These need to be tackled in order to obtain more evidence of effective and adequate adaptation;
- Limited reporting on evidence on the one hand and a lack of conceptual guidance on what constitutes adequate and effective adaptation on the other are mutually constraining;
- Apart from Party reporting, other assessment methods, including independent reviews, qualitative methods such as interviews and expanding the sources of evidence, are important, as is evident from the reviews of the various support mechanisms;
- Refining the review methods, including applied indicators, over time and with experience can continuously improve the review process.

3. CURRENT STATUS: PROGRESS ON METHODOLOGICAL AND CONCEPTUAL ASPECTS MADE POST-PARIS

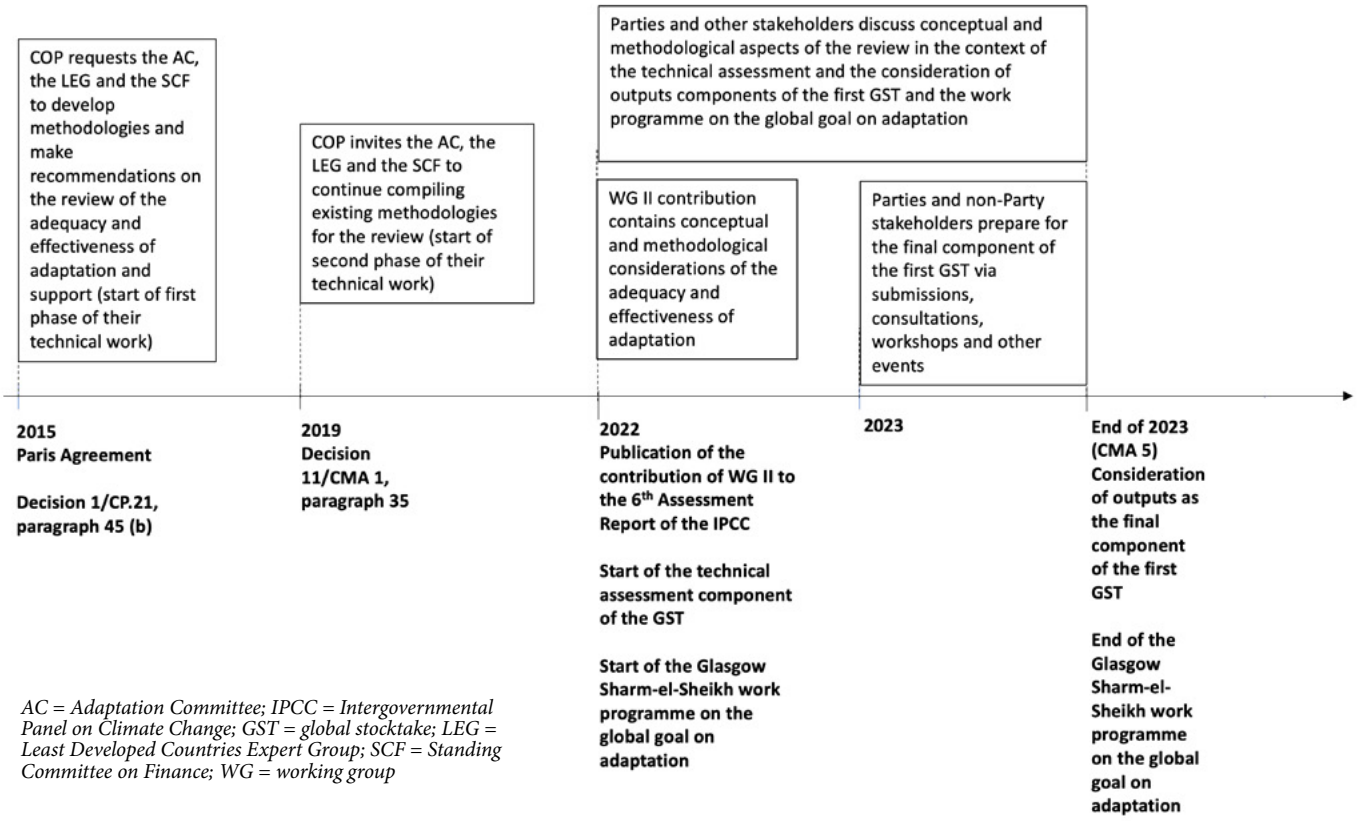
In the run-up to the Paris Agreement, adaptation and the question of whether it is actually making an impact gained traction. Since the adoption of the Agreement, methodological and conceptual aspects around the review of the adequacy and effectiveness of adaptation and support have received closer attention, mainly in the following three contexts: (i) within technical work mandated by the COP; (ii) as part of the Sixth Assessment Report of the IPCC; (iii) as part of the discussions under the technical dialogue of the first global stocktake; and (iv) within the negotiations and work programme on the global goal on adaptation (see Figure 2)

Table 2. Overview of mechanisms and institutional arrangements that provide support for mitigation and adaptation under the Convention and their respective review processes as conducted prior to the Paris Agreement (for a more detailed overview, see AC/LEG, 2021 and AC/LEG, 2020, annexes I - IV)

Mechanism/ institutional arrangement	Function	Cycle/years of reviews prior to the Paris Agreement	Criteria for assessing adequacy and effectiveness
Financial mechanism (Art. 11 of the Convention)	To channel financial resources from Annex II Parties (those required to provide financial assistance) to developing country Parties in order to assist them in implementing their commitments under the Convention (Art.11). Operated by operating entities which are currently the Global Environment Facility and the Green Climate Fund.	1998 and every four years thereafter	**Effectiveness** is assessed by reviewing: (i) the way financing is provided (e.g. the organizational effectiveness of the operating entities and their responsiveness to COP guidance, including criteria such as the transparency of decision-making processes, the adequacy, predictability and timely disbursement of funds, the accessibility of funds, the amount of finance leveraged and complementarity with other finance providers) (ii) the outcomes of the supported activities (criteria include, inter alia, the results and impacts achieved by the activities and the extent to which they contribute to the objectives of the Convention, their sustainability, their contribution to country ownership and gender-sensitive approaches, and the level of stakeholder involvement). **Adequacy** is assessed by comparing the funding needs of developing-country Parties in meeting their commitments under the Convention with the funds available via the operating entities.
Institutional arrangements established in relation to Art. 4, para 5 of the Convention on the development and transfer of technology	Art. 4, para 5 of the Convention calls on developed-country Parties and other developed Parties included in Annex II to "take all practical steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. […]."	Different parts of the review undertaken between 2008 and 2010	**Effectiveness** was assessed by reviewing how the implemented measures had • contributed to institutional and regulatory systems conducive to technology development and transfer; • furthered the involvement of the private sector and enhanced the cooperation with relevant intergovernmental processes; and • contributed to collaborative research on mitigation and adaptation technologies. **Adequacy** was assessed by reviewing the financial support provided for the purposes of the development and transfer of technologies in terms of their amount and timeliness, and of the gaps and barriers to the use of and access to the available resources. The adequacy of support was assessed as part of the effectiveness of the implementation of measures.
Technology Mechanism (established in 2010 to replace the institutional arrangements relating to the implementation of Art. 4, para.5)	To facilitate the enhancement of technology development and transfer to developing countries (the Mechanism consists of the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN))	2022[3] and periodically thereafter	**Effectiveness** of the Technology Mechanism in improving resilience is assessed by reviewing outputs, outcomes and impacts of the activities undertaken by the TEC and the CTCN. Criteria for assessing impacts include (i) the anticipated increased economic, health, infrastructure, built environment or ecosystem resilience to climate change impacts reported by CTCN participant countries; (ii) specific examples of increased climate resilience as documented in case studies and sources such as GEF project evaluations. **Adequacy** of the support provided to the Technology Mechanism in supporting the implementation of the Paris Agreement on matters relating to technology development and transfer was assessed by reviewing the sources, types and trends of the support provided, as well as the way it was used and how it has met the budgets and plans of the Technology Mechanism. The adequacy of support was considered separately from the effectiveness of the Technology Mechanism.
Capacity-building (CB) framework (established by decision 2/CP.2 in 2001)	To guide capacity-building activities related to the implementation of the Convention and effective participation in the Kyoto Protocol process.	2003 and every five years thereafter	**Effectiveness** is assessed by reviewing (i) key factors that have been identified to contribute to effective climate change capacity-building, including the involvement of national governmental organizations in CB activities, the integration of CB activities into planning processes, the exchange of best practices, experiences and information on CB activities among different stakeholders, the availability of resources, and donor coordination, among others; (ii) how CB activities have enhanced the ability of developing country Parties to implement the Convention, e.g. by reviewing initial and subsequent national communications and national adaptation programmes of action. **Adequacy** is assessed by comparing the defined scope and areas of activity of the framework as defined in decision 2/CP.7, as well as CB needs identified by the Parties with the actual implementation of CB activities, and by identifying potential gaps.

3 The first review of the Technology Mechanism has been included in the table for the sake of completeness despite the fact that it took place after the establishment of the Paris Agreement. The final report of the first review is contained in document FCCC/SBI/2022/13, available at https://unfccc.int/sites/default/files/resource/sbi2022_13.pdf.

Figure 2. Conceptual and methodological considerations regarding the review of the adequacy and effectiveness of adaptation and support since the adoption of the Paris Agreement



AC = Adaptation Committee; IPCC = Intergovernmental Panel on Climate Change; GST = global stocktake; LEG = Least Developed Countries Expert Group; SCF = Standing Committee on Finance; WG = working group

Status of the technical work mandated by the COP

As part of the decision that adopted the Paris Agreement, the COP mandated the Adaptation Committee (AC) and the Least Developed Countries Expert Group (LEG), jointly with the Standing Committee on Finance (SCF) and other relevant institutions, to develop methodologies and make recommendations on reviewing the adequacy and effectiveness of adaptation and support.[4]

The three bodies have addressed this mandate in two phases. In the first phase, from 2016 to 2019, they collected information through a desk review, submissions from the Parties and other stakeholders, and by organizing events. They proposed some general features and aspects of a possible approach towards the review but acknowledged that at the time the overall state of knowledge was not sufficient to develop fully flushed-out methodologies. The COP, serving as the meeting of the Parties to the Paris Agreement (CMA), subsequently invited further technical work by the Parties, academia and other stakeholders and invited the AC and the LEG, in collaboration with the SCF and relevant experts, to continue compiling existing methodologies.[5] During the second phase, which started in 2020, the three bodies compiled various existing methodologies that are applied at different scales, together with related metrics/indicators,[6] lessons, gaps and challenges, into a background paper based on submissions and a variety of other sources (AC/LEG, 2021). They also established a joint working group to advise on further work with the mandate, a group that has met several times and discussed the potential framing of the review, the context in which it is going to be undertaken and the potential sources of information it may draw on.[7]

During both phases, the three bodies advanced thinking along the following lines (the following is an extract of their work; more information is available in the background paper and websites indicated above):

- In terms of what to review for assessing the adequacy and effectiveness of adaptation and support and which sources to use, they considered the following:
  - The review needs to consider the concepts of adequacy and effectiveness separately, as well as the way in which they are linked (i.e. adaptation measures cannot be effective if they or their support are not sufficient/adequate, while an evaluation of the adequacy of adaptation and support is challenging if measures are not effective in the first place);
  - Consistent with the provisions for the global stocktake, the focus of the review should be on collective progress while considering information from sources at all scales;
  - The scope of the review should be limited to those adaptation actions and support undertaken and provided

4 Decision 1/CP. 21, paragraph 45 (b).
5 Decision 11/CMA.1, paragraph 35.
6 The terms "metrics" and "indicators" are used interchangeably in this paper.
7 For an overview of the work conducted during the two phases and the respective outcomes, refer to https://unfccc.int/process-and-meetings/bodies/constituted-bodies/adaptation-committee-ac/mandates-from-the-cma/methodologies-for-reviewing-the-adequacy-and-effectiveness-of-adaptation-and-support#eq-2

in response to the provisions of the Convention and the Paris Agreement;
- There is no "one size fits all" approach or methodology for undertaking the review. Instead, it will need to derive information from various individual assessments at different scales, applying a broad range of methodologies. Many of these already exist that can provide important lessons and serve as sources of information;
- Related global processes and goals, such as the global temperature goal, the global goal on adaptation, the sustainable development goals and the Sendai Framework for Disaster Risk Reduction, will influence the approach to and outcomes of the review and will need to be closely monitored during its further design; synergies with these processes should be established where possible.

- In terms of the "how", including what indicators to apply and by whom, they found that:
  - No single global metric for adaptation assessments exists due to the context-specific nature of adaptation, but qualitative and quantitative indicators play an important role for assessments at other, e.g. national levels and are increasingly being applied;
  - While no single, global metric exists, and a simple aggregation of sub-national and national metrics to the global level is not possible, experience from iterative assessments at various scales could assist in defining, over time, consistent types of information or metrics relevant for the global review. This could be applied across countries and help in defining future reporting requirements;
  - Indicators alone do not explain why and how change has occurred and need to be accompanied by qualitative descriptions in order to derive the right information and lessons;
  - Continuity and flexibility are required for successive reviews. Continuity refers to a repetitive assessment of the same aspects in order to capture developments over time. Flexibility refers to the need to take into account new societal developments, trends and values when establishing assessment criteria, since these influence the way adequacy and effectiveness are evaluated;
  - Innovative sources of information and data, such as big data, satellite observation and mobile technology, as well as innovative reporting systems, could facilitate future reviews and assist developing countries to establish and maintain well-functioning monitoring, evaluation and reporting systems;
  - Conceptualization of the concepts of adequacy and effectiveness in relation to adaptation remains difficult. The global stocktake should essentially be seen as a platform for sharing experiences on what works in adaptation, for learning from each other and for refining methodologies and criteria over time.

The three bodies will continue their work in light of their open-ended mandate and provide further input on how the review of the adequacy and effectiveness of adaptation and support may be undertaken under the first and subsequent global stocktakes.

Conceptual and methodological considerations by the Intergovernmental Panel on Climate Change

The IPCC, in the contribution of Working Group II to the Sixth Assessment report, which was released in 2022, considers the concepts of the adequacy and effectiveness of adaptation from both an ex-ante perspective (during adaptation planning) and an ex-post perspective (during or after the implementation of measures).

It describes the potential or actual effectiveness as "the anticipated or actual extent to which adaptation can reduce climate risk and impacts, by decreasing or avoiding further risk in vulnerability, exposure or hazards". Anticipated and actual adequacy is the extent to which adaptation responses are anticipated to be or are actually collectively sufficient to avoid dangerous, intolerable, or severe climate risk and impacts at a given level of warming (Ara Begum et al., 2022). Overall, the IPCC associates the success of adaptation with an "equitable balancing of synergies and trade-offs across diverse objectives, perspectives, expectations, and values", with successful adaptation and maladaptation forming the two ends of a continuum (New et al., 2022).

In terms of methodological considerations, the IPCC states, similar to the findings of the AC, the LEG and the SCF, that there is no single global reference metric for measuring the effectiveness of adaptation, but that its determination is context-specific and subject to the identified adaptation objectives and the needs of each individual adaptation situation. In line with its definition of successful adaptation, it suggests that effectiveness needs to be assessed along the adaptation–maladaptation continuum together with the attributes "feasibility" and "justice", as well as taking potential maladaptations into account. It further suggests that measures of well-being and multi-objective/multi-criteria measures might be most suitable in assessing successful, including effective, adaptation outcomes. Accordingly, from a global perspective, successful adaptation could consist of actions anticipated or documented to make significant contributions to meeting the sustainable development goals, such as ending extreme poverty, hunger and discrimination, and reducing the risks to ecosystems, water, food systems, human settlements, and health and well-being (Ara Begum et al., 2022).

While the IPCC underlines the important role of monitoring and evaluation systems at different scales for assessing the adequacy and effectiveness of adaptation, and associated challenges, such as the sustained lack of M&E efforts that focus on adaptation outcomes, it does not offer any concrete proposals for reviewing the adequacy and effectiveness of adaptation and support at the collective level as required in the context of the GST.

Status of discussions under the technical dialogue of the first global stocktake

Two meetings of the technical dialogue under the first global stocktake have taken place to date, one in June 2022, the other in November 2022.[8]

In their submissions prior to each of these meetings, the Parties have made some suggestions on how to review the adequacy and effectiveness of adaptation and support under the global stocktake.[9] However, these do not go much beyond of what has been discussed by the AC, the LEG and the SCF described in the previous section in terms of methodology and conceptualization. Some have shared how they undertook the review at the national level (e.g. UK).

Given that no single approach towards the review has been agreed as yet, the Parties have used the discussion space of the technical dialogue so far for making statements on the following issues:

- The links between the GST and the global goal on adaptation, including the importance of ensuring coherence among the two. Some of the Parties have underlined the importance of further operationalizing the global goal in guiding the review of the adequacy and effectiveness of adaptation and support (some advocate operationalization in both qualitative and quantitative terms here);
- Their experiences in what constitutes effective or ineffective adaptation, relating, for example, to governance, data and information, stakeholder involvement and the availability of resources;
- The inadequacy of financial support in relation to needs in terms of both quantity and quality, e.g. accessibility, distribution, type of finance and sustainability of flows;
- Their intention of setting up improved monitoring and evaluation systems, including the identification of appropriate targets and indicators, given their value in further identifying adequate and effective adaptation and support.

The second meeting of the technical dialogue featured a breakout group specifically on the review of the adequacy and effectiveness of ongoing adaptation and support at different scales.[10] Apart from repeating many of the points outlined in the previous sections of this paper, the discussion in this group revealed the following additional aspects and ideas that could be relevant for the review:[11]

General aspects and ideas:

- Considering developing indicators for adequacy and effectiveness at different scales (from local to global), e.g. global coverage of NAPs as one indicator of adequacy at the global level;
- Taking the transboundary and compound risks into account and applying a cross-sectoral lens;
- Considering the intergenerational aspects as indicators for the adequacy and effectiveness of long-term adaptation action and support, e.g. in terms of "generation-proofed" policies and financial flows;
- Developing a mapping process to capture the state of adaptation in countries in order to share experiences and tracking progress;
- Developing innovative ways of reporting (e.g. through technology, regional cooperation, improvement and harmonization of data-collecting systems and creation of synergies) given its importance for reviewing adequacy and effectiveness and the associated challenges for developing countries;
- Seeing the GST and the global review of adequacy and effectiveness as a continuous process of translating and linking different views and understandings and facilitating mutual learning - given the dynamic and context-specific nature of adaptation, its relationship with the temperature goal and all the complexities involved, such as various stakeholders and different geographical and time scales (approach of the "race to resilience" initiative).

In terms of reviewing the effectiveness of adaptation actions:

- Considering how successful local adaptation strategies can be taken into account and learned from under the global review;
- Assessing to what extent adaptation and climate information are integrated into all relevant decision-making processes at all relevant levels and by the public and private sectors – for example, into prioritization of activities, budget and investment planning – as an indication of the systemic/transformational change that is required;
- Applying the conservation of nature as an indicator.

In terms of reviewing the adequacy of adaptation actions:

8 Information on the first and second meetings of the first technical dialogue can be found at the following link: https://unfccc.int/topics/global-stocktake#The-Technical-Dialogues-of-the-Global-Stocktake

9 Submissions that have been reviewed for this article include Party submissions to the global stocktake that had an adaptation component and were submitted before December 2022 (for the first and second meetings of the technical dialogue) in response to the call outlined in paragraph 19 of decision 19/CMA.1. All submissions to the global stocktake are available at the Global Stocktake Information Portal at the following link: https://unfccc.int/topics/global-stocktake/information-portal. Select "Submissions to the Global Stocktake" and "Party".

10 The prompt for the breakout group is available at https://unfccc.int/sites/default/files/resource/RT2.7_Anand_Patwardhan_Prompt_final.pdf

11 This summary of the points made is based on the author's personal notes taken during the discussion, as no official report of the breakout group was available at the time of the publication of this paper.

- Assessing needs all along the adaptation policy cycle, as well as cross-cutting issues such as gender and youth, in order to identify gaps.

In terms of reviewing the effectiveness of adaptation support:

- Assessing whether and how much of the support is actually reaching the local level and the most vulnerable (youth, women, indigenous people) using respective disaggregated data;
- Assessing the international financial institutions as a whole and whether the way in which they provide finance is effective, or whether new ways and instruments of generating and delivering finance are required;
- Assessing enabling conditions for support, including capacity, data and availability and access to technology.

Status of discussions on the global goal on adaptation

Given the importance that some Parties ascribe to the role of the global goal on adaptation in further guiding the review of the adequacy and effectiveness of adaptation and support, the question is whether progress has been made under the negotiations or the Glasgow-Sharm el-Sheikh work programme in further operationalizing it?

In terms of the negotiations, at the fourth meeting of the CMA in November 2022 the Parties decided to initiate the development of a framework for the global goal on adaptation to be undertaken through a structured approach under the Glasgow-Sharm el-Sheikh work programme agreed in 2023.[12] The framework is intended to guide achievement of the goal and the review of progress towards it. The Parties have also decided that the framework may consider, inter alia, the following elements: (i) dimensions (or elements of the iterative adaptation cycle), taking into account the support provided for each dimension; (ii) themes, including water, food and agriculture and biodiversity, among others; (iii) cross-cutting considerations, such as gender, intergenerational equity and vulnerable groups, among others; and (iv) sources of information, including those referred to in the decision on matters relating to the global stocktake (decision 19/CMA.1, paragraph 37).

In terms of the Glasgow-Sharm el-Sheikh work programme, four workshops have been held so far throughout 2022, focusing on enhancing understanding of the global goal and reviewing progress towards it; enhancing adaptation action and support; methodologies, indicators, data and metrics, monitoring and evaluation; and communicating and reporting on adaptation priorities respectively.[13]

12 FCCC/PA/CMA/2022/L.16.

13 Summary reports of all four workshops are contained in the report on the implementation of the Glasgow–Sharm el-Sheikh work programme available at https://unfccc.int/sites/default/files/resource/sb2022_inf01_0.pdf

Regarding the conceptualization of the global goal, different ideas have been discussed, including setting targets at different scales and the need to treat the goal as dynamic instead of static, given its links to temperature and other established global goals.

Other themes of the workshops' discussions with relevance to the review of adequacy and effectiveness of adaptation and support included approaches for reviewing progress towards the goal, as well as methodologies, indicators, data and metrics, and monitoring and evaluation. Some sessions also focused specifically on the adequacy and effectiveness of adaptation and support. Discussions on these aspects mainly reflected what has been discussed in relation to the review of adequacy and effectiveness as described in previous sections of this paper. For example, with regard to reviewing progress towards the goal, proposals included applying combinations of quantitative and qualitative methods or of global and nationally set targets. In the discussions on the adequacy and effectiveness of adaptation and support and on methodologies and metrics, issues such as the need to take into account different scales and stakeholders; the need to accelerate implementation of adaptation and the monitoring of outcomes; the importance of enabling conditions and adequate support for effective adaptation; the links and synergies between the various global goals and agendas; and the need to apply a combination of methodologies in assessing collective progress while recognizing the context-specific nature of adaptation featured prominently.

Findings from the current status of methodological and conceptual progress

No clear methodological and conceptual approach towards reviewing the adequacy and effectiveness of adaptation and support as part of the global stocktake has been identified as yet, but a range of different aspects and views in terms of the "what" and the "how" has been brought to the table.

This reflects the complexity of the task at hand. While convergence is emerging on some aspects, e.g. the links with and desirability of synergies with existing global goals and processes, divergence remains on others, e.g. on whether to place the focus of the actual assessments and related goal-setting on the global or national level. As a result, the discussions under the GST and on the global goal, as well as the lessons and findings from the technical work carried out by the AC, LEG and SCF, resemble each other and circulate around the same issues. Having brought all these aspects to everyone's attention and initiated the joint discussion is already of value in itself and can be seen as part of the important learning function regarding the GST. It remains to be seen whether the continuation of these discussions and the approaches that will

be proposed for conducting the final component of the first global stocktake (= the consideration of outputs) in 2023 will result in a more streamlined approach to the review.

4. FUTURE PROSPECTS

Given the current status of methodological and conceptual progress, one possible scenario for approaching the review of the adequacy and effectiveness of adaptation and support under the first global stocktake is that it will consist of the consideration and structuring of the methodological and conceptual aspects and the experiences and views that have been brought to the table to date. This approach would not provide the very clear global picture of the adequacy and effectiveness of adaptation and support that some Parties might have expected from the review. However, it would have value in facilitating learning and mutual understanding, as well as in the opportunity it provides to identify gaps and areas of work which could help in arriving at a more systematic approach in future GSTs.

Possible areas for further action which could contribute to such a more systematic approach, if desired, include:

1. Further operationalizing the global goal on adaptation, which could assist countries in setting goals and targets for adaptation at the national and other levels and thus help to determine the adequacy and effectiveness of adaptation and support at various scales;
2. Defining a set of globally applicable review areas and/or criteria (both process- and outcome-related, and both qualitative and quantitative), which could be tracked across countries and complemented by national-level and/or context-specific (self-) assessments of the adequacy and effectiveness of adaptation and support in order to determine global-level progress on adaptation and to identify gaps and areas that require further or accelerated action;
3. Refining reporting guidelines for all Parties according to the defined goals, areas for review and criteria at the global and national levels, taking into account potential synergies with existing reporting requirements, including under the Paris Agreement's transparency system and other multilateral processes. This could lead to systematic, comprehensive and consistent reporting on adaptation and its outcomes;
4. Providing support to developing-country Parties, where required, and developing innovative methods to assist them in complying with the reporting requirements and setting up or enhancing and maintaining their monitoring, evaluation and reporting systems;
5. Adjusting targets, criteria and methods over time as knowledge and experience are gained and global and national contexts and priorities change.

The following ongoing processes and streams of work under the Convention and the Paris Agreement could deliver important inputs to such areas of action in the near term:

- The design of the final component of the first global stocktake (= the consideration of outputs), for which submissions have been invited until early 2023 and further consultations, workshops and events are planned in the course of the year;[14]
- The Glasgow-Sharm-el-Sheikh work programme on the global goal on adaptation, which will end at CMA 5 in November 2023, and the related negotiations;[15]
- The work of the AC and the LEG, in collaboration with the SCF, on compiling existing methodologies for the review;[16]
- The assessment of progress in the process to formulate and implement national adaptation plans which will be undertaken by the Subsidiary Body for Implementation starting in June 2024 and which will pay particular attention to the progress made by countries towards the objectives of the process (UNFCCC, 2021). This will indicate whether or not the process is successful in actually achieving national-level resilience;
- The review of the 8th national communications by Annex I Parties for which these Parties are requested to follow the revised reporting guidelines as adopted by COP 25 in 2019. The revised guidelines contain, for the first time, an encouragement to Annex I Parties to report on monitoring and evaluation frameworks to monitor implemented adaptation strategies and plans, as well as on progress with and the outcomes of adaptation actions (UNFCCC, 2019).

The views in this article are expressed in the author's personal capacity and do not necessarily reflect the views of the United Nations or of the United Nations Climate Change Secretariat.

REFERENCES

Adaptation Committee and Least Developed Countries Expert Group. (2020). *Methodologies for reviewing the adequacy and effectiveness of adaptation and support*. Version 1 of the draft background paper. Document AC-LEG/INFO/1. Retrieved from: https://unfccc.int/sites/default/files/resource/ac18_5e_acleg_adequacy.pdf.

Adaptation Committee and Least Developed Countries Expert Group. (2021). *Methodologies for reviewing the adequacy and effectiveness of adaptation and support*. Draft background paper. Document AC-LEG/INFO/3. Retrieved from: https://unfccc.int/sites/default/files/resource/ac20_5e_adequacy.pdf.

14 FCCC/SB/2022/L.8; developments under the final components can be followed at https://unfccc.int/topics/global-stocktake#Informal-consultations-TD12

15 Further information on the work programme and the planned activities in 2023 is available at https://unfccc.int/topics/adaptation-and-resilience/workstreams/glasgow-sharm-el-sheikh-WP-GGGA#eq-4

16 Their work can be followed at https://unfccc.int/process-and-meetings/bodies/constituted-bodies/adaptation-committee-ac/mandates-from-the-cma/methodologies-for-reviewing-the-adequacy-and-effectiveness-of-adaptation-and-support#eq-2

Ara Begum, R., et al. (2022): *Point of Departure and Key Concepts*. 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, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 121–196, doi:10.1017/9781009325844.003. Retrieved from: https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf.

Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE). 2021. *Chapter 9: Integration, Adaptation, Mainstreaming, Monitoring and Evaluation. In: CGE Training Materials for Vulnerability and Adaptation Assessment*. Retrieved from: https://unfccc.int/sites/default/files/resource/Chapter_9_updated_2021.pdf.

Intergovernmental Negotiating Committee for a Framework Convention on Climate Change. (1994). *Guidelines and procedures for first communications*. Annex to decision 9/2. Contained in document A/AC.237/55, annex. Retrieved from: https://unfccc.int/sites/default/files/resource/docs/a/55.pdf.

Intergovernmental Negotiating Committee for a Framework Convention on Climate Change. (1994a). *Matters relating to commitments. First review of information communicated by each Party included in Annex I to the Convention. Compilation and synthesis of national communications from Annex I Parties*. Document A/AC.237/81. Retrieved from: https://unfccc.int/sites/default/files/resource/docs/a/81.pdf.

New, M., et al. (2022): *Decision-Making Options for Managing Risk*. 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, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2539–2654, doi:10.1017/9781009325844.026. Retrieved from: https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf.

UNFCCC. (1992). *United Nations Framework Convention on Climate Change*. Retrieved from: www.unfccc.int/files/ essential_background/convention/background/application/pdf/ convention_text_with_annexes_english_for_posting.pdf.

UNFCCC. (1996). *Communications from Parties not included in Annex I to the Convention: guidelines, facilitation and process for consideration*. Decision 10/CP.2. Retrieved from: https://unfccc.int/documents/1030.

UNFCCC. (1998). *Review of the implementation of commitments and of other provisions of the Convention. National communications from Parties included in Annex I to the Convention. Second compilation and synthesis of second national communications*. Document FCCC/CP/1998/11. Retrieved from: https://newsroom.unfccc.int/resource/docs/cop4/11.pdf.

UNFCCC. (1999). *Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications*. Document FCCC/CP/1999/7, 80-100. Retrieved from: https://unfccc.int/resource/docs/cop5/07.pdf.

UNFCCC. (1999a). *National communications from Parties not included in Annex I to the Convention. First compilation and synthesis of initial communications from Parties not included in Annex I to the Convention*. Document FCCC/SBI/1999/11. Retrieved from https://unfccc.int/resource/docs/1999/sbi/11.htm.

UNFCCC. (2001). *Implementation of Article 4, paragraphs 8 and 9, of the Convention. Decision 5/CP.7*. Retrieved from: https://unfccc.int/documents/2516.

UNFCCC. (2002). *Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention*. Decision 17/CP.8, annex. Retrieved from: https://unfccc.int/documents/3217.

UNFCCC. (2003). *National communications from Parties not included in Annex I to the Convention. Consideration of the fifth compilation and synthesis of initial national communications*. Document FCCC/SBI/2003/13. Retrieved from: https://unfccc.int/sites/default/files/resource/docs/2003/sbi/13.pdf.

UNFCCC. (2003a). *National communications from Parties included in Annex I to the Convention. Compilation and synthesis of third national communications*. Document FCCC/SBI/2003/7. Retrieved from: https://unfccc.int/resource/docs/2003/sbi/07.pdf.

UNFCCC. (2005). *Sixth compilation and synthesis of initial national communications from Parties not included in Annex I to the Convention*. Document FCCC/SBI/2005/18. Retrieved from: https://unfccc.int/sites/default/files/resource/docs/2005/sbi/eng/18.pdf.

UNFCCC. (2007). *Compilation and synthesis of fourth national communications from Parties included in Annex I to the Convention. Executive summary*. Document FCCC/SBI/2007/INF.6. Retrieved from: https://unfccc.int/sites/default/files/resource/docs/2007/sbi/eng/inf06.pdf.

UNFCCC. (2011). *Compilation and synthesis of fifth national communications from Parties included in Annex I to the Convention. Executive summary*. Document FCCC/SBI/2011/INF.1. Retrieved from: https://unfccc.int/resource/docs/2011/sbi/eng/inf01.pdf.

UNFCCC. (2012). *National adaptation plans. Technical guidelines for the national adaptation plan process*. Least Developed Countries Expert Group. Retrieved from: https://unfccc.int/topics/adaptation-and-resilience/workstreams/national-adaptation-plans-naps/guidelines-for-national-adaptation-plans-naps.

UNFCCC. (2014). *Compilation and synthesis of sixth national communications and first biennial reports from Parties included in Annex I to the Convention. Executive summary*. Document FCCC/SBI/2014/INF.20. Retrieved from: https://unfccc.int/sites/default/files/resource/docs/2014/sbi/eng/inf20.pdf.

UNFCCC. (2015). *Monitoring and assessing progress, effectiveness and gaps under the process to formulate and implement national adaptation plans*. The PEG M&E tool. Least Developed Countries Expert Group. Retrieved from: https://www4.unfccc.int/sites/NAPC/Documents%20NAP/UNFCCC_PEGMonitoring_Tool.pdf.

UNFCCC. (2015a). *National adaptation plans*. Decision 4/CP.21. Retrieved from: https://unfccc.int/resource/docs/2015/cop21/eng/10a02.pdf.

UNFCCC. (2016). *National adaptation plans*. Decision 6/CP.22. Retrieved from: https://unfccc.int/resource/docs/2016/cop22/eng/10a01.pdf.

UNFCCC. (2018). *National adaptation plans*. Decision 8/CP.24. Retrieved from: https://unfccc.int/sites/default/files/resource/10a1.pdf.

UNFCCC. (2019). *Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications*. Decision 6/CP.25, annex. Retrieved from: https://unfccc.int/sites/default/files/resource/cp2019_13a01E.pdf.

UNFCCC. (2021). *National adaptation plans*. Decision 3/CP.26. Retrieved from: https://unfccc.int/sites/default/files/resource/cp2021_12_add1E.pdf.

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Where do we go from here? Four questions to enhance the adequacy and effectiveness of adaptation through the global stocktake

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INTRODUCTION

There has been a vibrant discussion on how to operationalize the concepts of adequacy and effectiveness in order to assess adaptation within the global stocktake by actors both within and beyond the UNFCCC process. This has included detailed work and synthesis by the Adaptation Committee, the UNFCCC secretariat and the Least Developed Countries Expert Group on methodologies for the stocktake and related questions around the global goal on adaptation[1] (Adaptation Committee, 2021; Adaptation Committee, 2022; UNFCCC, 2022a; AC and LEG, 2021). Work specifically on adequacy and effectiveness has highlighted potential methods such as the use of national monitoring and evaluation systems, assessing vulnerability over time, using theories of change and participatory approaches [2] (AC and LEG, 2021). These reviews show the variety of systems that are already in place to evaluate the effectiveness of finance and other forms of support, such as the results frameworks of climate funds, evaluations of programmes and the review of the UNFCCC's financial mechanisms.

The discussion to date has outlined a wide set of options, with many actors also emphasizing the importance of addressing inclusion. However, despite this debate, progress has stalled somewhat with few advances in recent years as to how exactly the stocktaking of adaptation action can include adequacy and effectiveness, despite the myriad of technical approaches, relevant methodologies and works of synthesis being undertaken as part of the global stocktake. This is due at least in part to the nature of adaptation: the local and contextual nature of adaptation responses, the changing and uncertain risk environment, the lack of clearly defined success metrics, the huge differences between countries, and the varying objectives the Parties and other stakeholders have for the process.

Craft and Fisher (2018) argue that the mandate of the stocktake to review overall and collective progress is not automatically aligned with its mandate to inform the updating and enhancing of national level action.[3] These mandates may provoke different incentives and suggest different ways of structuring an assessment.

There are also a variety of practical challenges, including the lack of data, finance and institutional capacity for assessment efforts. Whereas the stocktaking of collective action on mitigation leads to a quantitative analysis of the gaps in the necessary emissions reductions that can be used to catalyse further action, the stocktaking of adaptation action can lead to a huge amount of disparate information reflecting the diversity of adaptation objectives and activities included in a collective picture. The sheer quantity of information poses a dilemma for those managing the process: how to draw out the key messages that will support the ultimate aims of the stocktake, as well as reviewing collective progress and enhancing adaptation action.

This paper takes a step back from the detailed debates on frameworks and methodologies to ask a set of broader questions about the way stakeholders frame adaptation, the role of measurement in this process and why it matters. This paper does not provide a systematic review but instead uses key research from the social sciences to purposefully open up new questions for the stocktaking process. The research insights are drawn from several areas of scholarship, including public policy and framing, the role of measurement and quantification, the use and communication of knowledge, and future visioning. In each of these sections, a box summarizes the key findings of this research literature to provide the basis for the ensuing discussion.

A range of actors are engaged in adaptation assessments and research, and the UNFCCC process has unique political and technical strengths within this ecosystem. In posing these questions, the paper seeks to further define the specific contribution of the first global stocktake in supporting adequate and effective adaptation, as well as potential developments moving forward to the next round.[4]

CURRENT CONTEXT AND POINTS FOR ENGAGEMENT

The latest global assessment of the science of adaptation in the Intergovernmental Panel on Climate Change Working Group II's report released in February 2022 shows that globally adaptation is neither adequate nor effective enough for the scale of climate impacts.

The summary for policy-makers states that:
Most observed adaptation is fragmented, small in scale, incremental, sector-specific, designed to respond to current

1 As well as a joint working group of the Adaptation Committee and the Least Developed Countries Expert Group in collaboration with the Standing Committee on Finance.

2 The Adaptation Committee and Least Developed Country Expert Group report concludes that the following types of information could be useful in assessing effectiveness in the global stocktake: M&E systems applied at different levels and in different adaptation contexts; the findings of the M&E process; lessons learned, gaps and challenges; similarities and changes in the methodology applied over time; and thematic and geographical areas not yet covered by review/M&E mechanisms. For the review of the adequacy of outcomes, information on adaptation and support needs, including for meeting planned, autonomous and private adaptation costs would be needed.

3 Article 7.14(d) and Article 14.1, and Article 14.3.

4 The first global stocktake has three stages: information collection and preparation, technical assessment, and consideration of outputs. Over 2021-22 a series of inputs were submitted by Party and non-Party stakeholders, and synthesis reports were prepared on specific topics as part of the information stage. Technical dialogues are ongoing at the time of writing to reflect on these inputs along with a joint contact group as part of the technical assessment. By COP 28 there will be a synthesis report and a consideration of the outputs and what they mean for further action.

impacts or near-term risks, and focused more on planning rather than implementation (high confidence).

> Observed adaptation is unequally distributed across regions (high confidence), and gaps are partially driven by widening disparities between the estimated costs of adaptation and documented finance allocated to adaptation (high confidence). (IPCC, 2022 p. 20).

This is supported by the UNEP Adaptation Gap Report for 2022, which addressed adequacy and effectiveness more directly and concluded that "adaptation actions remain largely incremental in nature, typically do not address future climate change, and may reinforce existing vulnerabilities or introduce new risks, particularly for the most vulnerable (UNEP, 2022, p. XV).

There were several developments at COP 27 that could open up new avenues for the use of information around adequacy and effectiveness. The Parties agreed to work towards a framework for the global goal on adaptation and settled on an Action Plan on Action for Climate Empowerment. As well as these developments, the Egyptian Presidency, in partnership with the High-Level Champions and several UN agencies, launched the Sharm el-Sheikh Adaptation Agenda to focus collective action on thirty key adaptation outcomes. The Climate Champions called it "the first comprehensive global plan to rally both State and non-State actors behind a shared set of adaptation actions that are required by the end of this decade across five impact systems: food and agriculture, water and nature, coastal and oceans, human settlements, and infrastructure, and including enabling solutions for planning and finance" (Climate Champions, 2022).

As the IPCC, UNEP and the synthesis reports written for the global stocktake have highlighted, many gaps remain in our understanding of the adequacy and effectiveness of adaptation, and in the short-term we are unlikely to find any conclusive answers. Outcomes such as resilience, adaptive capacity and vulnerability are challenging to measure and are intermediate outcomes that should protect the ultimate goals of socio-economic development (Brooks and Fisher, 2014). As Singh et al. (2022) argue in the UNEP Adaptation Gap Report, "the effectiveness of adaptation will only be demonstrated through long-term trajectories of human and ecological well-being" (p. 39). These outcomes are captured in the SDG targets and indicators, which offer a framework for the future that adequate and effective adaptation actions are seeking to safeguard.

Given these limitations, what gaps of understanding might the global stocktake usefully fill to enhance the adequacy and effectiveness of adaptation? Using diverse debates from social science research on public policy and framing, the role of measurement and quantification, the use and communication of knowledge and visions of the future, I suggest some key questions that need to be asked around adequacy and effectiveness. Addressing these questions could help maximize the impact of the stocktake in raising the quality and ambition of adaptation actions. These questions are:

- *Who is adaptation adequate and effective for, over what timeframe, and to what hazards*
- *How can the design of the stocktake process shape action?*
- *How can the outputs take adaptation action further?*
- *How do different groups imagine an adapted future?*

WHO IS ADAPTATION ADEQUATE AND EFFECTIVE FOR, OVER WHAT TIMEFRAME, AND TO WHAT HAZARDS?

There are many different ways to define if adaptation is adequate and effective, and these definitions or frames also shape the type of answer that will be given.[5]

Applying these ideas to the global stocktake suggests several new directions to consider existing evidence and data sources. It prompts us to consider who or what is framing the existing information going into the stocktake around adequacy and effectiveness, and what are the implications of that framing?

Some of the approaches proposed for the stocktake rely on data collected through bilateral and multi-lateral adaptation programmes and national systems, which is important to avoid increasing the reporting burden. However, programmatic and national monitoring and evaluation systems have often not been able to capture effectiveness in a meaningful way (Fisher et al. 2015; Leiter, 2021). Incentives can support demonstrating success rather than identifying challenges and failures. Beyond the limitations of the data, using data from existing systems positions an assessment within current framings of adaptation. This may miss or underplay the gaps and elements of adequacy and effectiveness that are not currently captured by the adaptation architecture. For example, taking a national framing of adaptation emphasizing the role of National Adaptation Plans and national governments may underplay the role of transboundary risks and global policy issues, such as international migration and trade, that require action at a different scale.

5 There is a wide literature using terms like "framing", "discourse", "discourse coalitions" and "policy storylines" to describe these effects, with some differences in their theoretical origins (see Hajer and Versteeg, 2005; Goffman, 1974). For simplicity in this paper I refer to these post-structuralist approaches as framing and derive the potential policy uses from this broad range of approaches.

Box 1. Framing adaptation

Academic scholarship has theorised what factors shape policy processes (see Rai and Fisher, 2016 for a review). These approaches have included assessing the role of institutions, the choices of individual policymakers and the economic and political incentives in the system. One different approach has been to analyse what language is used to describe an issue, i.e. how it is framed, and how this shapes understanding of the problem, what solutions seem appropriate, what knowledge is deemed relevant and whose participation is needed (Hajer and Versteeg, 2005). The framing can become shared by different groups who build coalitions to support action around this framing. Within these groups key phrases can become signals of key ideas and shared understandings.

The framing around what success means in the context of adaptation can shape what it means to be effective, over what timeframe, including who should be included, at what stage, and in what decisions (Singh et al. 2021; Nalau and Verrall, 2021). Dilling and colleagues (2019) argue there is no single understanding or point of view that can say if adaptation has been effective or not: it will always depend on asking effective for whom, and over what time period. Similar arguments have been made by Brooks and Fisher (2014) who suggest resilience to climate shocks must always be considered in relation to specific groups, specific hazards and over certain time periods. Singh et al. (2021) identify a set of eleven principles that represent different frames for understanding the effectiveness of adaptation. They argue these frames offer different entrypoints into adaptation, and practitioners and policymakers should explicitly consider what frame they are using and what is included or left out of that frame

Not only are effectiveness and adequacy concepts that mean different things to different people they may also change over time or across scales (Singh et al. 2021). Dilling et al. (2019) argue that even searching for adaptation success is a flawed concept and there is no endpoint for adaptation in an evolving risk context.

Taking global transportation as an entry point would highlight areas of adequacy and effectiveness that might only be relevant when multiple shocks are experienced simultaneously but may not be considered in any one national plan. Reframing a national project that is understood to have been effective when seen through a regional lens may show negative effects in neighbouring countries or potential maladaptation.

The framings of adaptation within formal adaptation plans and programmes also reflect the framings of groups and institutions that have political or economic power. Effective adaptation for a government might entail moving communities away from high-risk coastal settlements, but the communities might understand an effective response as having access to short-term payments and safe temporary housing. What would the frames of adequacy and effectiveness be for those living in informal settlements, residents living in wildfire- or hurricane-prone areas around the globe, or young people living in small island states? Analysing the framing of adaptation actions and knowledge about adaptation would offer multiple, overlapping insights into different dimensions. Importantly, it would show the gaps in how the current system has been framed, as well as identify trade-offs and conflicts between approaches (Singh et al. 2021).

The first stocktake process could identify the main gaps and trade-offs between different frames of adaptation. In doing so, it could seek to catalyse new knowledge generation and engagement by non-Party stakeholders specifically on a *defined set of global gaps and challenges*. This would move past complex measurements of intermediate outcomes and would accept the current imperfect state of knowledge on aggregating global progress. It would encourage and support bringing knowledge about different constituencies together to amplify different perspectives beyond national boundaries and catalyse learning between countries across the Global North and South that are facing similar adaptation challenges. Questions to consider could be:

- What frames are being used around adaptation action in different spaces, by different funds and government, and in the knowledge gathered for the global stocktake?
- What are the implications of this for adequacy and effectiveness? What are the potential trade- offs between these approaches?
- How do they frame who benefits from adaptation, the purpose of adaptation, and progress over what timeframes?
- What elements and groups are not captured within current frames of adaptation, and how could these perspectives be included?
- What are the biggest gaps in adaptation that the global community needs to fill to achieve the SDGs?

Box 2. The role of measurement

Extensive research across academic disciplines shows that numbers and metrics are not just neutral conveyors of information and data but the processes of categorization, standardisation, comparison and auditing make visible (or invisible) certain populations, problems and solutions (Espeland and Sauder, 2007; Tichenor, 2022; Merry, 2016). Indicators can shape behaviour and change incentives in diverse areas such as global human rights, the Millennium Development Goals and forms of carbon accounting in forestry (Gupta et al. 2012; Fukuda-Parr and McNeill, 2019). For example, the experience of the Millennium Development Goals shows how monetary understandings of poverty gained traction through the global framing at the cost of human rights-based approaches (Fukuda-Parr and Yamin, 2014). This was due at least in part to how these targets were defined the terms of income. Practices of measurement can also shape relationships between transnational organisations (Grek, 2020). Global indicators can also shape national policies as has been seen with the Sustainable Development Goals where the global goals became integrated into national priorities and plans with national measurement systems mirroring the global system (Bandola Gill et al. 2022).

HOW DOES THE STOCKTAKE PROCESS ITSELF SHAPE ACTION?

The global stocktake is not just a process of assessment, it also plays a role in shaping global action and research around adaptation through both direct and indirect mechanisms. Funders, civil society and research organizations have all sought to contribute to ongoing international debates on these issues and have directed the resources and capacity to doing so. Building on the research in the previous section looking at the role of ideas within the policy process, this section looks at research on the role of measurement and indicators in shaping action.

Decisions made within the global stocktake will continue to shape the actions of other organizations, for example, through the choices they make on what research and programmes to undertake or fund, and the efforts groups make to participate in international processes such as this one. Not all actions to understand adequacy and effectiveness need to be undertaken through the formal UN processes, but the global stocktake will set the broad framing for other work. The global stocktake could also shape norms around adaptation measurement. For example, the ideas of success captured in metrics responding to the stocktake's five-year cycles may influence the timescales over which effectiveness is understood. This could underplay dimensions that are played out over much longer timeframes, such as institutional change and addressing the root causes of vulnerability. One way to address these issues is to design any measurement system specifically to create incentives for future action. There are several ways to do this, of which I explore two below: using global learning questions to catalyse reflections by national institutions, and framing progress in terms of enabling action rather than abstract outcomes.

Integrating a set of simple learning questions into national M&E systems for future stocktakes could offer cross-cutting insights, as well as instigate learning in national contexts. The design of the stocktake process will play a role in shaping how national monitoring and evaluation systems develop: this needs to support national learning and accountability, as well as any global aggregation. Experience has shown that national M&E systems that are too complex stop functioning over time and often need to be simplified (Leiter 2021). The Pilot Programme for Climate Resilience has held annual national monitoring workshops to reflect on progress as part of a monitoring system, and taking part in this experience seemed to support institutional learning (CIF, 2018). To institutionalize learning and reflection, a set of global learning questions integrated into future national systems could provide the impetus for reflection across government ministries and civil society. This would not only provide points of comparison for the global process, it would also have a potential impact on those taking part. This could be linked directly to the SDGs and the associated measurement infrastructures by asking questions about the climate-related barriers to achieving these goals.

Another approach to shaping implementation is to frame progress in terms of enabling actions rather than abstract metrics (Patwardhan, personal communication). The Sharm el-Sheikh Adaptation Agenda, for example, outlines a set of thirty outcome areas, including key enablers, that need to be in place for effective adaptation (COP Presidency, 2022). This agenda sets a framework for incentivizing national and international action around specific policy responses and measures that are understood from the best available knowledge to be effective forms of adaptation. This moves the emphasis from defining effectiveness and finding data sources to incentivizing the ac-

tion needed in ways that can be clearly and easily tracked. If agreed by enough countries to gain political traction, this type of approach could incentivize ambition through the way it seeks to measure and understand success. This could also be relevant for developing the framework for the global goal on adaptation.

HOW CAN THE OUTPUTS FURTHER ADAPTATION ACTION?

Knowledge and information need to serve a purpose. In the global stocktake this means both understanding collective progress and supporting countries to update and enhance their national plans and increase international cooperation. This requires national policymakers and practitioners to engage with the findings and for them to have a mandate or support for action from the general public.

Parties choosing approaches for the stocktake need to consider not only how this information will assess progress, but also how it will support improvements in national action and making the case for public support. Who will it motivate to act, and in what ways?

If the information on adequacy and effectiveness is well targeted and communicated, it could support engaged citizens to demand more effective adaptation from their governments and the international community. Deliberately linking this information with the Action for Climate Empowerment (ACE) agenda could support this and leverage much greater engagement. The ACE agenda seeks to empower all groups in society to engage with climate action through education and public awareness, training, participation, access to information and international cooperation (UNFCCC, 2022c). To be empowered to take action on adaptation, the public will need to know what the more effective adaptation responses are, and the stocktake can feed into making the case for adaptation policy and how national responses could be improved. Communicating the main challenges, progress relative to other countries facing the same risks or the ambition gap between any plans and anticipated impacts is more likely to mobilize public interest, as well as using existing frameworks such as the SDGs.

HOW DO DIFFERENT GROUPS IMAGINE AN ADAPTED FUTURE?

Assessing adequacy and effectiveness carries implicit assumptions about the different levels of warming the world needs to adapt to, as well as the ambition of countries and different groups for their futures in a climate changed world.

We may not be able to imagine what effective adaptation looks like from the present vantage point, but understanding ideas about the future that are currently embedded in adaptation plans and strategies would also open up an understanding of approaches that are not currently being considered. This might help shed light on the gap the IPCC identifies between the incremental, sectoral approaches identified so far, and the scale and urgency of climate impacts. Visioning exercises such as the Sustainable Development Goals have outlined global ambitions with frameworks that provide a way of understanding the future that adequate and effective adaptation efforts should protect. Taking a futures lens would mean analysing:

- What types of futures are imagined in current approaches to adaptation? Are the assumptions about the future clear, and do they reflect the scale and urgency of the impacts anticipated?
- Whose ideas of the future are captured in current adaptation processes?
- What are the climate-related barriers to achieving existing global aspirations for the future such as the SDGs?

Box 3. The use and communication of knowledge

Extensive research on the role of evidence in public policy shows that just communicating information or evidence is rarely sufficient to instigate change. There needs to be a political window for action, policymakers willing to take new approaches forward and the ideas need to resonate with wider societal priorities (Kingdon, 2003). Addressing the impacts of climate change requires significant financial investment and changes in the way people live their lives and so the general public need to engage with these concerns as part of developing a democratic mandate for adequate and effective responses (Willis, 2020). Climate change presents particular challenges for communication as the issues can seem distant to many people and a problem for the future. Research shows the public engage with information about climate change when it creates an emotional reaction, when it feels critical and urgent, has compelling pictures to help visualize the story, and taps into existing national priorities (Wang et al. 2018a; Wang et al, 2018b; Moser and Dilling, 2012; Bloomfield and Manktelow, 2021). Adaptation has not often been an issue of great salience to the general public or a voting issue in elections. The increasing importance of climate impacts and personal experiences of voting publics with intensifying wildfires, hurricanes, flooding, extreme heat and other climate-related events may change this.

Box 4. Visioning the future

Concepts of the future are an important part of adapting to climate change, as adaptation requires an implicit or explicit understanding of what climate future is adapted to and what dimensions of society need to be protected. Research on future visions within policy show how these visions can shape scientific, technological and political choices as well as being contested and open to challenge and change (Sismondo, 2020). Work on foresight and future methodologies seek to anticipate external changes on the horizon, but the future is also unwritten and can be shaped by individual and collective choices made today (Oldham, 2021). Emerging work on building collective social imagination takes a more active stance in proposing that through using imagination and cultivating imaginative practices, communities can rebuild and create new futures rather than just reacting to external events (Imagination Infrastructuring, undated). Hopkins, founder of the Transition Town movement in the UK, proposes moving the question from 'what is to what if?' He asks what would happen if policymakers prioritized imagination, arguing that unleashing public imagination is the best way to solving the world's problems (Hopkins, 2019). The future contained in adaptation plans or set indicators also reflects the future imagination of certain actors. Being attentive to the full possibilities of the future means also considering how marginalized group or constituencies that don't fit within UNFCCC categories can imagine their future in ways that gain traction and support (Oldham, 2021).

As well as evaluating ideas of the future that are already embedded in adaptation plans, it would also be possible to develop new pathways to the future through collective imagination processes. A review by the UNFCCC secretariat considers approaches that include an assessment of future visions, such as Future-Back thinking – developing a vision for the future and formulating the indicators for how to get there – and the four-tier approach to the global goal on adaptation that categorizes four different levels of aspiration for national adaptation from survival to transformation (UNFCCC, 2022). These techniques offer important entry points to consider aspirations for the future in the global goal on adaptation. These approaches could be part of a focused global imagination exercise not only to measure the goal, but also to re-imagine and co-create new visions of what is adequate and effective in order to guide and reach that target. This could involve more detailed visions and imagined futures for the three areas of the global goal on adaptation. The additional contribution of the UNFCCC process here could be in convening or incentivizing others to convene constituencies beyond national boundaries. This could include global communities of forest-dwellers, those living in the drylands across the world, communities living with disability or groups of countries located around a water resource. The building of collective imagination focuses not just on what is pragmatic or feasible, but also on what is desired and what is possible (Oldham, 2021). This could provide entry points for investments in systemic innovation (Fisher and Calkins, 2020).

This approach could build on the precedent of the Talanoa Dialogue and would actively co-create and imagine ambitious new futures from diverse viewpoints and assess the pathways to them. It could consider questions such as how can we imagine global trade flows under climate impacts? How could we imagine the movement of people in an adapted world? How might residents in low-lying islands imagine a prosperous future?

TAKING STOCK: NEXT STEPS

The global stocktake aims to offer a collective assessment of the adequacy and effectiveness of adaptation, but it also has the potential to catalyse learning, enhance the engagement of diverse stakeholders and increase incentives to raise ambition. There is a limit to the certainty more analysis can provide in the short term. Drawing out messages from the large amounts of information that already exist in targeted and useful ways is an important next step. The global stocktake provides the opportunity to build political will and understanding around these issues, to identify the main gaps and challenges, to amplify the global voices and constituencies that can provide new perspectives and to catalyse global learning to find collective ways ahead.

In this paper, I have argued that paying attention to the framings of adaptation, the incentives and norms created through the stocktake process and the potential uses of the outputs in national contexts, as well as finding ways to build collective imagination and ambition, would be useful ways to support adaptation that is effective and adequate. This would involve:

1. Identifying major gaps, trade-offs and challenges to achieving the SDGs through analysing different framings of adaptation action and information gathered in the stocktake. Asking questions such as "effective for whom", "over what timeframe" and "for what kind of future" will identify areas for learning, neglected topics and barriers to achieving the existing global goals.

2. Creating the incentives for more adequate and effective adaptation through the design of the process and the choice of metrics that support increasing ambition and action. This could include high-level learning questions for national systems and framing targets in terms of the enabling action that is needed to support effective adaptation.
3. Strategically communicating messages to policy-makers and the general public to catalyse wider conversations on updating and enhancing national and international adaptation efforts and leveraging the reach of the ACE agenda. This requires strategic choices about what types of information, knowledge and impacts will connect to these audiences.
4. Assessing the visions of the future within adaptation plans, and linking this to other global visions and to the level of climate risk to see if ambition and risks are aligned.
5. Imagining new collective futures by recognizing that the endpoint of adequate and effective adaptation is not fixed but can be re-imagined and co-created to raise ambition. This could also contribute to developing the forward-looking vision for the global goal.

Overall, taking a step back from the specific options proposed, the ideas I have discussed in this paper suggest that the conversations on assessing adequacy and effectiveness need to move on from debating the detail of methodology and frameworks to recognizing the limits to what can be known at this point. Measuring these concepts is not an end in itself, but a means to improve national and global adaptation efforts, and this ultimate objective needs to be kept in mind in the design and implementation of all stages of the process. Whilst discussion on refining the technical dimensions is reassuring and more politically palatable, the adequacy and effectiveness of adaptation will always be a complex issue for which science and evidence provide only partial insights that need to be interpreted and acted on through political choices.

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REFERENCES

Adaptation Committee, 2021, Approaches to reviewing the overall progress made in achieving the global goal on adaptation (Technical paper). UNFCCC, Bonn.

Adaptation Committee, 2022, Synthesis report for the technical assessment component of the first global stocktake. UNFCCC, Bonn.

Adaptation Committee and Least Developed Countries Expert Group, 2021, Methodologies for reviewing the adequacy and effectiveness of adaptation and support. UNFCCC, Bonn.

Bandola Gill, J., Grek, S., and Tichenor, M., 2022. Governing the sustainable development goals: quantification in global public policy, Palgrave Macmillan.

Bloomfield, E.F., Manktelow, C. 2021, Climate communication and storytelling. Climatic Change 167, 34.

Bowker, G.C. & S.L. Star 2000. Sorting things out: classification and its consequences. Cambridge: MIT Press.

Brooks, N., and Fisher, S., 2014, Tracking adaptation and measuring development: a step by step guide, IIED Toolkit, UK.

CIF, 2018, PPCR Monitoring and Reporting Toolkit, https://www.cif.org/sites/cif_enc/files/knowledge-documents/ppcr_en_monitoringreporting_toolkit.pdf [accessed 16.12.2022]

Climate Champions, 2022, COP27 Presidency launches Adaptation Agenda to build climate resilience for 4 billion by 2030, https://climatechampions.unfccc.int/cop27-presidency-announces-ambitous-climate-resilience-agenda/ [accessed 16.12.2022]

COP 27 Presidency, 2022, Sharm el-Sheikh Adaptation Agenda, https://climatechampions.unfccc.int/wp-content/uploads/2022/12/SeS-Adaptation-Agenda_Complete-Report_COP27-.pdf [accessed 16.12.2022]

Craft, B. and Fisher, S., 2018, Measuring the adaptation goal in the global stocktake of the Paris Agreement. Climate Policy, 18:9, 1203-1209.

Dilling, L., et al., 2019, Is adaptation success a flawed concept? Nature Climate Change, 9(8), 572–574.

Espeland, W., and Sauder, M. 2007, Rankings and Reactivity: How Public Measures Recreate Social Worlds, American Journal of Sociology Vol. 113, No. 1 (July 2007), 1-40.

Fisher, S., Dinshaw, A., McGray, H., Schaar, J., and Rai, N., 2015, Using methodologies from international development to address the challenges of monitoring and evaluating climate change adaptation, New Directions for Evaluation, Issue 147, 13-35.

Fisher, S., and Calkins, J., 2020, What makes climate action and innovation transformative? EIT Climate-KIC Transformation Insight Series, Insight 5.1. https://www.climate-kic.org/wp-content/uploads/2020/11/Insight_5.1_TransformativeClimateActionAndInnovation_FINAL.pdf [accessed 16.12.2022]

Fukuda-Parr, S., and McNeill, F., 2019, Knowledge and Politics in the SDGs. Global Policy, 10: 5-15.

Fukuda-Parr, S., Yamin, A., and Greenstein, J., 2014, The Power of Numbers: A Critical Review of Millennium Development Goal Targets for Human Development and Human Rights, Journal of Human Development and Capabilities, 15:2-3, 105-117.

Grek, S., 2020, Prophets, saviours and saints: Symbolic governance and the rise of a transnational metrological field. Int Rev Educ 66, 139–166.

Goffman, E., 1974. Frame analysis: An essay on the organization of experience. Harvard University Press.

Gupta, A., et al., 2012, In pursuit of carbon accountability, Current Op in Env Sus, 4:726–731.

Hajer, M and Versteeg, W., 2005. A Decade of Discourse Analysis of Environmental Politics: Achievements, Challenges, Perspectives. Journal of Environmental Policy & Planning. 7(3), 175-184.

Hopkins, R., 2019, From what is to what if: unleashing the power of imagination to create the future we want, Chelsea Green: London.

Imagination Infrastructuring, 2022, https://www.imaginationinfrastructuring.com/ [accessed 16.12.2022]

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, Cambridge, UK and New York, NY, USA, pp. 3-33.

Kingdon, J.W. (2003) Agendas, Alternatives, and Public Policies. 2nd Edition, Addison-Wesley Longman Inc., Boston.

Leiter, T., 2021, Do governments track the implementation of national climate change adaptation plans? An evidence-based global stocktake of monitoring and evaluation systems, Environmental Science and Policy, 125, 179-188.

Merry, S., 2016, The Seduction of Quantification, UCP.

Moser S., and Dilling L., 2011, Communicating climate change: closing the science-action gap. The Oxford handbook of climate change and society, 161–174.

Nalau, J., and Verrall, B., 2021, Mapping the evolution and current trends in climate change adaptation science. Climate Risk Management, 32.

Oldham, 2021, Imagination Infrastructure: what do we mean? https://oliviaoldham.medium.com/imagination-infrastructure-abd96262fff6 [accessed 16.12.2022]

Patwardhan, A., personal email communication, 20.11.2022

Rai, N., and Fisher, S., (eds), 2016, The political economy of low carbon resilient development planning, Routledge.

Singh, C., et al., 2021, Interrogating 'effectiveness' in climate change adaptation: 11 guiding principles for adaptation research and practice, Climate and Development, DOI: 10.1080/17565529.2021.1964937.

Singh, C., Brooks, N., and Neufelft, H., 2022, Effectiveness of Adaptation in UNEP, 2022, Adaptation Gap Report, 37-45.

Sismondo, S., 2020. Sociotechnical imaginaries: An accidental themed issue. Social Studies of Science, 50(4), 505–507.

Tichenor, 2022, Metrics, Cambridge Encyclopedia of Anthropology, https://www.anthroencyclopedia.com/entry/metrics

UNEP, 2022, Adaptation Gap Report 2022, https://www.unep.org/resources/adaptation-gap-report-2022 [accessed 16.12.2022]

UNFCCC, 2022a, Synthesis report for the technical assessment component of the first global stocktake: state of adaptation efforts, experiences and priorities. UNFCCC, Bonn.

UNFCCC, 2022b, Compilation and synthesis of indicators, approaches, targets and metrics for reviewing overall progress in achieving the global goal on adaptation. Glasgow-Sharm el-Sheikh work programme.

UNFCCC, 2022c, Action for Climate Empowerment, https://unfccc.int/ace [accessed 16.12.2022]

Wang, S., Corner, A., Chapman, D. and Markowitz, E., 2018a. Public engagement with climate imagery in a changing digital landscape. WIREs Climate Change. 9:2.

Wang, S., Leviston, Z., Hurlstone, M., Lawrence, C. and Walker, I., 2018b. Emotions predict policy support: Why it matters how people feel about climate change. Global Environmental Change. 50, 25–40.

Willis, R., 2020, Too Hot to Handle? The Democratic Challenge of Climate Change, Bristol University Press.

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Conceptualizing effectiveness in climate change adaptation action: applications for the Global Stocktake

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INTRODUCTION

Understanding if and how adaptation actions are effective is crucial in the current global effort to combat the increasing impacts of climate change. While there is a growing consensus about what constitutes adequate and effective adaptation, the process of assessing and evaluating adaptation actions and support has proved challenging. One challenge is that climate risks are wide-ranging, constantly changing in frequency and intensity, and require different solutions at different scales. Adaptation actions can be institutional, such as policies, programs and incentives; social, such as behavioural or cultural shifts to improve human well-being; physical, such as building new infrastructure and technologies; or ecosystem-based, using environmental processes to combat climate risks (IPCC, 2022). Climate solutions are not universally effective, however, and each must be grounded in local social, political, or geographical contexts and needs (Dilling et al., 2019).

A second challenge is that, even within local contexts, people and communities experience differential climate impacts. Some experience climate risks more frequently or more intensely than others; these differential impacts are often tied to social and infrastructural issues such racial discrimination and inadequate socioeconomic opportunities (Fernandez-Bou et al., 2021). Frontline communities often face barriers to accessing the necessary resources, like funding and autonomy in decision-making, to address the climate risks they face.

A third challenge involves the difficulties in establishing appropriate baselines for assessing progress and adaptation impacts (Christiansen et al., 2016) and attributing successful outcomes directly to adaptation interventions (Moser and Boykoff, 2013). Uncertainty in climate scenarios, changes in the frequency and intensity of climate hazards, differential exposure to climate risks and the entangled nature of climate change with other global challenges like poverty, health risk and environmental degradation make it difficult to monitor and evaluate what actions are effective, for whom and how. Besides determining the appropriate data to collect, access to appropriate data sources and monitoring systems is inconsistent across countries, institutions and local jurisdictions involved in adaptation actions.

A fourth challenge is that aggregating diverse adaptation actions that address a wide range of climate risks across varying geographical scales and social contexts is no small task. Not enough resources have been dedicated to developing adaptation assessments and to training people and institutions in how to implement adaptation assessments. These and other challenges have hindered the advancement of standardized guidance and frameworks to assess adaptation adequacy and effectiveness (UNEP, 2022).

However, recent developments stemming from adaptation practitioners and scholars can inform the development of a comprehensive, yet flexible set of adaptation goals and indicators to assess global progress. Over the past several years, scholars have conducted large-scale reviews of adaptation assessments (e.g., Berrang-Ford et al., 2011; Araos et al., 2021) and documented case studies of adaptation outcomes (Ensor et al., 2021; Piggot-McKellar et al., 2020; Singh et al., 2021) to achieve greater clarity on what exactly adaptation is and what effective adaptation looks like. Methods used to conduct these scholarly reviews could be applied to conducting the Global Stocktake of the Paris Agreement. Despite the ongoing challenges described above, there is the potential to collectively identify goals, indicators, and definitions of effective climate adaptation actions to inform a global practice of assessment and evaluation (e.g., UNEP, 2022).

This paper 1) briefly discusses emerging scholarly work on assessing adaptation effectiveness; 2) presents methods and findings from a systematic review of academic literature on effective adaptation actions from around the world; and 3) suggests ways to conceptualize current knowledge on adaptation effectiveness for the Global Stocktake.

CONCEPTUALIZING ADAPTATION EFFECTIVENESS

The Global Stocktake aims to assess progress toward the long-term goals of the Paris Agreement, which cover three main themes: mitigation, adaptation, and implementation and support. Determining what adequate and effective progress entails for each of these themes are distinct issues, as they have different goals and mechanisms for reaching them. As part of the Global Stocktake, the Global Goal on Adaptation aims to enhance adaptive capacity, strengthen resilience and reduce vulnerability to climate change, but currently no indicators, approaches, targets, or assessment frameworks have been defined. The discussion here focuses on the effectiveness of adaptation actions in supporting the process of conducting the Global Stocktake and conceptualizing the Global Goal on Adaptation.

Adaptation to climate change refers to the adjustments people make to 1) reduce their exposure to climate-related hazards, 2) reduce their vulnerability to climate-related risks, and 3) increase their capacity through knowledge and information, physical infrastructure and funding (IPCC, 2014). Beyond this basic definition, adaptation is difficult to pinpoint because it encompasses multiple types of climate risk that materialize in multiple ways across different geographical, environmental and social contexts. The ways in which individuals, communities and larger populations experience and understand climate change influence how they approach adaptation responses and their objectives (Goldman et al., 2018; Nightingale et al.,

2016). This epistemological and ontological pluralism refers to the multiple ways that people know, experience and understand the world. Local adaptation actions are also influenced by the multiple priorities and agendas of institutions and governing bodies within regional and global systems of finance and politics. It is important that the diversity of local experiences and understandings of climate change are incorporated into national and global priorities when developing and implementing adaptation strategies. Frameworks for assessing the effectiveness of adaptation should also incorporate local knowledge and action by being flexible and accommodating input from local to national scales.

Extending from the complexities of defining adaptation, it has also proved difficult to come up with a succinct definition of adaptation effectiveness. Effectiveness generally signals progress toward established goals. In practice, its definition is subject to the priorities of the person, community, institution, or governing body that establishes those goals. For the Global Stocktake, effectiveness seems to indicate progress made toward the Global Goal on Adaptation. However, because the current Global Goal on Adaptation lacks structure and definition, there is little agreement on how to define effective progress toward it.

Academic research has helped synthesize definitions and the complexities around understanding and assessing the effectiveness of adaptation. The IPCC reports a growing consensus that assessments could monitor four overarching components in order to evaluate effectiveness (Garschagen et al., 2022): 1) adaptation support, such as the inputs and resources used for adaptation actions; 2) the process of developing and implementing adaptation actions; 3) the outputs and products resulting from adaptation actions; and 4) the outcomes or changes that occurred because of adaptation actions. These four components are related but touch on different aspects of effectiveness. Support refers to access to, the availability of and the efficient use of resources, as well as the capacity and technical skills needed to implement adaptation actions. Process covers issues such as how actions are prioritized, how decisions are made and the ideas, types of knowledge and expertise that are included and excluded. Outputs and products are concerned with if, when and how proposed activities are completed and tangible materials developed. Finally, outcomes focus on perceptible changes that occur because of the outputs and the process of how actions are implemented.

All four components are important to consider when assessing effectiveness. However, assessments often only consider whether outputs were completed and actions taken, without paying proper attention to outcomes or the changes that these outputs and actions produced. Developing the methods and frameworks to assess these outcomes adequately is a main challenge for the Global Stocktake.

Without a holistic assessment that includes all four components, adaptation actions can create harm. Instead of reducing vulnerability, many adaptation responses have been shown to increase it (Juhola et al., 2016). Well-intentioned adaptation actions can lead to maladaptation across space and time by shifting the risk from one area to another, to another population or ecosystem, or to future generations (Eriksen et al., 2021; Gajjar, Singh, Deshpande, 2018; Magnan et al., 2016). One common pathway to maladaptation occurs when an adaptation action is taken that reduces risk in the short term, but ultimately increases risk in the long term. For example, reducing reliance on hydropower during a drought by switching to natural gas can increase greenhouse gas emissions (Christian-Smith et al., 2015). Another pathway occurs when an adaptation conducted in one place shifts climate impacts to another location. For example, protective structures to reduce coastal erosion in one area may cause erosion to shift to other parts of the coastline, impacting their communities and ecosystems (Nunn et al., 2021).

Increased awareness of adaptation actions that do not work as intended or create additional harm have provided increased insights into centring justice and equity in adaptation outcomes and approaches (e.g., Araos et al., 2021; Coggins et al., 2021; Ensor et al., 2021). Communities and individuals on the frontlines of climate change experience disproportionate exposure to climate-related risks and often face systemic and structural barriers that limit their autonomy in developing adaptation responses and their capacity to reduce exposure. These differential conditions have been actively created by a mixture of political, economic, environmental and social systems and structures. Therefore, reducing exposure to physical climate risk as well as structural barriers within adaptation processes should be equal priorities in assessing the adequacy and effectiveness of adaptation actions. Adaptation responses that do not consider the root causes of vulnerability, such as racial, ethnic and gender discrimination and inadequate resources for rural or low-income communities, risk entrenching themselves in the same systems of power and inequity (Sultana, 2022; Garcia et al., 2022; Fernandez-Bou et al., 2021). This expanded academic work on justice and equity in climate adaptation provides crucial components to definitions of effectiveness.

Understanding the challenges of adaptation and using lessons learned from maladaptive, ineffective and unjust adaptation actions offers insight into how to move forward. The ways that adaptation actions have been reported as effective, and how that effectiveness has been defined and analysed, also reveals

paths forward. In the past decade, several scholars have conducted literature reviews to improve characterization of the types of adaptation that occur in response to climate change, to deepen awareness of the adaptation challenges and to learn about the effectiveness of adaptation actions. Systematic literature reviews provide tangible methods of synthesizing and assessing large amounts of information (Berrang-Ford et al., 2015). These methods could help conduct the first Global Stocktake and inform the Global Goal on Adaptation. As an example, below are methods and findings from a systematic review conducted in 2019 to understand if and how effectiveness was measured and characterized in climate change adaptation projects (Owen, 2020). This example is provided less for its specific findings than to demonstrate a process of categorizing and synthesizing diverse types of adaptation actions from around the world that use diverse methods and evidence of effectiveness to take stock of adaptation progress.

A SYSTEMATIC LITERATURE REVIEW ON ADAPTATION EFFECTIVENESS

An analysis of 110 case studies from the academic research literature characterizes how adaptation support, processes, outputs and outcomes are described as effective (Owen, 2020). Case studies for this review were selected from the Web of Knowledge database using variations of nine search terms: climate, change, adapt, effective, success, evaluate, monitor, indicator and metric. These searches resulted in 2350 articles. Article abstracts were then reviewed for a set of inclusion criteria: evidence that an adaptation action was implemented; descriptions of how the action responded to social, environmental and climatic changes; and evidence of some degree of adaptation effectiveness, defined as achieving explicit objectives. The abstract review resulted in 780 articles. Article content was further reviewed, and the article was removed if inclusion criteria were not met. This process resulted in a total of 110 case studies. Case studies took place on all continents except Antarctica: Asia (38.2%), North America (30.9%), Africa (13.6%), South America (10.0%), Australia (6.4%) and Europe (6.4%). A total of 918 adaptation actions were described across all 110 cases. These actions were categorized into 1) social, 2) institutional and 3) physical and structural adaptation activities based on the IPCC AR5 Report.

Analysis was grounded in evidence as reported by case-study authors and from research literature about adaptation theory and practice. The following five main characteristics, defined by adaptation scholars as integral components of adaptation, were used to code the support and processes involved in effective adaptation actions: sustainability, legitimacy, efficiency, flexibility and equity, which are defined below in more detail. Qualitative and quantitative descriptions of these five components were documented and counted for each case study. Effective adaptation outputs and outcomes were coded inductively from the case studies by highlighting qualitative descriptions or quantitative measures of progress toward a stated goal or benefit. From these measures and descriptions in the case studies emerged five main categories of adaptation effectiveness: 1) reducing risk and vulnerability to climate change impacts; 2) improving the environment or natural resources; 3) enhancing social well-being for individuals or communities; 4) increasing access to economic resources; and 5) strengthening institutions, policies, or governance structures. Once these categories were established and case studies coded, percentages were totalled for each category of effective adaptation support and process and each category of effective outputs and outcomes (see Table 1).

Effectiveness of adaptation support and processes

- *50.9% of case studies reported characteristics of sustainability*, as indicated by institutional, social, economic and/or environmental systems set in place to help adaptation actions continue, thrive and evolve. Sustainability addresses the capacity of an adaptation to endure and withstand future changes, based on economic and human resources (Moser and Ekstrom, 2010) as well as the technical and institutional capacity to keep an adaptation action in continual operation (Brooks et al., 2011). Sustainability was often reported in natural resource-based and agricultural activities, information services and fisheries management. For example, a water management program in Mexico led to

Table 1. Percentage frequencies for categories of effectiveness across 110 adaptation case studies, related to A) supports needed and processes of designing and implementing adaptation actions, and B) outputs and outcomes of adaptation actions.

A. Effectiveness of Support and Process		B. Effectiveness of Outputs and Outcomes	
Sustainability	50.9%	Reducing Risk & Vulnerability	60.9%
Legitimacy	35.6%	Enhancing Social Well-Being	53.6%
Efficiency	31.8%	Improving Environments	52.7%
Flexibility	21.8%	Increased Economic Benefits	44.5%
Equity	12.7%	Strengthening Institutions	39.1%

the creation of a recognized multi-stakeholder group that allowed inputs from local resource users to guide future government projects in the river basin (Barrios et al., 2009).

- *35.6% of case studies reported characteristics of legitimacy.* Legitimacy is the extent to which adaptation processes and actions are acceptable, appropriate and workable in local social, political and environmental contexts (Adger et al., 2005). It was often indicated by generating trust — both in the adaptation actions themselves and among the people involved — and that local users would support the action. Legitimacy was reported most frequently in social-learning and knowledge-sharing activities, community-based activities and fisheries management. Schemmel et al. (2016) showed how incorporating local fisheries monitoring was instrumental in the success of a new fisheries management program in the U.S. Monitoring methods incorporated expertise and traditional management practices from local fishermen to inform fishery regulations, including closed seasons, fish size limits and the types of gear allowed.

- *31.8% of case studies reported aspects of efficiency*, which balances the costs of implementation against the benefits of an activity. While efficiency often considers economic costs or value, Adger et al. (2005) argue that it also includes property, human resources, ecological impacts, aesthetic impacts and services. Water storage, irrigation and harvesting systems reported indicators of efficiency, as well as agricultural activities such as agroforestry and cropping patterns. For example, Arnes et al. (2013) showed how two farm-management systems in Mexico, one based on crop-rotation and another on organic fertilizer use, led to more efficient use of resources than conventional farming practices. While crop yields were slightly higher in the conventional system, the crop-rotation and organic fertilizer systems had fewer input costs, thereby making them more profitable than the conventional system. In addition, because these systems relied less on external inputs, they were more adaptable to climate variability and drought.

- *21.8% of case studies reported components of flexibility*, referring to the degree to which an adaptation action can adjust to accommodate a broad range of decision-making contexts, regional conditions, timing constraints and specific needs (Smit and Pilosofova, 2001; Fussel, 2007). Flexibility was often reported in adaptive and fisheries management activities. For example, Castrejon and Defeo (2015) showed how a co-governance arrangement allowed for more flexibility in a fishing community in Uruguay. Community fishing operations quickly shifted to respond to changing economic conditions (e.g., increased imports of seafood), as well as changing environmental conditions (e.g., the sudden mortality of the yellow clam). In Canada, flexible water-sharing agreements allowed water managers to respond to seasonal and long-term changes in climate (Curran and Mascher, 2016). These governing structures tend to adopt learning-by-doing models, offer opportunities to reflect on past actions and try new approaches, and responding to emergent local stakeholder needs rather than rigid or top-down decisions from external institutions or governing bodies.

- *12.7% of case studies reported characteristics of equity,* which considers the distribution of benefits of an adaptation action and distribution of decision-making power during the adaptation process (Adger et al., 2005; Brooks et al., 2011). Most actions that reported equity characteristics were community-based or incorporated knowledge-sharing platforms. In one example, Indigenous observing networks, comprised of human observers who monitor environmental variables in the Arctic, were collaboratively developed across communities in the region to ensure that data collected were relevant and methods were culturally appropriate (Alessa et al., 2016). Data from these networks have informed more equitable natural resource management policies. In Uganda and Kenya, Ombogoh et al. (2016) describe how members of farmer cooperatives combined resources to buy fertilizer and seeds and developed labour-sharing strategies to balance the distribution of community resources across different income levels.

Effectiveness of adaptation outputs and outcomes[1]

- *60.9% of case studies demonstrated effectiveness by reducing risk to climate change hazards* through a qualitative or quantitative reduction in vulnerability, exposure, or risk to impacts; avoiding danger and promoting security; reducing sensitivity to climate-related threats; and increasing adaptive capacity or preparedness. Common actions from the case studies that indicated risk reduction involved the use of communication technologies or knowledge-sharing platforms, as well as increasing access to water resources through reservoirs, irrigation and rainwater harvesting.

- *53.6% of case studies reported enhancements in social and community well-being, relationships and networks*, such as increased cooperation, sharing resources and improved access to health services, food, water, education and housing. Actions that indicated effectiveness through these enhancements included extension

1 Examples and details are more fully explained in Owen, 2020.

services, developing opportunities for social learning, and sharing information and local or traditional expertise. Co-operative development practices and financial incentives also supported enhancements of social well-being, relationships and networks.

- *52.7% of cases studies reported improved ecosystems and environmental health,* demonstrated through environmental services, and the quality and quantity of natural resources. Land degradation, soil and water quality, improved ecosystem functions or increased biodiversity were common examples. Ecosystem-based adaptations and policies were reported to improve erosion control, environmental restoration and conservation, adaptive management and fisheries management.

- *44.5% of case studies reported greater access to economic resources* through measurable increases to income and employment, access to economic services and loans, and reductions in poverty. Higher levels of individual or community income were most often reported, resulting from improved agricultural, aquacultural, or livestock yields, or livelihood diversification.

- *39.1% of case studies reported strengthening institutions, policies, or governance structures.* Indicators in this category were related to new or improved institutional relationships, conflict management or resolution, enhanced community participation or autonomy in decision-making and leadership, and changes to governmental or other institutional systems. This type of effectiveness was most common in activities that brought together multiple actors, such as developing a decision-support tool or building an information network, as well as in fisheries management or community-based natural resource management.

Takeaway messages from the systematic review

Two main messages from the coding, analysis and categorization process described above are applicable to the Global Stocktake. The first takeaway is that it is feasible to compile, categorize and synthesize evidence of adaptation progress from diverse sources of input that cover a broad range of adaptation actions, cross different geographical, political and social contexts and scales, and use quantitative and/or qualitative evidence. Researchers and practitioners trained in this type of systematic review and content analysis could help synthesize diverse concepts of adaptation effectiveness and diverse indicators of global progress with adaptation.

The second takeaway is that effectiveness measures must include adaptation outputs and outcomes that demonstrate progress toward a stated set of goals *and* the support and adaptation processes that provide additional insights into how and why outputs and outcomes are effective. This comprehensive assessment of adaptation actions can help prevent maladaptive outcomes and promote equity and justice in adaptation. The final section explores the potential of applying these takeaway messages to the Global Stocktake.

APPLICATIONS TO THE GLOBAL STOCKTAKE

A systematic review takes a large set of information and analyses it to categorize, understand and operationalize this information. A global review and analysis process, grounded in current global adaptation actions and needs, could be used to establish adaptation goals and a robust framework to assess progress toward those goals. As the first Global Stocktake is set to close in 2023, a comprehensive and flexible framework to assess adaptation progress may not be agreed upon for use within this timeframe. One suggestion is to use the first Stocktake in 2023 to gather global inputs about adaptation goals, targets, actions and indicators of progress. Party contributors could submit adaptation data from existing processes and sources that countries already use to report adaptation targets and progress, such as National Adaptation Plans, Nationally Determined Contributions and data collected for other assessment frameworks like the UN Sustainable Development Goals. In addition to country-level data, the 2023 Stocktake has opened a mechanism for soliciting information from non-party actors, both locally and regionally. By doing so, locally led adaptation efforts can also inform global adaptation goals and an assessment framework.

After collecting diverse information about adaptation goals, targets, actions and indicators of progress, a large research team trained in coding, content analysis and conducting systematic reviews could synthesize and analyse this information. This process is well suited to a mixed methods approach. For example, a research team could develop relevant search terms and inclusion criteria to assess input from the 2023 Global Stocktake. Analysis using search algorithms and artificial intelligence could potentially help sort and categorize evidence of effectiveness across a large sample size (see Berrang-Ford et al., 2021). Cases and evidence could then be reviewed for relevance and analysed by the research team. Findings could be used to draft a defined Global Goal on Adaptation and to draft a framework that measures effective progress toward those adaptation goals. This draft framework would need to be reviewed and revised by adaptation professionals and organizations at local to national scales, and then finalized for use in subsequent Global Stocktakes. This development process would incorporate inputs across a breadth of

experience and knowledge from multiple scales and across multiple types of climate change adaptation actions. Below I expand on a few points about this process in order to develop a robust framework for assessing progress with adaptation.

A potential structural model for an actionable, goal-oriented, yet flexible assessment framework is the UN Sustainable Development Goals (SDG) framework. Under each of the 17 SDGs are nested sets of broad targets and indicators. For example, for SDG 13: Climate Action, the goal is to "Take urgent action to combat climate change and its impacts." Five targets support that goal, such as Target 13.1: "Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries." This target then lists three quantitative indicators that demonstrate progress toward it. A similar, perhaps more detailed framework could be developed to assess progress toward the Global Goal on Adaptation once it has been defined, developed and agreed upon.

Due to the wide variety of adaptation actions, the Global Goal on Adaptation is suited to a set of goals rather than one overarching target. It currently identifies three features: enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change. However, these three features are vaguely defined, and a Global Goal on Adaptation-based framework could be organized in other ways: by climate impact (e.g., wildfire, rises in sea level, heat, flooding, etc.), by geographical location (e.g., countries, regions, watersheds, continents, islands, polar regions, etc.), or by categories of adaptation action (e.g., IPCC categories of physical, social and behavioural, institutional and environment or nature-based).

Once a set of goals has been determined, each goal would need a set of targets, and each target would need a set of indicators to demonstrate progress. Indicators under each target could be developed to capture the outputs and outcomes of adaptation actions, as well as aspects of the adaptation process. Indicators should incorporate a mix of qualitative, quantitative, or hybrid types of input.

Below is a simplified sample framework illustrating a potential structure based on suggestions in this paper (Box 1). The structure builds on a set of goals for adaptation globally, followed by a series of targets toward each goal, with qualitative, quantitative, or hybrid indicators for 1) outputs, 2) outcomes, 3) process and 4) improvements needed. It is not meant to be comprehensive or complete. Several more Goals, Targets, and Indicators would need to be defined and developed, both in terms of quantity and types of action. The specific Goals, Targets and Indicators could be informed by inputs and contributions to the 2023 Global Stocktake and reviewed and refined for use in subsequent Stocktakes.

Just as adaptation actions should incorporate sustainability, legitimacy, efficiency, flexibility and equity, an assessment framework and evaluation process for the Global Stocktake should also reflect these qualities. For example, adaptation assessments can centre equity by incorporating indicators that prioritize the values, objectives and needs of frontline communities that face higher exposure to climate risk. The Global Commission on Adaptation developed eight "Principles for Locally-Led Adaptation", endorsed by over one hundred organizations to call attention to the need for local representation in adaptation ac-

Box 1. Example of a framework to assess adaptation globally

GGA 1. Reduce vulnerability to climate hazards

Target 1.1: Increase early warning system use and access

- *Output Indicators 1.1:*
  a: Proportion of populations with access to early warning systems (quantitative)
  b: Amount of funding spent on early warning system development and implementation (quantitative)
- *Outcome Indicators 1.1:*
  a: Decrease in loss and damages due to use of early warning systems (hybrid)
  b: Level of satisfaction with early warning systems (qualitative or hybrid)
- *Process Indicators 1.1:*
  a: Level of local participation in early warning system design (qualitative or hybrid)
  b: Level of local participation in implementation process (qualitative or hybrid)
- *Improvements 1.1:*
  a: Challenges that detract from progress toward this target
  b: Support that would enhance progress toward this target

Target 1.2: Increase infrastructure to address climate hazards

- *Output Indicators 1.2:*
  a: Proportion of populations served by infrastructure that reduces exposure to climate hazards (quantitative)
  b: Amount of funding spent on infrastructure that reduces exposure to climate hazards (quantitative)
- *Outcome Indicators 1.2:*
  a: Decrease in loss and damages due to infrastructure built, maintained, or improved (hybrid)
  b: Level of satisfaction with early warning systems (qualitative or hybrid)
- *Process Indicators 1.2:*
  a: Level of local participation in infrastructure design (qualitative or hybrid)
  b: Level of local participation in implementation process (qualitative or hybrid)
- *Improvements 1.2:*
  a: Challenges that detract from progress toward this target
  b: Support that would enhance progress toward this target

tion. Local-level representatives should lead or be engaged in not only the process of developing adaptation responses, but also in determining assessment indicators that are meaningful to them. Other ways that the qualities of sustainability, legitimacy, efficiency, flexibility and equity could inform the assessment process include: 1) building capacity to conduct adaptation assessments by providing specific funding and training to under-resourced communities or organizations to do so; 2) supporting local and community ownership of the assessment process and allowing multiple types of data collection; and 3) developing inclusive communication strategies to share information and lessons learned from adaptation actions.

While all parties to the Paris Agreement are encouraged to submit evidence of progress for the first Global Stocktake, a wider call for input from non-party organizations has also been issued. This input process provides opportunities for broader participation from adaptation practitioners, researchers, funders, local leaders and organizations, and invites insights from people and organizations that might not already be participating in these discussions. In developing such a mechanism, the Global Stocktake is supporting ways to incorporate more local and on-the-ground contributions. If non-party organizations submit evidence of adaptation progress, the inclusion of these submissions in a systematic review process could lead to a more useful assessment framework for adaptation effectiveness. Calls for input from parties to the Paris Agreement and from non-party organizations should clearly outline the necessary criteria for inclusion in a systematic review process, such as descriptions of the processes, outputs and outcomes of adaptation actions and support.

An assessment framework for the Global Stocktake must be flexible enough to incorporate input from multiple sources, accommodate multiple types of indicators and allow multiple data collection methods. Diverse organizations, governments and communities are implementing adaptation actions, all with varying degrees of capacity and access to technical skills and financial resources to respond to climate change and to assess it. A functional assessment framework will allow for multiple types of input from multiple sources and will still provide valuable insights on progress made (Garschagen et al., 2022). The framework should encourage the use of both quantitative and qualitative indicators in assessing progress. Qualitative and quantitative methods of data collection serve different but complementary functions. Quantitative indicators suggest overarching trends across geographic scales, economic sectors, types of governance, and adaptation actions. Qualitative indicators help contextualize these trends in people's realities of and lived experiences with climate change and the tangible impacts resulting from adaptation actions. While quantitative data are more easily aggregated and scalable, they do not provide adequate information about on-the-ground impacts and experiences. Both qualitative and quantitative data can be aggregated within a well-designed indicator framework to understand global, regional and local trends.

Include assessment of adaptation actions that need improvement or that did not work as intended. An important part of developing an effective practice comes from learning-by-doing. A learning-by-doing approach is often not linear, and it benefits from routine opportunities for reflection about what works well and what needs improvement. In the case-study review described in this paper, most cases were not reported as 100% successful. Rather, authors discussed how to improve the adaptation actions, such as the need to expand adaptation actions to additional beneficiaries, the need to include more local community members in decision-making, or the need to sustain funding for the maintenance of adaptation infrastructure. The Global Stocktake framework could consider designing a process that not only measures positive progress and benefits from adaptation, but that also allows documentation of lessons learned, improvements needed, and even evidence of the unanticipated negative impacts of adaptation actions. Measures of progress are not meaningful if they do not also look at evidence of maladaptation, or increased vulnerability and risk. An assessment that tracks both positive progress and suggestions for improvements will provide a more realistic approach to learning-by-doing. Reporting negative outcomes may have consequences for funding or capacity and would need to be carefully reported. Perhaps they could be reported as improvements needed, challenges that detract from progress, and/or support needed to deal with such challenges. Using assessments to only measure progress limits learning about what not to do and inhibits the design and implementation of effective adaptation actions. People can learn a lot from others' mistakes: documenting them and including them in the assessment process improves the probability that these mistakes will not be repeated.

By harnessing collective knowledge of and experiences with climate change adaptation to date, society has the capacity to develop a rigorous, comprehensive and flexible global assessment framework and process. As adaptation actions are documented and analysed from around the world, society's understanding of adaptation effectiveness will expand, enhancing the global capacity to meet the growing challenges posed by climate change.

REFERENCES

Alessa, L., A. Kliskey, J. Gamble, M. Fidel, G. Beaujeau, J. Gosz. (2016) 'The role of Indigenous science and local knowledge in integrated observing systems: moving toward adaptive capacity indices and early warning systems', Sustainability Science 11, pp. 91–102. doi.org/10.1007/s11625-015-0295-7.

Araos, M., K. Jagannathan, R. Shukla, I. Ajibade, E. Coughlan de Perez, K. Davis, J.D. Ford, E.K. Galappaththi, C. Grady, A.J. Hudson. (2021) 'Equity in human adaptation-related responses: A systematic global review', One Earth 4(10), pp. 1454-1467. doi.org/10.1016/j.oneear.2021.09.001.

Arnes, E., J. Antonio, E. del Val, M. Astier. (2013) 'Sustainability and climate variability in low-input peasant maize systems in the central Mexican highlands', Agriculture, Ecosystems and Environment 181, pp. 195–205. doi.org/10.1016/j.agee.2013.09.022

Barrios, J.E., J.A. Rodriguez-Pineda, M. de la Maza Benignos. (2009) 'Integrated river basin management in the Conchos River basin, Mexico: A case study of freshwater climate change adaptation', Climate and Development 1(3), pp. 249–260. doi.org/10.3763/cdev.2009.0024

Berrang-Ford, L., J.D. Ford, J. Paterson. (2011) 'Are we adapting to climate change?', Global Environmental Change 21, pp. 25–33. doi.org/10.1016/j.gloenvcha.2010.09.012

Berrang-Ford, L., T. Pearce, J.D. Ford. (2015) 'Systematic review approaches for climate change adaptation research', Regional Environmental Change 15, pp. 755–769. doi.org/10.1007/s10113-014-0708-7

Berrang-Ford, L., A.R. Siders, A. Lesnikowski, et al. (2021) 'A systematic global stocktake of evidence on human adaptation to climate change', Nature Climate Change 11, pp. 989–1000 doi.org/10.1038/s41558-021-01170-y

Brooks, N., S. Anderson, J. Ayers, I. Burton, I. Tellam. (2011) 'Tracking adaptation and
measuring development', In: IIED Working Paper No. 1. International Institute for Environment and Development.

Castrejón, M., O. Defeo. (2015) 'Co-governance of small-scale shellfisheries in Latin America: institutional adaptability to external drivers of change', In: S. Jentoft, R. Chuenpagdee (eds.), Interactive Governance for Small-Scale Fisheries 13 MARE Publication Series. doi.org/10.1007/978-3-319-17034-3_31.

Christiansen, L., Schaer, C., Larsen, C., Naswa, P. (2016). Monitoring & Evaluation for climate change adaptation: A summary of key challenges and emerging practice. Understanding, discussing and exemplifying the key challenges of M&E for adaptation. UNEP DTU Partnership Working Paper.

Christian-Smith, J., M.C. Levy, P.H. Gleick. (2015) 'Maladaptation to drought: a case report from California, USA', Sustainability Science 10, pp. 491-501. doi.org/10.1007/s11625-014-0269-1

Coggins, S., L. Berrang-Ford, K. Hyams, P. Satyal, J. Ford, J. Paavola, I. Arotoma-Rojas, S. Harper. (2021) 'Empirical assessment of equity and justice in climate adaptation literature: a systematic map', Environmental Research Letters 16, pp. 073003. doi.org/10.1088/1748-9326/ac0663

Curran, D., S. Mascher. (2016) 'Adaptive Management in Water Law: Evaluating Australian (New South Wales) and Canadian (British Columbia) Law Reform Initiatives', McGill Journal of Sustainable Development Law 12(2).

Dilling, L., A. Prakash, Z. Zommers, F. Ahmad, N. Singh, S. de Wit, J. Nalau, M. Daly, K. Bowman. (2019) 'Is adaptation success a flawed concept?' Nature Climate Change 9, pp. 570–574. doi.org/10.1038/s41558-019-0539-0.

Eriksen, S., E.L.F. Schipper, M. Scoville-Simonds, K. Vincent, H.N. Adam, N. Brooks, B. Harding, D. Khatri, L. Lenaerts, D. Liverman, M. Mills-Novoa, M. Mosberg, S. Movik, B. Muok, A. Nightingale, H. Ojha, L. Sygna, M. Taylor, C. Vogel, J.J. West. (2021) 'Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance?' World Development 141, pp. 105383.

Ensor, J.E., T. Mohan, J. Forrester, U. Kanti Khisa, T. Karim, P. Howley. (2021) 'Opening space for equity and justice in resilience: A subjective approach to household resilience assessment', Global Environmental Change 68, pp. 102251. doi.org/10.1016/j.gloenvcha.2021.102251

Fussel, H.M. (2007) 'Adaptation planning for climate change: concepts, assessment approaches,
and key lessons', Sustainability Science 2, pp, 265–275. doi.org/10.1007/s11625-007-0032-y

Fernandez-Bou, A.S., J.P. Ortiz-Partida, L.M. Classen-Rodriguez, C. Pells, K.B. Dobbin, V. Espinoza, J.M. Rodríguez-Flores, C. Thao, C.R. Hammond Wagner, A. Fencl, H. Flores-Landeros, M.L. Maskey, S.A. Cole, S. Azamian, E. Gamiño, A. Guzman, A. F. Alvarado, M.S. Campos-Martínez, C. Weintraub, E. Sandoval. R.M. Dahlquist-Willard, L.A. Bernacchi, C.C. Naughton, R.M. DeLugan, J. Medellín-Azuara. (2021) '3 Challenges, 3 Errors, and 3 Solutions to Integrate Frontline Communities in Climate Change Policy and Research: Lessons from California', Frontiers in Climate 3, pp. 717554. doi: 10.3389/fclim.2021.717554

Garcia, A., N. Gonda, E. Atkins, N.J. Godden, K.P. Henrique, M. Parsons, P. Tschakert, G. Ziervogel. (2022) 'Power in resilience and resilience's power in climate change scholarship', WIREs Climate Change 13(3), pp. e762. doi.org/10.1002/wcc.762

Garschagen, M., T. Leiter, R. Biesbroek, A.K. Magnan, D. Reckien, M. New. L. Berrang-Ford, S. Cheong, L. Schipper, R. Lempert. (2022) Approaches and Challenges to Assess Adaptation Progress at the Global Level. 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, Cambridge, UK and New York, NY, USA, pp. 2610-2613. doi:10.1017/9781009325844.026.

Goldman, M.J., M.D. Turner, M. Daly. (2018) 'A critical political ecology of human dimensions of climate change: epistemology, ontology, and ethics', WIREs Climate Change 9(4), pp. 1–15. doi.org/10.1002/wcc.526.

IPCC. (2022) 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. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi:10.1017/9781009325844.

IPCC. (2014) Summary for policymakers. In: C.B. Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir (Eds.). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom. Cambridge University Press, New York, NY, pp. 1–32.

Juhola, S., E. Glaas, B. Linnér, T. Neset. (2016) 'Redefining maladaptation', Environmental Science & Policy 55, pp. 135-140.

Magnan, A.K., E.L.F. Schipper, M. Burkett, S. Bharwani, I. Burton, S. Eriksen, F. Gemenne, J. Schaar, and G. Ziervogel. (2016) 'Addressing the risk of maladaptation to climate change', WIREs Climate Change 7, pp. 646–665. doi: 10.1002/wcc.409

Moser, S.C., M.T. Boykoff. (2013) Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World. Routledge, New York.
Moser, S.C., J.A. Ekstrom. (2010) 'A framework to diagnose barriers to climate change adaptation', Proceedings of the National Academy of Sciences 107(51), pp. 22026–22031. doi.org/10.1073/pnas.1007887107.

Nightingale, A. (2016) 'Adaptive scholarship and situated knowledges? Hybrid methodologies and plural epistemologies in climate change adaptation research' AREA 48, pp. 41–47. doi.org/10.1111/area.12195

Nunn, P.D., C. Klöck, V. Duvat. (2021) 'Seawalls as maladaptations along island coasts,' Ocean & Coastal Management 205(1), pp. 105554. doi.org/10.1016/j.ocecoaman.2021.105554

Ombogoh, D.B., J. Tanui, S. McMullin, J. Muriuki, J. Mowo. (2016) 'Enhancing adaptation to climate variability in the East African highlands: a case for fostering collective action among smallholder farmers in Kenya and Uganda', Climate and Development 10(1), pp. 61-72. doi.org/10.1080/17565529.2016.1174665.

Owen, G. (2020) 'What makes climate change adaptation effective? A systematic review of the Literature' Global Environmental Change 62, pp. 102071. doi.org/10.1016/j.gloenvcha.2020.102071.

Piggott-McKellar, A.E., K.E. McNamara. P.D. Nunn. (2020) 'Who defines "good" climate change adaptation and why it matters: a case study from Abaiang Island, Kiribati', Regional Environmental Change 20, pp. 43. doi.org/10.1007/s10113-020-01614-9

Schemmel, E., A.M. Friedlander, P. Andrade, K. Keakealani, L.M. Castro, C. Wiggins, B. Wilcox, Y. Yasutake, J.N. Kittinger. (2016) 'The codevelopment of coastal fisheries monitoring methods to support local management', Ecology & Society 21(4), pp. 34–45. doi.org/10.5751/ES-08818-210434.

Singh, C., S. Iyer, M.G. New, R. Few, B. Kuchimanchi, A.C. Segnon, D. Morchain. (2021) 'Interrogating 'effectiveness' in climate change adaptation: 11 guiding principles for adaptation research and practice', Climate and Development 14(7), pp. 650-664. doi.org/10.1080/17565529.2021.1964937

Smit, B., O. Pilifosova. (2001) 'Adaptation to climate change in the context of sustainable
development and equity.' Climate Change 2001: Impacts, Adaptation and Vulnerability. Cambridge University Press, Cambridge, Chapter 18.

Sultana, F. (2022) 'The unbearable heaviness of climate coloniality', Political Geography 99, pp. 102638. doi.org/10.1016/j.polgeo.2022.102638

UNEP - United Nations Environment Programme (2022) Adaptation Gap Report 2022: Too Little, Too Slow – Climate adaptation failure puts world at risk. Nairobi.

Weisner, E., G. Schernewski. (2013) 'Adaptation to climate change: A combined coastal protection and re-alignment measure in a southern Baltic tourism region', Journal of Coastal Research 65(2), pp. 1963-1968. doi.org/10.2112/SI65-332.1

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Assessing adequacy and effectiveness under the GST: the role of national MEL systems

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INTRODUCTION

In 2015, the Paris Agreement introduced the concept of adequacy and effectiveness (A&E) as key components for assessing progress on adaptation action and support. Paragraph 7.14 of the Paris Agreement states that the Global Stocktake will review the A&E of adaptation and support as one of the four adaptation dimensions to be considered as part of its global assessment of the collective progress towards achieving the purpose of the agreement and its long-term goals (Decision 19/CMA).

Yet, the concepts of A&E and the approaches to assessing them are yet to be clearly defined. As we reach the final year of the first GST, where are we in terms of how A&E should be assessed and captured at COP28? How can the global community assess the A&E of adaptation action and support in a way that can still be meaningful to the most vulnerable at the local level?

The question of how best to reconcile the global and local meanings of latent concepts has beset the scientific and practitioner community for decades. This paper presents an overview of some of the challenges and opportunities involved in assessing A&E, before suggesting a recalibration of their role globally and nationally to ensure they fit for the GST's purpose. It then highlights three key roles that national Monitoring, Evaluation and Learning (MEL) systems can play in implementing contextualized and meaningful assessments of A&E as part of the GST. The paper also underlines the need to focus on the governance systems for assessing progress with adaptation, in addition to conversations on methods and metrics.

This paper, while focusing on GST, recognizes the links between A&E, GST and the Global Goal on Adaptation (GGA). The work under the Glasgow-Sharm el-Sheikh work programme on the GGA (GlaSS) initiated the development of a framework for the global goal on adaptation that will inform the first and subsequent GST cycles. Thus, the results of the GlaSS at COP28 will have implications for the outcome of both the technical and the political processes under the GST. Countries and organizations supporting them in the GST process can reflect on this paper when preparing inputs and submissions for the GST in the forthcoming year, especially when considering next steps in developing their national MEL systems for adaptation and development.

ADEQUACY AND EFFECTIVENESS IN THE PARIS AGREEMENT

In 2015, the concept of adequacy and effectiveness (A&E) stimulated increased attention during the Paris Agreement negotiations. While A&E are both relevant for all countries, ongoing negotiations and UNFCCC work can suggest a reflection on the different priorities between developing and developed countries (IIED, 2016). On the one hand, adequacy can be related to the views of developing countries mostly seeking to assess whether adaptation finance, provided largely by developed countries, met their needs. From this perspective, adequacy also refers to climate finance under the UNFCCC as new, additional and flexible. On the other hand, effectiveness can be viewed as a concern primarily for developed countries in ensuring that the support and finance provided were spent effectively.

The Paris Agreement included a mandate to advance the key methodological area of how the GST would assess A&E under Decision 1/CP.21 (UNFCCC, 2016), which established the Paris Agreement. It requested the Adaptation Committee (AC) and the Least Developed Countries Expert Group (LEG), in collaboration with the Standard Committee on Finance (SCF) and other relevant institutions, to develop methodologies and make recommendations on "reviewing the adequacy and effectiveness of adaptation and support referred to in Article 7, paragraph 14c of the Agreement".

When referring to the A&E of finance, this also includes the A&E of the adaptation actions that have been delivered. Some aspects of A&E can refer solely to finance or to actions, including features of the delivery mechanisms. The assumption is that adequate and effective finance is needed for adequate and effective actions. Hence considering the outcomes of actions is necessary to fully evaluate whether its support and finance are adequate and effective. As such, the A&E of adaptation should consider both finance and actions – or adaptation and support – together.

CHALLENGES: A FOCUS ON INDICATORS FOR ASSESSING A&E GLOBALLY

The work on A&E under the UNFCCC has evolved slowly, being mired in the constant challenge and realization that there is no single way of reviewing A&E. In fact, after a first phase of work on this mandate, the joint working group of the AC, LEG and SFC concluded, amongst other findings, that:

> *"A global review of the adequacy and effectiveness of adaptation and support will need to derive information from various individual assessments at different scales, applying a broad range of methodologies. To this end, the methodologies described in the annex, variations thereof and others that will be deemed suitable, may provide a useful basis."* AC-LEG/INFO/2

This summarizes well the technical challenges of defining and in turn assessing A&E, reflecting the fact that both concepts are multidimensional: there are different facets representing what A&E means, such as the quality and/or quantity of finance mech-

anisms, activity design, outcomes, etc. Moreover, these facets are subjective to different contexts and individuals. This is in part because they are both highly contextual and subjective. This means that their definitions vary across different scales and contexts, communities and ecosystems. What represents adequate and effective adaptation finance and actions for a small-island developing-state community will be different from what this means for a peri-urban community in North America.

Over the years, there has often been a search for a new unifying approach, metric(s) or indicator(s) that could globally consist of multiple dimensions while retaining their meaning. The Sustainable Development Goals (SDG), the Sendai Framework for Disaster Risk Reduction and the Convention on Biological Diversity, amongst other international agreements, have taken this route. For example, the SDG's global indicator framework includes 248 indicators that can be selected and contextualized by countries (UNDESA, 2022). However, indicators are not relevant to all countries, reporting is voluntary, and most importantly the capacities and resources to collect and analyse data and evidence are limited in several countries.

In fact, there are well-documented perils of focusing on metrics to solve these issues (Anderson et. al. 2012, Muller 2018). An approach focused on defining shared global metrics is problematic as the aggregation required must confine metrics and methods to using simple, quantitative numbers that cannot account for important insights about the progress being made (Leiter and Pringle, 2018). Standardized indicators also face difficulties in remaining meaningful across scales (Beauchamp et al. 2019). For example, even relative measures such as the number of people living below national poverty lines hardly provide an appropriate basis for comparing the quality of life between poor and rich countries. Finally, it can lead to excessive bureaucratization and additional burdens in collecting evidence (Chaplowe and Hejnowicz, 2021).

This leads to the core problem that the GST and other multi-scale processes such as the GGA face: how to reconcile the diversity of data and meaning from assessments at different scales into a global, understandable set of findings? How to synthesize and analyse different types of data and indicators, without losing their meaning and informative value?

In determining how to assess A&E under the Paris Agreement, the global community could consider looking at this issue in relation to technical capacity and governance, rather than as a purely methodological matter. The question is how to structure and capture data and insights at multiple scales, through different layers of assessment rather than as an overarching one. Simply put, the need to assess data on A&E from different scales means that the governance of the data should be multi-scalar as well.

OPPORTUNITIES: REDEFINING THE ISSUES IN ASSESSING A&E UNDER THE GST

The idea that the GST – and the GGA – should feature different scales of assessment is not new (AC, 2021; Jeudy-Hugo et al., 2022). However, it tends to be too easily forgotten at the expense of reproducing systems we are already familiar with despite being repeatedly called for. To date negotiations and international discussions have stressed that the methods that countries implement under the Paris Agreement, such as assessing A&E, should be country-driven and based on the best available science (AC, 2021; AC & LEG, 2021). This includes work by the joint working group of the AC, LEG and SCF (2021) and recommendations from the 2021 report of the AC on approaches for the GGA (AC, 2021). In fact, countries have repeatedly called for the GGA to collectively represent a (set of) goal(s) rather than a single goal (Beauchamp and Motaroki, 2022).

As methods vary across countries, this points to national capacities and systems for MEL of A&E as the key to improving our understanding of A&E globally. This is important, as assessments of the A&E of adaptation action and support can only be considered in the context of country capacities and available resources. Otherwise, the risk arises of less complete and less robust data being interpreted as a lack of progress rather than a lack of the resources with which to collect evidence.

Under the redefinition of roles, international guidance can shine a light on key areas to drive the joint efforts needed to address global issues without overburdening countries. For example, a non-prescriptive frame and examples can give directions and guide the first steps in countries strengthening their national processes. Under the first GST, as the first stab in understanding how to assess A&E globally, this exercise can provide summaries and key take-aways on what is being understood as A&E across all the data gathered, thus informing the outcome of the technical discussion and political decisions executed at the end of the first GST. Subsequent GST processes can start working on this basis to refine our understanding of what an overarching yet nationally informed framework for A&E could look like. The GST can then use such predetermined framework that will evolve over time to do cyclical meta-analysis and evaluations to assess global trends. In this respect, national and related sub-national MEL systems provide key roles in bridging scales by allowing different actors to collect, assess and learn from the data. Managing assessments and evidence at different scales also ensures that the use of evidence can be fed into improving decisions and policies to enhance adaptation.

NATIONAL MEL SYSTEMS: THE KEY TO LINKING LOCAL AND GLOBAL ASSESSMENTS

The GST and other global exercises should be able to accommodate a diversity of metrics rather than narrowing down methodological pathways. Consequently, the first GST ought to consider how best to compile and synthesize various approaches and methods towards a flexible meta-analysis of the variety of national and sub-national evidence. Based on these premises, national MEL systems can improve global assessments of A&E through three key roles:

1. Providing a platform for accessing data and insights

National MEL systems can also facilitate the reconciliation of various data from local to global by providing a first layer of analysis and transformation. National MEL systems already compile, synthesize and aggregate various data for different reporting and policy purposes, including for other global reporting processes. These include adaptation-specific communication and reporting vehicles, such as Adaptation Communications and Biennial Transparency Reports, but also National Adaptation Plans (and their MEL systems), Nationally Determined Contributions and National Communications (AC, 2022), as well as in other forms.

In addition to communication and reporting vehicles from different international agreements, most countries today already have MEL systems for development and some climate outcomes, even though they may be nascent or confined to silos. To date, 65% of countries that have submitted National Adaptation Plans (NAP) have mentioned dedicated M&E systems in their NAPs. However, the number of parties engaged in developing or using mechanisms to track NAP implementation has increased by 40% since 2017 (Leiter, 2021). As such, most countries have already started to collect data, assess results and outcomes, communicate and produce reports to share and learn from the progress made.

For example, Fiji developed a catalogue of adaptation measures with relevant tags to cross-reference different sustainable development policies and agendas as part of its NAP (Government of the Republic of Fiji, 2018). The catalogue can then be used as a source for easier access to different types of data, as well as being a coherent narrative reconciling data across scales and contexts in the country. Information from MEL systems can provide credible representations of A&E in their countries that can serve as the basis for the GST.

As the mechanism for assessing collective progress across the Paris Agreement, the GST must rely on devolved, national and sub-national sources and types of assessment to represent global trends appropriately. As such, the GST is an assessment of assessments. Compiling an evidence base of A&E assessments and data sources from national MEL systems would support a country-driven and bottom-up GST (UNDP, 2022). Furthermore, the GST could later rely on country self-assessments of the A&E of their own actions based on different approaches, such as triangulated assessments or scorecards if available (Jeudy-Hugo et al., 2022). In turn, this can encourage countries to invest in their national MEL systems to provide increasingly comprehensive and robust data, rather than focusing on fulfilling prescriptive top-down indicators.

2. Capturing stories and outcomes from local voices

Being a global assessment, the GST can hardly collect data across all countries and communities of the world. It is therefore important for countries to capture varied voices and lessons about progress on adaptation that are reflective of their realities. As such, representative assessments of A&E at the national or sub-national levels are essential to obtain the disaggregated information needed to reflect the locally and contextually lived experiences of those at the forefront of the climate crisis. National and sub-national MEL systems can support the inclusion of local and most marginalized voices, which can easily be forgotten or difficult to assess in evaluations at the global level. While subjective data such as perceptions and self-assessed resilience can be collected through global surveys, several communities are difficult to identify from the outside and difficult to reach.

Not all the disaggregated data from local assessments can be condensed or aggregated globally. Rather, national MEL systems can serve to collect and create meta-narratives based on different data, key case studies and stories of change. MEL systems can host platforms and exercises that integrate the diversity of approaches and metrics required to triangulate the realities of adaptation across different contexts. Those can then be further compiled, analysed and synthesized globally.

For example, in 2022 the government of Eswatini developed an outreach programme to engage adaptation stakeholders as part of their National Adaptation Plan (NAP). A key element of this programme is collecting local stories to gather and understand traditional and Indigenous Knowledge on adaptation. Both their NAP and their next Adaptation Communications (AdCom) will be vehicles for this information, with the process becoming part of their national MEL system for adaptation (NAP GN, 2022). As such, national MEL systems and related processes such as the NAP can bring national and local lessons to the international conversation (Qi, 2022).

The GST can then synthesise local experiences and knowledge through meta-analyses within different dimensions of

the adaptation cycle, sectors and cross-cutting themes. By emphasizing the need and role of countries in creating their own evidence and narratives of what is adequate and effective adaptation nationally and locally, the GST can drive ownership, collaboration and investment in MEL systems (Beauchamp and Bueno, 2021). Altogether, this will lead more equitable and fairer assessments of collective progress.

3. Ensuring accountability and learning

The GST as designed has a ratcheting mechanism to increase ambitions on adaptation and enhance adaptation actions. This means that GST outputs should consider how best to disseminate and feedback their results to those making decisions about adaptation actions. Given that climate impacts are highly contextual, a large proportion of adaptation decisions should be devolved and locally led to be effective. Devolution of decisions and actions in turn means that evidence about the A&E of adaptation should also be devolved to enhance the planning and implementation of adaptation actions. Devolved and vertically integrated national MEL systems can follow the principle of subsidiarity, namely that issues and decisions should be dealt with at the most immediate or local level that is consistent with their resolution.

To date, definitions of what countries can voluntarily report on the A&E of adaptation action and support remain vaguely defined across Biennial Transparency Review and Adaptation Communication guidance. This does not mean there is a need to develop single methods for assessing A&E – on the contrary. This could ultimately incentivize countries to move from the simple monitoring and collection of data at output levels to the evaluation of outcomes and ultimately to more direct learning and the adaptive management of adaptation in their countries and communities.

Increasing accountability and learning, and strengthening MEL systems in general, should be approached with pragmatism and simplicity. Starting small to build from existing systems can mean adding a specific data collection, analysis and/or learning exercise gradually on the basis of priority actions or sectors. For example, reporting progress nationally and sectorally can help to take stock of actions and identify gaps in the A&E of adaptation and overall progress: over thirty parties have already published NAP progress reports or NAP evaluations (Leiter, 2021). Lessons from progress reporting show it can be a flexible approach for adaptive management through learning-by-doing, capturing impact stories, improving data collection, enhancing collaboration between ministries and agencies, and incorporating insights from disaggregated data on gender and social groups (Guerdat, 2021).

National and sub-national MEL systems can further provide spaces, platforms and events for exchanges between citizens and decision-makers through participatory collection, interpretation and learning from data and experiences. Activities for learning and accountability can include one-way dissemination such as developing online platforms or portals to share and verify data, such as South Africa's "Let's Respond" platform (LGCCSP, 2023). Other examples include citizen assemblies that can guide policies (European Climate Foundation, 2021; KNOCA, 2023). Altogether, these systems can help reinforce the ultimate goal of the GST: to enhance adaption action based on evidence.

CONCLUSION

The defining objective of GST is to assess the world's collective progress towards achieving the purpose of the agreement and its long-term goals. The GST is an important exercise in driving understanding of A&E of adaptation and support, scaling up ambitions of adaptation and designing policies that will improve A&E and adaptation generally. Countries can consider the current status and roles of their national MEL systems as part of inputs into the GST processes, but also to advance adaptation actions. As part of their GST contributions, countries can:

- Highlight existing assessments, communications and information on A&E as a basis for insights
- Utilize available adaptation communication guidelines along with the supplementary guidelines to broaden the level of information communicated.
- Share stories of change and lessons from diverse perspectives on A&E
- Reflect on national opportunities and channels for disseminating back the GST's assessment of A&E

Providing inputs in the GST is also an opportunity for countries to take stock of their current MEL systems, considering the next steps and needs for strengthening them. Reinforcing national MEL systems and capacities for assessing A&E are essential to complementing any global A&E assessment and approaches.

Yet countries should not lose focus of the need to improve national systems that will ultimately enable global and national learning from the representative and inclusive evidence gathered. This will increase the likelihood that the GST's assessment of A&E can lead to better adaptation decisions at other levels. As such, strengthening national MEL systems is essential to improving the quality, depth and coverage of evidence on adaptation, which in turn informs the GST. The GST, along with the GGA, should recognize its role in this process, and celebrate a diversity of methods rather than shying away from it.

REFERENCES

AC (2021) Approaches to reviewing the overall progress made in achieving the global goal on adaptation (technical paper). AC/2021/TP/GGA. UNFCCC, Bonn. https://unfccc.int/documents/273844

AC (2022) Draft supplementary guidance for voluntary use by Parties in communicating information in accordance with the possible elements of an adaptation communication. AC22/GUID/6B. https://unfccc.int/sites/default/files/resource/ac22_6b_adcoms.pdf

AC and LEG (2021) Methodologies for reviewing the adequacy and effectiveness of adaptation and support. AC-LEG/INFO/3. UNFCCC, Bonn. https://unfccc.int/sites/default/files/resource/ac20_5e_adequacy.pdf

Beauchamp, E., Motaroki, L. (2022). Taking stock of the Global Goal on Adaptation: from the Paris Agreement to the Glasgow-Sharm el-Sheikh work programme. IIED, London

Beauchamp, E., Bueno, M. (2021). Global Stocktake: three priorities to drive adaptation action. IIED, London. https://www.iied.org/20601iied

Chaplowe, S., & Hejnowicz , A. (2021). Evaluating Outside the Box: Evaluation's Transformational Potential . Social Innovations Journal, p. 5. https://socialinnovationsjournal.com/index.php/sij/article/view/704

Diaz-Sarachaga, J. M., Jato-Espino, D., & Castro-Fresno, D. (2018). Is the Sustainable Development Goals (SDG) index an adequate framework to measure the progress of the 2030 Agenda? Sustainable Development, 26(6), 663–671. https://doi.org/10.1002/SD.1735

El-Bakri, S, Roberts, E and Ngwadla, N (2015). Background paper: The African Group of Negotiator's Proposal for a Global Goal for Adaptation with an update based on the Paris outcome. CDKN, Cape Town.

European Climate Foundation (2021). The growing traction of climate citizens assemblies. Link: https://europeanclimate.org/stories/the-growing-traction-of-climate-citizens-assemblies/ (accessed 17 January 2023)

Grainger-Brown, J., & Malekpour, S. (2019). Implementing the Sustainable Development Goals: A Review of Strategic Tools and Frameworks Available to Organisations. Sustainability 2019, Vol. 11, Page 1381, 11(5), 1381. https://doi.org/10.3390/SU11051381

GAC - Government of Canada (2022) Engagement on the National Adaptation Strategy. Website: https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/national-adaptation-strategy/engagement.html

Guerdat, Patrick (2021) Eight Key Lessons of NAP Progress Reporting From Kenya and Burkina Faso. NAP Global Network. https://napglobalnetwork.org/2021/07/eight-lessons-nap-progress-reporting-kenya-burkina-faso/

Government of the Republic of Fiji (2018) Republic of Fiji National Adaptation Plan. https://www4.unfccc.int/sites/NAPC/Documents/Parties/National%20Adaptation%20Plan_Fiji.pdf

IIED. 2016. Reviewing the adequacy and effectiveness of adaptation and support. The International Institute for Environment and Development's submission on the Adaptation Committee and Least Developed Countries Expert Group mandates stemming from decision 1/CP.21, paragraph 45(b). https://unfccc.int/sites/default/files/697.pdf

IIED. 2023. Principles for locally led adaptation. Website: https://www.iied.org/principles-for-locally-led-adaptation

Jeudy-Hugo, S., S. Errendal and I. Kotani (2022), "Adaptation in the global stocktake: Options to deliver on its mandate", OECD/IEA Climate Change Expert Group Papers, No. 2022/04, OECD Publishing, Paris. https://doi.org/10.1787/396b5224-en

KNOCA (2023). KNOCA website. https://knoca.eu/ (accessed 17 January 2023)

Leiter, T. (2021). Do governments track the implementation of national climate change adaptation plans? An evidence-based global stocktake of monitoring and evaluation systems. Environmental Science & Policy. Vol. 125, p. 179–188. https://doi.org/10.1016/J.ENVSCI.2021.08.017

Leiter & Pringle 2018 Pitfalls and potential of measuring climate change adaptation through adaptation metrics

LGCCSP - Local Government Climate Change Support (2023). Let's Respond. Website found: https://letsrespondtoolkit.org/

NAP Trends (2021) Trends in NAP documents – Monitoring & Evaluation. Accessed at: https://trends.napglobalnetwork.org/search-by-trend/monitoring-evaluation

Ngwadla, X and El-Bakri, S (2016) The Global Goal for Adaptation under the Paris Agreement: Putting ideas into action. CDKN, Cape Town. https://cdkn.org/sites/ default/files/files/Global-adaptation-goals-paper.pdf

NAP GN (2022) National Adaptation Plan Global Network (2022). Eswatini Launches an Adaptation Outreach Programme. https://napglobalnetwork.org/2022/07/eswatini-launches-adaptation-outreach-programme/

Qi, Jeffrey (2022). Three Ways the National Adaptation Plan (NAP) Process Can Be Leveraged to Inform the Global Stocktake. IISD, blog: https://www.iisd.org/articles/insight/national-adaptation-plan-global-stocktake

UNDESA (2022). Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development. Website. https://unstats.un.org/sdgs/indicators/indicators-list/#:~:text=The%20global%20indicator%20framework%20includes,of%20SDG%20indicators%20is%20248.

UNDP (2022). Adaptation monitoring and the importance of the Glasgow-Sharm el-Sheikh programme in building national systems. United Nations Development Programme Policy Brief. May 2022: https://www.undp.org/sites/g/files/zskgke326/files/migration/mv/Adaptation-Monitoring---Policy-Brief-GGA-May-2022.pdf

UNFCCC (2016) Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015. FCCC/CP/2015/10/ Add.1. UNFCCC, Bonn. https://unfccc.int/sites/default/ files/resource/docs/2015/cop21/eng/10a01.pdf

UNFCCC (2022) Compilation and synthesis of indicators, approaches, targets and metrics for reviewing overall progress in achieving the global goal on adaptation. Glasgow-Sharm el-Sheikh work programme. https://unfccc.int/sites/default/files/resource/ReportGGATP_final.pdf

van den Berg, R.D., Hawkins, P., & Stame, N. (2021). Ethics for Evaluation. Routledge, New York. https://doi.org/10.4324/9781003247234

van den Berg, R.D., Naidoo, I. and Tamondong, S. eds (2017) Evaluation for Agenda 2030: Providing Evidence on Progress and Sustainability. Exeter, UK: IDEAS. https://www.c2es.org/document/cop-27-issues-and-options-for-a-global-goal-on-adaptation/

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The potential of expert judgment-based approaches to assessing adaptation under the GST: the case of the GAP-Track

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1. INTRODUCTION

Climate change is already a reality worldwide, and science is warning that we can expect a more precarious future for ecosystems and the most vulnerable people, including a two- to four-fold increase in today's global climate risks. This depends on the trajectory of the 21st century's global greenhouse gas emissions (Magnan et al., 2021a), and the inevitability of some degree of climate risks even under ambitious adaptation efforts (i.e. residual risks) (IPCC, 2022). On the other hand, science highlights the potential for ambitious adaptation to substantially reduce climate risks globally by the end of this century by more than a half under all warming scenarios (Magnan et al., 2021a). This suggests that investing extensively in adaptation is both inevitable and urgent (UNEP, 2022), though some concerns have been raised over the limits to adaptation being progressively reached across regions and sectors (O'Neill et al., 2022) and the potential shrinking of the "solution space", i.e. the range of options available for adaptation (Haasnoot et al., 2021). In the end, where we stand globally on adaptation efforts remains unclear.

Efforts towards enhancing adaptation policy, implementation and finance are recognized at all levels, in a wide range of sectors and through various funding channels (e.g. multi-/bilateral funding organizations and the private sector) (Berrang-Ford et al., 2021; IPCC, 2022, UNEP, 2022). At the same time, however, there is a growing consensus that such efforts are not enough and that the necessary shift in the scale of adaptation has not yet happened (UNEP, 2022). Globally adaptation remains short-sighted, narrow in scope—i.e. incremental in that it fails to address the root causes of climate exposure and vulnerability—insufficiently widespread, and still too slow (Berrang-Ford et al., 2021; UNEP 2022). On top of that, there is still a lack of shared understanding across stakeholders and scales of what adaptation actually means, especially in terms of the risk drivers and timescales to be considered.

At the global level, the climate negotiation arena considers "adequacy and effectiveness" as central to the discussion on adaptation efforts, referring respectively to whether various instruments (e.g. finance) match the adaptation needs identified by countries and to the outcomes of such instruments. This paper argues that understanding the adequacy and effectiveness of current adaptation strategies and interventions globally involves more than reviewing policy instruments and financing tools for a narrowed down schema of "bankable" adaptation-oriented projects. Rather, such an understanding requires further evidence of climate risk reductions at various timescales, whether one considers the underlying natural and anthropogenic drivers of exposure and vulnerability and asks whether compound cross-border and systemic dynamics are being addressed (AWB *forthcoming*).

Such a multi-dimensional understanding raises numerous methodological questions relating to the lack of quantifiable adaptation goals that can be used as baselines or targets. Another problem is the difficulty of identifying sets of both quantitative and qualitative indicators and metrics that capture adaptation in a more comprehensive way, are relevant across countries and can be informed with reliable data. Multiple assessment approaches are available that provide various views on progress with adaptation (AC, 2021; GCA, 2021; UNEP, 2022), but they often face similar problems when it comes to defining indicators and data availability. Alternative approaches are emerging to overcome such issues (e.g. Hallegatte et al., 2020; Rosenberg et al., 2021; World Bank Group, 2021), but to date they remain in the minority. In this paper, we add to the basket of alternative approaches by presenting the *Global Adaptation Progress Tracker* (GAP-Track) as a way to track adaptation efforts based on an expert judgement method. This tool, we argue, allows us to go beyond the usual indicator bottleneck, brings different aspects of adaptation together, and facilitates the rapid delivery of results to the international policy community in line with key time-frames (e.g. five-year cycles of the Global Stocktake process, or GST).

Section 2 presents the foundations of the GAP-Track and tests its application both nationally and globally. Section 3 discusses the benefits and limitations of the approach, as well as its potential to inform the GST process as a whole, including a discussion of its adequacy and effectiveness.

2. THE GLOBAL ADAPTATION PROGRESS TRACKER (GAP-TRACK)

The GAP-Track[1] has been developed to overcome some of the current barriers to tracking adaptation, henceforth providing a complementary method to inform policy processes at multiple levels. Inspired by other initiatives, such as one suggested by the UK's Climate Change Committee (UK CCC, 2019), the GAP-Track uses an expert judgement method supported by a scoring system and that is framed by six overarching questions reflecting core components of adaptation: knowledge, planning, actions, capacities, evidence and forecasting (see Figure 1).

1 https://www.iddri.org/en/project/assessing-global-progress-climate-adaptation-gap-track-2021. Methodological report (2021): https://www.iddri.org/sites/default/files/PDF/Projets/GAP-Track_Methodological%20report%20(D1)_September%202021.pdf. Final Results Report (2021): https://www.iddri.org/en/publications-and-events/report/global-adaptation-progress-tracker-gap-track-pilot-study-report-2021.

These components can help us understand the adequacy and effectiveness of different types of adaptation efforts in various systems, such as socio-ecological territories, sectors or (groups of) populations (hereafter "systems"), making the GAP-Track potentially useful in informing policy processes such as the GST, for example.

Section 2.1 presents the basics of the approach Sections 2.2 and 2.3 illustrates applications at the national and global levels respectively.

2.1. Methodological framing

2.1.1. The general approach

The methodology is framed by six overarching questions that are then subdivided into nineteen sub-questions (Figure 1, Table 1). These aim to gather, at the given scale of assessment, targeted context-specific information corresponding to a series of *Representative Adaptation Challenges* reflecting key areas of risk and related adaptation priorities (UK CCC, 2019). This question matrix establishes the foundations for the main components that are considered to shape successful adaptation, and are therefore to be considered to in assessing progress with or gaps in adaptation. The six main areas are:

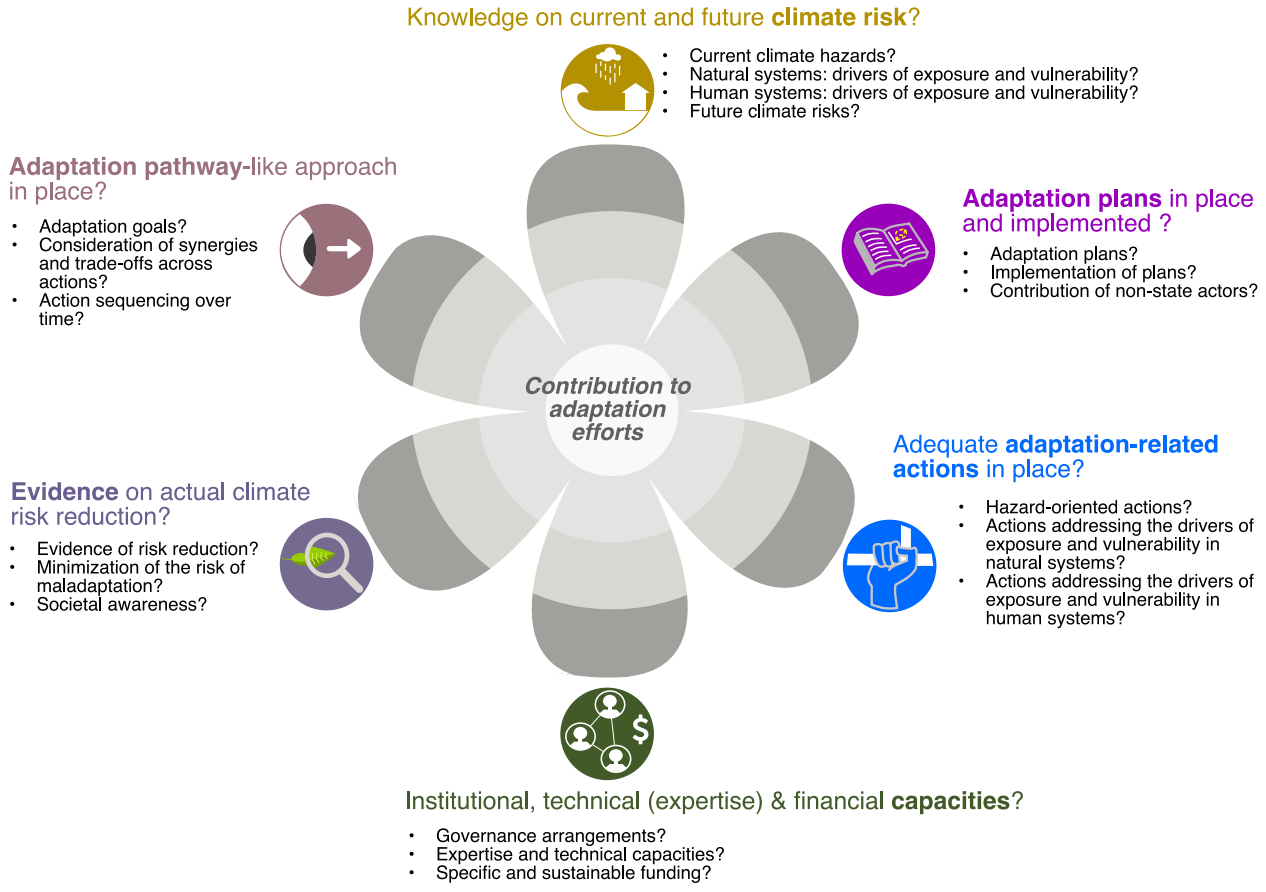
(i) *Knowledge about climate change risks* in the present and the future, especially where sufficient scientific information is available (with a focus on climate hazards, as well as the drivers of human and natural systems' exposure and vulnerability to climate change);

(ii) Adaptation *planning and policy tools*, including the extent to which these instruments are effectively implemented and whether a variety of stakeholders, at multiple scales, are included in these processes;

(iii) The adequacy of *adaptation actions* taking place to reduce climate risks, for example, whether the main climate hazards and drivers of exposure and vulnerability are adequately targeted;

(iv) The governance of adaptation, approached through the *institutional, human* and *financial capacities* to coordinate and carry out adaptation policy design and activities across relevant scales. The goal here is not to evaluate the "good" governance of adaptation but rather to acquire a broad understanding of the extent to which those responsible for carrying out certain tasks are indeed doing

Figure 1. The GAP-Track assessment matrix.



so or have the capacity to do so (e.g. the existence of adaptation-specific and sustainable funding mechanisms);

(v) *Evidence of progress* towards reducing current and future climate risks, which includes awareness of society and paying attention to minimizing the risk of maladaptation[2];

(vi) A consideration of *pathways for long-term adaptation planning*, which refers to goal-setting, action-sequencing and a consideration of alternative strategies based on the evaluation of trade-offs and synergies across adaptation options.

These six adaptation components resonate with how the Global Goal on Adaptation is defined (Figure 2). Through this channel, they can help address some of the needs of the first GST in 2023, then of subsequent GSTs every five years (see Section 3.2 especially). *Reducing vulnerability* indeed requires understanding the strengths and weaknesses of a system in the face of a given climate hazard. Yet, this ratio between strength and weakness depends on multiple parameters relating to the level of climate threat today and in the future —see (i) above—, the preparedness level of the system to cope with these threats —(ii) and (vi)—, and the actions actually being implemented together with their benefits for risk reduction —(iii) and (v). Similarly, *enhancing adaptive capacity* calls for improving knowledge on the patterns and drivers of climate risks —(i)—, putting in place long-term planning instruments —(ii) and (vi)—, and building human, technical, institutional and financial capacities to drive the change —(iv). Last, *strengthening resilience* relies on the same wide range of capacities —(iv)—, as well as on planning and implementation efforts —(ii), (iii), (iv) and (vi).

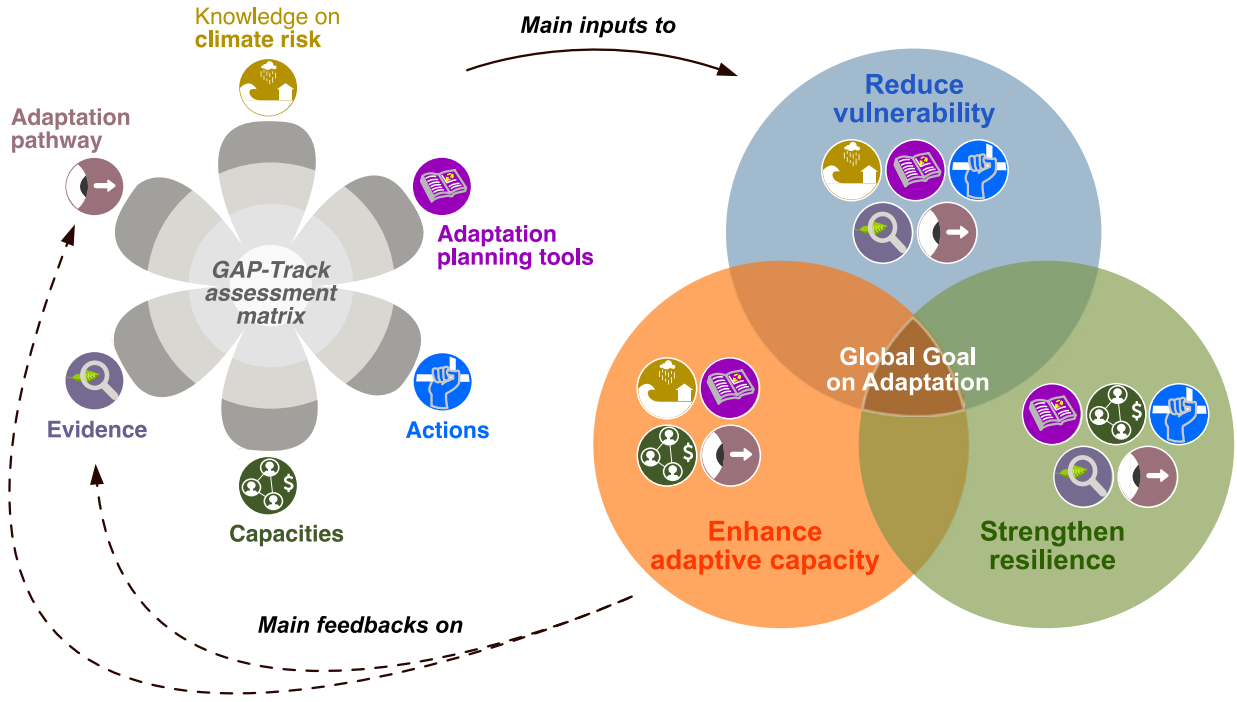
This framing has three general advantages. First, its simple structure (i.e. a limited number of questions) facilitates its appropriation by a wide range of stakeholders and users: for example, it does not require elaborate computational skills, tools or infrastructure. Second, the breadth of the question grid allows us to capture a comprehensive understanding of adaptation at a given system level. Third, the framing enables application in different contexts (e.g. both developing and developed

2 Maladaptation occurs when measures implemented in the name of adaptation actually reveal counterproductive effects in terms of increasing exposure and vulnerability elsewhere and/or over the long-term.

Table 1. The questions used to frame the GAP-Track.

Overarching guiding questions	Sub-questions
1. Does **scientifically based knowledge on current and future climate risks** exist at the appropriate scale (i.e. that of the study system as a whole)?	1.1. Are current climate-related hazards known? 1.2. Are current drivers of the exposure and vulnerability of natural systems known? 1.3. Are current drivers of the exposure and vulnerability of human systems known? 1.4. Are future climate risks projected (at a relevant/useful scale)?
2. Are there adaptation **plans** in place and implemented at the study system scale?	2.1. Are there adaptation-related planning tools with concrete implications at the system scale? 2.2. Have system-relevant adaptation planning tools been implemented? 2.3. Are the main non-state actors contributing to the design and implementation of the system-relevant adaptation planning tools?
3. Are **adequate actions** taking place at a relevant scale to reduce coastal climate risks?	3.1. Are there actions targeting the most prominent climate hazards? 3.2. Are there actions addressing the main drivers of natural systems' exposure and vulnerability? 3.3. Are there actions addressing the main drivers of human systems' exposure and vulnerability?
4. Are there sufficient **cross-scale institutional, human and financial capacities** to implement adaptation at the study system scale?	4.1. Are there governance arrangements in place to support institutional capacities to coordinate adaptation activities at the system scale (multi-level governance and mainstreaming across policy areas/sectoral plans)? 4.2. Are human capacities in place at the relevant scale (primarily at the system-level, but also beyond)? 4.3. Does specific and sustainable funding exist at the system-level that is specifically dedicated to managing climate-related risk and adaptation?
5. Is there evidence of the **effective reduction of current and projected climate risk** (including reducing hazards locally and managing long-term vulnerability)?	5.1. Is there evidence of risk reduction today? 5.2. Are there indications that the policies and actions implemented at the system-level contribute to **minimizing the risk of maladaptation** in the long run? 5.3. Are there indications that the society (system-level) is aware of the need to tackle both current and future coastal climate risks?
6. Is a **pathway-like approach** being considered?	6.1. Are system-relevant adaptation goals established in the short, medium and long terms (years, 1-3 decades, more, respectively), and are they articulated with each other (i.e. how does reaching present-day goals support reaching longer-term ones)? 6.2. Are synergies and trade-offs (now and over time) between various adaptation-related options considered? 6.3. Are options planned in a sequenced manner at the system level and alternative strategies considered?

Figure 2. Overview of the connections between the GAP-Track assessment matrix and the core components of the Global Goal on Adaptation.



countries) and to different types of risk (i.e. it is not specific to one type of climate hazard); moreover, it is neither scale-dependent nor restricted to any particular cultural, socio-economic or institutional setting. While operationalizing the approach implies some methodological adjustments in order to reflect the contextual specifics of the system under study (e.g., local coasts, megacities, water management at the watershed level, etc.), another key takeaway is that both the overarching and sub- questions are broad enough to be applied to various *Representative Adaptation Challenges* and socio-ecological contexts. That is, they offer an opportunity to frame and assess adaptation in a consistent way across systems and risks, from the project level to the national, regional and global scales, which in turn can benefit tracking, reporting and aggregation mechanisms. This last point is of particular relevance from the perspective of feeding the GST process with ground-rooted information (see especially Sections 2.3, 3.1.1. and 3.2).

2.1.2. Applying the method

Speaking practically, an expert judgement exercise treats the questions using a scoring system in order to assess the extent to which the elements addressed in each sub-question contribute to progress with adaptation under the system being studied (Figure 1). The scoring approach is composed of 5 scores ranging from 0 to 4 and defining, respectively, zero to high contribution to adaptation (as estimated by the experts). To allow different experts with various backgrounds and cultures to have the same understanding ("what does a given contribution level mean?"), each score is given a clear and precise definition in relation to specific criteria to be considered by the experts. The scores are qualified with a description (i.e. a qualitative narrative), as shown in Annex 1 for an application to a local coastal adaptation. From 0 to 4 there is a gradation in the description of the score, for example: no information available (score 0); only partial knowledge on a limited number of cases (score 1); in-depth knowledge for very specific cases (score 2); good to in-depth knowledge for a number of cases that are sufficiently representative of the diversity of situations found within the system studied, thus allowing for the lessons learnt to be scaled up (score 3); and in-depth understanding for most of the situations within the system being studied (score 4).

The scientific robustness of this scoring approach relies on the fact that evidence matching with the relevant criteria (e.g. depth of knowledge and number/representativeness of case studies) is systematically provided, and sources of information are systematically detailed. As highlighted in other works using expert elicitation approaches—e.g. feasibility and risk assessments under the IPCC Sixth Assessment Cycle (de Coninck et al., 2019; Zommers et al., 2020)—providing scores with robust explanations and sources of information is critical to ensuring that the assessment is scientifically robust, transparent and does not simply consist of a series of subjective and unsubstantiated individual opinions.

Scores are then aggregated (mean or median) across the sub-questions to synthesize the experts' view at the overarching question level, and then across all overarching questions (i.e. at the system level). These mean/median scores are scaled over the same 0-4 gradient that is used for individual scores, so that final mean/median scores of 4 and 1, for example, respectively indicate a high and very low contribution to adaptation progress across the six dimensions considered in Figure 1. Sections 2.2 and 2.3 briefly describe recent national and global applications.

2.2. National-scale application

A first pilot study was conducted in 2021 for two national-level case studies––Mauritius in the southwest Indian Ocean, and Senegal in West Africa––with a focus on one particular *Representative Adaptation Challenge*, i.e. coastal adaptation (Magnan et al., 2021b). Here we use the case of Mauritius to illustrate the expert judgement process and its main results (Figure 3; see footnote 1 for access to the full database and final report). The main results are not detailed here but can be fully accessed by following the links provided in footnote 1. However, Figure 3 illustrates the final output of the assessment in order to provide the reader with a sense of what can be achieved through this method.

In terms of how the expert judgement approach works, the Mauritius GAP-Track expert group was composed of five experts with extensive experience (mostly over ten years) of coastal adaptation in this country in terms of scientific research, project involvement and ground-rooted observations, as well as being sufficiently independent from institutional or organizational interests. Three of the experts were from Mauritius (two from consulting firms and the third involved in the climate research centre of the University of the Mascarenes), and two were from France (La Rochelle University and IDDRI). All had expertise in coastal risk and adaptation management and planning, as well as in integrated coastal zone management. The assessment process had four major steps:

(i) A review by the experts of the question framing in order, first, to allow each expert to understand the background method sufficiently, and second, to refine the latter so it better reflected the contextual specifics. In order to ensure some methodological consistency across the case studies and *Representative Adaptation Challenge* analyses, refinements to the assessment method have been deliberately limited. They do not imply any substantial changes in the meaning of the overarching questions, sub-questions or score graduations.

(ii) A first round of individual assessments where each expert provided scores for each sub-question and related evidence (justification and sources of information). Based on this series of five assessments (Excel sheets), a first group-level synthesis has been carried out through an independent review by the coordinator (A.K. Magnan at IDDRI) in order to bring together all expert assessments and calculate the mean scores and confidence levels, as well as oversee the evidence provided by each expert to identify potential gaps or areas where more information is needed. The difference between the experts' minimum and maximum scores at the sub-question level has been used to describe a qualitative confidence level: "high" in case of 0 or 1 point of difference between the experts' scores, "medium" when there are two points of difference, and "low" with three or more points of difference. In this approach, a high confidence level is attributed when experts' scores converged, e.g. on questions Q1.1, Q1.2 and Q1.3 in Table 1 and Annex 1. For some scores, however, expert views diverged. For example, on Q5.1 relating to the evidence for risk reduction today, the scores ranged from 0 to 3, with some experts concluding on no evidence at all, while others decided for a rather good level of evidence based on some specific cases and adaptation measures (mostly hard-coastal defences). Describing confidence levels has been instrumental for the second round of individual assessments.

(iii) During the second round of individual assessments, experts analysed the synthesis sheet from round 1 to understand the other experts' rationales (scores + justifications). This especially helped each expert either confirm the initial scores or revise them based on enlightening arguments and sources of information from the other experts. The individually reviewed assessments were then used for a second group-level synthesis. This step overall concluded with higher levels of convergence than in the previous round (16 sub-questions out of 19 with "high confidence", compared to 14 in the 1st round), but also raised areas where there were still diverging views. To come back to the above example of Q5.1, the range of individual scores moved from 0-3 during the first round of assessment ("low confidence") to 0-2 in the second round ("medium confidence") because some experts consulted some of the literature highlighted by the other experts in round 1 and realized that their initial assessments were too optimistic (e.g. on the actual, measured benefits of nature-based solutions).

(iv) The second group-level synthesis served as a basis for a collective discussion to provide feedback on the methodology (what works and what could be improved?), identify the underlying reasons for remaining "low confidence" scores and exchanging views on the main results.

These assessment results allowed the expert group to formulate a set of recommendations for improving the assessment of current and future climate risks, including: organizing and carrying out training to reinforce expertise and technical capacity in national institutions (within the Integrated Coastal Zone Management Unit, but also in other ministries such as those dealing with transport and social affairs) as well as local institutions (decision-makers and technical services); creating a mandate that gives responsibility to local-level actors to develop adaptation plans; developing a centralized information database to collect and track the actions implemented on the ground and their effectiveness to reduce climate risks; and understanding the synergies and trade-offs of adaptation options and their potential sequencing over time (adaptation pathways).

2.3. Global-scale application

The current phase of the GAP-Track aims to scale up the assessment to ten global-scale systems (Figure 4) that together reflect a set of *Representative Adaptation Challenges* at the global level and thus provide an overview of what adaptation and progress with it look like globally across areas and sectors. This phase uses the same scoring and expert judgment approach as that described in Section 2.1, with the aim of providing regular assessments against the UNFCCC Global Stocktake (GST) series that will operate every five years, and with the first GST ending in 2023. A first application is under way over 2022-2023 that focuses on global coasts and aims at testing and adjusting the methodological protocol. Applying the framing in Section 2.1 to the global scale indeed raises new methodological challenges, especially given the level and availability of information to inform the various (sub-)components of the GAP-Track flower (Figure 1) and determine how to organize the expert judgement exercise to depict the global-scale situation without relying on national averages. To address these methodological challenges, and as shown in Figure 5, the approach uses a bottom-up approach supported by evidence on what is really happening locally, followed by an aggregation exercise to inform the regional and global levels. This means a three-fold approach:

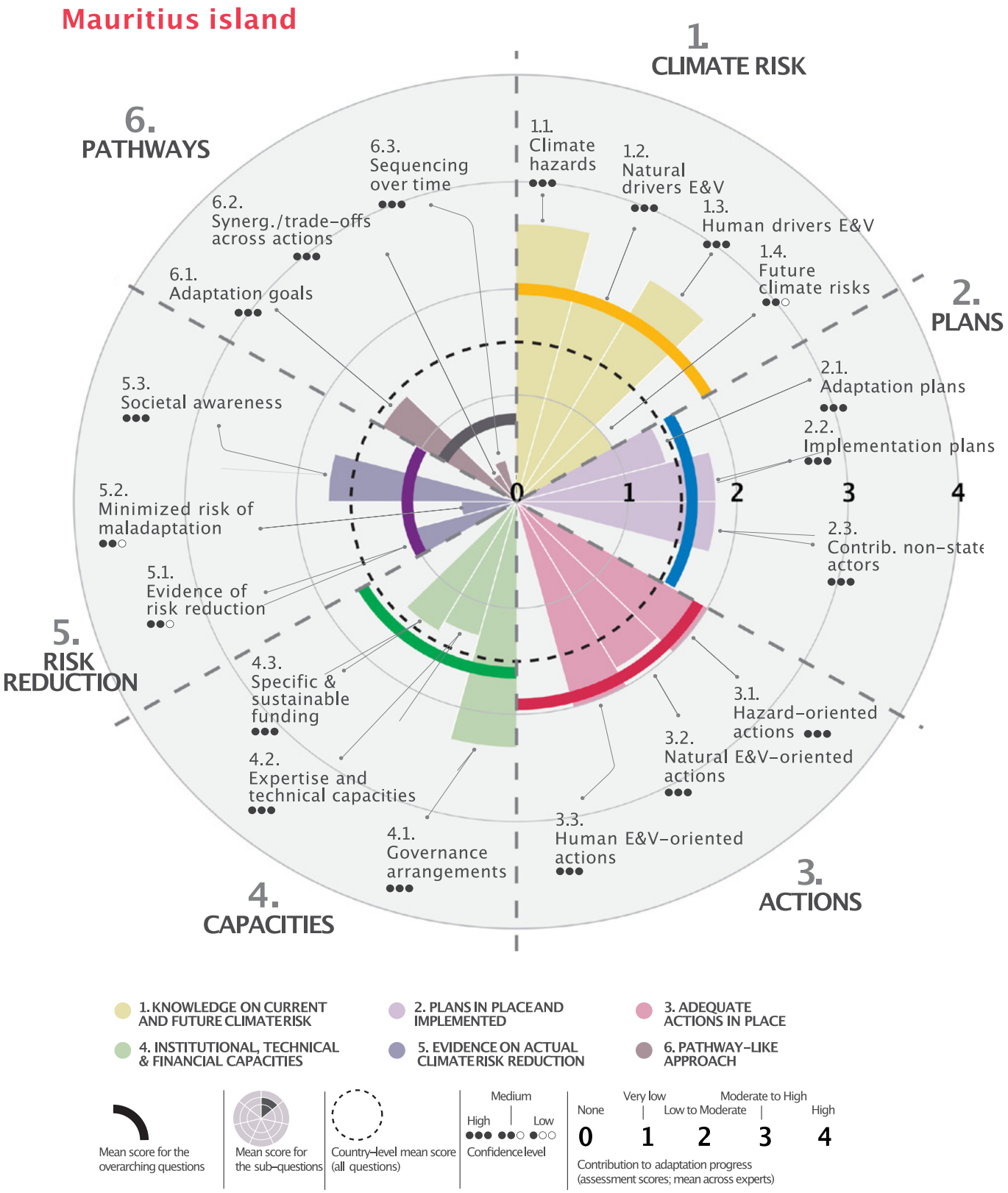
- First, global coasts are described as being based on "coastal archetypes" that offer proxy illustrations of the diversity of coastal situations around the world (Oppenheimer et al., 2019; Haasnoot et al., 2019; Magnan et al., 2022). Four main coastal archetypes are considered that distinguish between: *(i)* urban coastal areas with high population and asset densities (i.e. big cities); *(ii)* urban coastal areas with lower population and asset densities (i.e. middle-size cities); *(iii)* rural coastal areas with high-value economic activities (e.g. agriculture, tourism); and *(iv)* rural areas with non-economic high-value activities and features (e.g. traditional communities, protected areas where human activities are taking place).

- Second, in order to rely on ground-rooted information and thereby minimize the risk of averaging situations (e.g. at the national level) and losing granularity regarding the diversity of local contextual specifics, local-scale real-world examples are used to inform each archetype. That is, the GAP-Track flower (Figure 1) is applied to local real-world cases, several of them being used to inform a given archetype. In total, a minimum of three to four local case studies are developed for each archetype and for each of the seven regions (Africa, Asia, Australia-New Zealand, Central-South America, Europe, North America and Small Islands) that have been identified based on the last IPCC Working Group II report (IPCC, 2022), giving a minimum range globally of 21-28 cases per archetype. Local case studies are selected based on both similarities (e.g. for *(iii)*, large non-urban areas + areas dominated by agriculture) and differences (a range of socioeconomic, demographic, and governance characteristics). In addition, they are relatively well documented (peer-reviewed and grey literature, expertise, etc.) and provide enough information on the various adaptation components reflected in Figure 1. The GAP-Track analysis does not develop a specific assessment for any of these particular cases, but rather uses them to illustrate a diversity of situations within the generic categories of coastal settlements (i.e. the four archetypes).

- Lastly, each region is covered by a team of two to three experts[3] who ran two rounds of individual assessments (in July-Oct. and Oct.-Dec. 2022). In parallel to this, collective discussions have been regularly organized to obtain feedback on the methodology and the necessary adjustments to the description of the sub-questions and scoring scales. A first assessment synthesis was developed in October 2022, and a final one is to be developed by February 2023 that will especially explore several aggregation approaches (by mean/median, per archetype/region). This will be followed by a group-level virtual meeting to discuss the benefits and limitations of the approach, as well as the overarching conclusions emerging from the results.

3 As far as possible, each expert matches the following five skills: (1) a social-science perspective; (2) robust knowledge of adaptation science and practice; (3) experience of several areas and countries within a given region; (4) experience with both urban and rural systems; (5) and a very open mind for expert judgement exercises.

Figure 3. An overview of adaptation efforts on Mauritius.



3. KEY LESSONS LEARNT TOWARDS A GLOBAL-SCALE UNDERSTANDING OF ADAPTATION EFFORTS AND SUPPORT

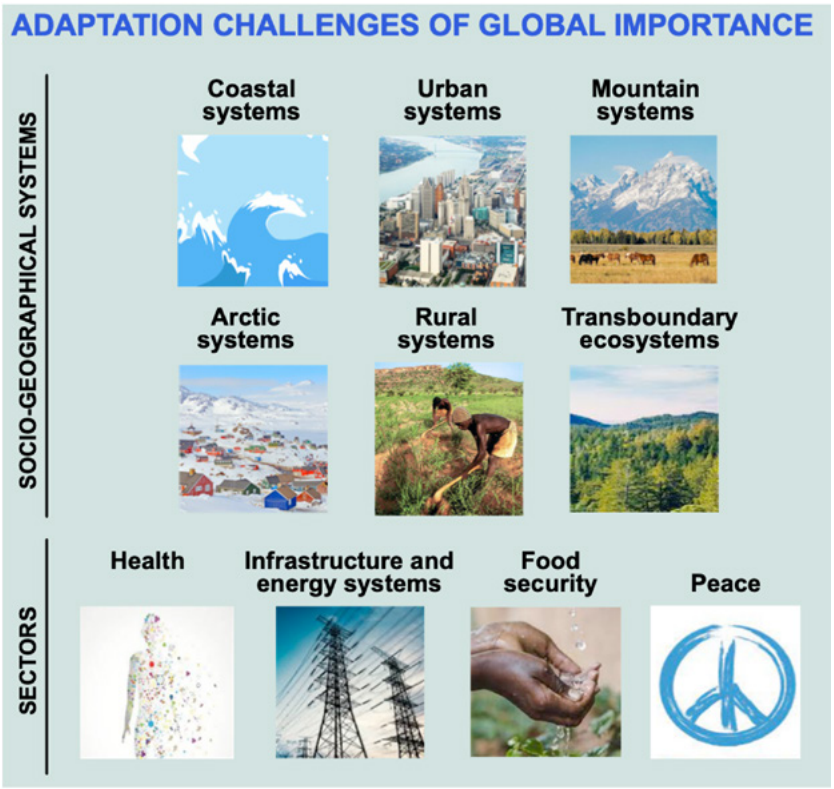
3.1. Global-scale relevant benefits and limitations

The feedback from the pilot phase in 2021 and initial insights from the current application (global coasts), as well as our own ten-year experience with expert judgement exercises highlight several elements referring to the potential usefulness of approaches such as the GAP-Track to complement other assessment frameworks. However, the sections below also emphasize that, as for any assessment methodology, strengths and limitations often go together.

3.1.1. The scale issue

One first added-value of the GAP-Track is that, when framed as in Figure 5, it allows the global scale to be informed based on a local-scale perspective. Given that adaptation is often described as primarily a local-scale issue, this represents a major improvement compared to assessment frameworks that use national-level statistics or policy documents. Such non-local elements are considered in the GAP-Track assessment provided they have an influence on what is happening locally, and not on their own. For example, when questioning the existence and implementation of adaptation planning instruments (Q2 in Table 1), the assessment does not consider any neat planning process from national to local, but rather focuses on what can be identified at the local case-study level. As a result, national-level planning instruments are used in the analysis either for the contextualization of the local case study, or as policy drivers where they have actual positive or negative knock-on effects locally. That means that archetype-level and cross-archetype analyses only rely on planning processes that have a direct influence on local processes. This makes the GAP-Track complementary to other approaches, such as the UNEP Adaptation Gap Report (UNEP, 2022), which analyses national-level policy documents and databases from international funding bodies. However, the GAP-Track local-scale entry point requires a substantial number of local cases to be developed in order that the diversity of situations (here, coastal) across regions can be considered representative. This also calls for specific databases to be developed, i.e. through the scoring system, that do not pre-exist and therefore require time to be completed. Note, however, that the 2021 and 2022-2023 pilot studies took/will take about 6 and 12 months respectively to be developed.

Figure 4. The global-scale Adaptation Challenges considered in the GAP-Track.

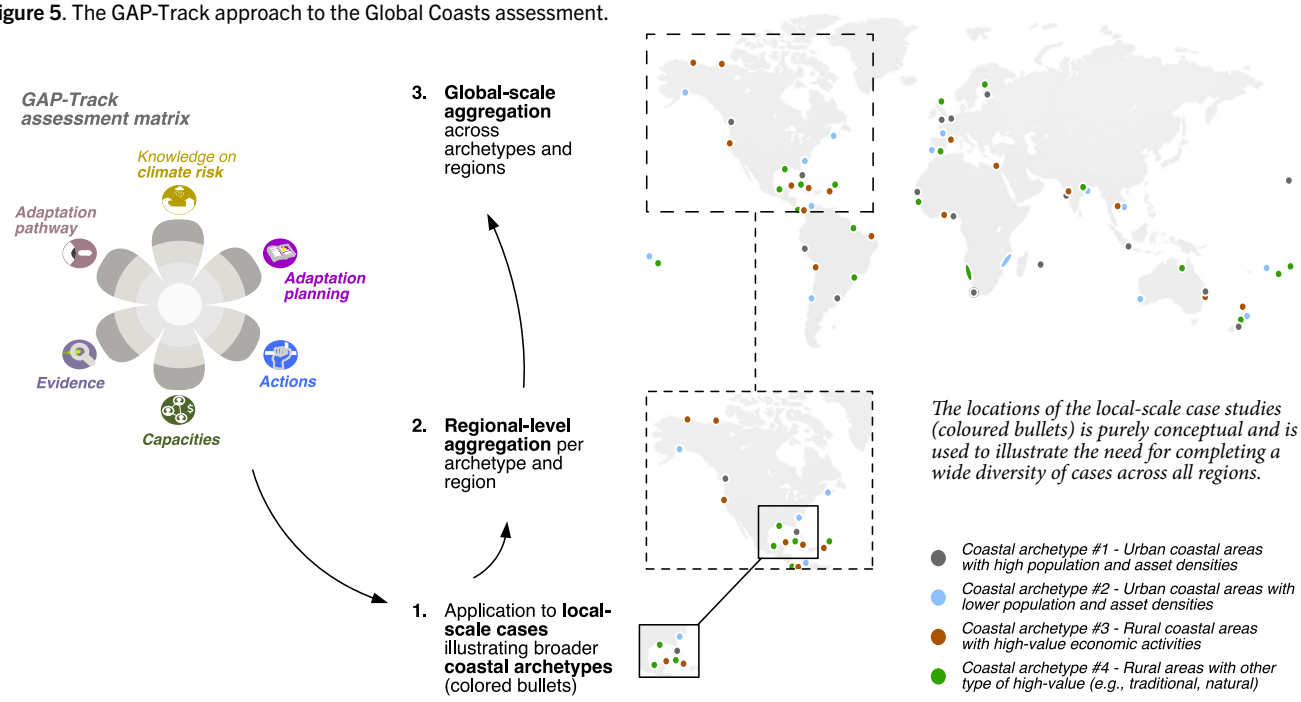


3.1.2. The level and types of background information

First, on the level of information, it has to be acknowledged that relevant adaptation decisions do not always require highly detailed information (on hazards, risk drivers, available capacities, etc.) and that learning-by-doing approaches often offer a relevant way to test things and progressively fill gaps in information and implementation. That does not mean that more science and detailed assessments are not needed, but just that in parallel, capturing the "big picture" in terms of adaptation efforts—what expert judgement-based approaches are designed for—can help to start guide decision-making at a system level. In Senegal, for example, the GAP-Track assessment suggested that the lack of systematic and detailed information on the anthropogenic drivers of risk and on perceptions of climate risk at the household level does not prevent decisions being taken on awareness-raising programmes or policies in favour of socioeconomic equality (see Magnan et al., 2021b). In Senegal as elsewhere, however, such conclusions are poorly acknowledged, and the general tendency remains looking for increasingly detailed adaptation tracking methodologies. This often leads to a vicious cycle: decisions are postponed because of a lack of information, while seeking for more information often delays decisions. Yet, central questions are usually missing from the debate, such as what level of information do we really need to support robust decisions on adaptation, for example, to advance discussions under the UNFCCC Glasgow-Sharm-el-Sheikh work programme on the Global Goal on Adaptation, especially in view of the Global Stocktake in 2023?

Second, expert judgement approaches using scoring systems allow the assembling of multiple types of information, including quantitative and qualitative, scientific and grey literature, from official documents and indigenous knowledge, etc. (Oppenheimer et al., 2019; Duvat et al., 2021; Magnan et al., 2022). As a counterpart, however, approaches such as the GAP-Track are limited in providing purely quantified information, for example, on the number of people currently at risk of being affected by marine flooding, or on future trends according to various warming scenarios and time horizons. This can be seen as a weakness from the perspective of comparing outcomes across countries, for example, and conducting regular assessments to "track" progress/gaps over time. On the other hand, when dealing with the global scale especially, focussing on a purely quantified approach often means relying on national averages that are known to reflect the diversity of local-scale situations badly, as well as on information covering some aspects of the GAP-Track flower (e.g., number of planning instruments in Q2.1 and available funding in Q4.3; Table 1) but not all (e.g., society's awareness level in Q5.3 and the existence of precise adaptation goals in Q6.1; Table 1). Yet, while relying on either very specific or mean and partial attributes can help with some aspects, it cannot be considered sufficient and could even lead to misinterpretations. This in turn calls for complementary approaches allowing a sense of both the diversity of real-world situations and a more comprehensive picture of adaptation to emerge. Tools such as the GAP-Track help do this by using a scoring system as a common language to bring together a wide range of quantitative and qualitative information.

Figure 5. The GAP-Track approach to the Global Coasts assessment.



3.1.3. The tracking issue

One main challenge with the GAP-Track approach refers to its reproducibility from one assessment to another, including by different expert groups, and therefore to the comparability of the results through time. While this limitation definitely needs to be acknowledged, some past experiences of regular expert judgement-based assessments provide interesting insights into the potential for moving this issue further on. One well known example touches on the five "Reasons for Concern" that are used by the IPCC to illustrate types of aggregated, cross-system and global-scale climate risks (Zommers et al., 2021; O'Neill et al., 2022). These risk assessments occur every five to seven years and are based on an expert judgement exercise building on the scientific literature. From one assessment to another, the expert groups are not the same but follow the same process of identifying risk transitions against temperature thresholds (including justifying each transition), and they rely on the same material (i.e. the scientific literature), so that in the end trends can be identified (Zommers et al., 2021). The last IPCC report, for example, shows that, compared to the conclusions of the previous IPCC assessment in 2014, risk levels transition from high to very high in all Reasons for Concern (against only two in 2014) and at lower levels of global warming (IPCC, 2022; O'Neill et al., 2022). This example illustrates the potential for expert judgement-based methods to provide a high-level overview of climate risks over time. The issue is more complex with the GAP-Track, as the assessment does not rely on a single metric or source of information—i.e. the risk level against temperature thresholds informed by the scientific literature in the case of the Reasons for Concern—but on nineteen sub-components informed on the basis of multiple sources of information. Whether the GAP-Track can be used to assess progress or gaps over time therefore remains an open question, and only a learning-by-doing process will allow it to be answered.

3.2. Implications for the GST process

Acquiring a clear understanding of what the adaptation component of the Global Stocktake should look like remains highly challenging (Christiansen et al., 2020). Four dimensions have been highlighted, namely recognizing adaptation efforts by developing country Parties; enhancing the implementation of adaptation actions by taking adaptation communications into account; reviewing the adequacy and effectiveness of adaptation, and the support provided to it; and review the overall progress made in achieving the Global Goal on Adaptation. However, "the scope and extent of what each dimension entails within the GST are not fully decided" (Beauchamp and Bueno, 2021, p. 3). What is certain is that the assessment and the reporting frameworks and processes that will be decided under the UNFCCC (AC-LEG, 2020, AC, 2021) will be country-driven (or groups of countries-driven). Yet, an inherent challenge to both the GST and the Global Goal on Adaptation is to capture adaptation outcomes beyond individual countries (Beauchamp and Bueno, 2021). The sections above suggest that approaches such as the GAP-Track could add such cross-country perspectives, and therefore provide complementary information, to, for example, Adaptation Communications (ADCOMS). Complementarity relies especially on three aspects:

- Beauchamp and Bueno (2021) identify three main priorities in driving adaptation actions under the GST: (a) create a narrative on adaptation action, (b) build inclusive processes, and (c) communicate progress to the international community. Regarding (a), the GAP-Track approach demonstrates the potential to support the development of a targeted (i.e. focussed on specific adaptation challenges), cross-country and comprehensive (i.e. multi-dimensional) narrative on adaptation efforts. Section 2.2.2 illustrates this for a national-level example, but Section 2.3 argues that it also applies at a cross-country level. Regarding (b), the GAP-Track promotes scale integration when it uses local case studies to inform the global scale (Section 3.1.1). Similarly, the integration of different views and voices is supported through the consideration of multiple sources of information (Section 3.1.2). Last, related to (c), it is evident from the above that current efforts to apply the GAP-Track globally aim at informing the international community of adaptation efforts, including possible progress and gaps (Section 3.1.3).

- Section 2 suggests that a same generic assessment framework (the GAP-Track flower in Figure 1) can be applied at different scales, both national (Section 2.3) and local (Section 2.3). This element is key, we argue, to enhance consistency across scales in the way adaptation is framed and assessed, which will be highly beneficial to national-level compilation under the ADCOMS and, through a domino effect, to global-level aggregation under the GST process. From a tracking perspective, indeed, there is a critical need to speak the same adaptation language across scales.

- Last, the whole paper suggests that outside views, i.e. views that are not developed by UNFCCC bodies or (coalitions of) Parties, can support the negotiation process by helping taking a step back (e.g., a cross-country perspective) and bringing new arguments to the table (e.g. on a broad set of key adaptation challenges and based on a multi-dimensional understanding of adaptation efforts). In that respect, the GAP-Track can offer a fresh eye on what adequacy and effectiveness could mean in the context of the GST series, because it is designed to understand adaptation beyond the outputs of policy and finance instruments, including, for example, in terms of scientific evidence for risk reductions (Q5).

REFERENCES

AWB. (*forthcoming*). *The Global Transboundary Climate Risks Report 2023*. Adaptation Without Borders, Flagship report 2023. Available on the AWB website (https://adaptationwithoutborders.org/) from April 2023.

AC-LEG. (2020). Methodologies for reviewing the adequacy and effectiveness of adaptation and support. Joint report by the Adaptation Committee and the Least Developed Countries Expert Group, AC-LEG/INFO/1, November 2020. https://unfccc.int/sites/default/files/resource/ac18_5e_ac-leg_adequacy.pdf?download

AC. (2021). Approaches to reviewing the overall progress made in achieving the global goal on adaptation. Technical paper of the UNFCCC Adaptation Committee, AC20/TP/5A, September 2021.https://unfccc.int/sites/default/files/resource/ac20_5a_gga_tp.pdf
Beauchamp, E., Bueno, M. (2021). *Global Stocktake: three priorities to drive adaptation action*. IIED Briefing, London. https://pubs.iied.org/20601iied

Berrang-Ford, L., *et al.* (2021). A systematic global stocktake of evidence on human adaptation to climate change. *Nature Climate Change*, 11, 989-1000. https://doi.org/10.1038/s41558-021-01170-y

de Coninck H. *et al.* (2019). Strengthening and Implementing the Global Response. In: *IPCC Special Report on the impacts of a 1.5°C global warming*, V. Masson-Delmotte et al. (eds.). Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 313–443. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter4_Low_Res.pdf

Christiansen L., Olhoff A., Dale T. (2020). *Understanding adaptation in the Global Stocktake*. UNEP DTU Partnership. Part of the iGST Designing a Robust Stocktake Discussion Series. https://www.climateworks.org/wp-content/uploads/2020/05/Understanding-Adaptation-in-the-Global-Stocktake_iGST_UNEP-DTU.pdf

Duvat V.K.E. *et al.* (2021). Risk to future atoll habitability from climate-driven environmental changes. *WIREs Climate Change*, e700. https://wires.onlinelibrary.wiley.com/doi/10.1002/wcc.700

GCA. (2021). *State and Trends in Adaptation Report 2021: Africa*. Global Center on Adaptation, 574 p. https://gca.org/reports/state-and-trends-in-adaptation-report-2021/

Haasnoot M. *et al.* (2019). Generic adaptation pathways for coastal archetypes under uncertain sea-level rise. *Environmental Research Communications*, 1, 071006. https://iopscience.iop.org/article/10.1088/2515-7620/ab1871

Haasnoot M. *et al.* (2021). Pathways to coastal retreat. *Science,* 372(6548), 1287-1290. https://www.science.org/doi/abs/10.1126/science.abi6594

Hallegatte S. *et al.* (2020). *Adaptation Principles: A Guide for Designing Strategies for Climate Change Adaptation and Resilience*. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/34780

IPCC. (2022). Summary for Policymakers. In *Climate Change 2022: impacts, adaptation and vulnerability*, H.-O. Pörtner *et al*., eds.

Magnan A.K. *et al.* (2021a). Estimating the global risk of anthropogenic climate change? *Nature Climate Change* 10, 879-885. https://doi.org/10.1038/s41558-021-01156-w

Magnan A.K., *et al.* (2021b). *Global Adaptation Progress Tracker (GAP-Track): pilot study report 2021*. IDDRI Special Edition, 47 pages. https://www.iddri.org/en/publications-and-events/report/global-adaptation-progress-tracker-gap-track-pilot-study-report-2021

Magnan A.K. *et al.* (2022). Sea-level rise risks and societal adaptation benefits in low-lying coastal areas. *Scientific Reports*, 12: 10677. https://www.nature.com/articles/s41598-022-14303-w

O'Neill B.C. *et al.* (2022). Key risks across sectors and regions. In *Climate Change 2022: impacts, adaptation and vulnerability*, H.-O. Pörtner *et al*., eds. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter16.pdf

Oppenheimer M. *et al.* (2019). *Sea Level Rise and Implications for Low Lying Islands, Coasts and Communities*. In: *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*, H.-O. Pörtner *et al*., eds.. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 321–445. https://www.cambridge.org/core/services/aop-cambridge-core/content/view/5D756335C9C3A6DDFAE0219073349E8D/9781009157971c4_321-446.pdf/sea_level_rise_and_implications_for_lowlying_islands_coasts_and_communities.pdf

Rozenberg J. *et al.* (2021). *360° Resilience: A Guide to Prepare the Caribbean for a New Generation of Shocks*. The World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/36405

UK CCC. (2019). *Progress in preparing for climate change: 2019 Report to Parliament*. UK Climate Change Committee. https://www.theccc.org.uk/publication/progress-in-preparing-for-climate-change-2019-progress-report-to-parliament/

UNEP. (2022). *Adaptation Gap Report 2022. Too Little, Too Slow: Climate adaptation failure puts world at risk*. United Nations Environment Programme, Nairobi. https://www.unep.org/resources/adaptation-gap-report-2022

World Bank Group. (2021). *Resilience rating system*. The World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/35039

Zommers Z. et al. (2020). Burning Embers: towards more transparent and robust climate change risk assessments. Nature Reviews Earth & Environment, 1: 516-529. https://www.nature.com/articles/s43017-020-0088-0#citeas

ANNEX 1. Description of the scores for the assessment sub-questions

Annex 1 provides an example of an application of the GAP-Track question-matrix (see Table 1) to a specific adaptation challenge at a specific scale, i.e. local coastal adaptation.

Sub-question	Score description
1.1. Are **current climate-related coastal hazards** known?	**NA** = Not assessed. **0** = **No information** exists on current climate coastal hazards at the case-study scale. **1** = **Very limited knowledge** at the case-study scale, e.g. only partial information on only one of the main climate hazards occurring locally. Knowledge also exists from other case studies but is very limited or too context-specific to be applied to the case study considered in this assessment. **2** = **More in-depth knowledge, but only for one or two of the main hazards** occurring at the local case study. On the other climate hazards, some in-depth knowledge exists for other case studies, but it remains very limited or too context-specific to be applied to the case study considered in this assessment. **3** = **In-depth knowledge on most of the main hazards** occurring in the case study. On the remaining main hazards, knowledge drawn from other case studies allows for lessons to be learnt (e.g. because cases present similar features in terms of geomorphology). **4** = **Wide understanding** of the climate hazards occurring on the case-study scale.
1.2. Are **current drivers of the exposure and vulnerability of natural systems** known?	**NA** = Not assessed. **0** = No information at the case-study scale on the drivers of natural systems' exposure and vulnerability to climate change. **1** = Partial knowledge on a limited number of drivers of climate-sensitive ecosystems' exposure and vulnerability at the case-study scale. Knowledge exists on other risk drivers from others, but remains experimental and/or too context-specific to allow lessons to be learnt. **2** = In-depth knowledge on a limited number of drivers of climate-sensitive ecosystems' exposure and vulnerability at the case-study scale. Still limited potential to draw lessons on risk drivers from other case studies. **3** = In-depth knowledge on most of the drivers of climate-sensitive ecosystems' exposure and vulnerability at the case-study scale. Complementary knowledge exists on other drivers from other case studies that can easily be extrapolated to the focus of the study (e.g. because of similar features). **4** = Wide understanding of the drivers of natural systems' exposure and/or vulnerability to climate-related hazards across the most climate-sensitive ecosystems of the case study.
1.3. Are **current drivers of the exposure and vulnerability of human systems** known?	**NA** = Not assessed. **0** = No information at the case-study scale on the drivers of human systems' exposure and vulnerability to climate change. **1** = Partial knowledge on a limited number of settlements/sectors/communities (i.e. only partial coverage of the case study) with regard to the drivers of their exposure and/or vulnerability to climate-related hazards. Knowledge exists on other risk drivers from other case studies, but remains experimental and/or too context-specific to allow lessons to be learnt. **2** = In-depth knowledge for a limited number of settlements/sectors/communities, but limited potential to extrapolate results to the whole case-study scale. That is, the root and contemporary causes of coastal exposure and vulnerability are well understood for some components of the human system being studied, but are too specific (e.g. in terms of socioeconomic conditions) to be representative of the wider case study. Similarly, still limited potential to draw lessons on risk drivers from other case studies. **3** = In-depth knowledge on most of the exposure and vulnerability drivers of settlements/sectors/communities, with a good representation of the diversity of the components of the whole case-study system. In addition, knowledge exists on other risk drivers from other case studies that present enough commonalities to allow lessons to be learnt. **4** = Wide understanding of the drivers of human exposure and/or vulnerability to climate-related hazards across most of the settlements/sectors/communities of the case study.
1.4. Are **future climate risks** projected (on a relevant/useful scale)?	**NA** = Not assessed. **0** = No projections available at an adequate scale (e.g. only global or regional information). **1** = Projections exist at the case-study scale, but only for a single warming scenario and a business-as-usual socio-economic scenario. Adaptation scenarios are not considered. No other case studies are available from which lessons could be learnt (e.g. because they present similar physical and socioeconomic features). **2** = Similar to score 1 —projections exist at the case-study scale, but only for one single warming scenario and a business-as-usual socioeconomic scenario; no adaptation scenario—but here, other case studies are available that allow lessons to be learnt (e.g. for long-term anticipation policies). **3** = Projections exist at the case-study scale that use contrasting/various warming scenarios, but only one business-as-usual socioeconomic scenario. Projections exist for other case studies that also include contrasting/various socioeconomic scenarios, therefore allowing some lessons to be learnt. Adaptation scenarios are not considered. **4** = Projections bringing climate, environmental and socioeconomic scenarios together exist at the case-study scale. These projections use contrasting/various warming scenarios and socioeconomic scenarios. Some adaptation scenarios are also considered, even roughly, that help contrast risk with/without enhanced adaptation efforts.

2.1. Are there **adaptation-related planning tools** with concrete implications locally?	*Dimensions considered: whether a national exist + is supported by local plans (to support implementation on the ground) + existence or not of a monitoring and evaluation system* **NA** = Not assessed. **0** = No local plan addresses coastal risk reduction or coastal adaptation. **1** = A local policy exists that covers a wide diversity of settlements/sectors/communities at the case-study scale, but only consists of a list of options without any guidance on prioritization and/or relevant timescales for implementation. No monitoring and evaluation system. The national-level adaptation planning process — if any— does not have any influence locally. **2** = A local policy exists (wide diversity of settlements/sectors/communities, list of options) and provides concrete guidance (action prioritization, timescales for implementation), but only for settlements/sectors/communities at higher risk (hotspots). A monitoring and evaluation system is at an embryonic stage. The national-level adaptation planning process may have limited influence locally, e.g. in terms of helping design locally-relevant guidance coastal risk reductions and adaptation strategies that are more broadly applicable, or means of implementation. **3** = A local policy exists that encompasses the main settlements/sectors/communities (not only hotspots) and provides concrete guidance (action prioritization, timescales for implementation). The monitoring and evaluation system is still limited and only partly operational. The national-level adaptation planning process may have some influence locally, e.g. in terms of helping design specific guidance to address coastal risk reduction and adaptation, or means of implementation. **4** = A local policy exists that encompasses the main settlements/sectors/communities (not only hotspots) and that provides concrete guidance (action prioritization, timescales for implementation). The monitoring and evaluation system is well advanced and fully operational. National-level adaptation planning may help with guidance design, means of implementation and monitoring systems.
2.2. Are **adaptation-related planning tools** implemented?	**NA** = Not assessed. **0** = No implementation activities. No monitoring and evaluation system. **1** = Pilot implementation: only in a very limited number of settlements/sectors/communities, and only some dimensions of the plan. No monitoring and evaluation system. **2** = Further implementation, but still only in a very limited number of settlements/sectors/communities, and only some dimensions of the plan). A monitoring and evaluation system is at an embryonic stage. **3** = Close to full implementation in the main settlements/sectors/communities (not only hotspots) and for most dimensions of the plan. The monitoring and evaluation system is advanced and (at least partly) operational. **4** = Full implementation: in almost all settlements/sectors/communities (not only hotspots) and for all the dimensions of the plan. The monitoring and evaluation system is fully advanced and operational.
2.3. Are the **main non-state actors** contributing to the design and implementation of national and local plans/policies?	**NA** = Not assessed. **0** = No participation processes are reported. **1** = Participation is very limited, e.g. to few people from a specific sector or community in a specific place, but not at the whole case-study scale. A national-level participatory process may exist, but a priori does not involve people or stakeholders from the case study considered in this assessment. **2** = Some level of participation of non-state actors is reported at the case-study scale, but only for certain specific sectors or communities. In addition, consultations/participatory processes are not carried out regularly (i.e. looking like a 'check the box' process). **3** = Some level of participation of the most representative non-state actors (e.g. representative of major economic sectors, main communities and main local NGOs) is reported at the case-study scale. These are not on-shot consultations, but their real regularity remains unclear (i.e. only 'check the box' approach at the beginning and in the end?). **4** = High level of participation of the most representative non-state actors (e.g. representative of major economic sectors, main communities and main local NGOs) is reported at the case-study scale. These participatory measures are maintained to review and revise existing policies/plans.
3.1. Are there actions targeting the most prominent **climate hazards**?	**NA** = Not assessed. **0** = No specific action is undertaken to control hazards at the coast. **1** = A very limited number of actions are reported on the ground, without any insights on their potential to reduce risk or generate maladaptation. **2** = Only one or two of the main hazards are considered (e.g. erosion and flooding, but not salinization). The majority of responses are inadequate and could imply some degree of maladaptation. For example: hard protection is implemented in non-densely populated areas; accommodation measures are not at scale or only address a small part of the impact; coastal retreat is not adequately planned and rather looks like an emergency response with potentially maladaptive outcomes. **3** = Most of the main hazards are considered. The majority of responses are adequate to addressing the current hazards, e.g. adequately calibrated hard/soft coastal protection, adequate accommodation measures and managed coastal retreat. They are implemented in relevant places and minimize the risk of maladaptation. However, they do not fully consider future changes in hazards. **4** = All the main hazards are considered. The majority of responses are adequate to addressing the current hazards, e.g. adequately calibrated hard/soft coastal protection, adequate accommodation measures and managed coastal retreat. They are implemented in relevant places and minimize the risk of maladaptation. A forward-looking approach is considered when designing the responses (including planning for adjustments over time).

3.2. Are there actions addressing the main **drivers of coastal natural systems' exposure and vulnerability**?	**NA** = Not assessed **0** = No response targets the preservation or restoration of key coastal ecosystems and their services at the case-study scale. In addition, there is some evidence for other adaptation-related activities that contribute to ecosystem degradation (e.g. hard protection of buildings and infrastructure from waves, which affect local natural dynamics). **1** = Only pilot and localized preservation or restoration measures are in place, and these address a very limited number of ecosystems (buffers and water/food providers). In addition, there is some evidence for other adaptation-related activities that contribute to ecosystem degradation. **2** = Preservation or restoration measures are emerging at the whole case-study scale, but still focus on ecosystems that are already at risk (acknowledged as hotspots). The risk of induced ecosystem degradation is considered in the design and implementation of other adaptation-related activities. **3** = Implementation of preservation or restoration measures is carried out at the whole case-study scale, but still mainly focuses on ecosystems that are already at risk of degradation. The detrimental effects to ecosystems of other adaptation-related activities are recognized in theory but not systematically considered in practice. **4** = Most if not all of the coastal ecosystems at the case-study scale benefit from preservation or restoration measures. Detrimental effects to ecosystems of other adaptation-related activities are systematically considered.
3.3. Are there actions addressing the main **drivers of coastal human systems' exposure and vulnerability**?	**NA** = Not assessed. **0** = No response targets the underlying socioeconomic drivers of exposure and vulnerability. **1** = Adaptation-related actions are sparse and are not being surveyed, so that the risk of maladaptation remains high. **2** = Only pilot actions are being undertaken to prevent direct impacts to some —but not all— of the dimensions above (people, tangible and intangible assets, economic activities). The risk of maladaptive outcomes is not considered. **3** = A wider range of actions are undertaken that, together, address most but not all of the dimensions above (people, tangible and intangible assets, economic activities). Current climate impacts are adequately considered, but there is no systematic forward-looking approach to consider also the potential for future changes in climate risk, so that the risk of maladaptation is considered but not fully minimized. **4** = Together, actions consider all the dimensions above (people, tangible and intangible assets, economic activities), and current and future climate impacts are almost systematically considered in the design, implementation and adjustments of responses. The risk of maladaptation is fully minimized (but not fully eliminated).
4.1. Are there **governance arrangements** in place to support institutional capacities to coordinate adaptation activities locally (multi-scale governance and mainstreaming across policy areas/sectoral plans)?	**NA** = Not assessed. **0** = No institutional arrangements are in place to address adaptation challenges. **1** = There are limited and scattered institutional arrangements that consider adaptation challenges, and no governance measures are in place to ensure information-sharing or the bottom-up coordination of activities. **2** = One institution is identified at the case-study level that is dedicated to addressing adaptation issues (e.g. an adaptation unit), but it remains isolated from other local and national institutions and is not supported by any governance arrangements to allow for multi-level and/or cross-sector coordination and communication (information-sharing) with local coastal municipalities and/or districts (e.g. only rare and pioneering ones). Nationally one institution is in charge of adaptation (i.e. an unit within the Ministry of the Environment), but it has poor connections with the local level (e.g. focuses on developing national adaptation communications to the UNFCCC, rather than working on sectoral guidance for local scale implementation). **3** = Institutional arrangements exist at the case-study level and are in theory well connected to other local to national institutions via coordination and information-sharing measures. Such cross-scale institutional arrangements are having an increasing influence on adaptation practice locally, but the outcomes remain limited (e.g. still mis-coordination when dealing with extreme events, limited information-sharing with other localities or national-level institutions). **4** = Institutional arrangements exist at the case-study level, and cross-institutional dialogues are systematically carried out (mainstreaming of climate change adaptation policies in other sectoral policies and planning tools). In addition, multi-level governance is in place: there are adaptation-dedicated institutional arrangements at the relevant levels (e.g. national, regional, local), and information-sharing measures are in place to ensure the upstream flow of information to national institutions.

4.2. Are **human capacities** in place at the relevant scale (primarily locally, but also nationally)?	**NA** = Not assessed. **0** = No people dedicated to coastal risk management and climate adaptation. **1** = A very limited number of people working on adaptation at the case-study scale, and with no to very limited training on coastal risk management and adaptation. No clear evidence of adaptation-compatible practices and decisions (e.g. in managing the crisis after an extreme event, or in deciding about building permits in risk-prone areas). This category also includes a situation where a more substantial number of non-trained people are dedicated to coastal risk management and adaptation (no training means increased risk of maladaptive practices and decisions). **2** = A limited number of people working on adaptation at the case-study scale, but with light training in coastal risk management and adaptation. Emerging evidence of adaptation-compatible practices and decisions by individual pioneers (as opposed to a better established process as in scores 3 and 4). **3** = Adequate number (i.e. relative to the case-study scale) of people working on adaptation, and having robust training in coastal risk management and adaptation. Increasing evidence of adaptation-compatible practices and decisions, but these are still not predominant or well established (e.g. variability depending on who exactly takes decisions, and depending on staff turn-over). **4** = Adequate number (i.e. at scale) of people working on adaptation, and having robust training in coastal risk management and adaptation. Adaptation-compatible practices and decisions are predominant and well established (i.e. not dependent on staff turnover) both in case of an extreme event and when considering slow-onset changes.
4.3. Does **specific and sustainable funding** is available at the case study scale that is specifically dedicated to managing climate-related coastal risk and adaptation?	**NA** = Not assessed. **0** = No budget dedicated to coastal risks and adaptation exists at the case-study scale. **1** = A budget exists at the case-study scale that is a priori dedicated to coastal risks and adaptation, but it remains unclear what its amounts, uses and timeframes are. **2** = A specific budget is available at the case-study scale to manage coastal risks, but only for specific sectors, communities, networks, etc. that are considered hotspots, and for a limited period of time (several years at best). There is no clear strategy for sustaining finance in the long run and that fully includes projected risks (decades ahead). **3** = A specific budget is available at the case-study scale to manage coastal risks and is not limited to specific sectors, communities, networks, etc. However, it has been designed for a limited period of time (several years at best). A strategy for sustaining finance over the long term and fully including projected risks (decades ahead) is only now emerging. **4** = A specific budget is available at the case-study scale to manage coastal risks which is not limited to specific sectors, communities, networks, etc. and is designed to support multi-year projects. There is also a more consolidated funding strategy over the long term that fully includes projected risks (decades ahead).
5.1. Is there **evidence of risk reduction** today?	**NA** = Not assessed. **0** = No relationship is established (either because there is none, or because risk reduction is not being assessed), and the expert does not have any clear view on this. **1** = No relationship is formally established locally, but there is an intuitive assumption (by the assessment expert or others, including local staff members or communities) that responses undertaken support risk reduction locally. However, such risk reduction is not measured, so that the possibility of "no or side effect on risk levels" cannot be excluded. **2** = The assessment of the relationship between responses and risk reduction is emerging locally. There are indications as well as increasing agreement among experts that some responses are contributing to current risk reduction locally; however, no robust conclusion can be drawn for a broader set of responses. The extent to which these responses also provide risk reduction benefits over the long run remain highly uncertain. **3** = The relationship between responses and risk-reduction levels is assessed and surveyed at the whole case-study scale. There are emerging indications as well as increasing agreement among experts that most of the responses undertaken are having an effect on climate risk reduction today and contribute to future risk reduction. **4** = The relationship between responses and risk-reduction levels is assessed and surveyed at the whole case-study scale. There are robust indications as well as high agreement among experts that most of the responses undertaken substantially reduce climate risk today and contribute to future risk reduction.
5.2. Are there indications that the policies and actions implemented at the case-study scale contribute to **minimizing the risk of maladaptation** in the long run?	**NA** = Not assessed. **0** = No indication, so that an insidious but substantial contribution to increasing coastal risk (maladaptation) cannot be excluded. **1** = Very little indication that the strategy in place intends to or does contribute to minimizing the risk of maladaptation, so that an insidious but substantial contribution to increasing coastal risk (maladaptation) cannot be fully excluded. **2** = Clear indications that the strategy in place intends to minimize the risk of maladaptation, but the overall lack of measured evidence makes interpretation of potential actual contribution too difficult/subjective, so that the contribution to increasing coastal risk (maladaptation) cannot fully be excluded. **3** = Increasing evidence that the strategy in place both intends and contributes to minimizing the risk of maladaptation. **4** = Clearly established evidence that the strategy in place intends and actually contributes to minimizing the risk of maladaptation.

5.3. Are there indications that the **society at the case-study scale is aware** of the need to tackle both current and future coastal climate risks?	**NA** = Not assessed. **0** = No indication that the local society/community either correctly perceives or understands the challenges related to coastal risk reduction and adaptation. **1** = Only very sparse indications, but not supported by any clear evidence. Coastal risk awareness at the local society/community level is considered almost non-existent, i.e. limited to individuals or small groups of population. **2** = Emerging signs: sparse surveys/evidence exist at the local society/community level (e.g. only isolated/specific groups of population) and indicate a limited degree of the perception of climate risk and/or of knowledge of the drivers of coastal risk. When national-level surveys exist, they do not provide any directly relevant information for the local case-study context (e.g. because of national means or based on case studies showing different features from those of the present case study). Coastal risk awareness at the case-study level is considered to be only emerging. **3** = Progressing: increasing surveys/evidence at the local society/community level (not only isolated/specific groups of population) and indicating an increasing degree of perceptions of climate risk and/or of knowledge of the drivers of coastal risk. Coastal risk awareness at the case-study level is considered in place and increasing. **4** = Advanced stage: extended surveys/evidence at the local society/community level, and indicating a relatively high degree of perception of climate risk and/or of knowledge of the drivers of coastal risk. Coastal risk awareness at the case-study level is considered substantial.
6.1. Are **locally relevant adaptation goals** established in the short-, medium- and long-term (years, 1-3 decades, more, respectively), and articulated with each other (i.e. how does reaching the present-day goals support reaching the longer-term ones)?	**NA** = Not assessed. **0** = No coastal risk-specific goal at the case-study scale, and none at higher scales that are highly relevant for the case study. **1** = A general goal(s) exists at the case-study scale but remains vague in scope in terms of targets, sectors and scales; and in terms of considering coastal risks more specifically. Similarly, goals established at higher scales (e.g. national) are too general to provide guidance at the case-study scale. **2** = Only short-term goal(s) is considered locally for current coastal risks (e.g. ≤2-3 years), but without any clear relation with longer-term ones OR A medium-long term (e.g. ≥ 3-5 years to a decade) goal exists only for a limited number of coastal 'hotspots' (i.e. sectors, areas and communities particularly at risk). Goals established at higher scales (e.g. national) are too general to provide guidance at the case-study scale. **3** = Medium-long-term (e.g. ≥ 3-5 years to a decade) goal(s) is established at the case-study scale for all coastal hotspots (i.e. sectors, areas and communities particularly at risk), and includes intermediate goals on shorter timescales (e.g. ≤2-3 years). Local goals align with those established at higher scales (e.g. national). **4** = Longer-term (multiple decades) goal(s) is established for most of —if not all— sectors, areas and communities potentially at risk (i.e. not only for hotspots), and includes intermediate goals for shorter timescales (several years). Local goals align with those established at higher scales (e.g. national).
6.2. Are **synergies and trade-offs** (now and over time) between various adaptation-related options considered?	**NA** = Not assessed. **0** = Synergies and trade-offs between different adaptation responses are neither known nor considered. **1** = Synergies and trade-offs are barely considered at the case-study level (e.g. only for a very small set of options, and possibly only for very specific location within the case-study context) **2** = Knowledge of synergies and trade-offs between various adaptation responses is emerging at the case-study level but is not supported by a scientifically-based assessment. There are only emerging signs that these considerations on synergies and trade-offs influence the design and implementation of coastal adaptation strategies at the case-study level. Relevant information from other case studies and/or higher scales remains limited. **3** = Knowledge of synergies and trade-offs between various adaptation responses at the case-study level is supported by a rough scientifically-based assessment, and there is some evidence that it influences the design and implementation of coastal adaptation strategies at the case-study level. Relevant information also exists from other case studies and/or at higher scales. **4** = Knowledge of synergies and trade-offs between various adaptation responses at the case-study level is supported by an advanced scientifically-based assessment and is fully considered in the design and implementation of coastal adaptation strategies locally, and possibly also in monitoring and evaluation systems. Relevant information also exists from other case studies and/or at higher scales.
6.3. Are options planned **in a sequenced manner and alternative strategies** considered at the case-study level?	**NA** = Not assessed. **0** = Responses are planned separately from each other. **1** = Responses are still mainly planned separately from each other, but signs are emerging of the consideration of their synergies and trade-offs (e.g. only for a very small set of options in a very specific location). **2** = Early examples of strategies concretely bringing together multiple responses and organized on the basis of their synergies and trade-offs over time; however, there is no formal process of establishing an "adaptation pathway" at the case-study scale, and no insights or guidance from the national level. **3** = There is medium evidence that knowledge of synergies and trade-offs influences the design and implementation of coastal adaptation strategies at the case-study level. The establishment of a "local adaptation pathway" is under way, and there are an increasing number of local strategies bringing together multiple responses and organizing them based on their synergies and trade-offs over time. National-level guidance may exist to support the development of local adaptation pathways. **4** = Knowledge of synergies and trade-offs is fully considered in the design and implementation of coastal adaptation strategies at the case-study levels, and possibly also in monitoring and evaluation systems. A "local adaptation pathway" has been established (or is close to being), and several local strategies are in place that bring together multiple responses and that organize them based on their synergies and trade-offs over time. National-level guidance may exist to support the development of local adaptation pathways.

Photo: Oxfam East Africa

How are the adequacy and effectiveness of adaptation and support made manifested in national submissions?

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1. INTRODUCTION

The Paris Agreement provides for a collective assessment of progress in achieving its long-term goals through the mandate on the Global Stocktake (GST), calling particularly for the Parties to *"Review the adequacy and effectiveness of adaptation and support provided for adaptation"*. Since the current GST cycle is the first attempt at a comprehensive global stocktaking exercise to assess climate action and support, it is still maturing. In this light, a critical challenge for the GST is to operationalize answers to fundamental questions such as how can we assess whether we are making progress in enhancing adaptive capacity, reducing vulnerability, and enhancing resilience; what does an adequate adaptation response imply and how can it be defined; how do we define and measure adaptation effectiveness, and what can meaningfully be assessed at the global level and what cannot?

As outlined in Paris Agreement, Article 13 paragraphs 4, 5, and 6, as well as decision 19/CMA.1, country reporting from Parties to the UNFCCC in the forms of Adaptation Communications (ADCOMs), Biennial Transparency Reports (BTRs), National Communications (NCs), and Nationally Determined Contributions (NDCs) would form the major inputs to the GST. Hence this paper explores the UNFCCC reporting needs on adaptation, and how and where countries report their adaptation actions and support. Since national submissions to the UNFCCC can be expected to have a large impact on the GST's review of the adequacy and effectiveness of adaptation and support, the paper then explores how adequacy and effectiveness are reflected practically in countries' submissions. These insights are reinforced through interview-based case studies of Ghana's and Nigeria's respective experiences of developing their ADCOMs. Insights generated here could support the GST in assessing the current status of adaptation adequacy and effectiveness and aid GST outputs in updating and enhancing reporting on adaptation action and support.

2. ADAPTATION IN UNFCCC REPORTING FRAMEWORKS

Adaptation plans, actions, and support are captured through various reporting requirements under the Framework Convention on Climate Change, its Kyoto Protocol and the Paris Agreement (Figure 1).

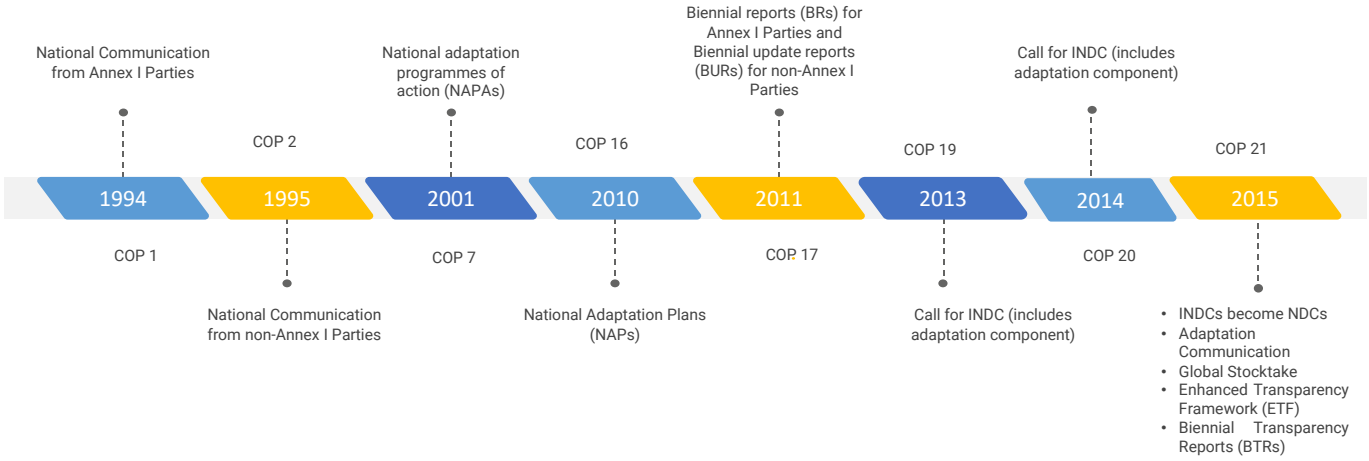
National Communications (NCs) reporting for Annex I countries was the first reporting requirement to be introduced when the Convention was adopted. Later Non-Annex I parties were also required to submit NCs. The guidelines for the preparation of NCs for both Annex I and Non-Annex I Parties indicate that NCs "shall" (but essentially voluntarily) include information on impacts and vulnerability and a description of adaptation actions and undertakings, while not explicitly asking for adaptation plans, resilience building or the monitoring and evaluation of the adaptation activities being undertaken (UNFCCC, 1999); (UNFCCC, 2002). In the case of implementation and support needs, the guidelines for NCs for Non-Annex I Parties encourage the Parties to include financing needs for proposed projects.

COP7 (2001) established the provisions for the preparation of **National Adaptation Programmes of Action (NAPAs)** as a part of the Least Developed Countries Work Programme. Later, the Cancun Adaptation Framework of COP16 (2010) built further on the NAPAs to establish the process for **National Adaptation Plans (NAPs)**. The NAPs are designed to enable the least developed country Parties to identify medium- and long-term adaptation needs and develop and implement strategies and programmes to address those needs (UNFCCC, 2021). The NAP guidelines provide for the Parties to report on implementation strategies and to recommend monitoring and reviewing the efforts undertaken while reflecting on the lessons learned. The NAP guidelines also encourage the Parties to assess implementation and support needs. Further, the Durban Platform for Enhanced Action (2011), which formally launched the second commitment period of the Kyoto Protocol, also established the commitment to report NCs every four years while preparing **biennial reports (BRs)** for Annex I Parties and **biennial update reports (BURs)** for non-Annex I Parties. However, adaptation reporting in BRs/BURs is not mandatory.

Decisions taken during COP19 (Warsaw, 2013) and COP20 (Lima, 2014) urged the Parties to submit their intended nationally determined contributions well in advance of COP21 (Paris, 2015). Once accepted, these submissions become the **nationally determined contributions (NDCs)** of the respective Parties towards achieving the goals of the convention (i.e., the UNFCCC). The Paris Agreement formalized the need for the Parties to update the NDCs regularly.

The Paris Agreement provided additional instruments for reporting and information-sharing on the progress and plans for adaptation. Article 7, Paragraph 10 of the Paris Agreement calls for the Parties to submit and regularly update an adaptation communication (UNFCCC, 2015). The scope of **adaptation communications (ADCOMs)** includes informing on adaptation actions under implementation, plans for future adaptation actions based on nationally determined priorities, and outlining the implementation and support needs. However, it does not explicitly ask the Parties to include monitoring and evaluation and information on the adequacy and effectiveness of adaptation and support within the adaptation communications. Although not a separate submission, reporting on adaptation implementation and planning may contain details of impacts, vulnerability and building the resilience of socio-economic and ecological systems, but it does not ask about the support needed for implementation (Kato & Ellis, 2016).

Figure 1: Development of UNFCCC reporting instruments over time



Furthermore, the Paris Agreement established the Enhanced Transparency Framework (ETF) and defined its role in informing the GST. Under the ETF, Parties need to submit **Biennial Transparency Reports (BTRs)** using Common Tabular Format (CTFs).[1] However, only Tables 7, 8 and 9 of the CTF provide for reporting on adaptation-related financial provisions and technology and capacity support.

The national reports made to the UNFCCC, described here, cover different aspects of adaptation and adaptation support-related planning, implementation and monitoring. Moreover, adaptation reporting is voluntary across most of the reporting requirements, and they follow their own time cycles. For instance, the National Communications need to be submitted every four years, the Biennial Reports/Biennial Update Reports every two years, updated NDCs every five years and Transparency Reports every two years. Moreover, there are no fixed timelines for developing, reviewing, or updating the NAPs and Adaptation Communications. This makes assessing progress on adaptation towards the Global Goal on Adaptation (GGA) under the GST a tricky exercise, since the information provided through national submissions may be insufficient, imprecise or lacking in details.

This may hamper the GST in providing a consistent and transparent assessment of progress on adaptation, support, and its adequacy and effectiveness. With further low needs to inform on monitoring and evaluation across these submissions, assessing the adequacy and effectiveness of adaptation and support becomes even more complicated. This paper attempts to understand how countries treat adequacy and effectiveness in the country reporting for the GST to review the efforts. Such an exercise could prove useful insight for the first GST to understand country perspectives and the challenges in reporting practice. The lessons from the first GST could then prove to be an input towards improving the reporting needs on the adequacy and effectiveness of adaptation and support to ensure better outcomes for future GST processes.

3. UNDERSTANDING COUNTRY REPORTING ON ADEQUACY AND EFFECTIVENESS FOR THE FIRST GST

Several attempts have been made to define the adequacy and effectiveness of adaptation to climate change. However, there is no collective understanding of the term "adequate adaptation" among all the Parties (IIED, 2016). The IPCC's latest report notes that "*Adequacy refers to a set of solutions that together are sufficient to avoid dangerous, intolerable, or severe climate risks*" (IPCC, 2022). Hence, adequate adaptation would mean the provision of a basket of solutions that works together to provide "enough" risk reduction from the impacts of climate change. The joint Adaptation Committee and Least Developed Country Expert Group of the UNFCCC frame the adequacy of adaptation and its support in terms of "*whether the implemented measures are sufficient or proportional vis-à-vis the identified needs*" (AC-LEG, 2021). As for the effectiveness of adaptation actions, this is characterized as "*the extent to which an action reduces vulnerability and climate-related risk, increases resilience, and avoids maladaptation*" (IPCC, 2022) or "*whether the measures that are being implemented achieve, over time, the intended outcomes and do not lead to unintended and negative side effects*" (AC-LEG, 2020).

1 https://unfccc.int/topics/climate-finance/workstreams/transparency-of-support-ex-post/existing-arrangements-on-measurement--reporting-and-verification-of-support

Adequacy and effectiveness assessments are implemented through monitoring and evaluation systems and processes (Leiter, 2021); (AC-LEG, 2020). Hence, the next section explores what countries report regarding the monitoring and evaluation of adaptation and support in their national submissions – NAPs and ADCOMs. Furthermore, it explores country experience in conveying adequacy and effectiveness in their ADCOM using the cases of Nigeria and Ghana and their respective experiences. The last part here proposes a possibility for transparency reporting to include information for reviewing the adequacy and effectiveness of adaptation and support.

3.1 What are countries reporting on adequacy and effectiveness?

Reporting on the Parties' monitoring and evaluation is the primary data source for reviewing the adequacy and effectiveness of adaptation and support (UNFCCC, 2015). Hence, this paper performs a status check on how national submissions perceive the monitoring and evaluation systems and how this is reflected and/or described in the national submissions. To do so, it reviews the ADCOMs and the NAPs submitted by the Parties to the UNFCCC. Annex 1 consists of a list of the NAPs and ADCOMs that were considered for the review. The NAPs have been accessed through NAP central, and ADCOMS through the Adaptation Communications Registry.[2] 27 NAP submissions and 35 ADCOM submissions have been examined. The paper uses the content analysis method to understand the perceptions of monitoring and evaluation within these NAPs and ADCOMs. The submission documents were therefore searched using the keywords "monitoring", "evaluation", "adequacy", "adequate", "effectiveness", "effective", "track", "capacity", "finance", "technology", "sufficient" and "insufficient". The next step was to screen the hits and filter out the unrelated sections manually. The monitoring and evaluation systems described in these Party submissions are described in the next sections.

3.1.1. Adequacy and effectiveness as reported in NAPs

Since the NAP technical guidelines have defined reporting, monitoring and review as core components of NAP, the submissions envision some form of monitoring and evaluation process. However, as the paper considers only those NAPs that are available on NAP central and does not look at other submissions by Parties or the national policies and documents. Moreover, the discussions of monitoring and evaluation have been explored from developing country perspectives only, and these discussions are varied across those countries.

For instance, **Sri Lanka**'s NAP has been developed for a ten-year horizon with a monitoring framework for monitoring the implementation of adaptation action. This is planned to occur biannually and will be reviewed in the third and sixth years, as well as post-plan. Although the NAP does not explicitly discuss the adequacy and effectiveness of adaptation actions and support, it identifies key performance indicators against each action and the latter's support needs. For example, for the actions of "Strengthening the surveillance and monitoring of climate-induced diseases", the performance indicators are "Surveillance programme established, Number of vulnerability maps produced, and Money allocated for establishing a mechanism for sharing meteorological, clinical and entomological information". Tracking these indicators over time would potentially help in understanding the adequacy and effectiveness of these actions.

Timor-Leste's NAP emphasizes a monitoring methodology using an assessment of vulnerability and mentions undertaking additional vulnerability and risk assessments in the near-term (2020-2022). It aims to create a centralized database of village (sub-district)-level vulnerability and risk assessments by standardizing vulnerability assessment methodology and capacity building. However, there is no indication of the frequency at which the exercise to track progress with vulnerability and risk reduction is repeated, adding less value to understanding adequacy and effectiveness over time. The NAP also records the inadequacy of sectoral regulations and enforcement concerning climate change issues.

Suriname's NAP mentions upfront that it has been designed to address adaptation-related challenges effectively. It describes a strategic implementation framework for sectoral and cross-sector implementation actions. Since the sectoral actions are designed to be complementary, the NAP treats it as assuring effectiveness for adaptation and adaptation support. Suriname relies on a sectoral approach to inform ongoing and future planning and implementation processes. It also describes the strategic outcomes that they are envisioning through the adaptation plan and the output indicators for all adaptation measures. Examples of these include Poverty level where climate adaptation action is taken, number of local area/district climate adaptation programs, number of funded agreements with the private sector, number of women's groups actively and consistently engaged, and number of opportunities taken for advanced foreign training. This would potentially provide inputs for assessing the adequacy and effectiveness of adaptation and support outcomes.

2 https://unfccc.int/ACR

Brazil's NAP states that "Effective adaptation implies that the strategy to be deployed must integrate appropriate climate-change risk management into current public-sector and thematic planning, policy-making, and national development strategies." Beyond this broad description, the NAP does not discuss how this effectiveness is assessed in Brazil. It provides a list of specific adaptation and support objectives, main initiatives planned, agencies responsible, impacts and monitoring indicators across sectors and themes. The detailed monitoring plan was under development when the NAP was formulated. Hence, there is a lack of information until an updated plan is submitted. The NAP is planned to be reviewed every fourth year.

Cambodia's NAP sets out its strategic objectives for adaptation and outlines the actions it plans to undertake to achieve those. As the foundation of its NAP, Cambodia's Climate Change Strategic Plan 2014-2023 (CCCSP) states that "to effectively deal with the implications of climate change, the capacity of RGC[3] institutions needs to be strengthened to identify and develop a strategy to deal with the anticipated impact of the climate change, and strengthen disaster management capabilities". It has proposed a national framework on monitoring and evaluation to measure to what extent resources have been efficiently and effectively used to achieve the targets set in policies and action plans, thus improving accountability to civil society and international sources of funding. The framework under design by 2013 was expected to include a theory of change, an indicator framework with a baseline and targets for tracking CCCSP through participatory approaches. However, there is no indication of adequacy being considered. Also, although submitted in 2021, the NAP was drawn up in 2013 and thus does not provide up-to-date information on progress with adaptation and its adequacy and effectiveness.

Despite the relatively structured format and flow of components presented in the NAP's technical guidelines, the above analysis shows that country practice uses a variety of approaches: Timor-Leste uses assessment of vulnerability to monitor progress, while Cambodia has not investigated vulnerability in detail and intends to use the theory of change to track progress instead. Although several of these NAPs were submitted around 2015-16, there are not enough submissions of progress reports or updated NAPs except for Paraguay, which submitted its updated NAP in 2022, around two years after its first NAP in 2020. Thus, a lack of information about progress with adaptation and support could act as a large barrier in reviewing the adequacy and effectiveness of adaptation and support for the first GST.

Furthermore, although NAPs are the only set of submissions that require discussion of needs, gaps, monitoring and evaluations of adaptation, these documents generally do not take a step forward to include deliberation on how they see adaptation actions and support in terms of their adequacy and effectiveness.

3.1.2. Adequacy and effectiveness as reported under ADCOMs

As stated in the Paris Agreement, an Adaptation Communication may be submitted "*as a component of or in conjunction with other communications or documents, including a national adaptation plan, a nationally determined contribution*" (UNFCCC, 2015), making it a country-driven and flexible submission. The guidance from CMA.1 decision outlines a list of elements of adaptation communication, but there is flexibility for countries regarding reporting structures. Hence, the adaptation communication submissions are varied in nature and delve into different levels of depth of information. Of the 56 Parties that have submitted an ADCOM, 17 (including the EU) are Annex I Parties, and 39 are non-Annex I Parties. Thus, the difference (if any) in the reflections of developing and developed country parties on adaptation and adaption support, adequacy and effectiveness is examined next.

For Annex I Parties, **Italy**'s ADCOM describes a co-design approach for assessing stakeholder perceptions of adaptation actions and identifying the criteria for evaluating these actions to be included in the NAP and to build governance models for adaptation through stakeholder consultations. However, the document does not go on to discuss the evaluation criteria and indicators used for monitoring and assessing adaptations, nor for support.

Canada's ADCOM does not describe adequacy and effectiveness concerns, but intends to develop a National Adaptation Strategy that would establish a framework for measuring progress.

Norway's ADCOM is a part of its NC. It describes an exercise undertaken in the country to assess nature-based solutions to climate challenges. The output report included an evaluation of their effectiveness and brief cost-benefit analyses. However, there are no further insights on how Norway perceives the adequacy and effectiveness of other climate actions.

Similarly, **Australia**'s ADCOM, which is a standalone submission, describes domestic as well as international adaptation actions. It states that the support it provides to developing countries for adaptation is effective. A supplementary submission on Australia's own National Climate Resilience and Adaptation

3 RGC - Royal Government of Cambodia

Strategy (2021-2025) perceives effective adaptation as "*coordinated action across the natural, built, social and economic domains*" and states that locally led and tailored approaches support effective adaptation. However, there is no discussion of how the adequacy and effectiveness of these actions are evaluated for either domestic implementation or international support.

For non-Annex I Parties, **Singapore**'s NC consists of its first ADCOM, which describes a monitoring and evaluation system and progress reporting. Although Singapore conducts risk assessment studies, they need to be conducted regularly to help inform the risks, risk reductions and in turn the effectiveness of adaptation actions undertaken by the Party. There is no further discussion of how the monitoring systems and risk assessments feed into adequacy and effectiveness.

Mauritius's adaptation communication is also part of its updated NDC. As part of the description of how adaptation is implemented, it identifies barriers to effective and adequate outcomes such as conflicting timescales, conflicting interests and coordination concerns in multi-level governance. It specifically also notes the issues of limited financial resources, insufficient human resources, inadequate technical expertise and technology, uncertain social costs and future benefits that hinder progress on adaptation.

Indonesia has submitted a standalone ADCOM that estimates adequacy and effectiveness. By adopting a transparency framework for climate change action, it includes vulnerability and readiness assessment scores to look into the effectiveness of resilience building actions. Indonesia's current assessment of adaptation is qualitative in nature, and it plans to move towards developing quantitative assessment tools. The ADCOM has a section on identifying the barriers, challenges and gaps in adaptation and support, as well as what needs to be undertaken to overcome them. It also acknowledges the need to develop a standard method to assess the effectiveness of the adaptation actions. This could prove to be a useful input for reviewing the adequacy and effectiveness of the GST. ADCOM also reviewed the adaptation finance for specific outputs and the funding adequacy through various ministries and agencies' budgets and clearly states that more funding is allocated to mitigation than adaptation actions, which may be resulting in inadequacy. Other reasons for a lack of adequacy assessments have been identified as a lack of reliable data and stakeholders' understandings and perceptions of adaptation action priorities. Beyond, it indicates capacity and knowledge dissemination challenges for the development of adaptive technologies. ADCOM also proposes a strategy for enhancing the effectiveness of the implementation and support.

Angola's ADCOM is part of its updated NDC and does not follow the guidance structure. However, adaptation assessments are part of the NDC monitoring and review framework. The proposed system suggests that adaptation efforts will be assessed through indicators of resilience based on the implementation process and results and international indexes, such as the vulnerability and risk reduction measures. It provides a suggestive list of indicators based on the world risk index and global climate risk[4] index. Box 1 shows this list of indicators list as just one of a very few examples.

Overall, only a few Parties mention adequacy- and effectiveness-related concepts in their ADCOMs. A further few discuss the barriers and challenges in achieving adequate and effective adaptation. However, no particular difference in the way Annex I Parties and non-Annex I Parties approach this subject has been observed. The challenges related to the inclusion of the adequacy and effectiveness of adaptation and support in ADCOM are explored at greater depth through detailed case studies of Nigeria's and Ghana's ADCOM development process. Since the ADCOMs are submitted as a part of various national submissions, each country has a different submission year. Several of these submissions mention that systems for monitoring and measuring progress are in the development stages. These systems will be operationalized in course of time, and the outcomes from them will be reflected in the national submissions. Thus, it is anticipated that only future and updated national submissions will act as inputs to future GSTs when reviewing the adequacy and effectiveness of adaptation actions and support. Furthermore, each Party that has tried to discuss adequacy and effectiveness (although sometimes in the context of tracking and monitoring) has its own approach to the evaluation and assessment of adaptation, some preferring an indicator-based approach, while others prefer a participatory approach. The varied nature of these approaches makes comparing and combining the efforts complicated: e.g., the bottom-up participatory approach may ensure that the adaptation action is designed and implemented in accordance with stakeholder needs and is hence efficient and adequate (pre-determining the adequacy and effectiveness), while the top-down tracking approach may support the assessment of adequacy and effectiveness during and after implementation and support acceptance.

4 https://www.germanwatch.org/en/17307

Box 1. The adequacy and effectiveness of adaptation efforts mentioned in country reporting: the example of Angola's ADCOM

Area	Indicator
Climate parameters	Change in annual temperature
	Mean monthly temperature
	Number of hot days
	Change in annual precipitation
	Monthly precipitation
	Extreme precipitation events
Climate impacts	Number of households affected by drought
	Percentage of total livestock killed by drought
	Number of people at high risk of heat stress
	Number of people living in flood prone areas
	Number of properties flooded per year
	Number of properties located in river/coastal floodplain
	Number of hectares of productive land lost to soil erosion
	Total forest area impacted by wildfire per year
	Weather-related disruption of electricity supply
	Number of properties lost due to coastal erosion per year
	Losses of GDP in percentage per year due to extreme rainfall
Adaptation Action	Number of public awareness campaigns on water efficiency
	Number of government staff who have received training in adaptation
	Degree of integration of climate change into development planning
	Percentage of municipalities with local regulations considering adaptation and vulnerability assessment results
	Existence of interministerial/ intersectoral commissions working on adaptation
	Uptake of early warning systems
	Percentage of coastline under marine protection
	Number of financial mechanisms identified to support climate change adaptation

3.2 Exploring the adequacy and effectiveness of adaptation and support in submissions from the West Africa Region

Noting that Africa has one of the most vulnerable geographies to the impacts of climate change and that several African nations have submitted their ADCOMs, this section focuses on understanding how adequacy and effectiveness were comprehended in these submissions. Thus, detailed unstructured interviews were conducted with the national representatives from Ghana and Nigeria who were involved in preparing these submissions. The insights gained through the interviews are presented in case studies of Nigeria's and Ghana's experiences with and perceptions of adaptation reporting and their inclusion of the associated adequacy and effectiveness concerns.

3.2.1. Case Study: Nigeria

Nigeria submitted its first Adaptation Communication to the UNFCCC in October 2021. The document captures adaptation actions and strategies that are being deployed currently and identifies gaps and adaptation priorities for Nigeria. Interviews with the representative from Nigeria revealed that the current ADCOM was developed through a participatory approach along with an in-depth desk review of all the country's climate change-related policies and laws. However, they did observe challenges in what manages to be reported in these ADCOMs. Since the adaptation plans cascade through several public and non-public institutions on the ground, several civil-society and non-governmental organizations were involved in undertaking adaptation actions whose engagement with the NAP process was not robust. Hence, data gathering on progress with implementation and assessing cumulative effectiveness and adequacy as a national priority becomes a challenge. Lack of sufficient representation of adaptation actions in national submissions translates into an inefficient NAP process, making it difficult to review the status and need for adaptation and support and their desired adequacy and effectiveness.

In 2011, the government of Nigeria developed "The National Adaptation Strategy and Plan of Action for Climate Change in Nigeria (NASPA-CCN)". Nigeria also put in place a National Adaptation Plan (NAP) Framework in 2020 and a National Climate Change Policy in 2021. All these exercises have helped Nigeria identify appropriate policies, strategies and action plans for achieving its adaptation priorities. However, the adaptation communication notes the lack of a formal and systematic approach to assessing, monitoring, reviewing, or

reporting ongoing adaptation efforts at all government levels (federal, state and local). The adaptation communication sets out concerns in achieving the desirable adaptation outcomes and points out the adequacy and effectiveness of the efforts made in mainstreaming climate change on their development agenda. It identifies the challenges related to funding, capacity-building and poor technical skills upfront.

The current policy frameworks take a sectoral approach to addressing adaptation priorities in Nigeria. Agriculture, energy, water resources, forestry and wildlife, education, health, security and transportation are the key sectors considered, along with cross-cutting issues of gender and finance. While adaptation actions are implemented through different ministries and departments at various levels of government, the Department of Climate Change of the Federal Ministry of Environment coordinates all adaptation activities. However, for each activity or programme, the institution responsible for its implementation has its own way of measuring outputs, as they take diverse approaches, and it induces high inter-department/ministry coordination needs. With institutions working in silos, generally with only limited opportunities to collaborate, the lack of synergies, coordination, target-setting, monitoring and evaluation has given rise to overlaps, duplication of effort and a greater cost burden. While the outputs *are* measured in some shape or form, the outcomes of these adaptation activities are not being tracked.

Successful implementation of adaptation actions also occurs at various levels of government in Nigeria, where the lack of active involvement by sub-national governments (especially local governments) is seen as a major barrier to effective NAP implementation. Since the institutional arrangements and coordination between various levels of government have become crucial factors in determining the success or failure of implementation and the outcomes of adaptation efforts, the effectiveness and adequacy of the adaptation actions and support suffer from disorganization and a lack of institutional synchronization. The same was observed while formulating the ADCOM. The National Assembly of Nigeria has recently approved the creation of a National Climate Council, a body mandated to undertake coordination activities across adaptation and mitigation actions within the country. The council is expected to have a cohesive structure, programs and metrics to measure progress or lack of it through appropriate evaluation and tracking plans. Such interventions would strengthen Nigeria's reporting on the adequacy and effectiveness of adaptation in updated ADCOMs.

The adequacy and effectiveness of adaptation actions as well as support (technological and financial) are also perceived to hinge on the adequacy and effectiveness of capacity support. Capacity affects the ability to leverage the opportunities for international funding, such as the Green Climate Fund, the adaptation Fund, the World Bank, and similar other channels. Hence, inadequate capacity often translates into inadequate financial support, further leading to inadequate adaptation actions. Although multilateral agency-funded projects are assessed, they are not translated of fed into national assessments due to the fact that the measurement tools are provided by the funders. Hence, evaluation of the project outputs and outcomes is undertaken in accordance with the terms for funding: e.g., World Bank-funded projects are evaluated in the middle and at the end of the project. More support on funding, capacity-building, linkages and collaboration, technology transfer, tools, and technical skills is thus needed to enable Nigeria to achieve adequate and effective adaptation.
Nigeria's adaptation communication outlines the observed and expected risks, impacts, and vulnerabilities. It also mentions the need for Nigeria to keep a database of all stakeholders and develop a monitoring and evaluation mechanism to ensure that all adaptation actions, achievements, challenges and support needed in the different sectors and by the various stakeholders are documented and tracked in real time. The NAP Framework provides an overview of where the country is, what it needs to do and how it will get there in terms of reducing vulnerability. The framework is up for review in 2023. Such efforts at tracking and review also help in estimating the adequacy of adaptation actions and support.

3.2.2. Case Study: Ghana

Ghana submitted its first Adaptation Communication to the UNFCCC in November 2021, being one of the few developing countries to have done so. A senior representative involved in drawing up Ghana's ADCOM was invited for an interview. The insights gained from it suggest that the ADCOM was drafted from the point of view of providing a status check on all the achievements thus far in the domain of climate change adaptation and looking into identifying gaps, as well as establishing future adaptation needs. The adaptation communication in itself tries to communicate the country's profile when it comes to adaptation needs and its key vulnerabilities and how these vulnerabilities are being addressed. Since this was a relatively new process as the first ADCOM, it was created after reviewing some of the adaptation communications submitted by other countries. It may be safely assumed here that taking other submissions that lack descriptions of adequacy and effectiveness as an illustration of what an ADCOM should look like may have led to such omissions being replicated in Ghana's ADCOM.

Despite this, the guidelines on ADCOM (which do not mention reporting on adequacy, effectiveness, monitoring or evaluation) were adhered to. Hence, the need to include adequacy and effectiveness assessment-related perspectives and information seemed to be lacking. Another insight gained from the unstructured discussions was that the ADCOM development process received external support in the form of capacity-building and finance. The interviewee noted that a lack of available funding and time constraints due to political motivations led to an inadequate ADCOM development process, i.e. sufficient field data, surveys and interviews with stakeholders to obtain comprehensive information on the adequacy and effectiveness of adaptation and support were lacking.

Although the Adaptation Communication does not describe the measures used in tracking the adequacy and effectiveness of adaptation actions and support in an upfront manner, there is intrinsic coverage of these concerns. The Adaptation Communication also states that there is a need for more "deliberate efforts, creative partnerships and collaborative efforts that bring people, groups, communities, and institutions together from diverse backgrounds and sectors to share information, develop knowledge and acquire new skills and insights to drive further actions". This indication of the inadequacy of the adaptation actions being undertaken currently was also confirmed by the interviewee.

The first Adaptation Communication submission serves as a precursor to Ghana's NAP. The Adaptation Communication also refers to the national policy initiatives – the National Climate Change Adaptation Strategy (NCCAS, 2012), the National Climate Change Policy (NCCP, 2013), the Nationally Determined Contributions (NDC, 2015), the National Climate Change Master Plan Action Programmes for Implementation (2015–2020), and National Adaptation Plan (NAP) framework (2018). The NAP aims to consolidate these policies and provide implementation pathways at multiple levels and diverse sectors for effective medium- to long-term adaptation planning in Ghana.

For example, a monitoring framework and a reporting mechanism are both mentioned in the National Climate Change Master Plan Action Programmes for Implementation, whereby programs and actions items under ten headings: agriculture, infrastructure, communities, ecosystems, health, water, gender, migration, energy and carbon sinks, are listed. For each action, moreover, the objective, purpose, output/tasks/outcomes, objectively verifiable indicators, sources of verification, and assumptions and risks are described in detail. However, none of this is reflected clearly in the Adaptation Communication document. A more structured format for tracking the crucial indicators to establish the adequacy and effectiveness of adaptation actions and support from the UNFCCC party decisions would go a long way in avoiding and supporting uniform national reporting as an input to the GST exercise.

The Adaptation Communication also mentions the theory of change that Ghana has created using wide-ranging stakeholder consultations. If repeated in the future, this exercise in mapping the theory of change may prove to be a significant indicator of the adequacy and effectiveness of adaptation planning in Ghana. As Ghana progresses further in developing its NAP, it will be expected to monitor, evaluate and communicate its efforts to ensure steady progress. The ADCOM also notes that, as the NAP process is moving ahead efficiently, funding requirements to support such efforts remain a challenge. Much work therefore remains to be done, and support is needed to enhance resilience. The ADCOM lists adaptation data-sourcing architecture, national legislation on climate change, adaptation capacity-building and enhancing climate financing skills as some of the priority areas for immediate action. These indicate that Ghana acknowledges that current and planned actions are not adequate to build resilience in facing the enormous challenges stemming from climate impacts.

Furthermore, one of the priority areas identified in Ghana's ADCOM is undertaking a climate risk assessment for different ecological zones. Ghana conducted a vulnerability assessment study in 2008 which has served as a basis for NCCAS and NCCP. A repeat exercise on updating the vulnerability assessment would also provide an estimate of the adequacy and effectiveness of adaptation actions and support that are already in place.

3.3 Potential role of the Common Tabular Format in supporting countries' reporting of the adequacy and effectiveness of adaptation and support for the GST

The above analyses show that the Parties are making various attempts to report adaptation while a systemic information collection and management system is yet to be put in place. ADCOMs may include common minimum reporting but as part of various other submissions, such as NDCs, NCs, etc., their updating is not mandated at a set frequency. To improve clarity on Article 13 (which underpins the "Information collection and preparation" for the GST), decision 19/CP.18 lists 9 tables (16 sub-tables) under the so-called Common Tabular Format (CTF),[5] which allows uniform and regular (time-wise) quantitative tracking and assessment. Although adaptation is related to financial flows in only three places, and that too as one of the items with mitigation, for ease of reporting and reviewing adaptation information, an estimate of support provided/received

5 The current CTF tables related to adaptation support can be find here: https://unfccc.int/decisions?f%5B0%5D=body%3A1343&f%5B1%5D=conference%3A3845

for adaptation in terms of finance, capacity building, and technology development and transfer is provided. Tracking these may indicate whether the support has increased or decreased over time, but it may not be sufficient to establish an assessment of the adequacy and effectiveness of this support.

To bring uniformity in the reporting periodicity and content, the CTF tables may be expanded to include common minimum adaptation action-related reporting indicators and measurements. Bringing in synergies with the monitoring and measuring of the Sustainable Development Goals (SDGs), parameters like vulnerable or at-risk populations based on demographic characteristics and socio-economic situations and access to basic amenities (clean water, housing conditions, etc.) may be included in the CTFs. Beyond that, the reporting tables could also track vulnerability-related targets such as extreme climatological events, related mortality, loss and damage (costs), and estimates of lives saved or lost due to disaster management activities and early warning systems so that the Parties can report across sectors: water, biodiversity, agriculture, coastal ecosystems, public health, and so on. Such reporting would serve as a potential data source for GST.

4. CONCLUSION

Multiple reporting instruments on adaptation have been established for the UNFCCC, the Kyoto Protocol and the Paris Agreement. However, each of these reporting frameworks follows a different time cycle. This poses a problem with the availability of the latest data and status of adaptation planning, implementation and support assessments for the GST, causing concerns for the consistency and comparability of reporting periods. Lack of updated information on adaptation and its support impact adversely on the effective reviewing of their adequacy and effectiveness.

The scope of adaptation information being reported through all national reporting instruments described in Section 2 shows some overlaps. Hence, although there are several reporting channels, the amount of fruitful information being reported may be limited. The insights gained from the discussions conducted for the case studies of Nigeria and Ghana point out that adaptation and support-related information is also often available in national documents that are not necessarily submitted to UNFCCC or referred to in national submissions. This is especially true for reporting on the monitoring, evaluation and tracking of progress with adaptation actions and support. This makes access to information on the adequacy and effectiveness of adaptation and support very dispersed and hard to handle.

Although guidance documents are designed for all the reporting instruments, there is flexibility on how and what is reported on adaptation and support as compared to emissions and mitigation-related reporting. This poses a problem of consistency and comparability regarding what and how much is reported and hence reflected on in the adequacy and effectiveness assessments for the GST.

It is not just that the information is dispersed: due to its very nature, the implementation of adaptation actions is played out at various governance and sectoral levels in the forms of projects and programmes, rather than at national levels. The support in terms of finance and capacity-building is therefore also fragmented. As indicated in the case of Nigeria, the monitoring and evaluation may happen in accordance with the financing entity's requirements and guidelines. Again, therefore, adaptation tracking becomes inconsistent and incomparable. This impacts on how adequacy and effectiveness are perceived as well as reported: an impediment in reviewing the adequacy and effectiveness of adaptation actions and related support.

REFERENCES

AC-LEG, 2020. *Methodologies for reviewing the adequacy and effectiveness of adaptation and support,* s.l.: Adaptation Committee - Least Developed Countries Expert Group.

AC-LEG, 2021. *Methodologies for reviewing the adequacy and effectiveness of adaptation and support,* s.l.: Adaptation Committee - Least Developed Countries Expert Group.

GEF, 2014. *Guidance Document: Monitoring and Evaluation in the LDCF/SCCF,* Washington DC, USA: Global Environment Facility Independent Evaluation Office.

IIED, 2016. *Reviewing the Adequacy and Effectiveness of Adaptation and Support,* s.l.: IIED.

IPCC, 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability,* Cambridge, UK and New York, NY, USA,: Cambridge University Press.

Kato, T. & Ellis, J., 2016. *Communicating Progress in National and Global Adaptation to Climate Change,* Paris, France: OECD/IEA.

Leiter, T., 2021. Do governments track the implementation of national climate change adaptation plans? An evidence-based global stocktake of monitoring and evaluation systems. *Environmental Science & Policy,* Volume 125, pp. 179-188.

UNFCCC, 1999. *Guidelines for the Preparation of National Communications by Parties,* s.l.: UNFCCC.

UNFCCC, 2002. *Resource Guide for Preparing the National Communication of Non-Annex I Parties,* s.l.: UNFCCC.

UNFCCC, 2015. *Paris Agreement,* s.l.: s.n.

UNFCCC, 2021. *National Adaptation Plans 2021 Progress in the Formulation and Implementation of NAPs,* Bonn, Germany: United Nations Climate Change.

ANNEX 1. List of country reports referred to in the paper

Sr. No.	NAPs	Sr. No.	ADCOMMs
1	Albania	1	Angola
2	Armenia	2	Antigua and Barbuda
3	Brazil	3	Australia
4	Burkina Faso	4	Austria
5	Cabo Verde	5	Brazil
6	Cambodia	6	Canada
7	Chad	7	China
8	Democratic Republic of Congo	8	Dominica
9	Ethiopia	9	Eswatini
10	Fiji	10	European Union
11	Grenada	11	Ghana
12	Kenya	12	Indonesia
13	Kiribati	13	Italy
14	Kuwait	14	Jamaica
15	Liberia	15	Japan
16	Nepal	16	Kenya
17	Saint Lucia	17	Lebanon
18	Saint Vincent and the Grenadines	18	Liberia
19	Sierra Leone	19	Marshall Islands
20	South Africa	20	Mauritius
21	South Sudan	21	Namibia
22	Sri Lanka	22	Nepal
23	State of Palestine	23	Netherlands
24	Sudan	24	New Zealand
25	Suriname	25	Nigeria
26	Timor-Leste	26	Norway
27	Tonga	27	Portugal
		28	Rwanda
		29	Singapore
		30	South Africa
		31	Sudan
		32	Sweden
		33	Timor-Leste
		34	UK and Northern Ireland
		35	Zimbabwe