THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

Disccusion Paper

A Transformative Global Goal on Adaptation: Scope, Science and Policy

Suruchi Bhadwal, Manish Kumar Shrivastava, Ronnie Abolafia-Rosenzweig
Christine A. Shields, and Mari R. Tye

Contributors

Ms Suruchi Bhadwal, Senior Fellow & Programme Director, TERI

Mr Manish Kumar Shrivastava, Senior Fellow & Associate Director, TERI

Mr Ronnie Abolafia-Rosenzweig, https://www.linkedin.com/in/ronnie-abolafia-rosenzweig-phd/

Mr Christine A. Shields, https://www.linkedin.com/in/christine-shields-69a4175/

Mr Mari R. Tye, https://www.linkedin.com/in/maritye

Suggested Citation

Bhadwal, S., Shrivastava, M.K., Abolafia-Rosenzweig, R., Shields, C.A., and Tye, M.R. (2024), *A Transformative Global Goal on Adaptation: Scope, Science, and Policy*. Discussion Paper. The Energy and Resources Institute, New Delhi. pp. 16.

Published By

The Energy and Resources Institute (TERI)

Darbari Seth Block, IHC Complex, Lodhi Road,

New Delhi - 110 003

CONTENTS

ADAPTATION IS NOT OPTIONAL

It is unequivocal that: human influence has warmed the atmosphere, ocean, and land; this warming is already affecting many weather and climate extremes in every region across the globe; current surface warming reaching at least 1.1°C; and most of this warming has occurred since 1975. Robust and diverse adaptation is required to reduce risks associated with more frequent and severe extreme events that are exacerbated by warming, such as droughts, heatwaves, floods, and tropical cyclones. It is now very clear that adaptation needs an equal emphasis in any plan being discussed for climate action given that the world is already locked into a certain degree of climate change, scales of which would be dependent on how effective we are in curtailing the overall emissions of greenhouse gases and in adhering to Article 2 of the Paris Agreement that clearly states the need to limit temperature increases to well below the 2 degrees Celsius, with all efforts to contain it at 1.5 degrees.

The year 2023 was reported to be around 1.44 degrees Celsius warmer than the period of 1880 to 1920. The warming has continued to increase over decades and years with 2023 being highlighted as one of the warmest years since 1880.[1] The impacts have been well evident spread across different regions and sectors affecting both natural and human systems.

Since the Paris Agreement, the emission reduction commitments through NDCs have shown progress yet in aggregate they fall short of keeping global warming below the 2 degrees mark. The Climate Action Tracker (CAT) indicates that the projected warming by 2100 to nearly 3 degrees Celsius can only be brought down to 2.5 degrees centigrade with the current level of policies and actions proposed. (Figure 1).

In the meanwhile, the impacts are evident. There are already observed changes in the climate that are being experienced by countries for which many are not prepared. Systems are not able to adjust to the rate at which changes are happening. Both natural and human systems are affected. In certain cases, development deficit adds to the challenges and contributes to limits in adaptation exceeding and adaptation deficit. Most adaptation is the form of plans that have been developed and need to be implemented. The adequacy and effectiveness are still not well understood.

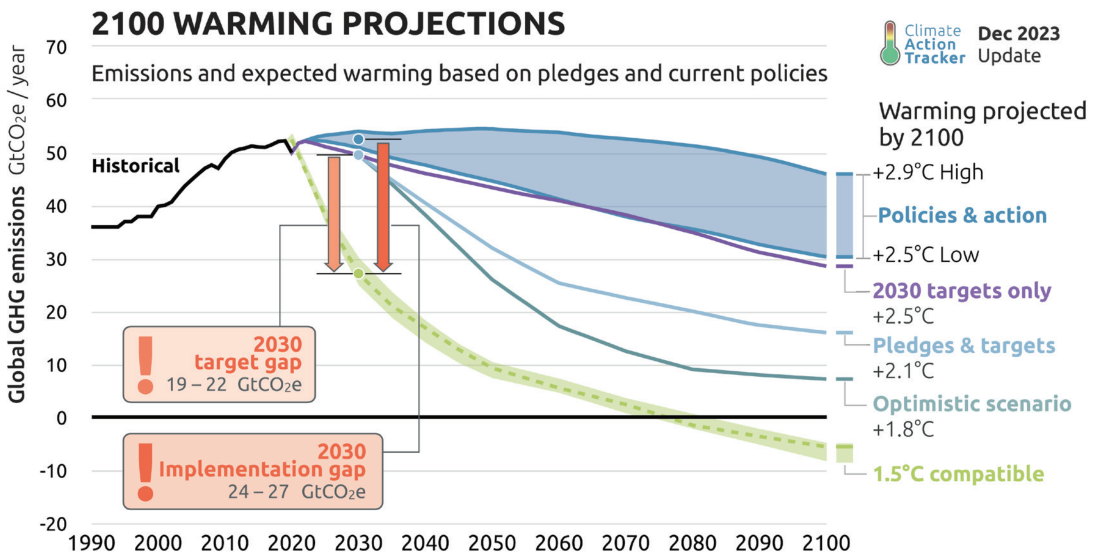

Figure 1: Global ambition for compliance with the Paris Agreement; Source: Climate Action Tracker

[1] https://www.co$_2$.earth/global-warming-update

The need to focus on adaptation, particularly in the next few decades, in defining any long-term climate action is urgent. The pivotal issue of climate equity and justice is the vulnerability of those countries and communities that have contributed the least in creating these risks but are if not equally exposed and have little scope and capacity to address the causes of climate change with limited resources and capabilities to adapt to the consequences of climate change. While Mitigation still needs to be emphasised the current policy goals fall short of the requirements outlined in the Paris Agreement, the focus on Adaptation is urgently needed.

The Establishment of a Global Goal on Adaptation (GGA) through Article 7.1 of the Paris Agreement in 2015 marked both recognition of the importance of adaptation and its inclusion in the global climate governance by giving adaptation its due structural and procedural space within the UNFCCC process. The GGA aims to establish a clear framework and specific targets to guide global adaptation efforts boosting support for adaptation in developing countries. At COP26, in 2021 the Glasgow-Sharm el-Sheikh work program (GlaSS) on Global Goal on Adaptation was established to develop a framework by COP28 in 2023[2]. In the process, disagreements between developed and developing countries, particularly on financing of adaptation in vulnerable countries, led to the establishment of a new initiative, the UAE-Belém work program at COP28 to address these gaps by COP30 in 2025. While there has been some progress on the content and structure of the GGA, there are still issues to be resolved. This paper looks at the progress on the GGA from a perspective balancing the scientific imperatives and policy priorities, particularly of developing countries and suggest an action agenda that may be incorporated in the global governance of GGA.

THE SCIENTIFIC BASIS

The 6th Assessment Report of the IPCC (AR6)[3] notes that there are many types of risks the world faces due to climate change. The climate induced risks result from the simultaneous presence of climate-related hazards, exposure, and vulnerability of affected human and ecological systems. The IPCC AR6 WG2 report highlights the nature in which the impacts of climate change impinge upon a range of sectors and cross-cutting areas which span from agriculture, water, health, energy, infrastructure to issues of migration, gender, conflicts, planetary and humanitarian context.

While some of these risks are known and have a high degree of certainty of occurrence there are many that are still not well documented and have a large uncertainty surrounding their occurrence. The confidence levels in the occurrence of the various incidences and its scales also vary. Over time the scientific understanding of the risks has improved. The figure 2 below indicates how over time the science has progressed in enhancing its understanding of the climate system over the years. It has contributed to reducing uncertainty and increasing the confidence levels with which projections are being made and discussed. Both positive and negative feedback loops are included apart from the

2 Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its third session, held in Glasgow from 31 October to 13 November 2021. Addendum Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its third session. https://unfccc.int/documents/460952

3 IPCC_AR6_WGII_SummaryForPolicymakers.pdf

shared socioeconomic pathways that define the various scenarios. Besides the number of models have increased and CMIP6 and CMIP5 outputs are being used and analysed for the purpose.

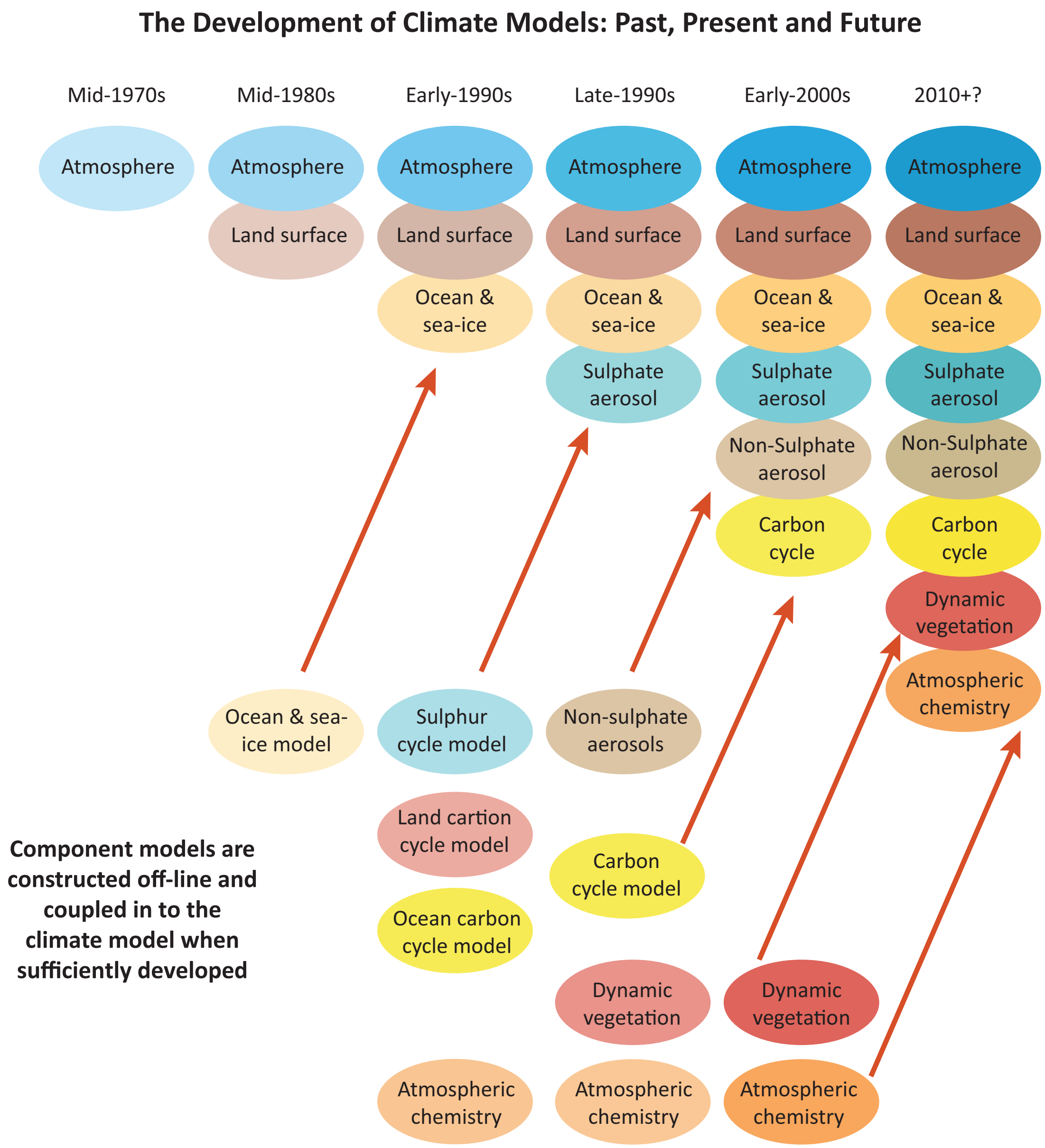

Figure 2: Advancement of climate models over time; Source: https://www.giss.nasa.gov

The science now dictates that the evidence on climate change is unequivocal in nature which has further led to a growing concern globally. Evidence of climate change in the form of observed impacts has been increasing with time. This includes impacts in the form of rising temperatures, loss of glaciers and ice mass, rising sea levels and changes in rainfall and extremes. Delays in action shall pose a huge threat to the planet and humanity as a whole. The nature of these impacts is well evident with impacts on ecosystems including coral reefs, water and food resources, human health, infrastructure posing challenges to mankind.

The nature of these impacts vary by region and country based on factors such as geography, socioeconomic conditions that define capacities of countries to respond. The adaptive capacities determined by parameters of education, wealth, incomes, access to technology, information, services including access to basic resources, financial support, self-organisation etc., that helps determine how well a particular region/ society is structured in responding to the risks of climate change. The Intergovernmental Panel on Climate Change (IPCC) highlights that approximately 3.3 to 3.6 billion people live in areas highly vulnerable to climate impacts. The ND-GAIN Index, which shows the level of vulnerability of countries to climate shocks, clearly indicates that developing and least developed countries are significantly more vulnerable than developed countries. Key drivers of heightened vulnerability are resource constraints, political instability and high exposure to climate risks (Chen et al., 2015). Clearly, countries facing challenges of development are at particular risk. Their limited abilities to respond effectively on account of lack of access to technology, mechanisms for information sharing, capacity to comprehend complex scientific information, etc. also exacerbate conditions of social inequities and injustice. These regions include sub-Saharan Africa, S Asia, the SIDs, Central and South America attributed largely to factors of poverty, conflict and inadequate infrastructure.

ADAPTATION IN THE MULTILATERAL PROCESS

Since impacts are felt in regions and on countries, adaptation has always been understood and dealt with locally at the country scales. Assessments have always been carried out and reported by countries in their national communication processes to the UNFCCC over time. These communications initially focused on the understanding of the risks faced by countries across different sectors and geographies. About a decade and half back countries started formulating policies, legislation, climate action plans which included components on adaptation and defined broad strategies to help address core areas of concern. However, countries while had these plans developed lacked the means of implementation. Also, many of these plans lacked scientific clarity in their choices and design, reflecting insufficient understanding of the risks and the additionality context. These plans are now being revisited and better structured strategies for implementation have begun to emerge. There are examples of national, sub-national and city level plans that have been developed. There are many platforms for engagement of stakeholders/ actors that are now created that allow for and learnings and sharing of experiences.

At the international level, the Paris agreement, and the Sustainable Development Goals (SDGs) have strong synergies to strengthen the case for adaptation. The Paris agreement discusses the need to adapt to the adverse impacts of climate change and foster climate resilience. The GGA was hence established under its purview in 2015. The SDGs outline 17 goals many of which are critical for enhancing adaptive capacity. The Sendai Framework for Disaster Risk Reduction (SFDRR), the Convention on Biodiversity (CBD), and the UN Convention to Combat Desertification (UNCCD) are other multilateral platforms with significant synergies with the imperatives of the GGA.

THE EMERGING TWO-LEVEL GGA GOVERNANCE

The Paris Agreement envisioned the GGA as an instrument of enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change to ensure an adequate adaptation response commensurate with the temperature goals outlined in Article 2. Substantive work on the GGA however began only in COP26 the GlaSS Work Programme on GGA was adopted. A two-level governance approach for the GGA has emerged. The first level follows a country-driven approach to substantive adaptation interventions focused on national-level processes, whereas the second level is structured around the Global Stocktake (GST) process of the scientific and policy aspects of progress on adaptation.[4]

At the national level the key aspects considered are adaptation planning and implementation through National Adaptation Plans (NAPs), Nationally Determined Contributions (NDCs), and adaptation communications. Integral to it is establishing robust systems for monitoring and evaluating adaptation progress at the national level, and eventually improving communication of adaptation priorities, actions, and support needs. The global level considerations include bringing within the scope of GST to review progress and avoid redundancy in communication, improve understanding of adaptation goals, including methodologies, indicators, and the support needed to assess progress, and overall strengthen adaptation efforts in vulnerable developing countries.

Continuing the two-year work of the GlaSS work programme, the COP28 established another two-year negotiation track, the UAE Framework for Global Climate Resilience to elaborate further on the implementation architecture for GGA.[5] The UAE framework has identified eight thematic focus areas to enhance adaptation through NAPs. Each of these thematic areas are required to be implemented within a framework of four-dimensional targets for climate adaptation and resilience (See Fig. 3) defined over a period up to 2030. It is proposed that the thematic and dimensional targets are to be implemented in an iterative manner at the country level. To complement, a two-year UAE-Belém work program to develop indicators for tracking progress toward these targets has also been established.[6]

---

4 Glasgow–Sharm el-Sheikh work programme on the global goal on adaptation referred to in decision 7/CMA.3. Revised draft decision -/CMA.4. https://unfccc.int/documents/624436

5 Glasgow–Sharm el-Sheikh work programme on the global goal on adaptation referred to in decision 7/CMA.3. https://unfccc.int/sites/default/files/resource/cma5_auv_8a_gga.pdf

6 Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fifth session, held in the United Arab Emirates from 30 November to 13 December 2023. Addendum. Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its fifth session, 15 Mar 2024. https://unfccc.int/documents/637073

Figure 3: The Implementation Framework of the GGA

The seven thematic targets under the UAE framework include:

- *Water Security*: Reduced climate-induced water scarcity, enhanced resilience to water hazards, climate-resilient access to safe, affordable potable water, etc.
- *Food Security*: Achieving climate-resilient agricultural production, food supply; equitable access to sufficient food and nutrition; sustainable and regenerative practices.
- *Health Resilience*: Reduced climate-induced morbidity and mortality, Enhanced access to health services.
- *Ecosystem Protection*: Ecosystem-based adaptation and nature-based solutions for restoration, conservation, and protection of diverse ecosystems; Minimize climate impacts on ecosystems and biodiversity.
- *Infrastructure Resilience*: Ensure continuous essential services, reduce climate-related disruptions, enhanced resilience of infrastructure and human settlements
- *Livelihood Protection*: Reduce climate impacts on poverty eradication and livelihoods, promote adaptive social protection measures.
- *Cultural Heritage*: Safeguard cultural heritage from climate risks, incorporate traditional and Indigenous knowledge to preserve cultural practices and heritage sites.

The four-dimensional targets of the iterative adaptation cycle of the UAE Framework include:

- *Impact, vulnerability and risk assessment*: By 2027, all countries should have multi-hazard early warning systems and climate information services in place. By 2030, all countries complete up-to-date assessments of climate hazards, impacts, risks, and vulnerabilities to inform their national adaptation plans and policies.
- *Planning*: By 2030, all countries have in place country-driven, gender-responsive, and transparent national adaptation plans and strategies that integrate ecosystems, sectors, and vulnerable communities; mainstreamed into all relevant national strategies.
- *Implementation*: By 2030, all countries should show progress in implementing their national adaptation plans, resulting in reduced social and economic impacts from key climate hazards identified in earlier assessments.
- *Monitoring, evaluation and learning (MEL)*: By 2030, countries should have developed and operationalized systems for MEL to track national adaptation progress, with the necessary institutional capacity in place to support these systems.

Overall, the UAE Framework and the UAE-Belém work program are supposed to guide the achievement of the GGA and assess overall progress, with the aim of reducing the growing adverse impacts, risks, and vulnerabilities of climate change, while also enhancing adaptation efforts and support. The ongoing discussions under the subsidiary bodies, SBI and SBSTA, stresses on the need of incorporating adaptation into relevant national socioeconomic and environmental policies through approaches that are country-driven, gender-responsive, inclusive, and fully transparent. Ensuring respect for human rights, intergeneration equity and social justice is also the responsibility of individual developing countries. To further delineate on these aspects, enhanced and inclusive technical expert participation in the UAE-Belém work programme is the next step.

BLIND SPOTS IN THE GGA DISCOURSE

Notwithstanding the urgency of action and push for adaptation within the UNFCCC process, it was foretold that the GGA will prove a challenging task to define and operationalize. Given that the climate risks and adaptation measures are highly context-specific, it difficult to define the global targets on adaptation that can be applied uniformly. However, it seems that in order to navigate the complexities, the GGA negotiations have been restrictive in defining its scope and have built on the very narrative of adaptation that kept it on the margins of the UNFCCC process. The emerging two-level governance of GGA is aimed at creating complementary systems of generating information to track progress on adaptation related actions. Effectively, it considers national adaptation goals as a global concern and tracking progress of these goals as part of the Enhanced Transparency Framework as a proxy for 'global goal'. In a way, it only refines the processes that have already been in place and being followed at the national level through the overlapping reporting requirements of the National Communications, Biennial Update Reports, and Biennial Transparency Reports which also include adaptation strategies and implementation.

Without undermining the importance and unavoidability of the nation centric approach to adaptation in the emerging two-level governance of GGA, it is critical to be aware of the critical global aspects of enhancing adaptative capacities and resilience that have not received due attention. While the emerging structure has aimed to be holistic in what needs to be done by countries/ regions in addressing the challenges of climate change, it fails to capture the global context for adaptation. There is a need to think one level above on how should the global elements of adaptive capacity building be structured and what are the looming issues that might emerge due to climate risks at a global scale? To illustrate, a few aspects are discussed below:

a. Full and Agreed Cost of Adaptation

It is important to recall that while proposing the need for a GGA in 2013, the African Group of Negotiators had argued for 'a quantified' GGA directly linked with global cost of adaptation supported to be covered by the developed country Parties[7]. A categorical responsibility of developed countries in the implementation of GGA is essential for the "full and effective implementation" of the Article 4.4 of the UNFCCC. The GST centric global governance reduces the responsibility of developed countries to participating in the review process of actions by developing countries, which itself has been subject to serious objections on account of equity considerations. While the GGA framework is beginning to take shape with broad targets such as risk assessments, adaptation planning, and implementation, it lacks specific, measurable indicators and a clear global level strategy for mobilizing the necessary finance for adaptation actions. Owing to non-clarity in its structure the GGA leaves the critical issue of finance for implementation of climate action vague. This also emerges from the complexity that countries have in clearly defining the additionality component for implementation of adaptation actions to address climate risks. As a result, the centrality of the principle of common but differentiated responsibilities and provisioning of finance has been pushed to the margins.

b. Scientific capacity of developing and least developed countries

Without accurate scientific data and assessments feeding into local climate impacts, vulnerabilities, and risk assessments countries will not be able to prepare suitable NAPs. It is not without a reason that despite the process to develop NAPs beginning in 2010 and 170 countries reporting adaptation strategies at national or city level (IPCC, 2023), less than 50 countries have submitted their NAPs to the UNFCCC. The GlaSS Work Programme outcome identified improvement in methodologies and indicators whereas the UAE Framework requires the countries to have multi-hazard early warning systems and climate information services in place by 2027. In the absence of robust scientific data generation, management, and analysis capacities such goals are more likely to be unmet for a long time. There is also a risk of many instances of maladaptive choices emerging from these gaps. Many countries, particularly those with limited resources, may lack the necessary scientific expertise, technical capacity and data to develop robust adaptation strategies, which can impact tracking of targets and progress. One must recognize that these gaps may not be filled at country level within a couple of years or even decades.

c. Global embeddedness of national adaptive capacities

The need for adaptation goals setting arises due to combination of exposure, vulnerabilities, adaptative capacities, hazard occurrence and resulting risks. Each of these factors have different values at different scales of decision making (governance): Local, National, Regional, and Global. It is

---

7 https://africanclimatewire.org/2023/12/what-happened-with-the-global-goal-on-adaptation-at-cop28/

possible that adaptation governance responses at one scale are not suitable for adaptation needs at another scale. It would make it difficult to rely on the type of aggregation that is suggested by the GST based tracking to assess progress on global adaptation in a meaningful and comprehensive manner. A global goal on adaptation therefore needs to be such that it addresses vulnerabilities, exposures and adaptive capacities that operate through or deeply embedded in global institutional and economic structures. Such a goal also needs to play a facilitative role for enhancing adaptive capacity building and vulnerability reduction at lower scales of decision making.

d. Global Adaptation Priorities

The eight thematic focus areas identified by the UAE Framework represent the possible spread of risks emanating from different sectoral aspects, including culture. However, adaptation priorities of countries are likely to vary for nations due to the diversity of demography, geography, economic structure, level of development, and culture across countries. These priorities may vary across sectoral and temporal scales. A global goal on adaptation therefore also needs to focus on common elements underlying diverse country priorities.

TOWARDS A TRANSFORMATIVE GGA

From a scientific perspective, the scope of the GGA is expansive and necessarily builds on synthesis of a wide range of information including the potential geographical distribution of climatic hazards, exposure of human and ecological systems to those hazards, assessment of the vulnerabilities and resulting risks, and how various adaptation efforts affect the distribution of exposure and vulnerabilities, and the second-order risks thereof. From the policy perspective, the scope could include building a globally coordinated effort to apply the scientific assessments of global distribution of climate induced risks and facilitate interventions at various scales that minimize the climate induced risks by building and maintaining adaptive capacities and resilience of the vulnerable societies. There is a need for re-framing the Global Goal on Adaptation that seeks to address larger global challenges that might emerge due to climate change. For a robust GGA that is truly fit to serve the purpose of assisting countries in meeting larger adaptation objectives we propose that three aspects and their inter-relations matter the most- aspects related to scientific capacity, commensurate financial architecture, and scale of intervention.

Science matters

Effective adaptation responses, policy, and governance requires comprehensive grounding in observationally-informed scientific assessments of risks associated with climate change and a clear communication of these risks and climate vulnerability. Integrated response measures at local to national to global scales that leverage reliable hydroclimate risk data are needed to enable populations to address the risks that are being exacerbated by climate change. However, important gaps exist which motivate research developments to more comprehensively monitor and predict climate extremes, evaluate adaptation success, and ultimately provide a means to reactively and proactively develop management and policy decisions that reduce vulnerability.

Contemporarily available scientific knowledge and data are not robust enough to monitor and predict the full range of global risks related to climate change at actionable lead times and spatial scales, or to develop and assess appropriate and robust adaptation strategies. For example, many regions that are vulnerable to climate change have sparse observational networks and lack regionally-calibrated Earth-system model simulations that are invaluable for monitoring climate, weather, and hydrologic conditions (Singh et al., 2018). The range of different time and spatial scales across different climate extremes important for defining risk include (but are not limited to) phenomena such as flash drought, long term drought, heatwaves (days to weeks to months), extreme storms, flooding, and even the oscillation between dry and wet extreme conditions called "weather whiplash." There is overlap between the most vulnerable nations and those nations with insufficient hydrometeorological observation stations and computational resources, which are needed to generate sophisticated model simulations valuable for monitoring and predicting extreme weather and climate events (Birkmann et al., 2022; Kidd et al., 2017; Lennard et al., 2018). A research agenda that addresses these gaps requires more dense ground-based meteorological and land surface (e.g., soil moisture, vegetation, snow, and streamflow) observational networks in vulnerable regions. Ground-based observations are necessary to:

- quantify baseline conditions from which changes can be calculated, and relative to which extremes can be evaluated,
- Characterize how climate has changed over a specific region relative to the historical climate of that region;
- establish a reliable observational record of extreme events;
- train and calibrate climate, weather, and hydrologic models; and
- validate the accuracy of satellite observations and the performance of model data products, informing the question, "Are the models fit for purpose"?

Ground-based observational networks that provide highly accurate measurements at specific locations, and Earth-observing satellites and models, are commonly used (often in synergy, e.g., with data assimilation) to provide a more complete estimate of the environmental conditions without gaps in space or time. However, the accuracy and reliability of models and satellites often relies on ground-based observations for calibration, training, and validation. For example, machine learning models require accurate measurements of environmental conditions and potential climate change consequences to derive useful formulas that relate climate change to consequences (e.g., loss and damage), and physically-based models (e.g., models that simulate real-world processes using fundamental physical principles) require parameter tuning and calibration that can be supported by observational networks. Furthermore, quantifying the accuracy of models, and in-turn a model's reliability, requires a representation of "true" environmental conditions against which relative uncertainties can be calculated. Therefore, observations that are deployed across diverse regions with varying climates, elevations, and ecosystems can provide high utility to the development and validation of globally applicable climate and weather monitoring tools, namely models and satellites. Particular attention should be paid to validation in areas that are underserved by ground-based observational networks.

Earth-observing satellites are a valuable data source in regions that lack ground-based observational networks by providing snapshots of environmental conditions globally; however, satellite observations are often infrequent with multiple days between consecutive satellite observations of the same areal) and coarse (>10-km^2 observational footprint) and require models to fill gaps to provide continuous estimates of conditions at actionable spatial scales. Furthermore, models provide predictive capabilities and often relatively more relevant variables than satellite observations. However, sophisticated models are often computationally expensive and require extensive resources (e.g., high-performance computing), together with reliable power sources, to generate simulations and store the large data outputs (Prein et al., 2015). Therefore running sophisticated models over some climate-vulnerable regions requires enhancing computing capabilities in those regions and motivates advancements in computationally-efficient modelling techniques (e.g., machine learning), or requires extensive collaborations with other research communities.

Beyond resource limitations, there are currently also scientific limitations that motivate future research. Particularly, model predictions and corresponding early warning of natural hazards is a valuable climate adaptation tool that has significant room for model improvement at long-lead times (e.g., 3-weeks - 2 months for subseasonal to seasonal forecasting). Therefore, adaptation strategies designed to proactively manage risks can benefit from prioritizing enhancing models to be able to more reliably predict extreme events at subseasonal to seasonal (3-weeks – 3-months) lead times and project long-term (multiple decades) hydroclimate trends at actionable spatial resolutions. For example, subseasonal-to-seasonal model predictions can benefit from a focus on improving process-level model representations of the environment informed by observations of corresponding processes (for example, land-atmosphere interactions, snow and ice physics, etc.) (Coelho et al., 2019; Robertson et al., 2015; Dirmeyer et al., 2019). Furthermore, climate extremes interact across multiple scales in space and time (e.g., global, regional, local, daily, seasonal, annual, multidecadal). Because global-scale climate change has heterogeneous local impacts, understanding complex impacts and interactions of climate change using the global-to-local-to-global paradigm can benefit early warning systems (Baldos et al., 2023; where global-scale systems impact local communities and ecosystems, and local communities and ecosystems also have impacts and feedbacks to global systems). For example, global scale climate change can increase the risk of fire activity at local and regional scales, while local-to-regional scale fires can feedback to the global climate system through vast smoke plumes that affect air quality and other responses (e.g., ocean cooling) in regions remote from the fire(Van Oldenborgh et al., 2021; Fasullo et al., 2023).

There is also a need to continually link weather and climate data that has been enhanced by collaborations between scientists, model developers, early warning system coordinators, and early warning system end users, to strategic information dissemination and decision making (Taylor et al., 2018; Golding et al., 2019). It is also essential to acknowledge the inseparability of diverse sectors (e.g., water, food, infrastructure, health). For example, hydrologic extremes (droughts and floods) cause cascading impacts on water security, food security, and ecosystem health, each with profound health consequences, and all requiring infrastructural developments for impact mitigation and resilience creation. For instance, new infrastructure designs need to include flexibility for the changing and evolving risks from extreme weather events and population growth to continue to function as anticipated for the full design and operation life of the infrastructure.

Most existing infrastructure was designed under an assumption of a stationary climate to withstand the effects of low probability extreme weather events. As those events happen with greater frequency and intensity, the likelihood of catastrophic failure increases (e.g. bridge collapse after inundation, loss of power, loss of sanitation networks and clean water supply) with compounding effects. Investing in new, or upgrading existing, infrastructure to withstand extreme weather events is insufficient without also accommodating the evolving risks from these extremes over the design and operable life. There is a considerable need for collaboration across financing organizations, civil engineering institutions, urban planners, and climate scientists to ensure that design codes and standards are fit and adapted to the future climate. This is a burgeoning research area that will continue to grow in importance as countries seek to adapt their infrastructure to be climate resilient. Such changes in design codes and standards may also serve as useful indicators towards adaptation progress that can be monitored and evaluated from a robust, quantitative, scientific basis using climate modeling tools.

Finally, evaluating progress on adaptation needs to address uncertainties pertaining to measuring the impacts—benefits and unintended consequences—of adaptation strategies at local levels, acknowledging that initiatives embedded in the context of one community can produce different outcomes in another (Owen, 2020). Routine evaluation into adaptation processes with a systems approach requires establishing useful and diverse metrics and indicators that represent the large range of impacts and goals of adaptation strategies. Further research in this area can benefit from developing, enhancing, and evaluating methodologies designed to untangle the effect of one development initiative from other influencing factors and developing adaptation evaluation strategies that acknowledge that climate change operates on timescales of multiple years to centuries.

Finance matters

The ultimate objective of the GGA is to enhance adaptation action, including adaptive capacity building in the vulnerable countries. Developing countries have for long maintained that development is a precondition for adaptation. The underlying logic is that with development comes greater capability to adapt as well as reduction in vulnerability. The discussion on adaptation finance, however, tends to focus on estimating costs of implementing adaptation interventions identified broadly as sectoral projects. The global estimates of over $1.1 trillion to meet the adaptation needs is a result of project costing exercises. Such estimates miss the point that risks are embedded in systems and adaptation will require systemic modifications and transformation. Individual projects do not guarantee systemic resilience as their design, scope and scale are determined by the available data, knowledge, and its accuracy, which still needs substantial improvement. Moreover, these estimates are likely to be on a lower side as the risks have not been adequately quantified. The question of adaptation finance, therefore, has to look beyond project financing.

Stability and prosperity of economy is critical for continued development. Last few decades have witnessed multiple global economic shocks that have affected the economic progress of many countries. More globally integrated an economy is, more vulnerable it is to such economic crisis. While deglobalization is not an option, resilience of global economy in general, and of vulnerable economies in particular against global economic crisis originating in one country or region is also an integral aspect of global goal on adaptation. While the mitigation agenda is pushing for transforming economies to a low-carbon economic system, the adaptation and resilience agenda warrants that this new economic system should also be robust, stable and favourable to countries vulnerable to climate change.

A building block of a adaptation friendly global economic system is the global financial system. The reform of global financial system to promote decarbonization emerged as a key priority area from the G20 process, particularly under the Indian presidency. It is important for the GGA to also develop a dedicated negotiation track to understand whether the existing global financial architecture adds to the vulnerability of many developing and least developed countries. It is very likely that the poor credit ratings as well as volatility of financial markets is impeding development in general, and investment in adaptation projects in particular in the vulnerable countries. The low adaptive capacities, including lack of scientific data and research in these countries, then is attributable to the governance of global financial system.

Scale matters

Vulnerability of a community or country is extremely complex. It exists at the intersection of multiple social, economic, ecological, and political drivers at different scales. Adaptation too therefore has to be commensurate with these inter-sections across scales. Such intersectionality is more relevant to some of the thematic areas and dimensional aspects identified under the UAE Framework above.

An example of global scale intersectionality in adaptation is the thematic area of food security. Global food security includes climate and non-climatic impacts on global food production and availability to feed the world. While the scientific research helps in dealing with climate induced food security challenges, its interaction with determinants of global trade and prices makes it even more complex. A great deal of adaptive capacity is determined by these non-climatic factors which are subject of regional and global governance. In fact, the questions of equity and CBDR are deeply embedded in the challenges faced by vulnerable countries in accessing food at affordable prices from the global market. It is important to understand how resilience of food production systems in different countries, including developed countries, adds up to global food security, particularly in the event of simultaneous climate shocks to foods systems of multiple countries. In addition, the GGA should focus on larger issues of maintaining the gene pool and protection and conservation of various species which are vulnerable to climate risks. Another example is that of global health security. While impacts of health hazards are felt locally, they may have global triggers. Some of these relate to the timely availability of affordable medicines, effective emergency response systems, and development of drugs needed by poor populations. Creating a facilitative R&D capacity in vulnerable countries, including a favourable IPR regime, therefore is integral to global goal on adaptation.

One has to be mindful of the fact that many of the areas that require interventions at different scales may not be governed by the UNFCCC process. In fact, there already exist global institutions, treaties, and multilateral agreements dealing with the issues related to thematic focus. However, a recognition under the GGA process that a smooth coordination among these diverse global governance mechanisms is necessary to fulfil the ultimate objectives of the GGA is important. The GGA should become a meeting point for a vulnerable country friendly global governance mechanism, encouraging each of them to integrate adaption in their mandates in a similar fashion as the UNFCCC has done with the International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO) for mitigation.

CONCLUSION

The establishment of GGA fills a much needed, and urgent, gap in global climate policy by placing adaptation at equal footing to mitigation, if not at the centre stage. From a developing country perspective, it is extremely significant platform of negotiation. While the agenda of GGA has made slow progress, the direction it has taken builds on aggregating national adaptation goals and strategies. In this paper, we have tried to illustrate the limitations of such an approach even though it is important in its own right. The emerging governance of GGA falls short of doing justice to the complexities involved in building adaptive capacity and climate resilience for vulnerable communities at global scale. By ignoring the embeddedness of poor adaptive capacities in the global economic systems as well as limited capacities of countries to generate necessary scientific data, manage and analysis it, the emerging governance structure of GGA leaves much to be desired. This paper proposes to initiate a discussion to rethink about and expand the scope of GGA at least on three accounts: need for robust scientific capabilities, an adaptation friendly global financial system, and scale of various adaptation thematic areas in terms of their global linkages.

REFERENCES

Birkmann, J., E. et al., 2022: Poverty, Livelihoods and Sustainable Development. 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. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1171–1274, doi:10.1017/9781009325844.010.

Chen, Chen & Noble, Ian & Hellmann, Jessica & Coffee, J. & Murillo, M. & Chawla, Nitesh. (2015). University of Notre Dame Global Adaptation Index Country Index Technical Report

Coelho, C.A.S., Brown, B., Wilson, L., Mittermaier, M., Casati, B., 2019. Forecast Verification for S2S Timescales, in: Sub-Seasonal to Seasonal Prediction. Elsevier, pp. 337–361. https://doi.org/10.1016/B978-0-12-811714-9.00016-4

Dirmeyer, P.A., Gentine, P., Ek, M.B., Balsamo, G., 2019. Land Surface Processes Relevant to Sub-seasonal to Seasonal (S2S) Prediction, in: Sub-Seasonal to Seasonal Prediction. Elsevier, pp. 165–181. https://doi.org/10.1016/B978-0-12-811714-9.00008-5

Fasullo et al., A multiyear tropical Pacific cooling response to recent Australian wildfires in CESM2. Sci. Adv.9, eadg1213(2023). DOI:10.1126/sciadv.adg1213

Golding, B., Ebert, E., Mittermaier, M., Scolobig, A., Panchuk, S., Ross, C., & Johnston, D., 2019: A value chain approach to optimising early warning systems. Contributing paper to GAR2019. UNDRR, www. preventionweb. net/publications/view/65828.

IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001

Kidd, C., A. Becker, G. J. Huffman, C. L. Muller, P. Joe, G. Skofronick-Jackson, and D. B. Kirschbaum, 2017: So, How Much of the Earth's Surface Is Covered by Rain Gauges?. Bull. Amer. Meteor. Soc., 98, 69–78, https://doi.org/10.1175/BAMS-D-14-00283.1.

Lennard, C. J., Nikulin, G., Dosio, A., & Moufouma-Okia, W., 2018: On the need for regional climate information over Africa under varying levels of global warming. Environmental Research Letters, 13(6), 060401.

Owen, G., 2020: What makes climate change adaptation effective? A systematic review of the literature. Global Environmental Change, 62, 102071.

Prein, A.F., Langhans, W., Fosser, G., Ferrone, A., Ban, N., Goergen, K., Keller, M., Tölle, M., Gutjahr, O., Feser, F., Brisson, E., Kollet, S., Schmidli, J., Lipzig, N.P.M., Leung, R., 2015. A review on regional convection permitting climate modeling: Demonstrations, prospects, and challenges. Rev. Geophys. 53, 323–361. https://doi.org/10.1002/2014RG000475

Robertson, Andrew W., et al. "Improving and promoting subseasonal to seasonal prediction." Bulletin of the American Meteorological Society 96.3 (2015): ES49-ES53.

Singh, C., Daron, J., Bazaz, A., Ziervogel, G., Spear, D., Krishnaswamy, J., Zaroug, M., Kituyi, E., 2018. The utility of weather and climate information for adaptation decision-making: current uses and future prospects in Africa and India. Climate and Development 10, 389–405. https://doi.org/10.1080/17565529.2017.1318744

Taylor, A. L., Kox, T., & Johnston, D., 2018: Communicating high impact weather: Improving warnings and decision making processes. International Journal of Disaster Risk Reduction, 30, 1-4.

Van Oldenborgh, G.J., Krikken, F., Lewis, S., Leach, N.J., Lehner, F., Saunders, K.R., Van Weele, M., Haustein, K., Li, S., Wallom, D., Sparrow, S., Arrighi, J., Singh, R.K., Van Aalst, M.K., Philip, S.Y., Vautard, R., Otto, F.E.L., 2021. Attribution of the Australian bushfire risk to anthropogenic climate change. Nat. Hazards Earth Syst. Sci. 21, 941–960. https://doi.org/10.5194/nhess-21-941-2021

Contact us

The Energy and Resources Institute
Darbari Seth Block, Core 6C,India Habitat Centre,
Lodhi Road, New Delhi - 110 003
Tel: (+91 11) 2468 2100, 7110 2100
E-mail: amlan.mishra@teri.res.in, manish.shrivastava@teri.res.in,
suruchib@teri.res.in, rr.rashmi@teri.res.in

This Paper has been prepared under a project supported by a grant from Bloomberg Philantrophies.

THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future