THE GLOBAL STOCKTAKE: AN OPPORTUNITY FOR AMBITION

Landscape Analysis of Adaptation Opportunities for Climate Ambition

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The Center for Climate and Energy Solutions (C2ES) is working closely with the Environmental Defense Fund (EDF) on a project to help shape the Paris Agreement's global stocktake (GST) process, including by ensuring a strong focus on opportunities to scale up climate ambition. We have developed three landscape analyses,[1] or surveys, of promising opportunities that could provide substantial, near-term scalable enhanced climate action and support in the context of the Paris Agreement's long-term goals.

These landscape analyses are not intended to be comprehensive, but rather provide a snapshot of key opportunities and could serve as a basis for further work. They also address the draft cross-cutting guiding questions posed by the Subsidiary Body Chairs for the Technical Assessment component of the first GST, particularly around good practices, barriers, and challenges for enhanced action in mitigation, adaptation, and climate finance.[2]

A separate paper suggests some initial considerations relevant to how the GST could best translate the vast amount of inputs it will generate into clear signals that will ultimately be of use to decision-makers in raising climate ambition and implementing existing commitments.[3]

These considerations, together with the landscape analyses, comprise an 'opportunities framework' that may be helpful in adding further structure to information gathering and technical analysis under the GST, as well as towards generating clear outputs.

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[1] "Global Stocktake: An Opportunity for Ambition," Center for Climate and Energy Solutions (C2ES), last modified February 28, 2022, https://www.c2es.org/content/global-stocktake-an-opportunity-for-ambition.
[2] See Guiding questions by the SB Chairs for the Technical Assessment component of the first Global Stocktake, paras 21–22, updated February 16, 2022, https://unfccc.int/sites/default/files/resource/Draft%20GST1_TA%20Guiding%20Questions.pdf.
[3] See *Distilling Critical Signals from the Global Stocktake* (Center for Climate and Energy Solutions, February 2022: Arlington, VA), www.c2es.org/document/distilling-critical-signals-from-the-global-stocktake.

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Landscape Analysis of Adaptation Opportunities for Climate Ambition

Introduction

The Paris Agreement, for the first time, defined a global goal on adaptation of "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 global stocktake will track collective progress toward this goal.

The GST specifies four main adaptation functions:

- recognize adaptation efforts of developing country Parties
- enhance the implementation of adaptation action taking into account adaptation communications
- review the adequacy and effectiveness of adaptation, and the support provided for adaptation
- review the overall progress made in achieving the global goal on adaptation.

The key information sources listed for the GST for adaptation:

- formal submissions from UNFCCC parties: Adaptation Communications (ACs), Biennial Transparency Reports (BTRs), National Adaptation Plans (NAPs), and Nationally Determined Contributions (NDCs)
- IPCC reports
- Marrakesh Partnership
- UN Climate Action Summit 2019, UN Climate Ambition Summit 2020, Adaptation Summit 2021
- other information sources.

In relation to adaptation and resilience, this paper surveys the landscape of emerging research, data, frameworks, initiatives, technologies, policy options, and processes, including through literature reviews, interviews, and surveys, as appropriate. This landscape analysis provides a starting point to understand the intricate and fragmented landscape of adaptation actors and actions. It brings light onto the technical aspects of adaptation, highlighting potentially transformational opportunities to scale up adaptation ambition. Please note that the financial aspect of adaptation is subject to a separate and detailed financial landscape analysis.

Part I: Executive Summary

The current level of adaptation, if analysed on a global scale, is a far cry from being at a level where the threats from climate change are adequately reduced and where people, livelihoods, and ecosystems are sufficiently protected. The scale and gravity of the many risks resulting from climate change are increasing in frequency and intensity, leaving the poorest, most vulnerable, and marginalized at the mercy of their governments and the global society at large.

Information on adaptation measures, risk parameters, barriers, and solutions on a global scale is unavailable, fragmented, and sparse, reflecting the project-based (as opposed to process-based) approach adaptation has had for years. Further work on understanding risk and risk parameters for adaptation could be linked to the ongoing discussions on indicators for adaptation, but the scientific community needs to be encouraged to gather relevant data at a global scale.

For a global analysis to be possible, necessary national information and data must be available. One way in which the global community can increase adaptation information is through national communications, such as the National Adaptation Planning (NAP) process.

There is a lack of a coherent system to organize the different adaptation-related issues, or in other words, establish a common frame for discussing adaptation (which again should be discussed with a common language, see above). This analysis has tried to rectify this by undertaking a structural analysis of the different ways some leading institutions categorize adaptation issues and then create a coherent and inclusive system for future adaptation discussions. Appendix II sets out the structural analysis and the analysis is organized accordingly.

Information on the possible effects the listed adaptation measures can have on reducing climate risk at regional and global levels is lacking. National adaptation information should highlight potential opportunities in reducing climate risk while using a common language (e.g., risk parameters, indicators).

The lack of integration of adaptation in national processes, sustainable development, and disaster risk reduction initiatives leaves these at risk of being maladaptive or increasing existing inequalities at worst, or simply ignoring transformational adaptation potential. The integration of adaptation planning processes, and in particular the NAP process, holds great potential in reducing the silo-oriented risk reduction measures, ensuring comprehensive and transformational adaptation.

The NAP process is one of the most significant tools in order to ensure greater coordination and integration of adaptation in national, sub-national, and local planning processes, across all sector and thematic areas.

Cost-effective adaptation solutions are inherent in nature itself, hereunder nature-based solutions, as exemplified in adaptation measures such as agroforestry or urban city cooling. However, a lift in technical, biological, and engineering experience is needed to ensure the full potential of nature-based solutions. In addition, understanding the importance of incentivizing the local communities living with these measures is key to ensure long-term success. All of this is not possible without the continued effort by governments across the globe. If adaptation is put firmly on the national agenda, it has the potential to reduce policy barriers across the board and strengthen cooperation and collaboration desperately needed.

Adaptation finance, although nationally driven, should aim at reaching the global levels of support agreed in Paris, and aim to protect the poorest, most vulnerable countries and communities.

Key findings – sector/thematic approach:
From a global perspective, water is a politically neglected and mismanaged issue, which is closely tied to a lack of understanding of the value of water and its importance in decision-making.

Adaptation interventions related to water and coastal areas can reinforce existing inequalities and vulnerabilities; further, they commonly redistribute climate risks to already socio-politically marginalized people.

Adaptation action, hereunder measures to prevent and reduce the risk of coastal flooding, such as nature-based solutions, is more cost effective than the more common cycle of post-disaster response.

Agroforestry is one of the adaptation options with highest potential impact for the agriculture sector. However, it is often ignored in land-use planning and development policies, fails to deliver on implementation, and falls short of ensuring long-term success.

As disaster risk reduction (DRR) increases focus on preventative measures, it is essential that they do not operate in a DRR-vacuum. Maladaptation could be the result if adaptation planning, with its principles and systems for successful processes, is side-lined. The myriad of DRR initiatives could benefit enormously from coordination and integration with existing national adaptation planning processes, such as the NAP process.

The increasing frequency and intensity of heat waves makes adaptation measures key, as they build resilience and reduce vulnerability to the risks related to extreme heat. Relevant adaptation measures include green and blue spaces, as well as green infrastructure.

Adaptation in climate risk reporting frameworks, including the framework set forth by the Taskforce on Climate-related Finacial Disclosure (TCFD), is barely present, resulting in a lost opportunity for deepening the understanding of adaptation and its potential for risk reduction, potentially leaving companies more vulnerable to climate risk than otherwise necessary.

Population growth is directly connected to the level of climate risk, hereunder the level of vulnerability and resilience. To ensure the successful adaptation planning, it is key to understand how population growth affects adaptation options for reducing vulnerability and strengthening resilience; closely connected to this is the important role women and local communities play in ensuring successful adaptation action.

Key findings – specific sectoral/thematic adaptation solutions:

- **Water (freshwater and ocean)**
    - Solution #1: Integration of adaptation planning processes with freshwater management
        - Institutional strengthening, hereunder support for integrated water resource management plans, policies, and regulation, is key to address the issue of freshwater mismanagement. Relevant local and national sectoral agencies, and in particular managers of water utilities and water resources, should receive assistance and support to enable them to integrate adaptation planning processes into their practices.
    - Solution #2: Adaptation processes for freshwater and coastal zones that reduce climate risk and vulnerability for marginalized communities
        - Marginalized and vulnerable communities should be enabled to influence the water-related planning processes, including the NAP process. In addition, structures and systems should be assessed to ensure that freshwater adaptation measures do not lock in existing inequities.
    - Solution #3: Nature-based solutions for adaptation to address coastal flooding/storm surge and erosion
        - It will be important to ensure coherence, integration, and consistency between local decisions and actions and national-level strategies and move away from silo-oriented design toward more comprehensive approaches, plans, and strategies. One significant tool to address this is the NAP process.
- **Rural environment**
    - Solution #1: Agroforestry
        - Addressing agroforestry in NAP processes and regional planning processes, and better management of projects during the implementation phase.
    - Solution #2: Integration of adaptation planning processes with Disaster Risk Reduction initiatives
        - Relevant local and national sectoral agencies should receive assistance and support to enable them to integrate adaptation planning processes into their practices before potential disasters hit.
- **Built environment**
    - Solution #1: Reduce the urban heat island effect through cooling adaptation responses

        - Decisive and coordinated action is needed to identify vulnerable populations and to raise public awareness of heat as a health risk.
        - More research is needed to design effective adaptation strategies, including to develop indicators for heat risk/heat vulnerability indices.
- **Production and services**
    - Solution #1: Ensure private sector reporting frameworks sufficiently and correctly reflect adaptation
        - Review reporting frameworks, such as the TCFD, in order to ensure adaptation is sufficiently and correctly reflected.
        - Start the conversation about what the production and services sector can do to assist with adaptation measures for local communities and how to ensure the climate risk burden is equitably distributed.
        - Engage in dialogue, cooperation, and collaboration (including creating possible guidelines) to ensure that there is no 'race from the bottom' in which the most vulnerable areas to climate change are left without efforts to reduce risk/vulnerability, strengthen resilience, and strengthen adaptive capacity.
- **Societal environment**
    - Solution #1: Achieve replacement-level fertility rates/balance in the world's population
        - A balance in the world's population can be achieved by increasing educational opportunities for girls, expanding access to reproductive health services, and reducing infant and child mortality so that parents do not need to have as many children to ensure survival of their desired number.
        - National family planning and population policies including information on replacement-level of fertility rates should be part of the national adaptation planning processes, as an adaptation response.

Part II: Context

Part II gives an introduction of climate change and sets the stage for adaptation and its potential in the Global Stocktake (GST).

The IPCC's latest report paints a stark picture of the current and projected changes to the climatic system and its impact on the natural and human-made environment.[1] It is clear that human influence has warmed the climate at a rate that is unprecedented in thousands of years. The result is changes in weather patterns and climate extremes in every region across the globe, such as heatwaves, wildfires, heavy precipitation, floods, droughts, and tropical cyclones, as well as continued decrease in glaciers, the Greenland ice cap, and Arctic sea ice, leading to sea level rise.[2] The dangers of global warming for human and natural systems are grave, disconcerting, and already visible. Natural disasters and increasing temperatures affect billions of people across the world, leading to hundreds of thousands of excess deaths, and causing damage to social and economic systems. Sea level rise pose risks to low-lying coastal areas, and could potentially drown small island states, leading to incalculable loss for the people affected. Climate change also puts enormous pressure on wildlife and habitats, escalating the global extinction crisis we are already witnessing.

The most effective measure to reduce risks resulting from climate change is to reduce emissions in line with the Paris Agreement's temperature goal. However, adaptation actions have the potential to protect people, livelihoods, and ecosystems, reducing vulnerability and strengthening resilience and adaptive capacity to climate change. Although political and financial support for national adaptation planning processes is steadily increasing for the least developed countries, in particular the poorest and most vulnerable countries, they still suffer from lack of capacity, as well as the technical, technological, and financial means to undertake adaptation planning processes and implementation at the scale needed.[3]

The Paris Agreement made great strides in asserting the role of adaptation as a necessary and valuable part of the climate negotiations, giving it greater recognition than previous agreements under the UNFCCC. The establishment of the global adaptation goal, the intricate structure and content of adaptation principles and processes, the focus on international and regional cooperation, and the clear obligation to support adaptation actions form the foundation of Article 7 of the Paris Agreement.[4] Article 7 further ensures flexibility in that adaptation communication is voluntary and that adaptation action should follow a country-driven approach; it sets out voluntary commitments for planning and implement action. In addition, adaptation is integrated into the enhanced transparency framework and is also a central part of the GST, which aims to strengthen the implementation of the collective progress toward achieving the global adaptation goal. The GST could bring much needed attention to the global efforts to reduce vulnerability, strengthen resilience, and enhance adaptive capacity—to ensure that the adaptation response is adequate in light of current and future climate risks.[5]

The integration of national planning processes for adaptation in all relevant sectors is critical to ensure success in achieving the global goal on adaptation. Further, planning processes for adaptation will bring light to the limits of adaptation, as well as where and in which circumstances loss & damage will be inevitable. While support for adaptation has been agreed, developed countries and other voluntary countries have yet to deliver on their commitments. Both public and private adaptation finance must be scaled up significantly to meet the requirements for adaptation globally.[6] The GST, if its full potential is utilized, could work as a catalyst for adaptation action, spurring cooperation, coordination, and greater action.

Past emissions are already locked in and changes to the climate will continue until at least the mid-century in all emission scenarios presented by IPCC.[7] In addition, questions around the occurrence and intensity of future climate risks and the type and level of adaptation needed for the future depend on which future emissions pathway can be realized. But not only are the following adaptation interventions already relevant to current climate risks but they will also be useful in meeting future changes to the climate.

Please note that the lack and availability of global aggregated information, the uncertainties in future scenario analysis, as well as the inherent problems with weighing risks and values against each other creates enormous difficulties in ascertaining which adaptation solutions should be flagged as those with the highest potential for impact. In this report, particular attention has been given to the marginalized and the most vulnerable populations when data are available, and the number of deaths or impact on humans have played a more central role than the economic effects in determining which adaptation solutions to be promoted.

Finally, it should be noted that adaptation is increasingly seen as part of a wider discussion about the Sustainable Development Goals (SDGs) and Agenda 2030, the Convention on Biological Diversity, and the Sendai Framework on Disaster Risk Reduction. Coherence across different international and regional initiatives and frameworks is very welcome, in particular if adaptation as a response is respected in its own right and development agendas are not re-cast as adaptation measures without having been through the necessary adaptation planning processes.

The GST Process

Alongside its binding obligation for each Party to maintain and implement an NDC, the Paris Agreement establishes two essential mechanisms. The first is an enhanced transparency framework requiring all parties to regularly report on their greenhouse gas emissions and on the implementation and achievement of their NDCs, subject to two different layers of international review. This system provides some measure of accountability and—to the degree that it demonstrates that countries are fulfilling their commitments—can strengthen collective confidence to do more. The second essential feature is a **GST process in which, every five years, countries assess collective progress toward the agreement's long-term goals, considering mitigation, adaptation, and finance, as well as equity and the best available science**. Each country, informed by this periodic stocktake, is then to submit an updated NDC

reflecting a "progression" beyond its current NDC and "its highest possible ambition." This combination of GST and NDC updating is known as the "ambition cycle." Properly executed, the GST process can provide the critical foundation for a regular series of high-level political moments that progressively ratchet up climate ambition.

Although the GST is, formally, a process among countries, it will be taking place within an evolving climate regime in which non-state actors play an increasingly prominent role. Traditionally relegated to the role of *observers*, NGOs, companies, subnational governments, and other non-Party stakeholders have been afforded greater opportunity in recent years to engage more directly in UNFCCC processes, such as through the Technical Examination Process and the Marrakech Partnership on Global Climate Action facilitated by the UNFCCC High Level Champions.[8] The GST's modalities explicitly provide for "participation" by non-Party stakeholders, including through an invitation for them to provide submissions, thereby opening the way for them to exert a stronger presence in the negotiations and subsequent country action. Moreover, the GST is now widely accepted even beyond the UNFCCC process by a wide range of actors, who will also be working to enhance action alongside Parties and non-Party stakeholders that formally participate in the GST process.

The GST is widely understood as an exercise in assessing action to-date against the Paris Agreement's long-term goals. However, in designing the GST, countries put strong emphasis on identifying "opportunities for enhanced action and support," a clear recognition that the goal of higher ambition will be best served by highlighting both urgency and opportunity. The success of the GST depends on adequate attention to both dimensions and an emphasis on near-term scalable action. The GST provides an opportunity to refocus global efforts on the actions and opportunities that can be scaled to achieve long-term goals, including by identifying clear strategies for sectoral decarbonization. Indeed, there is already a large body of work that analyses these mitigation opportunities that will be immeasurably useful for inputting into the GST process.

The next section of this paper provides a compilation of that work.

Part III: Interventions

Part III builds on the analysis presented in the other sections and gives a broad overview of the relevant threats/risks and provides recommendations for specific adaptation opportunities with great potential for strengthening resilience and reducing vulnerability. The list of influential actors provided for each solution should be seen as a starting point, and a more comprehensive list of relevant actors working in the adaptation field can be found in the survey presented in Appendix III, which is also not a comprehensive list.

Water

Introduction

Freshwater is the foundation to the survival of the human species and is intrinsically linked to all parts of life: catering to the basic needs for drinking water and sanitation; as an indispensable part of agriculture and food production; its role in the energy, industry, and business sectors; its importance for the natural environment and ecosystems; and its role in both cultural and religious aspects of society. Alternatively, 'disruptive water availability,' such as water scarcity (e.g., dry spells, heat waves, and desertification) and water excess (e.g., heavy rainfall, flooding, and tsunamis), is becoming increasingly prominent due to climatic changes. These changes in water patterns lead to less dependable water resources and increase the risk of water-related events/natural disasters, resulting in potentially devastating effects on the society, economy, and environment.

Risks/threats

Nearly a billion people live without access to an improved water source, and 2.5 billion lack access to improved sanitation facilities. The number of people who may lack sufficient water, at least one month per year, will soar from 3.6 billion today to more than 5 billion by 2050.[9] Of these, it is the marginalized and poor communities, including indigenous peoples, that suffer disproportionately.[10] Freshwater-related risks due to climate change increase significantly in parallel with global warming. The IPCC reports that climate change will reduce surface water and groundwater resources significantly in most dry, subtropical regions, changing streamflow and water quality negatively and increasing droughts in presently dry regions.[11] This will intensify competition among the different water-reliant usages, such as water supply and sanitation, agriculture, industry and energy, and ecosystems. In contrast, areas in higher latitudes will receive increased water resources, with risks of flooding and soil erosion, also in parts of South, Southeast and Northeast Asia, tropical Africa, and South America.[12] As the glaciers melt, an increase in meltwater will eventually be replaced by a reduction in meltwater availability, potentially affecting several hundred million people.[13]

Currently, nearly 10 percent of the global population, around 680 million people, live in low-lying coastal zones, projected to reach more than one billion people by 2050.[14] Of these, Small Island Developing States (SIDS) are home to 65 million people who are particularly vulnerable, with some island nations likely to become uninhabitable.[15] By 2050, at least 570 cities and 800 million people will be exposed to rising seas and storm

surges, amounting to costs close to $1 trillion.[16] By 2100, if no adaptation measures are in place, coastal flooding due to climate-related extreme weather events is expected to affect 2.5–4 percent of the global population (an increase of 52 percent) and 12–20 percent of global GDP (an increase of 46 percent).[17] Impacts on coastal communities and ecosystems include increased exposure to storm surges and coastal flooding, increased rates of coastal erosion, and increased risk of groundwater salinization.[18] The result is that hundreds of millions of people in coastal cities could be forced from their homes, with a total cost to coastal urban areas of more than $1 trillion each year by 2050.[19] Kolkata, Mumbai, Guangzhou, Shanghai, Dhaka, and Ho Chi Minh City are cities with highest exposed population in 2070, the first four also rank amongst the top six cities in terms of assets exposed to flooding in 2070, together with Miami and New York-Newark.[20] Smaller cities, both in terms of population and wealth, are also rapidly increasing in population and asset exposure, such as Mogadishu in Somalia and Luanda in Angola.[21] In addition, low-lying coastal zones in rural areas disproportionately house poor communities in a few developing countries. Just 15 developing countries in South Asia, East Asia and the Pacific, and Sub-Saharan Africa contain over 90 percent of the world's rural poor living in low-elevation coastal zone. [22]

Climate change could push more than 100 million people within developing countries below the poverty line by 2030.[23] Climate change, without adaptation efforts, may depress growth in global agriculture yields up to 30 percent by 2050. It is the 500 million small farms worldwide that will be most affected.[24]

Adaptation measures are incremental in responding to this, hereunder strengthen resilience and reduce vulnerability in relation to water.[25]

Solution #1: Integration of adaptation planning processes (NAPs) with freshwater management	**Influential actors (i.e., initiatives, coalitions, and organizations, key geographies)**
Description of solution or scale of the problem, quantification of opportunity From a global perspective, there is currently a political neglect and mismanagement of water, closely tied to a lack of understanding of the value of water and its importance in decision-making.[26] Institutional strengthening, hereunder support for integrated water resource management plans, policies, and regulation, is key to address the issue of freshwater mismanagement. Relevant local and national sectoral agencies, and in particular managers of water utilities and water resources, should receive assistance and support to enable them to integrate adaptation planning processes into their practices.[27]	• Adaptation Committee • Least Developed Countries Expert Group (LEG) • Nairobi Work Program on impacts, vulnerability, and adaptation (NWP) • Alliance for Global Water Adaptation • Andean Community General Secretariat • Asia Pacific Adaptation Network • Asia-Pacific Network • CARE • Central Asia Regional Economic Cooperation • Climate and Development Knowledge Network

Key geographies

Billions of people across the globe are affected by changes in precipitation, drought, or reduced river flows. The marginalized and poor communities, including indigenous peoples are disproportionately affected.

Key actions and policies

- Integration of climate risk to freshwater resources in the NAP processes. The NAP process includes developing an understanding, hereunder identifying available information, and addresses capacity gaps. It also includes undertaking risk assessments for future climate scenarios (scenario-planning), implementation, and coordination, as well as reporting, monitoring, and review.[28] It is an inclusive process which offers a long-term, cyclical step-by-step approach to strengthen resilience and reduce vulnerability.
- The cooperation and coordination of freshwater resource management on regional levels should also be addressed.
- Specific adaptive measures could include but are not limited to: rainwater harvesting, conservation tillage, maintaining vegetation cover, planting trees in steeply sloping fields, mini-terracing for soil and moisture conservation, improved pasture management, water reuse, desalination, more efficient soil and irrigation water management, restoring and protecting freshwater habitats, and managing natural floodplains.[29]
- Reduction of the impact of natural disasters by implementing monitoring and early warning systems, developing contingency plans, diversifying water sources, promoting switching to drought-resilient crops, and improving design of sewers, sanitation, and wastewater treatment infrastructure to cope with variations in influent quantity and quality.[30]

- Climate Resilient Infrastructure Development Facility
- Consortium for the Sustainable Development of the Andean Ecoregion
- European Commission's Euroclima+
- FAO
- Global Center on Adaptation
- Global Climate Change Alliance
- GCF, GEF, AF, etc.
- Global Water Partnership
- HELVETAS Swiss Intercooperation
- International Centre for Integrated Mountain Development
- International Climate Initiative
- International Institute for Sustainable Development
- Lake Chad Basin Commission
- Mekong River Commission for Sustainable Development
- OECD
- Pacific Islands Applied GeoScience Commission
- SouthSouthNorth
- Stockholm Environment Institute
- UNDP
- UNEP
- UN Economic and Social Commission for Western Asia (ESCWA)
- World Resources Institute

Policy and other barriers

	• Political neglect and mismanagement of water resources • Lack of human and institutional capacity • Lack of financial resources[31] • Lack of awareness and communication • Uncertainty of future climate scenarios.

Solution #2: adaptation processes for water (freshwater and coastal zones) that reduce climate risk and vulnerability for marginalized communities[32]

Description of solution or scale of the problem/quantification of opportunity

People with the highest exposure and vulnerability are often those with lowest capacity to respond/adapt.[33] In addition, adaptation interventions related to water and coastal areas can reinforce existing inequalities and vulnerabilities and commonly redistribute climate risks to already socio-politically marginalized people.[34] Instead of increasing adaptive capacity and decreasing vulnerability for these marginalized communities, vulnerability increases and adaptive capacity is reduced under the current regime.

Marginalized and vulnerable communities should be enabled to influence the water-related planning processes, including the NAP process. In addition, structures and systems should be assessed to ensure that freshwater adaptation measures do not lock in existing inequity.

Key geographies/potential effects

Close to a billion people lack proper access to freshwater. Areas with significant increases in flooding are seen in North-West Europe, India/Bay of Bengal, South-East Asia, and East Asia.[35] Just 15 developing countries in South Asia, East Asia and the Pacific, and Sub-Saharan Africa contain over 90 percent of the world's *rural* poor living in low-elevation coastal zone.[36] Further, 13 percent of the world's total urban land mass is located in low-elevation coastal zones, including many large and densely populated cities such as Shanghai, Kolkata, Jakarta, London, and New York City.[37]

Key actions and policies

- To ensure that water adaptation measures are equitable, existing governance structures and water interventions should be assessed to ascertain whether they create marginalization or vulnerability to climate risks. If so, it will be necessary to introduce disruptive or transformative adaptation solutions based on best available science and knowledge from the affected communities. This includes undertaking national adaptation planning and integrating water-related adaptation concerns into all relevant sectors.

Influential actors (i.e., initiatives, coalitions, and organizations, key geographies)

See above solution #1

Policy and other barriers

- Lack of/weak adaptation planning focus in development projects and governmental water related interventions
- Retrofitting of adaptation to existing development priorities/measures for freshwater and coastal zones (at odds with vulnerability reduction and support for marginalized groups)[42]
- Existing water interventions and governance that are inequitable, or do not take into account the needs and/or rights to freshwater for marginalized and vulnerable groups
- Top-down adaptation measures that do not take into account local communities and/or marginalized groups
- Adaptation measures that redistribute vulnerability instead of decreasing it overall.[43]

• Marginalized/vulnerable people should be given the opportunity to shape the official and informal aims of projects, influence the distribution of funds and contracts, and participate in decision making processes.[38] • The adaptation planning process should also include assessing, acknowledging, and protecting existing water-rights/water tenure for marginalized communities, including indigenous peoples.[39] • The NAP process with the *UNFCCC Technical Guidelines* is a good starting point, but should be supplemented with (i) integrated vulnerability assessments (IVA) designed for water resources and coastal zones;[40] (ii) assessment of existing development projects, societal structures, governance and policies for freshwater and coastal zones in order to ascertain whether these create climate risk vulnerability or marginalization; and (iii) the establishment of freshwater rights/tenure for marginalized and vulnerable groups.[41]	

Solution #3: Nature-based solutions for adaptation to address coastal flooding/storm surge and erosion	**Influential actors (i.e., initiatives, coalitions, and organizations, key geographies)**
Description of solution, quantification of opportunity Adaptation action, hereunder measures to prevent and reduce the risk of coastal flooding, is more cost effective than the more common cycle of responding after disasters hit.[44] Nature-based solutions for adaptation restore, build on, and enhance ecosystem services with the aim to reduce vulnerability and climate change risks/impacts and enhance climate resilience. Nature-based flood resilience offer many advantages over 'hard' engineered measures (e.g., seawalls) as healthy ecosystems can regenerate, do not need energy supply, and do not lose their performance capacity over time.[45] Adaptation finance toward nature-based solutions for resilient coastal infrastructure is predicted to be of increasing importance.[46] Nature-based solutions for coastal flooding and erosion have potential added benefits, such as biodiversity conservation, improved fish stock, carbon sequestration and storage, sediment accretion, water filtration, and tourism and associated employment.[47] Coastal development and aquaculture investing in flood risk prevention measures outweighs the costs (i.e., costs of damage to structures such as flood embankments) in a ratio of 1:4.[48] Nature-based solutions should be used in tandem with other efforts to reduce vulnerability and strengthen resilience, such as early-warning mechanisms and disaster response systems,	• Least Developed Countries Expert Group • NAP Central • GEF, GCF, Adaptation Fund • International Climate Initiative • Nature-based Solutions Initiative • the Global Mangrove Alliance • the Neotropical Mangrove • Conservation Alliance • UN Convention on Biodiversity[62] • SDG 14 and related targets[63] • UNDESA and its work on a voluntary disaster fund for SIDS • Grantham Research Institute (LSE) • West Indian Ocean Marine Science Association (WIOMSA)

including forecast-based financing. Other actions to reduce the impact of climate risks include planned coastal retreat and resettlement and revising existing plans for settlement in flood-prone coastal areas. In addition, it could be useful to assess whether nature-based solutions are best mixed with engineered infrastructure solutions, which is common in urban settings.[49]

Key geographies

Populated deltas (in particular, Asian mega-deltas), low-lying coastal urban areas, and atolls are key coastal low-lying areas with particular vulnerability. South, South-East, and East Asia; Africa; and SIDS are most vulnerable. The effect on SIDS is aggravated by the risk of being drowned. Further, SIDS are located in some of the most disaster-prone regions of the world and comprise of two-thirds of the countries with the highest relative annual losses due to disasters.[50] In addition, more than 80 percent of SIDS residents live near the coast.

Key actions and policies

Integrated planning:

- For successful use of nature-based solutions for adaptation in response to coastal flooding and erosion, it will be important to ensure coherence, integration, and consistency between local decisions and actions and national-level strategies.[51] It will be important to move away from silo-oriented design toward more comprehensive approaches, plans, and strategies.[52] One significant tool to address this is the NAP process.[53] Planning frameworks such as integrated water management or integrated coastal zone management are also relevant.[54]
- Nature-based solutions could become more prominent in decision-making if regulatory frameworks include cost-benefit analysis to address short- and long-term needs, because these solutions ensure greater return on investment.[55]
- In addition, assessment of the benefits derived from the natural environment should be taken into account, for example through the quantification of natural capital.[56]
- Integrating the NAP process (which should include national coastal flood risk management) and plans for nature-based solutions for adaptation into development policy and funding, including urban development planning, is also important to ensure a coordinated approach to strengthening resilience and reducing vulnerability.
- For mangrove restoration in particular, stakeholder participation and in-depth understanding of the underlying reasons for mangrove loss is key to success.[57]

Means of implementation:

Finance/technology:

- the Zurich Flood Resilience Alliance
- Ocean Risk Resilience Action Alliance,
- REDD+ results-based financing programs for mangrove protection and restoration,
- Paris Agreement Article 6 market mechanism possibilities,
- the transfer of technology under Climate Technology Centre & Network (CTCN)

Policy and other barriers

- The limitations of nature-based solutions in urban environments are visible where ecosystem fragmentation or remaining physical space for interventions are limited.[64]
- For most nature-based solutions initiatives it is too early to assess their effects on reducing climate risks, as work is still ongoing.[65] Lack of stakeholder participation is a key concern.
- Lack of adaptation planning for development; agriculture development and deforestation;[66] coastal development prioritized over mangroves and natural habitat resulting in 67 percent of mangroves lost or degraded to date, with additional 1 percent each year.[67]

• Both technical and human capacity is urgently needed to enable and speed up access to Global Climate Fund (GCF) and other adaptation funds. Financing, through existing initiatives such as REDD+ results based payments (RBP), or solutions arising from the Paris Agreement Article 6.2 can provide much needed support.[58] • Public-private trust funds should also be explored.[59] • In addition, innovative financing, such as access to capital markets, environmental impact and sustainability bonds for coastal resilience, and nature-based infrastructure could deliver cash up front and would allow risk sharing.[60] *Nature-based/ecosystem-based adaptation measures to reduce coastal flooding and erosion include*:[61] • restoration or protection of coral reefs to reduce flooding/attenuate wave energy/alleviate coastal storms, or coral gardening • management of seagrass meadows, oyster reefs, and kelp forests • management of coastal wetlands • mangrove forests protection, restoration, regeneration, and recovery (creating enabling environmental conditions) to anchor sediments and dissipate wave energy/alleviate coastal storms/reduce flooding • management and restoration of coastal marshes and/or dunes and beach vegetation to dissipate wave energy/alleviate coastal storms and/or complement engineered protection.	• Climate finance for implementation of nature-based solutions is insufficient.[68] • Nature-based solutions is not an independent category in development context, thus making it difficult to assess its coverage and effect. • Lack of frameworks assessing the cost-benefit of nature-based solutions versus hybrid or grey interventions. • Lack of trust in nature-based solutions as opposed to man-made. • Difficult to monetize 'soft' benefits, and lack of clear approach to quantify natural capital. ○ Lack of capacity, including technical and human capacity constraints for SIDS to develop concept notes and funding proposals to the GCF standard.[69] ○ Lack of historical or national climatological data necessary to substantiate claims for GCF funding.[70] ○ Insufficient finance and inadequate funding.[71]

Rural Environment

Introduction

Global warming has resulted in increased frequency, intensity, and duration of heat-related events, including heatwaves, in most regions. In addition, droughts are increasing in severity in the Mediterranean, West and North-East Asia, many parts of South America, and much of Africa.[72] Land degradation also takes place through increases in rainfall intensity, flooding, sea level rise and wave action, wind, and permafrost thaw.[73] Climate change also leads to water scarcity and desertification, soil erosion, vegetation loss, wildfires, biodiversity loss, and food insecurity.[74] This will affect food systems, livelihoods, biodiversity, infrastructure, and human and ecosystem health, with possible compounding effects.

Changes in forest cover from afforestation, reforestation, and deforestation, affects regional surface temperature.[75] The world's forest areas are decreasing at a rate of around 5 million hectares per year, although the rate of loss has slowed.[76] Forest loss in Africa has increased since 1990, and Africa had the largest annual rate of net loss of forest area in 2010–20, at 3.9 million ha.[77] South America had an annual net forest loss of 2.6 million ha in 2010–20. Since 1990, 420 million ha of forest has been lost due to deforestation. In addition to halting deforestation, IPCC found that 950 million ha of land will need to be reforested by 2050 to hold temperature rise below 1.5 degrees Celsius.[78]

According to the IPCC, agriculture, forestry, and other land use (AFOLU) activities accounted for 23 percent of total greenhouse gas emissions during 2007–16.[79]

Climate variability and natural disasters, conflict, and economic slowdowns are slowing down progress on achieving the goal of ending hunger, food insecurity, and malnutrition by 2030.[80] Between 720 and 811 million people faced hunger in 2020, mainly in Asia and Africa. In 2030 the number of people facing hunger may be double the current population of the USA.[81] Food insecurity has increased slowly for the past six years, affecting more than 30 percent of the world's population.[82] In 2020 food insecurity was equal to that of the previous four years combined. The need to scale up climate resilience across food systems as well as strengthening resilience of the most vulnerable are two key actions.

According to the IPCC the three adaptation response options for land management with the largest magnitude of impact (i.e., positive for more than 25 million people) *and* highest confidence level are: (i) increased food productivity, (ii) agroforestry, and (iii) reduced post-harvest losses.[83] In addition, these measures positively impact mitigation,[84] combat desertification,[85] and land degradation,[86] and enhance food security.[87] The cost of increased food productivity and reduced harvest-loss is not known, whereas the cost for agroforestry is low.

IPCC has also pointed at how the following adaptation options have large positive impact (i.e., impacting more than 25 million people), but with lower confidence level: improved cropland management, agricultural diversification, integrated water management, forest management, increased soil organic carbon content, reduced soil erosion, restoration and reduced conversion to wetlands, improved food processing and retailing, and improved energy use in food systems and livelihood diversification.[88]

No data is available on the magnitude for the following adaptation response options: (i) reduced grassland conversion to cropland, (ii) restoration and reduced conversion of peatlands, (iii) dietary change, and (iv) reduce food waste.[89]

Solution #1: Agroforestry

Description of solution, quantification of opportunity

According to IPCC, agroforestry is one of the adaptation options with highest potential impact for the agriculture sector. UN Environment Programme (UNEP), the Global Center on Adaptation (GCA), and World Resources Institute (WRI) point toward agroforestry as a solution to climate change. However, it is often ignored in land-use planning and development policies.

Agroforestry is the 'cultivation and use of trees and shrubs with crops and livestock in agricultural systems.'[90] It reduces drought and flood risk,[91] has the potential to control erosion, contribute to soil fertility, ensure water retention/cycling, and restore and maintain soil health because of higher abundance of beneficial soil organism.[92] Trees can provide shade for livestock and crops, reducing heat stress and staggering production loss.[93] Agroforestry also contributes to system intensification through providing on farm tree-fodder and firewood, which frees up labor, time, and other resources, such as dung (which can then be utilized as fertilizer).[94] In 2020 the reported area of agroforestry was 45.5 million globally, mostly in Asia (31.2 million ha) and Africa (12.8 million ha).[95] The global coverage of agroforestry increased 4.21 million ha from 1990 to 2010.[96] However, since the peak in 2010 global coverage has declined to 2000-levels.

It has been estimated that close to 1.5 billion ha of degraded land may be restored through mosaic restoration using tree-based systems such as agroforestry schemes.[97] If looking solely at agroforestry, this is a possible increase of approximately 3,300 percent of current agroforestry land. In addition, 678 million ha of tree cover gain is feasible if consumption moves toward plant-based food, making it possible to convert grazing land.[98] Agroforestry could be part of that transition.

Influential actors (i.e., initiatives, coalitions, and organizations, key geographies)

- LEG
- AC
- World Agroforestry Centre (ICRAF)
- FAO
- GCA
- WRI
- UNEP
- CGIAR Research Program on Forests Trees and Agroforestry
- (FTA)
- CTCN
- GCF, GEF, AF, etc.
- All relevant actors working with agriculture and forestry – please also see the survey of multinational and regional actors

Policy and other barriers

- Too short timeframe for adaptation projects (1-3 years)[106]
- Weak understanding of the underlying ecological factors (type of tree species and genetic variation, and mismatch of planting site and tree)[107]
- Lack of tree tenure (i.e., management/monitoring to continue long after tree planting)[108]

However, current tree-planting practices, including agroforestry, fail to deliver on implementation and fall short of ensuring long-term success.[99] Many of the published NAPs and NDCs promote agroforestry.[100] However, although most NAPs include recommendations to plant trees for different adaptation purposes, they lack important measures to establish the enabling environments needed for agroforestry.[101]

Key geographies

Africa and Asia have the largest share of current agroforestry. These regions are also those with the highest share of degraded land.[102] However, potential for agroforestry should not be limited to these areas but could also be attained for agriculture in South America, North America, Europe, Australia, and the Pacific.

Key actions and policies

- Addressing agroforestry in NAPs and regional planning processes:[103] (i) improve the evidence base for agroforestry; (ii) ascertain the potential benefits and drawbacks, and the gaps and needs to undertake implementation action; (iii) assess the need/potential for policies, incentives or land rights,[104] and ascertain whether agricultural and forest policies limiting the potential for agroforestry should be removed; (iv) enable inter-ministerial cooperation and integration; (v) assess the potential for long term management, establish accountability and monitoring and assessment.
- Better management of projects during the implementation phase: (i) planting of genetically diverse healthy and productive tree species that match the planting site; (ii) ensure that the time of year is correct for planting; (iii) assess the socio-economic site-specific factors; (iv) enclose land or establish social rules to protect the tree establishment from farm animals; (v) establish a long-term plan to ensure that growth is monitored that involves the local communities living in the area; (vi) establish incentives (i.e., income, food, thatching, grazing, and other ecosystem goods and services) to the local community living in the area of agroforestry.[105]

- Lack of understanding of the socio-economic situation for the land
- Insecure land tenure
- Lack of incentives
- Weak cooperation between authorities responsible for forestry and agriculture[109]
- Lack of evidence relating to the performance of agroecological practices including agroforestry, and sparse data on economic performance[110]
- Lack of awareness and technical support.[111]
- Financial resources/availability[112]

Solution #2: Integration of national adaptation planning processes (NAPs) with Disaster Risk Reduction (DRR) initiatives **Description of solution, quantification of opportunity** Natural disasters, such as floods, earthquakes, tsunamis, and droughts affect rural communities, in particular the most vulnerable and marginalized. For example, more than one billion people were affected by drought between 1994 to 2013, with 41 percent of drought disasters in Africa.[113] In the same period, floods affected nearly 2.5 billion people worldwide, causing more than 244,000 deaths. Finally, earthquakes and tsunamis caused three times as many deaths during the same period.[114] This increasing trend of natural disasters indicates that existing early warning systems need to be strengthened, and new systems need to be put in place to reduce the effect of drought, floods, and earthquakes, in particular in lower income countries. Disaster risk reduction (DRR) is aimed at preventing new and reducing existing disaster risks. However, historically, the focus has been on reactionary post-disaster measures. Recently, some DRR initiatives have begun the process to reduce the risk of disasters before the disaster hit, rather than after it is a fact. Although adaptation action is primarily for climate-related events, the distinction is rarely relevant when undertaking adaptation measures on the ground. Thus, the overlap between DRR and adaptation action is obvious. Sadly, however, it is often overlooked. As DRR actors focus more on preventative measures, it is essential that they do not operate in a DRR-vacuum. Maladaptation could be the result if adaptation planning, with its principles and systems for successful processes, is side-lined. DRR initiatives could benefit enormously from coordination and integration with existing national adaptation planning processes, such as the NAP process. **Key geographies** All regions are affected by natural disasters. Deaths due to disasters are three times as likely to occur in low-income countries.[115] Almost half of the world's drought disasters take place in Africa. Asia is one of the continents with the highest number	**Influential actors (i.e., initiatives, coalitions, and organizations, key geographies)** • WIM ExCom • Adaptation Committee • African Adaptation Initiative • Asian Disaster Preparedness Center • Asian Disaster Reduction Center • CARE • Caribbean Community Climate Change Centre • Caribbean Disaster Emergency Management Agency • ClimDev-Africa • InsuResilience Global Partnership • GEF, GCF, AF, etc. • FAO • Global Water Partnership • Helvetas Swiss Intercooperation • IGAD Climate Prediction and Application Centre • International Federation of Redd Cross and Red Crescent Societies (IFRC) • International Union for Conservation of Nature • SAARC Disaster Management Centre • Secretariat of the South Pacific Environment Program (SPREP) • South African Development Community • Stockholm Environment Institute • UNDP • UNEP • UN Economic and Social Commission for the Asia and the Pacific (ESCAP)

of affected people by disasters, with 3.3 billion people affected in China and India alone between 1994–2013.[116] Also, Eritrea, Mongolia, as well as the small island state Haiti experienced the highest number of people affected or killed relative to the size of its population in that same period.[117] **Key actions and policies** • Integration of the NAP processes with existing DRR initiatives. The NAP process includes developing an understanding, hereunder identifying available information, and addressing capacity gaps. It also includes undertaking risk assessments for future climate scenarios (scenario-planning), implementation and coordination, as well as reporting, monitoring, and review. It is an inclusive process which offers a long-term, cyclic, step-by-step approach to strengthen resilience and reduce vulnerability. DRR initiatives should be undertaken as part of a broader adaptation process in order to avoid maladaptation. • Institutional strengthening, hereunder support for integrated agricultural management plans, policies, and regulation, is key to address the risk of food insecurity. Relevant local and national sectoral agencies should receive assistance and support to enable them to integrate adaptation planning processes into their practices before potential disasters hit. • The cooperation and coordination of risk reduction and adaptation for rural regional levels should also be addressed. • Early warning systems, payment schemes, and insurance systems should be part of the DRR and adaptation discussions. • Awareness raising, hereunder better communication and engagement by adaptation experts and institutions, such as the Adaptation Committee and the WIM ExCom, in DRR-forums and vice-versa. • Strengthened support for DRR and early warning systems from the public and private community.	• UN Office for Disaster Risk Reduction (UNDRR) • The World Bank • The World Food Program • For DRR initiatives, please see the survey of multinational and regional actors **Policy and other barriers** • Lack of awareness of adaptation planning processes (such as the NAP process) by non-adaptation experts is a barrier to successfully integrate adaptation with DRR-initiatives • Weak processes for coordination and cooperation between different regional, national, and local institutions and agencies • Lack of human and institutional capacity • Insufficient early-warning systems • Lack of insurance measures • Lack of finance and support

Build Environment

Introduction

In 2018, 55 percent of the world's population lived in urban settlements, and by 2030 this is projected to increase to 60 percent.[118] Most megacities are in the global south, and the fastest growing cities are in Asia and Africa. Most cities are vulnerable to at least one type of the following natural disasters: cyclones, floods, droughts, earthquakes, landslides, and volcanic eruptions.[119] 189 cities, mostly along coastlines, are vulnerable to more than one of the listed disasters, and 26 cities face high risk of exposure to three or more. In addition, as the temperature increases many cities experience warmer weather, including heatwaves, than surrounding rural areas.

Risks/threats

Risks from floods on the built environment and its citizens have received increased focus in recent decades. Flooding is the most frequent type of natural disasters, closely followed by storms.[120] Urban flooding, together with storms, also represent the largest share of economic losses, followed by earthquakes.[121] Tools to ensure integrated urban flood risk management have been developed by a variety of actors such as the World Bank Group,[122] and the Zurich Flood Resilience Alliance.[123]

Heatwaves, on the other hand, rarely receive adequate attention because their death tolls and destruction are not always immediately obvious, but also because of lack of data and underreporting.[124] All regions are projected to experience more extreme heat, and the intensity and duration of heatwaves have increased globally since 1950.[125] Currently, 30 percent of the world's population is exposed to a deadly level of heat for more than 20 days a year.[126] Increased heat related mortality is evident on all continents. One study estimates that 37 percent of current heat-related deaths are linked to climate change.[127] Deadly heat exposure is projected to increase also under a climate scenario with drastic greenhouse gas reductions.[128] Productivity loss due to heat has been estimated to reach 302 billion hours lost, with India accounting for 40 percent of this total.[129] Global economic costs of reduced productivity could reach U.S. $2 trillion by 2030.[130]

The most vulnerable populations, including the poor, ill, elderly, and children are worst affected. For example, the last 20 years has seen a 54 percent increase in heat-related deaths in older people.[131]

The world's city landscapes—with its enormous investments in buildings and infrastructure—were not designed to mitigate the impacts of the urban heat island effect, which occurs when surfaces in cities and other built environments, like pavement, concrete, and glass absorb and retain heat causing increased urban temperatures. In fact, about 60 percent of urban surfaces are covered by roofs and pavements absorbing sunlight and converting it to heat.[132] Aerosols from pollution then further exacerbate the effect by reflecting heat back onto the city.

Furthermore, when humidity is coupled with heat, it creates a 'wet-bulb' effect, with lethal consequences on humans if it exceeds 35 degrees C for a few hours, even under shaded, well-ventilated conditions.[133] These deadly wet-bulb temperatures are not currently occurring but are predicted for three extensive regions by the end of the century under a business-as-usual scenario.[134] It will negatively affect the vulnerable and poor populations such as densely populated agricultural regions of South Asia without access to air-conditioning.[135]

Urban environments often lack vegetation, areas with water, permeable surfaces, and open spaces that have a cooling effect. Regions along the urban boundary can also experience urban heat island effect due to low vegetation and lack of evapotranspiration.[136] However, despite recent efforts to research risks of heat on city populations, the global data on the risk of temperature variability on city populations is not always present.[137] Thus, the following should be read with this in mind.

Adaptation measures targeting the risks of heat on urban development can increase resilience, reduce heat vulnerability, maintain economic and social stability, and protect peoples' health.

Solution #1: Reduce the urban heat island effect through cooling adaptation responses	**Influential actors (i.e., initiatives, coalitions, and organizations, key geographies)**
Description of solution or scale of problem quantification of opportunity According to one study, around 500,000 deaths globally per year between 2000 and 2019 are heat-related, the number of people dying from heat is increasing and predicted to increase substantially.[138] Another study covering 43 countries and 732 locations found that the number of heat-related mortality deaths over a period of 25 years were close to 30 million.[139] During 2021 there has been record-breaking heatwaves and high mortality rates across Europe and North America, and official estimated deaths seem to be underreported.[140] The number of cities exposed to heat will triple by 2050, and the urban population exposed will increase by 800 percent to reach 1.6 billion people by 2050.[141] Extreme heat can also affect cold supply chains that preserve vaccines, essential medicines, and food.[142] Demand for energy during heatwaves increase, risking blackouts of the electrical grids, with potential deadly results and damaging effects to the economy. Physical destruction resulting from heatwaves are also underreported globally.[143] Adaptive measures for heat risk reduction can have great positive impact. Ahmedabad in India serves as an example: the 2010 heatwave in Ahmedabad led to a 30 percent increase in fatalities compared to the year before and spurred the city's Heat Action Plan in 2013, the first in South Asia.[144] The plan is community driven and targets the most vulnerable to excess heat risk, such as the poor communities, street vendors, migrant workers, elderly, and children. The main adaptive measure has been on establishing a system for heat risk alerts, awareness raising, as well as community programs to coat	• LEG • AC • UNDRR • Global Cool Cities Alliance, • C40 Cities Climate Leadership Group • the Cool Cities Network, the Climate Services for Resilient Development partnership (CSRD) • the Global Heat Health Information Network (GHHIN) • Asian Cities Climate Change Resilience Network, • Natural Resources Defence Council • Climate & Development Knowledge Network (CDKN) • Global Heat Health Information Network • Council of European Municipalities and Regions • ICLEI • Marrakech Partnership for Global Climate Action • SouthSouthNorth

roofs white to reflect heat—with particular focus on the most vulnerable parts of the population. The plan has reduced yearly mortality rates due to heat waves by 20–25 percent (more than 1,100 people), and the Indian national authorities are currently working on creating heat plans in 23 states with heatwave risk.[145] However, there is potential for further heat risk reduction when introducing policies for pollution management as well as planning for green and blue cooling measures.

Increasing numbers and intensity of heat waves makes adaptation measures key as they build resilience and reduce vulnerability to the risks related to extreme heat. Relevant adaptation measures include green and blue spaces and green infrastructure.[146] Forests retain and regulate water (reducing the risks from heavy rainfall), moderate local air temperature fluctuations, provide evapotranspiration, soften the impact of heat waves, and are often cheaper than traditional infrastructure.[147]

Key geographies[148]

According to one study, the highest heat-related excess death rate was in low lying, population dense coastal cities in South and East Asia, South America, but urban development in Southern and Eastern Europe are also particularly vulnerable.[149] The west coastline of Latin America revealed a high heat-related mortality burden.[150] Africa reported 5 percent excess heat-related deaths, however, there might be severe underreporting. Finally, Oceania had less than 1 percent of the global count. However, the death ratio was considerably high in comparison with other regions.

In China, 2.7 percent of non-accidental mortality was heat-related between 2013–2015. Whereas the risk of mortality in the USA increased by 5–10 percent due to heat exposure between 2000 and 2006.[151] There has also been reported an association between ambient temperature and mortality risk in India, Australia, South Africa, and other countries and regions.[152] Cities in India are projected to have the highest rate of growth of urban populations by 2030.

Key actions and policies

- Decisive and coordinated action is needed to raise public awareness of temperature as a health risk, and more research is needed to design effective adaptation strategies.[153]

- UN Economic and Social Commission for Asia and the Pacific (ESCAP)
- UN Human Settlements Program (UN-Habitat)
- WRI

Policy and other barriers

- Underreporting, or limited/dubious data[163]
- Heat illness, including the dysfunction of organs, resulting from exposure to extreme heat is often misdiagnosed, leading to lack of data on the health consequences of heat exposure[164]
- Although numerous studies report on heat-related mortality, quantifying the global risk remains challenging due to lack of comparable data[165]
- The academic literature is not consistent in terms of mortality rates or number of affected people
- Knowledge gaps/lack of understanding on difference between dry heatwaves and hot and humid heatwaves (wet-bulb), and knowledge gaps on whether adaptive measures to reduce dry heat waves have the same effect on wet-bulb heat
- Lack of national planning processes and weak/little coordination and cooperation between relevant agencies and actors
- Weak/non-existent policy-measures to reduce pollution from traffic and nearby power plants/factories that influence the heat levels

• Strengthen research, data, and information on heat effects and adaptation options and develop indicators for heat risk/heat vulnerability indices. • Identify vulnerable populations at risk for exposure to heat, such as children, the elderly, slum communities, outdoor workers, etc. • Remove counterproductive policies that leads to underreporting of heat-related deaths (i.e., compensation schemes for disaster-related deaths). • Improving the response to extreme heat through the integrated national planning processes. For example, ensure that heat-related risks are dealt with in the NAP process and create comprehensive early warning systems and preparedness plans for extreme heat.[154] • Strengthen intersectoral collaboration, and ensure that all relevant actors, including health agencies, emergency response teams/agencies, adaptation agencies, electricity distributors, and media outlets are included in the risk assessment and preparedness plan, policy development, and risk reduction implementation phase. • Ensure monitoring and evaluation of the progress. • Build public awareness of health risks through trainings, public advertisements, and community outreach. Ensure media outlets are known and evenly distributed also to the vulnerable populations. • Assess the possibility to install off-grid solar-powered air conditioning, or battery powered air conditioning, which works also during power outages and ensure sites with air-conditioning are available for those without access. • Advance policies and incentives that ensure better housing insulation. • Transfer of technology to developing countries for systems forecasting extreme heat and early warning systems/heat wave alerts. • Measures, such as planting green spaces/trees/vines have cooling effect through giving shade and evapotranspiration.[155] Urban forestry programs could be part of the NAP. • Diverting heat on roofs with adaptive measures such as green rooftops and white roofs. White roofs are typically 28–36 degrees Celsius cooler than dark roofs in afternoon sunshine.[156] • Replacing or upgrading pavement with more reflective materials.[157] • Measures to reduce negative effects from hot wind paths (i.e., wind traveling from hot areas), and increase positive effects from ventilation and cool wind	• Lack of awareness of heat related impacts and adaptive strategies • Not sufficient green and blue spaces to ensure evapotranspiration and cooling effects • No understanding of wind and its potential cooling effect, but also lack of understanding of wind as heat risk • Underreporting of heat-related deaths due to compensation schemes for disaster-related deaths • Risk of power outages due to energy demand for air-conditioning • No early warning systems or limited access to early-warning systems

paths (i.e., remove structures to ensure benefits from sea breeze, or encourage wind traveling down tall buildings).[158] • Create wind corridors by establishing forest corridors between forests and parks generating and spreading cold air.[159] • Measures to reduce air pollution (as greenhouse gas emissions and aerosols envelopes the heat over cities).[160] • Traffic and congestion policies and strategies, regulating the number and type of vehicles,[161] or establish traffic-free and traffic restrictive zones to reduce pollution.[162] • Increase capacity among health care workers to recognize and treat heat-related illnesses and ensure that these illnesses are properly diagnosed.	

Production and Services

Introduction

The risk of climate action failure and extreme weather events is at the top of the World Economic Forum's global risk landscape.[166] Climate risk creates vulnerability for production and services in both public and private sector and leads to increased risk for market failure in the global financial system. In the financial sector, climate risk has also been labelled 'green swans', hereunder potentially destructive incidents that can lead to the next financial crisis.[167]

Climate risk reporting for companies has been promoted as one of the solutions to address climate risk—with the view that knowledge will lead to action to reduce the risk. The interest for climate risk reporting crystallized around 2000 with the Carbon Disclosure Project (now CDP), and over the next 20 years several hundred reporting initiatives were established. However, the understanding of physical climate risk and its impact on private sector (i.e., production and services) is lacking depth and nuance. Despite recent development such as the TCFD framework, which aims to reduce fragmentation and establish itself as the global standard for climate change reporting for private companies, the adaptation component is lacking.[168]

Solution #1: Ensure private sector reporting frameworks sufficiently and correctly reflect adaptation

Description of solution, quantification of opportunity

Adaptation in climate risk reporting frameworks, including the TCFD framework, is barely present, resulting in a lost opportunity for deepening the understanding of adaptation and its potential for risk reduction, potentially leaving companies more vulnerable to climate risk than otherwise necessary. Although the current number of companies reporting in line with the TCFD framework is low, there are calls by the G7 of making climate reporting compulsory. As the current frameworks for climate risk reporting are evolving, there is an opportunity for strengthening the understanding and use of adaptation processes for the private sector in these frameworks.

In addition, the potential for widening the discussion to also include potential cooperation and collaboration in undertaking adaptation measures for the local communities affected by the private sector could also be pursued.

Key geographies

All regions

Influential actors (i.e., initiatives, coalitions, and organizations, key geographies)

- Adaptation Committee
- LEG
- UNEP (i.e., UNEP Financial Initiative)
- UNDP
- Task Force for Climate Related Financial Disclosures (TCFD) framework
- CDP (previously Carbon Disclosure Project)
- Global Reporting Initiative (GRI)
- Climate Disclosure Standards Board (CDSB)
- The Value Reporting Foundation (previously International Integrated Reporting Council (IIRC) and SASB
- Principles for Responsible Investment (PRI)
- Network for Greening the Financial System (NGFS)
- Financial Stability Board (FSB)
- Greenhouse Gas Protocol

<table>
<tr>
<td rowspan="2">Key actions and policies
• Ensure private sector reporting frameworks sufficiently and correctly reflect climate risk and adaptation—both for companies and local communities affected by company presence.
• There is a need to have a conversation about what the production and services sectors can do to assist with adaptation measures for local communities and how to ensure the climate risk burden is equitably distributed.
• Engage in dialogue, cooperation, and collaboration (including creating possible guidelines) to ensure that there is no ‘race from the bottom’ in which the most vulnerable areas to climate change are left without efforts to reduce risk/vulnerability, strengthen resilience, and strengthen adaptive capacity.
• Support the establishment of shared reporting frameworks, including shared metrics/indicators in order to measure needs and progress related to adaptation.</td>
<td>• WEF Stakeholder Capitalism Metrics
• IFRS Sustainability Standards
• OECD guidelines for multinational corporations
• FN Global Compact
• ISO 1400-series</td>
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<tr>
<td>Policy and other barriers[169]
• Limited understanding of climate risk and relevant adaptation action for the private sector, including limited adaptation coverage in climate risk reporting frameworks
• Not one agreed, comprehensive list of indicators to measure climate risk and adaptation
• Short-term business cycles
• Non-binding rules and procedures
• Fragmentation of reporting frameworks
• Lack of clear procedures for private sector companies engaging in adaptation action
• No clear guidelines to reduce a ‘race from the most risk-prone areas’ and to ensure private sector is equitably sharing the burden of climate risk with the local communities affected by its business</td>
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Societal Environment

Introduction

Population growth not only drives climate change but acts as a climate change threat multiplier.[170] Thus, population growth is directly connected to the level of climate risk, hereunder the level of vulnerability and resilience. To reduce vulnerability and strengthen resilience, understanding how population growth affects adaptation options is key; closely connected to this is the important role women and local communities play in ensuring successful adaptation action. According to the UN World Population Prospect, the world's population will reach an estimated 9.7 billion people in 2050.[171] Continued rapid population growth represents challenges for these countries but also the rest of the world, as it will put pressure on already strained resources and make it more challenging to achieve the SDGs. For example, the availability of water considered sufficient for well-being is not on par with the available cubic meters of water available per person in dryland ecosystems. Increased water scarcity and shortages will be the result if the predicted population growth in these areas holds true.

Mitigation co-benefits are available if adaptation measures to ensure balance in the world's population size is achieved. In achieving the SDGs, the carbon footprint will likely increase for emerging economies and developing countries, depending on the emission intensity of the development pathway chosen. Although per capita emissions are higher for developed countries, the global energy demand is set to increase by 4.6 percent in 2021, led by emerging markets and developing economies; importantly, 80 percent of the expected rise in coal usage is projected to come from Asia.[172] In addition, there are mitigation co-benefits from adaptation measures to ensure that the population growth is curbed in developed countries with currently high carbon footprints. The potential carbon reduction from achieving a balanced population has not been assessed by the IPCC due to the topic's political sensitivities. However, despite the troubling history connected with population control in most parts of the world, it is an important element of adaptation planning that should not be overlooked. One of the reasons that it has been kept on the back burner is due to various religious and cultural sensitivities connected with women's rights and the right to reproductive health, and this should be kept in mind when discussing this issue.[173]

Solution #1: Achieve replacement-level fertility rates/balance in the world's population size

Description of solution, quantification of opportunity

For many countries, including SIDS and LDCs, the challenges to achieve sustainable development are compounded by their vulnerability to climate change.[174] It is not possible to understand and reduce vulnerability without taking population dynamics into account—as the size, composition, location and mobility of populations change, so does their exposure to climate risk.[175] Population growth is occurring most rapidly in the developing world with the result that the scale of vulnerability to the projected impacts of climate change increases.[176] Achieving balance in population size, often referred to as replacement-level fertility rates, can be seen as an adaptation strategy as it reduces vulnerability to climate change impacts and strengthens resilience to climate change, at local, national, regional, and global levels.

Influential actors (i.e., initiatives, coalitions, and organizations, key geographies)

- Family Planning 2020,
- The Overpopulation Project
- WRI
- United Nations Population Fund (UNFPA)

Policy and other barriers

- Lack of educational opportunities for girls

Of the 164 NDCs submitted under the Paris Agreement, about one-third link population growth to a negative effect and/or identify population growth as a challenge or trend affecting social needs.[177] Increased energy demand, natural resource degradation, vulnerability to climate impacts, and decreased food and water security were some of the negative impacts listed as a consequence of population growth. However, only seven NDCs included strategies to slow population growth, but these did not specify implementation measures.[178] This shows that family planning policies as an adaptive measure is largely overlooked in NDC documents, suggesting that they are also neglected in NAPs and climate change planning processes.[179] **Key geographies** Countries of sub-Saharan Africa could account for more than half of the growth until 2050. However, the United States, India, Indonesia, and Pakistan are also projected to be amongst the countries with largest population growth.[180] **Key actions and policies** According to WRI, the following are the key actions to take three forms of social progress that have led all others to voluntarily reduce fertility rates:[181] • increasing educational opportunities for girls • expanding access to reproductive health services • reducing infant and child mortality so that parents do not need to have as many children to ensure survival of their desired number. In addition, national family planning and population policies including information on replacement-level of fertility rates should be part of the NAP processes as an adaptation response. In-depth understanding of how population growth interacts and increases the risks associated with climate change is necessary in order to find the correct measures. This should include scenarios of how technology, consumption, population, and biocapacity evolve and affect each other.[182] Support for these adaptation measures should be open to finance from GCF, GEF and the AF and should be a greater focus by national governments in order to secure finance.	• Lack of access to reproductive health services • High infant mortality • Lack of national planning (i.e., planning and population policies) • Lack of scientific focus by the IPCC: although IPCC includes population growth in its scenarios, IPCC is not assessing the potential measures needed for curbing population growth • Weak media-coverage: family planning is not at the top of the list on how to tackle climate change related risks (i.e., compared to coverage on natural disasters) • Policy considerations: some governments are worried about the effect of declining populations of its country on the welfare system and urge women to have more children • Unclear indicators and evaluation criteria • Limited access to finance as adaptation funds do not cover adaptation measures aimed at achieving replacement-level fertility rates • Political, religious, and cultural barriers, such as push back on women's rights to reproductive health.

Appendices

The Appendices provide an explanation of the underlying reasoning for the analysis in Part III.

Appendix I: Rationale/Organizing Principles

This appendix provides an explanation of the underlying reasoning for the analysis in Part III and gives a brief overview of the main organizing principles for reporting on adaptation risks and solutions that has been used by relevant actors. It also sets out the underlying reasoning behind the structure of the report, which, together with a list of risk parameters and capacity building measures, frames the adaptation analysis and aims to shed light on the pieces of information necessary to understand the full picture of adaptation gaps and needs.

A) Understanding the Structure

There are different organizing principles used to discuss adaptation-related issues, and there is not one agreed system/structure. An assessment of the sectors and themes present in adaptation reports by relevant actors has, however, revealed some common denominators for how they structure the discussion on adaptation.[183] First, adaptation is usually tied to the different landscapes or *environments* in which adaptation takes place: water, natural environment, rural environment, and cities and urban development. Secondly, *thematic areas* such as food security and health are also regularly presented as stand-alone categories. [184] Closely linked to the thematic areas is the discussion on adaptation measures to influence society and human behaviour, which is rarely discussed, but could offer important insights and provide opportunities for mitigation co-benefits. Further, the agriculture *sector* is also commonly represented, sometimes together with the fisheries and forestry sector.[185] Discussions around the specific *threats/risks* of climate change are also often used to highlight the different adaptation measures needed in each environment, thematic area, or sector. Further, *disaster risk management* is sometimes added as a separate category. However, disaster risk reduction interventions are cross-sectoral and therefore also discussed under other relevant categories. In conclusion, there is not one commonly agreed system but rather a mix of adaptation related environments, sectors, and thematic areas in which specific climate risks are highlighted.

Sector integration of adaptation considerations is, however, becoming more prominent as countries evolve in their adaptation planning processes and begin implementing their adaptation strategies.[186] Although countries are taking different approaches to initiating integration of adaptation into sector planning, the uptake of adaptation priorities and initiatives into sectoral planning and policy-making is a key concern throughout the spectrum of approaches.[187] The sectoral focus for adaptation has historically focused on the primary sector most affected by a changing climate, in particular agriculture. This is not surprising as the primary sector to a great extent depends on nature and its climatic variables in producing agricultural and marine products and extracting natural resources. However, the deepened

understanding of climate risk and its effect on other sectors necessitates a more comprehensive assessment of adaptation in these sectors as well. At the same time, it is important to bear in mind that the need for adaptation action in the most affected areas and sectors should be prioritized, based on principles of equity.

Thus, this report attempts to reflect the organizing principles of the current adaptation discussion, but also takes into account the ongoing effort to integrate adaptation into sectors. The following system for organizing the discussion on adaptation opportunities for raising climate ambition is a combination of relevant landscapes and sectors (first tier):

1. **Water**
    a. **Freshwater**: freshwater ecosystem, river, basin, watershed, water rights, products, and fisheries
    b. **Ocean and fisheries sector**: ocean ecosystems, coastal areas, low-lying areas, islands, coastal communities, ocean/water rights, products, and fisheries
2. **Rural environment/primary sectors**: terrestrial ecosystem, land use, agriculture, forestry, hunting, mining and quarrying, and terrestrial products.
3. **Built environment**
    a. **Cities, urban development, and human settlement:** circular economy, buildings, green areas/open spaces, health, biodiversity, disaster risk reduction, nature-based solutions, and mitigation-co benefits
    b. **Infrastructure:** transportation modalities and services, utilities for water, sewage and waste, and energy system
4. **Production and services:**
    a. Companies involved in manufacturing, construction, and processing of goods
    b. Service providers such as retail, entertainment, restaurants, tourism, healthcare services, legal services, insurance and banking, financial services, financial markets, trade, investment, and IT development and services

As mentioned above, some *thematic areas* with particular importance for adaptation have also crystallized over the years:

a. Health: The health of the earth as a climate system and ecosystem will depend upon which mitigation pathway is pursued and which adaptation interventions are implemented. Human health is closely aligned and intertwined with that of the earth. As the climate changes and produces more disruptive and unpredictable weather it becomes increasingly difficult to ensure that we keep the levels of development, health, and safety we currently have and attain the development goals set for the future. The scale and speed of implementing correct adaptation measures will, together with the level of mitigation, determine the scale of loss and damage and the level of development attainable. Adaptation measures aim to strengthen the resilience and

reduce vulnerability of the natural, rural, and built environment with long term effects on human health.

b. **Natural environment:** biodiversity, ecosystem services, and nature-based solutions
c. **Disaster risk reduction (DRR):** DRR is aimed at both preventing new and reducing existing disaster risks. Hazardous events such as droughts, floods, cyclones, earthquakes, or tsunamis, can lead to loss of, destruction or damage to people, assets, infrastructure, and ecosystems, depending on the level of vulnerability and exposure of such systems. In short, disaster risk management is the strengthening of resilience and reduction of vulnerability in the face of ongoing or future natural or man-made disasters. Thus, it is not limited to disasters resulting from climate change. The international collaboration on disaster risk reduction led to the Hyogo Framework for Action 2005-2015, which was later replaced by the Sendai Framework for Disaster Risk Reduction 2015-2030.[188] The United Nations Office for Disaster Risk Reduction (UNISDR) has been tasked to support the implementation, follow-up, and review of the Sendai Framework. The preamble of the Sendai Framework states that addressing climate change as one of the drivers of disaster risk represents an opportunity to reduce disaster risk.[189] It also refers to the importance of incorporating disaster risk reduction measures into development programs related to adaptation. [190] At the same time, the Sendai Framework acknowledges the mandate of the UNFCCC as the primary oversight body for climate change policy.[191] The Paris Agreement and its accompanying decisions do not explicitly mention the Sendai Framework. However, the linkages and overlaps between DRR with adaptation and loss & damage are clearly present also in the Paris Agreement.[192] The global goal on adaptation 'provides an umbrella for integrated actions' with the Sendai Framework in its call for enhanced adaptive capacity, strengthened resilience, and reduced vulnerability to climate change.[193] In addition, the Warsaw International Mechanism on Loss and Damage (WIM), established under the UNFCCC and cemented in the Paris Agreement, coordinates and cooperates on its mandate to avert, minimize, and address loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events.[194]
d. **Societal environment:** economy, institutions, politics, laws and regulations, societal values, behavioural, religion, migration/displacement, indigenous and vulnerable communities, peace and conflict, population growth, and development goals. The discussion related to societal and behavioural adaptation measures are budding but is still sparingly reflected in NAPs and NDCs. However, due to the level of transformational opportunities inherent in adaptation measures that influence social structures and behavior, this thematic area has been elevated to a stand-alone section in the analysis under part III.
e. **Research and education:** NGOs, universities, research institutions, IGOs, private sector.
f. **Adaptation planning processes:** Adaptation planning has received particular attention by the UNFCCC bodies which has resulted in the National Adaptation Planning (NAP) process. Adaptation planning processes is one of the cornerstones of Article 7 of the Paris Agreement and has risen the awareness of the importance of national rooted

processes for strengthening resilience and reducing vulnerability. The NAP process is organized around the following structure: (i) laying the groundwork and addressing gaps; (ii) preparatory elements; (iii) implementation strategies; and (iv) reporting, monitoring and review. In addition, the NAP process assesses the progress in achieving the objectives to formulate and implement NAPs, including guiding principles. These relate to reduction of vulnerability to climate change, and to facilitate integration of climate change adaptation into development. In addition, both technical and financial support is assessed. There has been a progression from an overarching NAP process for the national work on adaptation toward integrating the NAP process in all governmental processes and establishing an adaptation planning process for each sector. The NDCs have also indirectly strengthened the focus on adaptation planning processes as the adaptation goals and measures presented in the NDCs should reflect the long-term policies and plans on adaptation at regional, national, and local levels. In the UNEP Adaptation Gap Report, the global progress on adaptation planning is assessed in a stand-alone chapter. The assessment of whether adaptation planning is 'adequate and effective' is organized around the following five criteria: (i) comprehensiveness/risk assessment; (ii) inclusiveness and stakeholder engagement; (iii) implementability; (iv) horizontal and vertical integration; and (v) monitoring and evaluation.

Finally, *the type of adaptation work* gives insight into the areas of adaptation support and interventions provided. These areas include adaptation planning; risk assessments; information/knowledge sharing; institutional development; regulatory/legal; means of implementation (e.g., finance mechanisms, capacity building, and technology transfer); scientific/research/education; technology; financial/market mechanisms; policy/regulatory/legal; cooperation; knowledge and education; awareness raising; measuring, reporting and verification (MRV); nature-based solutions; biodiversity/ecological; DRR; adaptation finance; mitigation-related adaptation; social/behavioural; and gender; among others.

B) Risk parameters

This analysis is meant to bring the discussion further on the technical and practical elements of adaptation. It includes adaptation measures that have potential impact on different *risk-parameters* discussed below.

Climate risk can have direct or indirect effect on the natural environment, ecosystems, and human systems (i.e., food systems, built environment, society, and economy). The effect is difficult to ascertain, and subject to uncertainties. The recent work by the UNFCCC Adaptation Committee points toward the inherent empirical, methodological, conceptual, and political difficulties in creating indicators for reviewing the overall progress in achieving the global goal of adaptation on enhancing adaptative capacity, strengthened resilience, and reducing vulnerability. In addition, few reports are clear about the underlying risk parameters

underpinning its adaptation recommendations. Thus, it is not always possible to ascertain the risk parameters for an adaptation measure in an inclusive manner.

Furthermore, it has proven to be problematic to find information at a global aggregated level on the possible effects an adaptation measure can have on reducing climate risk. This is an important finding as Parties approach the 2023 global stocktake with the aim of assessing progress toward reducing vulnerability and strengthening adaptive capacity and resilience. The relevant information for the global stocktake will, amongst others, derive from Parties' adaptation communications. It is therefore important to ensure that the information Parties communicate is sensitive to the national context but also contains information that can be used in the aggregated review of the status of adaptation globally. The information relevant for a review of the global goal on adaptation could attempt to give an overview of the effect global warming has on a variety of parameters, i.e., risk parameters. The risk parameters that could provide useful in ascertaining global climate risk levels should attempt to measure vulnerability and resilience levels and could include current and projected effect (i.e., for 2030, 2050, and 2100). The same parameters can also be used to ascertain the effect adaptation measures can have on climate risk, thus ascertaining adaptation's potential for risk reduction. However, it is important to underline that these risk parameters will not explain the developmental, political, or ethical context and should be used together with other indicators and information that can better explain the national context. Thus, the review of the global adaptation goal should also highlight these considerations, albeit in a manner that does not identify/single out one particular country. For example, the potential risk of drowning of small island states is not possible to ascertain or measure solely with a set of risk parameters/indicators as the potential losses incurred include loss of heritage and culture, as well as psychological and non-material effects. With these caveats, the following is a list of risk parameters that can be useful in ascertaining the need for adaptation and its potential impact:[195]

Climate change impact/risk parameters:	Measure
Health (i.e., people with climate related health conditions)	Number of people and type of health condition
Workability (i.e., peoples capacity to work outdoors)	Number of people and number of hours
Mortality, direct effect on death rates due to climate related events	Number of people
Food systems, effect on yield and distribution	Percentage of yield, distribution in number of days
Physical assets, effect on buildings, infrastructure etc	USD/other currency
Area affected	Hectare (ha)
Vulnerable/marginalized people and communities, including indigenous peoples, women, elderly, children, people with disability, LGBTIQ community, etc.	Number of people and information on level of marginalization
Natural capital, such as biodiversity, ecosystem services, and natural environments	USD/other currency or other
Culture and society, such as risk of losing culture, language, traditions and way of life, and risk of riot and civil unrest	USD/other currency

Displacement and migratory effects of climate risk	Number of people, both internally and cross-border
IPCC confidence level of climate change effect	Low – medium – high – very high etc
Scientific levels of intensity and frequency (base-level, current and projected)	Percentage increase, and number of occurrences

When measuring the effect of *adaptation interventions* on climate change impacts, the above risk parameters are relevant. In addition, the following could be ascertained:

Climate change impact/risk parameters:	**Measure**
The cost of adaptation intervention and possible economic benefits	USD/other currency
Co-benefits, such as CO_2-reductions, biodiversity, and natural capital	CO_2-eq and others
Relevant climate scenario-analysis, and level of adaptation chosen	i.e., IPCC's SSP1-1.9 to SSP5-8.5
Timeline for implementation of adaptation measure	Days/months/years
Function/effect of adaptation measure (to prevent, protect, tolerate, restore etc), including projected success rate	Success rate in percentage or other relevant measure
Information on the status of a country's national adaptation planning processes	Number of NAPs submitted; the number of sectors included in the adaptation planning processes

C) Capacity Building Measures

Equally important is the need to ascertain the level of capacity and readiness to engage in adaptation action. Without capacity the transformational opportunities of adaptation solutions might be lost. Capacity building measures and other enabling factors for adaptation include, but is not limited to:[196]

○ **Institutional arrangements**
- **strengthen or establish national climate change secretariats or national focal points**
- **strengthen sectoral, national, and subnational capacities**
- **strengthen national ownership of capacity building**
○ **Policy and decision making**
- **improved decision-making, including assistance for participation in international negotiations**
- **support needs for NAPs and decision-making for adaptation action,**
- **integrating adaptation into sectoral planning processes**
- **capacity building for implementation of adaptation measures**
- **mainstreaming climate change**
○ **Development and transfer of technology**
○ **Technical assistance**
- **support with vulnerability and adaptation assessment**
- **support needs for impact assessment, risk mapping and disaster forecasting**

- research and systematic observation, including meteorological, hydrological, and climatological services
- to access climate funds to secure additional climate finance resources
o Financial support, from public and private sources
- improving capacity to access existing climate funds
o Legal and regulatory
- develop coordination mechanisms, legislation, policies, and action plans
o Education, training, and public awareness
- Awareness raising among local actors, communities, and private sector with a view to transform behaviours and mindsets
- Information sharing and networking, including the establishment of databases

In terms of the main organizing principles for reporting on adaptation risks and solutions used by relevant actors, sectors, themes, landscapes, and other organizing 'headlines' have been assessed for some of the main adaptation actors in order to find a common structure. They include the following:

Adaptation Component of the NDCs

The adaptation component of the NDCs, which sets out the national adaptation strategies and goals, has been analyzed by IISD, which lists the following:[197]

1. food security and production
2. terrestrial and wetland ecosystems
3. freshwater resources
4. human health
5. key economic sectors and services
6. coastal and low-lying areas
7. disaster risk management (DRM)
8. urban areas and other human habitats
9. ocean ecosystems.

In addition, the IISD points out that the NDCs also elaborate synergies and co-benefits between adaptation and mitigation, such as: climate-smart agriculture, reducing food waste, vertical farming, adapting coastal ecosystems, increasing the share of renewable sources in energy generation, improving energy efficiency, carbon capture and storage, fuel switch and fuel price reforms in the transport sector, and moving to circular economy for better waste management.

Global Commission on Adaptation (GCA)

In its 2019 report GCA focuses on three main areas for adaptation that needs to be strengthened: (i) understanding climate risk; (ii) mainstreaming climate risk in planning and decision-making; and (iii) mobilizing finance to accelerate adaptation. These three areas are then highlighted in the following structure:[198]

1. food security and livelihoods for small-scale producers
2. natural environment

3. water
4. cities and urban areas
5. infrastructure
6. disaster risk management
7. financing adaptation.

German Institute for Development Evaluation (DEval)

DEval has in its 2020 discussion paper on adaptation gaps created the following four categories:[199]

(i) water
(ii) forestry, fishing, and agriculture
(iii) land use and built environment
(iv) society, economy, and health.

It also points out that disaster risk reduction interventions are cross-sectoral and can be found in all sectors listed above depending on whether the target is water resources, people and infrastructure, or agriculture.

IPCC

In its forthcoming assessment report (AR6) for working group II, IPCC has used the following chapter outline in its assessment of risks, adaptation and sustainability for systems impacted by climate change:[200]

1. terrestrial and freshwater ecosystems and their services
2. ocean and coastal ecosystems and their services
3. water (on basin and watershed scale)
4. food, fiber, and other ecosystem products (agriculture, fisheries and forestry, nutrition risks, competition for use and conflicts with indigenous rights to land and water bodies)
5. cities, settlements, and key infrastructure
6. health, wellbeing, and the changing structure of communities (including psychological, social, and cultural dimensions, migration, displacement, and trapped populations)
7. poverty, livelihoods, and sustainable development (including attribution of observed impacts and challenges for equity, adaptive capacity, and human security).

In addition, the IPCC will produce focused chapters on regions and its key risks, cultural dimensions, governance and economic aspects, and adaptation options. In addition, there will be special focus on biodiversity hotspots, cities and settlements, deserts and semi-arid areas, Mediterranean region, mountains, polar region, and tropical forests. Finally, a section will discuss adaptation synergies and trade-offs within the mitigation and sustainable development context.

The EU

The EU's climate adaptation strategy has the following elements:[201]

1. Improving knowledge and managing uncertainty, including more and better climate-related risk and losses data and creating a climate knowledge platform for impacts, good practices, and solutions.
2. More systemic adaptation, including mainstreaming of climate resilience considerations in all relevant policy fields with three cross-cutting priorities: (i) integrating adaptation into macro-fiscal policy; (ii) nature-based solutions for adaptation; and (iii) local adaptation action. Adaptation strategies must be effective and based on the latest science. Monitoring, reporting, and evaluation is essential to set a robust baseline in which to measure progress on adaptation. Comparisons with areas with common climate risks across borders, hereunder river basins, mountainous areas, islands, or the outermost regions with particular vulnerabilities, as well as security of energy supply.
3. Accelerate the transformation to a climate resilient future. Faster adaptation is needed to bridge the adaptation gap more swiftly. Lack of access to actionable solutions is one of the main barriers to adaptation. The Mission Europe also points out the need to scale up actionable solutions triggering societal transformations

The EU will assess its climate resilience in three dimensions: (i) resilience of environmental systems with a commitment to long-term sustainability and support of overarching goals of the European Green Deal such as reaching climate neutrality, adopting circular economy principles and preserving biodiversity and a toxic-free environment; (ii) resilience of social and economic systems that is inclusive and leaves no one behind to achieve societal transformation; and (iii) resilience of political systems, in which societal transformations involve all stakeholders in all its phases. It uses words like "co-design," "co-implementation," and "co-evaluation."

EUs areas of research and innovation for adaptation is divided into five 'sectoral' categories:[202]

1. regenerating community and social infrastructure
2. protecting human health and wellbeing
3. restoring biodiversity and ecosystem services
4. rethinking water management
5. reviving rural landscapes and sustainable food systems.

Appendix II: List of Actors/Initiatives

Appendix II provides a survey of a large number of multinational and regional actors, including information on the type of organization, geographical area covered, description of adaptation activities undertaken, beneficiaries, sectors and thematic areas, and type of adaptation support provided. The survey is an updated and simplified version of the 2017 survey by the Adaptation Committee but includes a greater number of regional adaptation actors. [203] *The survey is meant to be a living document highlighting opportunities for global and regional collaboration and cooperation. Although adaptation must be locally anchored to cater to the local communities and the specific attributes of the specific area, there are opportunities for engagement and learning how others have engaged in the adaptation processes, integration, and implementation. It is also meant to give private funders and investors the opportunity to ascertain potential projects and programs.*

The information below has been updated based on information available on the organizations' webpages as well as from relevant published literature.[204] Please note that the list is non-exhaustive and is meant to give a snapshot of the landscape of actors and actions for adaptation.

Multi-national actors & geographical areas covered[205]	**Description of adaptation work/activities undertaken**[206]	**Beneficiaries**[207]	**Sectors and thematic areas**[208]	**Type of adaptation support provided**
Adaptation Action Coalition	The Adaptation Action Coalition was formed in January 2021 and builds upon the Secretary General's 2019 UN Climate Action Summit (UNCAS) "Call for Action on Adaptation and Resilience." Its primary aim is to deliver sector-specific, action-oriented workstreams on 12 sectors. The focus in 2021 is on health, infrastructure, and water. The workstreams will (i) demonstrate real world action that is being taken to respond to climate risks; (ii) build the evidence base on good adaptation; (iii) support the integration of climate risk into sectoral and national plans; (iv) ensure work is driven in partnership with others, including the Race to Resilience to being together state and non-state actors; and (v) integrate inclusion and the locally-led principles.[209]	Parties to the UN who have signed the Call for Action	Water, Rural environment, Built environment (infrastructure, urbanization & mobility), Health, Natural environment, Research and education, Disaster Risk Reduction (DRR), Social and behavioral, Technology and Finance.	Research/knowledge; Cooperation/ information sharing/awareness raising.

Adaptation Committee (AC): a UNFCCC-affiliated body covering all regions	The AC's overarching objective is to promote the implementation of enhanced action on adaptation in a coherent manner under the UNFCCC and works to raise the profile of adaptation within and outside of the UN system. It also promotes synergies with organizations, centers and networks, the private sector and civil society outside of UNFCCC. In addition, it has the following focus areas:[210] (i) **Gender:** The AC works to improve gender balance and increase participation of women in the UNFCCC processes as well as increased awareness and support for the development and effective implementation of gender-responsive climate policy and action at regional, national, and local levels. (ii) **Technical support:** The AC provides technical support and guidance to the Parties of the UNFCCC with a view to facilitate the implementation of adaptation activities. It has established a task force on National Adaptation Plans (NAP Taskforce) with the aim to support developing countries seeking to formulate and implement National Adaptation Plans (NAPs).[211] It also works on assessing possible next steps on monitoring and evaluation of adaptation, reports on the best practices and needs of local and indigenous communities. It also reports on the adaptation approaches that promotes livelihoods and economic diversification including the various approaches to community-based adaptation and ecosystem-based adaptation. (iii) **Means of implementation (finance, technology, and capacity building):** The AC provides information and recommendations for guidance on means to incentivize the implementation of adaptation actions, including finance, technology, and capacity-building. The most	Parties to the UN Framework Convention on Climate Change (UNFCCC).	Water (freshwater & ocean/coastal areas), Rural environment /primary sector, Built environment (cities, settlements, and infrastructure), Production and Research services, and education.	Research/knowledge; Means of implementation (technological, capacity building and finance); Institutional arrangements; Policy/regulatory; Cooperation/ information sharing/awareness raising; Technical support; Gender considerations.

	recent work has been focused on how to advance the engagement of the private sector in adaptation.			
Africa Adaptation Initiative (AAI): an initiative covering Africa	AAI was launched by African Heads of State in 2015 to enhance action and support to Africa on adaptation, in particular to address the adaptation financing gap.[212] It has begun phase 3 (2020-2030) in which funds will be leveraged in the form of catalytic grant and bond financing to facilitate partnerships, unlock further private and public investment, and scale adaptation efforts. AAI has four flagship programs:[213] (i) **Africa Program on Climate Services for Adaptation and Resilience**, led by the African Development Bank, to enhance observational infrastructure for climate and weather systems, and grow capacity for sustained delivery of climate information services (ii) **Advancing Risk Transfer in Africa**, led by African Risk Capacity, to strengthen financial resilience to weather-related events and other disasters through risk transfer such as insurance pooling and the Extreme Climate Facility (iii) **Lake Chad River Basin Early Warning System,** led by Lake Chad River Basin Commission, that seeks to reduce the risk from climate-related disasters in the Chad Basin by developing hydro-meteorological capacity for early warnings and forecasting (iv) **Knowledge Management Program for Adaptation Planning in Africa**, led by UNEP and Stockholm Environment institute, which seeks to facilitate the integration of climate change adaptation into relevant and existing policies, programs, and activities, such as NAPs.	Local and national authorities, local communities	Agriculture, Water, Disaster reduction, Cities and local communities, Coastal protection, Health, and Biodiversity and ecosystems.	Research/education; Risk assessments; Information/knowledge; Capacity building; Financial/market mechanism/risk transfer; Cooperation; Information sharing; Communication; Outreach; Awareness raising; Technical support.

	In addition, it has two other flagship programs in the pipeline[214]: (**v) Adaptation of African Agriculture (AAA),** with projects to improve soil management, agricultural water control, resilience in agricultural plans, and technical financial support**; and (vi) African Climate Finance Forum**.			
African Climate Policy Centre (ACPC): a UN-affiliated organization covering Eastern, Middle, Northern, Southern, and Western Africa	ACPC came into operation in 2010 and serves as a knowledge hub and policy facilitator for poverty reduction through mitigation and adaptation in Africa. Its vision is to make Africa's development sustainable, inclusive, and climate-resilient through responsive policies, plans and programs.[215] ACPC is the secretariat of the **ClimDev-Africa** program running from 2010 until 2021. The first phase of the program focused on the generation and development of climate information services, research, and analysis to support policymaking and climate governance. The second phase address the climate change and development context. ACPC is also leading the Pan Africa component of the **Weather and Climate Information Services for Africa (WISER**), which aims to reduce risks from weather related events on agriculture, food security, water, energy, infrastructure, and health.[216]	National and local authorities, local communities	Adaptation finance, Gender, Research and education, Socio-economic activities	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Science and research, Technology
African Risk Capacity (ARC): a regional center/network/ initiative covering Eastern, Middle, Northern, Southern, and Western Africa	ARC assists African governments to improve their capacities to better plan, prepare, and respond to extreme weather events and natural disasters. ARC enables countries to strengthen their disaster risk management systems and access rapid and predictable financing when disaster strikes to protect the food security and livelihoods of their vulnerable populations. It does so by relying on concepts of risk pooling and risk transfer using Africa RiskView, an advanced satellite weather surveillance and software, to estimate and trigger readily available funds.[217]	National governments, local authorities, local communities	Adaptation finance, Agriculture and food security, Disaster risk reduction	Adaptation planning and practices, Adaptation policy, Capacity-building, Vulnerability assessment; Risk pooling/risk finance; Weather technology
African Union (AU): an intergovernmental organization (IGO) covering Eastern, Middle, Northern,	AU is a continental body consisting of the 55 member states that make up the countries of the African Continent. It was officially launched in 2002 as a successor to the Organization of African Unity (OAU, 1963-1999). The vision of the AU is 'an integrated, prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in global arena.' The AU has shifted focus from supporting liberation movements in African	National governments	Disaster risk reduction, Energy, Gender, Human settlements and infrastructure, Socio-economic activities	Adaptation planning and practices, Adaptation policy, Monitoring and evaluation

Southern, and Western Africa	territories under colonialism and apartheid, to an organization spear-heading Africa's development and integration.[218]			
AGRHYMET Regional Center: a regional center/network/ initiative covering the Sahelian region of Africa	AGRHYMET is a regional center for information, training and research on food security, desertification control and water control/management in the Sahelian region of Africa. Its expertise includes (i) agricultural statistics, plant protection, pest problems; (ii) hydrological modeling, analysis of watershed and irrigation schemes/management; (iii) management of databases and software engineering, mathematical modeling, and numerical simulations; and (iv) remote sensing and image interpretation.[219]	National governments and local authorities, local communities	Agriculture and food security, Water resource, Research, and education	Capacity-building, Communication and outreach/awareness, Education, and training, Monitoring and evaluation, Observation and scenarios, Science and research, Vulnerability assessment
Alliance for Global Water Adaptation (AGWA): an international network/NGO – covering Africa, Latin America, and the Caribbean, Asia, and the Pacific	Since 2010, AGWA has been working as a global network to develop, crowd-source, and mainstream the emerging practice of climate resilience, especially with regard to water management.[220] AGWA works primarily across two complementary and synergistic workstreams: (i) driving the **global and national water-climate policy** agenda to support and enable more water-wise decisions, actions, and investments. AGWA engages with the UNFCCC bodies and partnerships and assists in revising the NDCs, engages with the UNDRR (and the Sendai Framework), and hosts the podcast ClimateReady (ii) developing **technical approaches** to resilient water management. It hosts the **BUA Knowledge Platform** with case studies, webinars, and tools for climate related water management.[221] It hosts training for national adaptation focal points. It has also developed **Water Infrastructure Criteria** in collaboration with Climate Bonds Initiative. Its focus on urban resilience is through cooperation with partner organizations with the **City Water Resilience Approach.**[222] AGWA enables hundreds of institutions and thousands of individuals globally to align their vision, co-construct tools to	National governments, local authorities, Local communities, institutions, private parties.	Water resources, Agriculture, and food security, Built environment (cities and infrastructure), Disaster risk reduction, Ecosystems, Energy,	Adaptation planning and practices, Adaptation policy, Institutional arrangements, Vulnerability assessment; Capacity building; Nature-based resilience; Climate Finance; Private Sector

	enable resilience, and intertwine emerging technical knowledge, finance instruments, and policy processes into synthetic, integrated tools and methodologies.			
Amazon Cooperation Treaty Organization (ACTO): an intergovernmental organization (IGO) covering South America	ACTO was formed by the eight Amazonian countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela, which signed the Amazon Cooperation Treaty (ACT). In implementing ACT, ACTO works in different dimensions: political-diplomatic, strategic, and technical, building synergies among governments, multilateral organizations, cooperation agencies, organized civil society, social movements, scientific community, productive sectors, and society as a whole.[223] Ongoing projects include (i) the Amazon Basin Project; (ii) the project to support the preparation and implementation of the Amazonian Strategic Cooperation Agenda; (iii) the Project Contingency plans for health protection of highly vulnerable Indigenous Peoples and in Initial Contact; (iv) Regional action in the area of water resources; and (v) and the Bioamazon project.[224]	National governments, local authorities, local communities, scientific community, NGOs	Biodiversity, Ecosystems, Health, Socio-economic activities, Water resources, Infrastructure, and transport,	Adaptation planning and practices, Knowledge management and information sharing, Adaptation policy, Capacity-building, Institutional arrangements, Monitoring and evaluation, Vulnerability assessment; Indigenous peoples and tribal communities; Tourism, Institutional, financial, and legal, Conservation of renewable natural resources
Andean Community General Secretariat (CAN): an intergovernmental organization (IGO) covering South America	Bolivia, Colombia, Ecuador, and Peru work together for the purpose of achieving more rapid, better balanced, and more autonomous development through Andean, South American and Latin American integration.[225]	National governments	Biodiversity, Disaster risk reduction, Gender, Health, Socio-economic activities, Water resources	Capacity-building
ASEAN Partnership with The Economics of Ecosystems and Biodiversity (ASEAN TEEB): an intergovernmental	The TEEB initiative seeks to draw attention to the invisibility of nature in the economic choices across the domains of international, national, and local policymaking, public administration, and business. TEEB sees this invisibility as a key driver of the ongoing depletion of ecosystems and biodiversity.[226]	National governments, local authorities, scientific community, NGOs	Biodiversity, Ecosystems, Agriculture and food security, Ocean, and coasts,	Adaptation planning and practices, Adaptation policy, Vulnerability assessment, Natural capital accounting,

organization (IGO), regional center/network/ initiative covering Africa, America, Asia & Pacific, Europe, and Arctic	The work is focused on agriculture and food security and natural capital accounting. The **TEEBAgriFood Evaluation Framework**, developed through collaboration with over 150 scholars from 33 countries representing a wide range of disciplines, backgrounds and perspectives, has been designed to guide the evaluation of food systems and their complex linkages to the environment, society, and human health.[227] It has also undertaken several country study pilots and has published reports and knowledge products.			Research, Information/knowledge sharing
Asia Pacific Adaptation Network (APAN): a regional center/network/initiative covering all regions	APAN was launched in 2009 as the first regional adaptation-specific network being part of the Global Adaptation Network (GAN). In 2011 APAN consolidated with the regional Adaptation Knowledge Platform for Asia (AKP) and kept the name APAN. The aim of the initiative is to 'build climate change resilient, gender-sensitive and sustainable human systems, ecosystems and economies through the mobilization of knowledge, enhanced institutional capacity and informed decision making-processes, and facilitated access to finance and technologies.'[228] It has special emphasis on knowledge, information sharing and capacity building. Since 2010 it has hosted **the APAN Forum**, which is the largest gathering of adaptation practitioners in the Asia and Pacific region. It also hosts a website with resources, publications, and projects for adaptation in an array of different thematic areas.[229]	National governments, local authorities, local communities, scientific community	Water (incl coastal zone management), Rural environment, Built environment (urban area and infrastructure), Mountainous regions, Production and services, Research and education, Disaster risk reduction, Financing	Adaptation Strategies, Adaptation-mitigation nexus; Capacity-building, Communication and outreach/awareness, Ecosystem based adaptation; Community based adaptation; Forecasting and Assessment; Gender and Social Impacts; Loss and damage; Private sector
Asia-Pacific Network (APN):[230] a regional center/network/initiative, UN-affiliated organization covering Eastern Asia, Southern Asia, South-Eastern Asia	The Asia-Pacific Network (APN) project on 'Strengthening Capacity for Policy Research on Mainstreaming Adaptation to Climate Change in Agriculture and Water Sectors' aims to: (i) enhance capacity and strengthen research, policy, and implementation of adaptation into agricultural and water policies; and (ii) create a network for adaptation policy research in Asia to enhance interactions between researchers and policy makers and promote regional cooperation in these	National governments, local authorities, local communities, scientific community	Water (freshwater), Rural environment (agriculture),	Information/knowledge, Communication and outreach/awareness, Science and research, Policy, Implementation, Regional cooperation

	areas **– the Adaptation Research Policy Network for Asia and the Pacific** (ARPNAP).[231]			
Association for strengthening Agricultural Research in Eastern and Central Africa (ASARECA): a non-profit sub-regional organization covering 11 African countries	ASARECA brings together scientists from the national agricultural research institutions of the member countries, national agricultural extension service providers and other strategic development-oriented partners to generate, share and promote knowledge and innovations to solve common challenges facing agriculture in the member countries.[232] Thematic areas include (i) agricultural transformational technologies and innovations; (ii) knowledge and information management; (iii) transformative capacity strengthening and integration; and (iv) enabling policy environment, functional markets and strengthening institutions.	Scientific community and research institutions	Agriculture and food security, Socio-economic activities	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication, and outreach/awareness, Monitoring and evaluation, Science and research, Technology
Association of Southeast Asian Nations (ASEAN): an intergovernmental organization (IGO) covering South Eastern Asia	ASEAN was established in 1967 with the signing of the ASEAN Declaration (Bangkok Declaration) by the founders Indonesia, Malaysia, Philippines, Singapore, and Thailand.[233] The member countries work together to achieve a number of developmental goals. ASEAN cooperates on environmental issues including climate change.[234] It has issued a joint statement on climate change and has established the ASEAN Working Group on Climate Change (AWGCC) in 2009 to enhance regional cooperation and action to address the adverse impacts of climate change on socio-economic development in ASEAN member states. Climate change is also addressed by other relevant working groups such as agriculture and forestry, energy and transport, and science and technology.	National governments	Disaster risk reduction, Water resources	Adaptation planning and practices, Adaptation policy, Communication, and outreach/awareness
Asian Cities Climate Change Resilience Network (ACCCRN): a regional center/network/ initiative covering Southern Asia, South-Eastern Asia	ACCCRN is a regional network connecting professionals and communities across Asia to build inclusive urban climate change resilience (UCCR) that focuses on poor and vulnerable people affected by climate change.[235] ACCCRN commit to empower people in building climate resilience, influence urban agendas, and build a regional resilient community in Asia where there is rapid urbanization and fast-growing cities that are prone to sudden shocks, as well as long-term stresses.[236] It has established a working group for Urban, Peri-Urban and Ecosystems with initial focus on the following:[237]	Local authorities, local communities, private sector	Adaptation finance, Disaster risk reduction, Health, Human settlements and infrastructure, Water resources	Adaptation planning and practices, Capacity-building, Communication and outreach/awareness, Institutional arrangements, Vulnerability assessment

	○ Water related risk in urban contexts including, but not limited to, flooding, salination of fresh water supply, water security and access, drought, and conservation of green space through restriction of damaging land use change patterns. ○ The interaction and impact of cities in their surrounding landscapes, including watersheds and peri-urban regions. ○ How upstream and downstream water management practices can raise resilience. Opportunities to integrate pro-poor/inclusive/just outcomes through ecosystem-based decision making into city resilience building through planning and budgeting in Asia. ○ Exploring an 'avoidance of loss and damage' perspective (real and potential) in line with COP21. ○ Knowledge sharing, networking, and mapping needs It also facilitates learning through webinars, talks, capacity building and forums.			
Asian Disaster Preparedness Center (ADPC): a regional organization covering all subregions	ADPC works to build the resilience of people and institutions to disasters and climate change impacts in Asia and the Pacific.[238] It supports countries in building their disaster risk reduction (DRR) systems, institutional mechanisms, and capacities to become resilient to numerous hazards, such as floods, landslides, earthquake, cyclones, droughts, etc. ADPC develops and implements cross-sectoral projects/programs for risk governance, urban resilience, climate resilience, health risk management, preparedness for response and resilient recovery, as well as cross-cutting themes of gender and diversity, regional and transboundary cooperation as well as poverty and livelihoods. The **ADPC Academy** designs and delivers specialist capacity-building and training courses and enhances the capabilities of national training centers on DRR.	National governments, local authorities, national training centers	Disaster risk reduction, Health, urban resilience, Human settlements, and infrastructure	Adaptation planning and practices, Capacity-building, Institutional arrangements, Monitoring and evaluation, Science and research, Vulnerability assessment, Gender and diversity, Cooperation, Poverty, and livelihoods

	DPC has been supporting **the Regional Consultative Committee on Disaster Management** (RCC) since 2000 as its secretariat.[239] Comprised of National Disaster Management Organizations (NDMOs) of 20 member countries, RCC serves as a non-binding mechanism to develop action strategies for disaster risk reduction; promote cooperative programs at regional and sub-regional levels; and provide guidance to ADPC on its future work and strategies in the region			
Asian Disaster Reduction Center (ADRC): a regional center/network/initiative covering Central Asia, Eastern Asia, Southern Asia, South-Eastern Asia, Western Asia, Melanesia	ADRC works to build disaster-resilient communities and to establish networks among countries through personnel exchanges and a variety of other programs.[240] Its main focus is on information sharing on disaster reduction through the following projects:[241] (i) developed a database in order to serve as a clearinghouse of disaster information; (ii) Global unique disaster Identifier Number (GLIDE) initiative to identify and share disaster information around the world; (iii) Disaster management support system (Sentiel Asia Project) using satellites, offers maps and satellite images and disaster information to the Asia Pacific region; (iv) convenes the Asian Conference on Disaster Reduction (ACDR).	National governments, local authorities, local communities, scientific community	Disaster risk reduction	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Education and training, Observation and scenarios, Vulnerability assessment
Asia Pacific Economic Cooperation (APEC): an intergovernmental organization (IGO), regional center/network/ initiative covering Eastern Asia, South-Eastern Asia, Melanesia	APEC is a regional economic forum with the aim to create greater prosperity for the people of the region by promoting balanced, inclusive, sustainable, innovative, and secure growth and by accelerating regional economic integration.[242]	National governments	Agriculture and food security, Energy, Gender, Health, Water resources	Capacity-building, Financial support
C40 Cities: an NGO covering Africa, Asia, Caribbean and Central America, Europe, North America,	C40 City Advisers are dedicated staff supporting selected member cities in the development and implementation of priority policies, programs, and projects to reduce greenhouse gas emissions and/or climate risks. City Advisers select cities based on city needs and potential for impact. C40 City offers	Local level government in developing countries, with focus on cities	Built environment (cities and urban landscapes, infrastructure), Coastal Areas/Zones, Water/riverine	Impact and Vulnerability Assessment, Stakeholder Engagement, Awareness Raising,

Pacific/Oceania, South America	guidance and tools for cities in order to adapt to urban flooding, heat, drought, sea-level rise, storms and wildfires.[243] **C40 Cities *climate change risk assessment network*** helps build climate resilient cities through the prioritization and assessment of climate change risks to inform short- and long-term planning. Cities participating in the network have prioritized four focus areas around which they are actively sharing policies and strategies with one another: (i) risk data and reporting; (ii) community engagement; (iii) private sector; and (iv) governance coordination engagement. C40 Cities implementation-related adaptation networks are: (i) **connecting delta cities network**, provides for information, best-practice and knowledge sharing on adaptation, spatial development, and water management between cities vulnerable to sea-level rise and extreme climate related events, such as green infrastructure and surface drainage typologies and policies and monitoring and evaluation.[244] (ii) **cool cities network**, focusing on data monitoring and measurement on urban heat island (UHI) effects, identifying strategies for the heat-vulnerable populations, integrating heat assessments and strategies in long-term planning, and evaluating green and cool solutions and their implementation.[245] It works in partnership with the Global Cool Cities Alliance. (iii) **urban flooding network**, which supports cities to monitor and review flood prone areas and assess impacts on resident, workforce, assets, and infrastructure, shares measures and best practices to flood response and flood reduction (i.e., drainage, storage, infiltration, recapture, and integration of water in urban ecosystems (blue-green infrastructure)), and promotes holistic water management.		systems, Disaster-Risk Reduction,	Planning and Prioritization, Implementation/Project Impact Assessment, Training and Education, Access to Financial Resources, Community-Based Adaptation, Biodiversity and invasive species

	C40 Cities Finance Facility (CFF) supports low carbon infrastructure projects already prioritized within the city's formal planning processes, with focus on transportation, energy, and adaptation. It offers support in the form of technical assistance, capacity development and access to sectoral experts to facilitate effective cooperation within the city. It supports cities in emerging economies to develop finance-ready projects.[246] For adaptation some of the current projects include: ○ Support to Dar es Salaam City Council for *flood prevention and waste management* in Msimbazi floodplain. The measures are designed to protect the surrounding communities, including some of the poorest and most vulnerable citizens, from flood events caused by heavy short-term rainfall and tackle the (waste-) blocked storm water and drainage infrastructure. The support includes technical advice, financing of the feasibility studies and exploring potential financing and funding structures for the project.[247] ○ Support to improve *resilience to climate induced flooding* caused by heavy short-term rainfall and tackle the issue of illegal wastewater and household waste dumping into the basin as well as uncontrolled vegetation in the Grand Yoff district in Dakar, Senegal. The assistance will allow the city to build the business case for the project and identify the most appropriate financing sources.[248] ○ Assists the eThekwini Municipality (Durban) with a *Transformative Riverine Management Program* in order to adapt the streams and rivers in the city to the flooding, drought and climate change. It builds on the existing Sihlanzimvelo stream cleaning program which involves community co-operatives for stream management. The project also builds on the city's experience with ecosystem-based adaptation and its commitment to increase resilience for its most vulnerable communities. CFF assists in developing a business case for the project.[249] It has			

	developed a toolkit for adaptation related river transformations.[250]			
CAB International (CABI): an NGO covering all world regions	CABI provides information and applies scientific expertise to solve problems in agriculture and the environment. Its approach involves putting information, skills, and tools into people's hands. CABI's 50 member countries guide and influence its work which is delivered by scientific staff based in our global network of centers.[251] It publishes academic literature in the life science category and delivers education and training. Specific expert areas include crop health, science-based agricultural knowledge and digital development, invasive species, sustainable value chains and trade.	National governments, local authorities, local communities	Agriculture and food security, Biodiversity, Ecosystems, Gender, Water resources	Adaptation planning and practices, Communication and outreach/awareness, Monitoring and evaluation, Science and research
CARE: an international humanitarian organization/ regional center/network/initiative covering Asia, Oceania, Africa, Latin America, Middle East, and Eastern Europe	CARE's Climate Change and Resilience Platform (CCRP) coordinates the integration of climate change and resilience across CARE's development and humanitarian work, with particular emphasis on vulnerable populations, in particular women and girls. CARE's adaptation and resilience work include:[252] (i) **Community-Based Adaptation (CBA) projects**, such as the **Adaptation Learning Program for Africa (ALP)**. The APL covers four countries in sub-Saharan Africa (Niger, Ghana, Kenya, and Mozambique) and the following adaptation strategies: (i) alternate livelihood options/business skills; (ii) conservation agriculture – building resilience by farming with nature; (iii) village savings and loan association to diversify climate sensitive livelihoods; (iv) dry-season farming/gardening – introduction of pumps and irrigation to improve food security; (v) warranty-warehouse receipt/credit system; (vi) improved seed varieties/early maturing cassava; (vii) small ruminant raising/marketing. (ii) **Disaster risk reduction** and the establishment of early warning systems; **water management** rehabilitation of degraded rangelands through construction of stone bunds and infiltration galleries to avoid erosion during heavy rain	Local communities, local governments, local service providers, NGOs, Research institutions, Banks/Private sector	Freshwater, Rural environment (agriculture and food security), Natural environment and ecosystem, Disaster risk reduction, Financial support and systems, Adaptation planning, Societal	Adaptation planning and practices, Adaptation policy, Capacity-building, Vulnerability assessment; Access to climate information; Community credit/banking systems/micro-finance; Gender equality, resilience, advocacy

	and to ensure availability of groundwater during the dry season (iii) **Community Adaptation Planning (CAP)**, working with communities and authorities to set up climate adaptation plans to reduce vulnerability, resource management plans and ecosystem protection plans (iv) Information gathering through the tool **Climate Vulnerability and Capacity Analysis (CVCA**), and climate information services through **Participatory Scenario Planning** (v) capacity development through the platform **CARE Climate and Resilience Academy** which offers online courses and coaching. (vi) Access to climate information services and capacity building			
Caribbean Community Climate Change Centre (CCCCC): an IGO, regional center/network/ initiative covering developing countries, SIDS and LDCs that are members of the Caribbean Community (CARICOM)	The main goal of the Centre is to improve the ability of Caribbean people living in communities at risk from climate change to adopt more sustainable lifestyles. It does this through the provision of services designed to improve knowledge of climate change and foster adaptation to the effects of climate change.[253]These services include: (i) **Clearing House** – The Caribbean Community Climate Change Centre's (CCCCC) Regional Clearinghouse Database is the region's premier repository of information and data on climate change specific to the region. (ii) **Community Projects** – The Centre's expertise is used to facilitate projects for communities-at-risk and to expedite community "buy-in" and adaptation measures. The Centre seeks to conceptualize, develop, and implement projects which result in behavior	National Government, Local-Level Government, NGOs, Communities, Business, Academia	Coastal Areas/Zones, Energy, Tourism, Health, Agriculture, Finance	Impact and Vulnerability Assessment, Climate Data, Information and Observations, Climate Scenarios, Planning and Prioritization, Implementation/Project Impact Assessment, Access to Financial Resources, UNFCCC Negotiations, Training and Education, Awareness

	change through a participatory process involving the communities as partners. (iii) **Joint Programs** – Regional and international agencies, educational institutions, non-governmental organizations (NGOs), and other civil organizations will find a ready and receptive partner for climate change projects at the Centre. The Centre has a network of experts who are available for all stages of project design and management. (iv) **Environmental Scanning** – The Centre has access to the necessary information and expertise to identify climate-related threats. It uses this information to help its stakeholders, including regional governments, private sector businesses, financial institutions, and voluntary organizations, to develop and implement adaptation strategies based on scenarios developed by the Centre. The Centre would also be an integral part of any regional early-warning system. (v) **Climate Change Curricula** – Climate change is increasingly becoming a field of specialization within the realm of environmental and sustainable development. The Centre has access to the expertise to take curricula-related programs from concept to implementation. The Centre can also monitor and evaluate existing and new programs. (vi) **Training** – The Centre will develop appropriate courses for different organizations and levels of management in issues related to climate change. This includes technical areas, like proposal writing and negotiations. (vii) **Consultancy Services** – Using its network of expert consultants, the Centre can provide services for a wide range of situations and projects. It can conceptualize, plan, develop, implement, monitor, and evaluate			

	projects and programs in areas related to climate change. Such areas range from biodiversity to alternate energy. (viii) **Trust Fund** – The Centre has established a Trust Fund as a mechanism to provide support in situations where external funds are not readily available or are difficult to mobilize within the allotted time frame.			
Caribbean Disaster Emergency Management Agency (CDEMA): a regional IGO covering the Caribbean community (CARICOM)	CDEMA is a regional inter-governmental agency for comprehensive disaster management in the Caribbean. Its approach to disaster management and seeks to reduce the risk and loss associated with natural and technological hazards and the effects of climate change to enhance regional sustainable development.[254]	National governments	Coastal areas/zones, Disaster risk reduction	Adaptation planning and practices, Access to funding, Knowledge and research
Central Asia Regional Economic Cooperation (CAREC): an intergovernmental organization (IGO), Regional center/network/initiative covering Central Asia, Eastern Asia, Western Asia	CAREC promotes multi-sector cooperation in addressing development and environmental problems in Central Asia at the local, national, and regional levels. [255] The CAREC program is a proactive facilitator of practical, results-based regional projects, and policy initiatives critical to sustainable economic growth and shared prosperity in the region.[256] Its main focus is on transport, trade and energy. It promotes South-South cooperation and has a strong network across a broad spectrum of environmental policy issues in those countries where it operates.	National governments	Water Resources, Biodiversity, Ecosystems Forestry; Energy efficiency; renewable energy Energy, Human settlements and infrastructure, Socio-economic activities	Planning and Prioritization, Awareness Raising, Adaptation policy, Capacity-building, Communication and outreach/awareness, Institutional arrangements
Climate Action Network South Asia (CANSA): a non-governmental organization (NGO), regional center/network/initiative covering Southern Asia	CANSA is a coalition of about 300 civil society organizations working in eight South Asian countries to reduce the effects of climate change on communities, in particular the most vulnerable. It represents the southern perspectives at international climate negotiations and undertakes inter-governmental, regional, and national actions. It works toward linking policy work, research, and action-based work to address and set workable solutions to the adverse effects of climate change affecting the region.[257]			Adaptation policy, Capacity-building, Communication and outreach/awareness, Institutional arrangements, Science and research

Climate and Development Knowledge Network (CDKN): an NGO, network/initiative covering developing countries in Caribbean and Central America, South America, Asia, Africa, and the Pacific	CDKN is a network led by SouthSouthNorth (SSN), working closely with its partners Fundación Futuro Latinoamericano (FFLA) in Quito, ICLEI – Local Governments for Sustainability, South Asia in Delhi, as well as the Overseas Development Institute (ODI) in London.[258] CDKN supports decision-makers in designing and delivering climate compatible development. They do this by developing its knowledge-sharing and learning work, providing technical assistance to decision makers in the design and delivery of climate compatible development and engages in research through collaborative projects. They work in partnership with decision-makers in the public, private and non-governmental sectors. CDKN collaborates in the following research projects: (i) the *Future Climate for Africa* (FCFA) program, which aims to generate new climate science focused on Africa; (ii) the *Climate Resilient Cities Initiative* in Latin America, led by FFLA, focused on advancing urban resilient development in small and medium-sized cities in Latin America; and (iii) *Mobilizing Investment for NDC implementation* project in Ethiopia, Kenya, Bangladesh, Peru, Philippines, Vietnam and the Dominican Republic.	National and local governments and decision makers, local communities, NGOs, private sector	Water Resources, Agriculture, Food security, Human settlements, Energy and low carbon technologies, Finance	Adaptation planning and practices, Policy development, Impact and Vulnerability Assessment, Climate Data, Information and Observations, Stakeholder Engagement, Access to Financial Resources/financial support, Awareness, Climate compatible development,
Climate Finance Advisory Service (CFAS): an NGO, network/initiative covering developing countries, in particular LDCs and SIDS in Africa, Asia, Caribbean and Central America, Pacific/Oceania, South America	CFAS is an initiative which is delivered by a consortium of experts led by Germanwatch e.V. and funded by the Climate and Development Knowledge Network (CDKN).[259] CFAS offers negotiators, policy makers and advisors in the poorest and most climate-vulnerable countries tailored information and guidance to help them effectively participate in complex global climate finance negotiations. CFAS facilitates a better link between national climate finance strategies, the Green Climate Fund (GCF) and the technical discussions in the Standing Committee on Finance (SCF). Its website serves as a knowledge portal on climate finance topics, also targeting the broader finance community. CFAS delivers briefings of information from meetings of the Green Climate Fund (GCF) and Standing Committee on Finance (SCF).		Knowledge and education, Adaptation Finance	Knowledge and education, Access to Financial Resources
Climate Resilient Infrastructure	CRIDF is working to provide long-term solutions to transboundary water issues for poor communities in South	Least developed/poor	Water management	Capacity building, Technology transfer,

Development Facility (CRIDF): A program supported by the Foreign, Commonwealth and Development Office	Africa. CRIDF works to bring together financial resources for projects in the region, and advises partners of the best way to select, manage and implement their projects. CRIDF works physically, hands-on together with people to show how to employ climate-resilient techniques. Thus, it focuses strongly on sharing technical expertise with local engineers on small-scale projects. The skills that the engineers learn include climate-resilient techniques, as well as approaches that benefit marginalized groups. These skills are then transferred to many other projects and engineers across the region. Projects include: (i) CRIDF delivers water irrigation projects that adopt low tech weirs, solar powered pumps and low-cost storage solutions and irrigation network that give farmers a regular supply of water throughout the year, enabling them to irrigate crops planted in fields further from the riverbank and preventing increased erosion. It also supports flood forecasting and early flood warning systems in the Limpopo and Incomati Basins. Other projects include ensuring resilient water supply and sanitation in areas affected by cross-border travelers, rehabilitation of water treatment, and improving agriculture value chains by ensuring accessible water resources for communities and their crops, freeing up the existing water for wildlife and preventing human/animal conflict. (ii) CRIDF is supporting improved monitoring, collecting, analyzing and distribution of information on rainfall and river flows.[260] (iii) CRIDF is focused on helping viable water projects capture the funds needed from governments, development finance institutions and the private sector to bring them to completion.[261]	communities in Southern Africa Collaboration with private sector – investment opportunities	Least developed, Finance mobilization,	Knowledge, information sharing and education, Finance

Climate Technology Centre and Network (CTCN): a UNFCCC affiliated body covering all world regions	The CTCN is the operational arm of the UNFCCC Technology Mechanism, hosted by the UN Environment Programme and the UN Industrial Development Organization (UNIDO). The Centre promotes the accelerated transfer of environmentally sound technologies for low carbon and climate resilient development at the request of developing countries. CTCN provides technology solutions, capacity building and advice on policy, legal and regulatory frameworks tailored to the needs of individual countries by harnessing the expertise of a global network of technology companies and institutions. CTCN, together with UNEP, administer **the Adaptation Fund Climate Innovation Accelerator** (AFCIA) to foster innovation in adaptation in developing countries. The primary objective of the AFCIA is to support developing countries to test, evaluate, roll out and scale up innovative adaptation practices, products, and technologies. Based on technical assistance services, 25 micro-grants projects will be implemented for 5 years to enhance climate resilience and adapt to climate change in the countries. Moreover, the AFCIA will facilitate knowledge sharing and the exchange of best practices, strengthening opportunities of South-South and triangular cooperation on innovation in adaptation among the countries.[262]	National governments, technology companies/private sector		Technology transfer, Innovation, and finance for adaptation; Cooperation, Capacity building, Monitoring and Evaluation, Legal, regulatory, Policy,
ClimDev-Africa: a regional center/network/initiative covering Eastern, Middle, Northern, Southern, Western	The Climate for Development in Africa (ClimDev-Africa) Program is an initiative of the African Union Commission (AUC), the United Nations Economic Commission for Africa (ECA) and the African Development Bank (AfDB). The Program was established to create a solid foundation for Africa's response to climate change. The Program works closely with other African and non-African institutions and partners specialized in climate and development.[263] ClimDev-Africa is actively involved in efforts to upgrade climate science capacity across Africa, such as the upgrading of climate observation networks in the Gambia, Rwanda, and Ethiopia. Both meteorological and hydrological networks are targeted, in addition to improvement in capacity for climate event early warning system and climate data rescue.[264]		Disaster risk reduction	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Institutional arrangements, Monitoring and evaluation, Observation and scenarios, Science and research, Vulnerability assessment

	An annual **Climate Change and Development in Africa (CCDA) conference** is the flagship event of ClimDev-Africa. It provides a forum where stakeholders such as NGOs and CSOs from across the continent engage on climate change issues. The event is in recognition that the end users of ClimDev-Africa results are rural and urban communities whose livelihoods, health and security are affected by climate change.[265]			
Coalition for Climate Resilient Investment (CCRI): a global partnership/ coalition covering all regions	CCRI was launched in 2019 and represents the commitment of the global private financial industry, in partnership with key private and public institutions, to foster the more efficient integration of physical climate risks in investment decision-making.[266] CCRI aims to advance and support: (i) National decision-making – by facilitating an understanding of the economic and social value at risk associated to physical climate risk (ii) Project valuation and investment appraisal – by providing investors with greater predictability of longer-term cash flows (iii) Financial innovation – by identifying innovative taxonomies for financial instruments capable of guiding a more efficient allocation of capital.	Focus on the most vulnerable regions and communities	Built environment (infrastructure), Finance	Technical support; Capacity building; Research and knowledge management; advocacy and cooperation, Finance
Coalition for Disaster Resilient Infrastructure (CDRI): a global partnership/ coalition covering all regions	CDRI is a partnership of national governments, UN agencies and programs, multilateral development banks and financing mechanisms, the private sector, and knowledge institutions that aims to promote the resilience of new and existing infrastructure systems to climate and disaster risks in support of sustainable development.	Members of the CDRI that has endorsed the Charter	Built environment (infrastructure, schools, hospitals), Nature (ecological infrastructure)	Technical support; Capacity building; Research and knowledge management; advocacy and cooperation, Finance
Comité permanent inter-Etats de lutte contre la sécheresse dans le Sahel (CILSS): a regional center/network/initiative covering the	CILSS's mission is to be involved in the research of food security and to combat the effects of drought and desertification for better ecological stability.[267]		Agriculture and food security, Ecosystems, Human settlements and infrastructure, Water resources	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Science and research

Sahel region of Africa				
Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN): an NGO, network, initiative covering the Andean region in South America	CONDESAN is committed to overcoming poverty and social exclusion in the Andean region through the sustainable management of natural resources. The **Andean Dialogue program** gives policy recommendations at the local level, which have been produced through research, direct observation, dialogue, and consensus. The **Andean Monitoring program** focuses on environmental monitoring on issues relating to biodiversity, carbon, livelihoods, and in particular water resources and watershed management. CONDESAN provides in-person customized training, webinars, and information and knowledge products.	Local level government, NGOs, local communities	Water Resources (including watershed management), Rural environment (land use, livestock, farming, rural economy), Ecosystems, Natural environment (biodiversity), Renewable energy,	Planning and Prioritization, Awareness Raising, Stakeholder Engagement, Climate Data, Information and Observations à first stage NAP process, Capacity development, Knowledge and education, Community-Based Adaptation, Human Settlements
Consultative Group for International Agricultural Research (CGIAR): an NGO covering East Africa, West Africa, Latin America and the Caribbean, Southeast Asia, South Asia	CGIAR is a global research partnership, and its mission is to deliver science and innovation that advance the transformation of food, land, and water systems in a climate crisis. It works to ensure its research impacts science-based innovation, capacity development (improvement of technological and institutional solutions), and policy advice.[268] It has particular interest in science an innovation that deal with heat, drought, flood, and unpredictable growing seasons that harm farmers, aquatic producers, and production systems. It has the following adaptation-specific working areas: (i) **Agriculture and food security:** CGIAR has a research program on Climate Change, Agriculture and Food Security (CCAFS) that promotes climate smart agricultural policies, practices and services that enable agriculture to meet goals of food security, climate change adaptation and mitigation.[269] It is committed to improve access to capital for 8 million households with increased benefits to women, and to adopt climate-smart agriculture for 11 million farm households, both by 2022. CCAFS has the following research themes:[270] (i)	National Government, Local-Level Government, Business, NGOs, Communities, Academia	Rural environment (agriculture and food security), Natural environment (biodiversity and ecosystem), Research and education, Health, Gender, Energy,	Adaptation planning and practices, Adaptation policy, Capacity-building, Implementation, Communication and outreach/awareness, Education and training, Science and research, Monitoring and Evaluation, Stakeholder Engagement, Community-Based Adaptation, Youth; Social inclusion

	Priorities and policies for climate-smart agriculture; (ii) Climate-smart technologies and practices; (iii) Low emission development; (iv) Climate services and safety nets; (v) Gender and social inclusion. (ii) **Global cooperation:** CCAFS strengthens the linkages between global processes and agricultural communities, giving equal attention to technology, institutions, power, and process that alleviate poverty, increase gender equity, and support sustainable landscapes. (iii) **Research/information/knowledge gathering:** CCAFS aims to increase the capacity of research partners to generate knowledge. It focuses on four research areas: (i) priorities and policies for climate-smart agriculture; (ii) climate-smart technologies and practices, including equitable sub-national adaptation planning and implementation; (iii) low emission development; and (iv) climate information services and safety nets to manage climate risk, including weather-related agricultural insurance products and programs.[271] (iv) **Capacity building:** Once knowledge is produced, CCAFS then works to increase the capacity of decision-makers to use that knowledge effectively. Activities with researchers will include training in and co-development of scientific tools and models, support for a network of research students to share methods, support for women in their workplaces, and south-south and south-north exchanges. Activities with decision-makers include knowledge-sharing platforms, critical science-policy dialogues, support to attend key decision-making forums at regional and global levels, awareness-raising on decision-support tools and other CCAFS outputs, and			

	multi-stakeholder development of regional scenarios looking forward to 2030.			
Coordinating Body on the Seas of East Asia (COBSEA): a UN-affiliated organization covering Eastern Asia, Southern Asia, South-Eastern Asia	COBSEA brings together nine countries (Cambodia, People's Republic of China, Indonesia, Republic of Korea, Malaysia, the Philippines, Thailand, Singapore, and Vietnam) for the sustainable development and protection of the marine environment and coastal areas of the region. Efforts are focused on addressing marine pollution, strengthening marine and coastal planning and management, and strengthened regional governance for marine environmental management.[272] COBSEA is one of 18 Regional Seas programs for the sustainable management and use of the marine and coastal environment.	National governments	Coastal areas/zones, Biodiversity,	Adaptation planning and practices, Capacity-building, Communication and outreach/awareness, Institutional arrangements
Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI-CFF): an intergovernmental organization (IGO) covering South-Eastern Asia, Melanesia	The Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF) is a multilateral partnership of six countries working together to sustain extraordinary marine and coastal resources by addressing crucial issues such as food security, climate change and marine biodiversity. The cooperating countries have developed a **Region-wide Early Action Plan for Climate Change Adaptation** as the first deliverable of the CTI-CFF. The Plan requires, amongst others, putting in place effective adaptation measures for coastal communities and investing on the ability to conduct climate change vulnerability assessments and to plan for improving resilience of coastal communities.[273]	National governments	Agriculture and food security, Biodiversity, Coastal areas/zones, Socio-economic activities	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Education and training, financial support
Council of European Municipalities and Regions (CEMR): an IGO covering Sub-Saharan Africa	The European Commission launched the "***Covenant of Mayors in Sub-Saharan Africa" (CoM SSA)*** to support African cities by increasing their planning capacities and providing them with a platform to share knowledge and best practices. CoMO SSA is a 4-year project with the general goal of increasing the capacities of cities to implement the Covenant of Mayors in Sub-Saharan Africa and the following goals: o Overall coordination and network o To provide guidance to interested cities o Support international, regional, and national associations of local governments through training materials and specifically tailored trainings/workshops	Local-Level Government	Built environment (cities and infrastructure), Adaptation Finance, Research and education, Energy, Services	Planning and Prioritization, Stakeholder Engagement, technical support, Knowledge and learning, Access to Financial Resources, Institutional Arrangement, Grant applications

	○ Coordinate with local civil society organizations and support to participative local governance of the projects ○ To provide support to signatories in the preparation of grant applications ○ To provide support for drafting Sustainable Energy Access Climate Action Plans (SECAP) ○ To provide action related technical support to the SSA cities			
Eco-Agriculture Partners: an NGO covering Africa, Asia, Caribbean and Central America, Europe, North America, and South America	Eco-Agriculture Partners undertake research and generate new knowledge for practitioners and to guide policy priorities. They provide training, develop tailored resource materials, guides, videos, webinars, and training manuals.	Scientific community and practitioners	Rural environment (agriculture, food security, land use), Bult environment (urban Resilience), Human Settlements	Monitoring and Evaluation, Impact and Vulnerability Assessment, Stakeholder Engagement, Training and Education, Awareness Raising
European Commission: a regional organization covering projects and programs in developing countries	***EUROCLIMA+*** is the flagship program of the European Commission, actively engaging in 18 Latin American and Caribbean countries. The objective is to promote regional cooperation and reduce the impact of climate change and its effects by providing technical and financial support to the development and implementation of adaptation, mitigation, and resilience policies.[274] Actions are defined in a participatory manner based on the needs of the region, identified through the National Focal Points to ensure longer-term country-ownership. Adaptation related measures include climate-resilient agriculture, disaster risk management and reduction related to flood and drought risks, water management with an urban resilience perspective, and forest, biodiversity, and ecosystem measures. Implementing parties range from public and private sector bodies to academic institutions and civil society.[275] EU, together with UNDP, has established a two-year project to address ***urgent adaptation financing gaps in Africa*** in order to scale up and build more effective locally-led adaptation actions. The project will also increase the capacity to utilize climate risk information, assess and implement risk transfer mechanisms, and deepening knowledge for effective adaptation solutions. It	National Government	Water Resources (urban water management), Natural environment (forests, biodiversity, and ecosystems), Built environment (energy efficiency, urban mobility), Rural environment (resilient food production, food security, agriculture measures, soils, desertification) Disaster risk reduction and management.	Climate Data, Information and Observations, Awareness Raising, Training and Education, Development of database maps, Plans and policies, Climate financing, Transparency, Intersectoral, Gender and vulnerable groups, Involvement of indigenous peoples

	will be implemented by UNDP in partnership with the African Adaptation Initiative and the African Union Commission.[276]			
Food and Agriculture Organization (FAO): an intergovernmental organization (IGO), UN-affiliated organization covering Africa, Asia, Caribbean and Central America, Pacific/Oceania, South America, Europe	FAO is supporting countries to both mitigate and adapt to the effects of climate change through a wide range of research based and practical programs and projects. Its strategic climate programs include:[277] (i) **Scaling up Climate Ambition on Land Use and Agriculture through NDCs and National Adaptation Plans (SCALA).** Support includes strengthening policies, adopting innovative approaches to climate change adaptation and mitigation, removing barriers related to information gaps, governance, finance, gender mainstreaming and integrated monitoring and reporting. To achieve this shift, the program will engage the private sector and key national institutions; (ii) **Economic and Policy Analysis of Climate Change (EPIC)** supports countries in evidence-based policy making through sound economic and policy analysis to reform policies, institutions, and investments on climate change, in connection with agricultural development and food security. It aims to strengthen sustainable agricultural systems through better policies and sound analysis of the costs, tradeoffs, adoption barriers and benefits, as well as the impacts of climate change on agriculture; and (iii) **Globally Important Agricultural Heritage Systems (GIAHS)**. In order to safeguard and support the world's agricultural heritage systems, FAO started an initiative for the identification and the dynamic conservation of Globally Important Agricultural Heritage systems (GIAHS) in 2002. FAO seeks to **increase the resilience of livelihoods** to threats and crises that affect agriculture, food, and nutrition, focusing on three major areas: (i) natural hazards and disasters; (ii) food	National Government, Local-Level Government	Rural environment (food Security, agriculture, livestock systems, forests), Water (coastal Areas/zones, aquaculture, water resources), Built environment (Urban Resilience) Finance, Disaster-Risk Reduction, Human Settlements.	Capacity development, Early-warning systems, Stakeholder Engagement, International Cooperation/Coordination, Awareness Raising, Poverty reduction, Community-Based Adaptation, Access to Financial Resources, Planning and Prioritization, Implementation/ Project Impact Assessment, Socio-Economic Data and Information, Monitoring and Evaluation, Training and Education, International Cooperation, Indigenous peoples, Gender,

	chain threats caused by pests and diseases; and (iii) conflict and protracted crises.[278] FAO facilitates **South-South Cooperation (SSC) Gateway**, which brings together countries that have development solutions with countries that are also interested in applying them. The modalities of exchange include:[279] o deployment of experts or technicians to a country for an average of two months (short-term) or one-two years (medium- to long-term) o short educational exchange between groups of participants (e.g., professors, technicians, ministers) as well as access to training courses offered by FAO's centers of excellence o forums for policy exchange at national, regional, or global level o in-kind and technical solution exchange. FAO's technical knowledge is made available through the **Technical Cooperation Program (TCP)**.[280] The purpose of the TCP is to make technical knowledge available to support the development efforts of member countries and their regional organizations, and to provide emergency assistance following disasters that affect rural livelihoods. TCPs are targeted short-term projects that respond to demand, transfer technical know-how (not financial), promote sustainability, and assist in mobilizing resources. Another FAO program is the **Investment Centre**. It supports developing and in transition countries to design, implement and evaluate investment programs, including environmental and natural resources management projects. It also facilitates policy dialogue, undertakes sector analysis and value chain studies and advises governments on policy and legislation.			
InsuResilience Global Partnership: a G7 initiative	The initiative **InsuResilience Global Partnership** was initiated by G7 members and aim to increase the climate resilience of developing countries and protect the lives and livelihoods of	Developing countries, local	Water, Rural environment, Built environment,	Disaster risk reduction, Early warning systems,

covering Asia, Africa, South America, the Caribbean and Middle East	poor and vulnerable people against the impacts of disasters.[281] The central objective of the Partnership is to enable more timely and reliable post-disaster response and to better prepare for climate and disaster risk through the use of climate and disaster risk finance and insurance solutions, reducing humanitarian impacts, helping poor and vulnerable people recover more quickly, increasing local adaptive capacity and strengthening local resilience. This complements ongoing efforts in countries to avert, minimize and address climate and disaster risks. It has developed the **InsuRisk tool**, an interactive map with risk level estimates, programs, and type of resilience/adaptation measures, as part of their efforts to monitor progress toward key indicators. The initiative brings together countries, civil society, NGOs, international organizations, the private sector, and academia.	authorities, and local communities.	Production and services, Research and education, Natural environment, Disaster risk reduction, Finance	climate and disaster finance, insurance solutions, Vulnerable populations, Cooperation/information sharing/awareness raising, Risk assessment/information/knowledge
Global Center on Adaptation: an IGO/network covering all regions	GCA works as a solutions broker to accelerate action and support for adaptation solutions and to foster resilience, from the international to the local, in partnership with the public and private sector.[282] It engages in innovative solutions to drive adaptation at scale, high-level policy development, new research contributions, advocacy, communications, and work with our partners to deliver action on the ground. The work focuses on those who are the most vulnerable to the effects of climate change including the poorest people in the poorest countries. The work covers three areas: (i) programs and actions, which aims to mobilize finance, advice on project implementation and design governance structures; (ii) knowledge acceleration, which focuses on knowledge management and creation, research and science; and (iii) agenda setting and advocacy. Projects include the ○ **Water Adaptation Hub**, a knowledge zone to accelerate and scale-up climate and water adaptation interventions globally.	National governments, Scientific community	Water, Rural environment (food security), Built environment (infrastructure), Natural environment (nature-based solutions), Research and education, Finance	Scientific, research, education, Information and Knowledge sharing, Institutional arrangements/governance structures, Capacity building, Advocacy and outreach, Finance mobilization, Youth leadership, Locally-led action

	○ **Mainstreaming nature-based solutions through systems-based infrastructure planning** ○ **Adaptation Action Africa program (AAAP)**			
Global Climate Change Alliance (GCCA): an NGO covering developing countries, in particular LDCs and SIDS in Caribbean and Central America, South America, Africa, Asia, Pacific/Oceania	The GCCA Intra-ACP (African, Caribbean and Pacific) program, through its Climate Support Facility (CSF), offers direct technical assistance to entities located in any ACP Member State, while placing special emphasis on LDC and SIDS. Technical Assistance includes short-term, demand-driven assignments that allow beneficiaries to fill a specific capacity gap currently preventing them from achieving their goals related to climate change adaptation and mitigation. Assistance is flexible and varied, with support tailored to beneficiary needs. The program provides support by contracting one or more experts to complete a proposed task. The support is the hiring of the expert(s); the program does not provide direct financial support.	ACP member States	Water (coastal areas/zones, water resources, freshwater fisheries) Rural environment (food security, agriculture, land management, forests), Built environment (infrastructure, technological development, energy) Tourism, Health, Research and Education; Natural environment (natural resource management)	Planning and Prioritization, Implementation/ Project Impact Assessment, Access to Financial Resources, Training and Education; Poverty Reduction;
Global Environment Facility (GEF): an intergovernmental organization (IGO) - covering all regions	The GEF is the largest multilateral trust fund focused on enabling developing countries to invest in nature and supports the implementation of major international environmental conventions including on biodiversity, climate change, chemicals, and desertification. It brings together 184 member governments in addition to civil society, international organization, and private sector partners. Through its Small Grants Program, the GEF has provided support to more than 25,000 civil society and community initiatives in 135 countries.[283] The GEF's climate change adaptation strategy, which is financed through **the Least Developed Countries Fund (LDCF)** and the **Special Climate Change Fund (SCCF),** aims at supporting developing countries to move to a climate resilient development pathway while reducing exposure to the immediate risks posed	Developing countries	Adaptation finance, Agriculture and food security, Biodiversity, Coastal areas/zones, Disaster risk reduction, Ecosystems, Gender, Health, Human settlements and infrastructure, Water resources	Financial support

	by climate change.[284] The GEF adaptation strategy hinges upon three main pillars: ○ Reduce vulnerability and increase resilience through innovation and technology transfer for adaptation ○ Mainstream adaptation and resilience for systemic impact ○ Foster enabling conditions for effective and integrated adaptation.			
Global Green Growth Institute (GGGI): an IGO covering developing countries in Africa, Asia, Caribbean and Central America, Pacific/Oceania, South America	GGGI works with developing and emerging countries to design and deliver programs and services that demonstrate new pathways to pro-poor economic growth. Its approach is both flexible and tailored to local needs and provides member countries with the tools to help build institutional capacity and develop green growth policy, strengthen peer learning and knowledge sharing, and engage private investors and public donors. Their experts are embedded within partner governments as trusted advisors to explore green growth opportunities in line with the country's development goals. In addition to providing support for green growth planning and implementation within individual developing and emerging countries, GGGI aims to create an open, global platform for the sharing of experience and insight among countries that are pursuing rigorous green growth strategies, whether or not these have been prepared with GGGI's assistance.[285]	National Government, Local-Level Government	Water Resources, Urban Resilience, Agriculture, Food Security, Land Use, Heavy Industry, Infrastructure, Green City Development, Energy, Human Settlements,	Planning and Prioritization, Implementation/ Project Impact Assessment, Access to Financial Resources, Impact and Vulnerability Assessment, Climate Data, Information and Observations, Socio-Economic Data and Information, Awareness Raising
Global Water Partnership (GWP): a regional center/network/initiative covering all regions	GWP is a global action network with over 3,000 partner organizations in 179 countries. The network has 69 accredited Country Water Partnerships and 13 Regional Water Partnerships. GWP's action network provides knowledge and builds capacity to improve water management at all levels: global, regional, national, and local.[286] It is a forum for all organizations involved in water resources management: developed and developing country government institutions, agencies of the United Nations, bi- and multi-lateral development banks, professional associations, research	National and local governments, local communities, research community	Water resources	Adaptation planning and practices, Institutional arrangements, Vulnerability assessment

	institutions, non-governmental organizations, and the private sector. Its adaptation related programs include:[287] ○ Activities under the **Global Water, Climate and Development Program** (WACDEP) aim to strengthen the resilience of countries to climate change. It focuses on support to coordinate and formulate the NDC and the NAP processes, including support to prepare funding proposals to GCF and others, as well as capacity development for planning, implementing and monitoring water related actions in NDCs, NAPs and SDGs. ○ **Integrated Drought Management Program** (IDMP) is a joint initiative of the World Meteorological Organization (WMO) and GWP focusing on enhancing drought resilience and aiming to promote better scientific understanding and inputs for drought management, drought risk assessment, monitoring, prediction and early warning, policy and planning for drought preparedness, and mitigation across sectors. A regional IDMP have been developed in Central and Eastern Europe, and other regional programs are under development in the Horn of Africa and West Africa. ○ **Associated Program on Flood Management** (APFM) is a joint initiative of the World Meteorological Organization (WMO) and GWP. It promotes the concept of Integrated Flood Management (IFM) as a new approach to flood management with the aim of efficiently using floodplains and minimizing losses of life from flooding. The program aims to combine IWRM principles into flood management practices and vice versa. **The Enabling Delta Life-initiative** is a collaborative initiative between GWP and the Delta Alliance, supported by the Netherlands Ministry of Development Cooperation, with the objective to stimulate increased cooperation worldwide among			

	those involved in the governance of deltas, aiming at enhancing climate resilience of communities in delta regions.			
Greater Mekong Subregion (GMS): a research institution covering South-eastern Asia	GMS Core Environment Program seeks to enhance resilience and build adaptive capacity for its vulnerable population and infrastructure around the Mekong delta and coastal areas vulnerable to sea level rise.[288]		Adaptation finance, Biodiversity, Ecosystems, Human settlements and infrastructure, Socio-economic activities	Adaptation planning and practices, Adaptation policy, Capacity-building, Observation and scenarios
Green Climate Fund (GCF)	The GCF is the world's largest climate fund, mandated to support developing countries raise and realize their Nationally Determined Contributions (NDC) ambitions toward low-emissions, climate-resilient pathways. GCF aims to deliver targets for adaptation and resilience by ensuring a 50/50 balance in allocation of funding between mitigation and adaptation projects, with over 50 percent of adaptation funding going to Least Developed Countries (LDCs), Small Islands Developing States (SIDS) and African States.[289] The adaptation result areas for GCF-funded projects are:[290] i) Most vulnerable people and communities, ii) health and well-being, and food and water security, iii) Infrastructure and built environment, and iv) ecosystems and ecosystem services. The results of all GCF-funded adaptation projects must be monitored and reported through these four categories.	SIDS, LDCs, developing countries	Adaptation Finance	Planning processes, Knowledge and information, Finance, Project implementation, NDCs and NAPs.
Group for the Environment and Renewable Energy and Solidarity (GERES): an NGO covering Europe, Africa, and Asia (in particular central and southeast Asia and West Africa)	GERES initiates development and solidarity projects in the fields of energy and environment, in partnership with local stakeholders. It helps communities to cope with climate change through awareness-raising and information and enhancing local skills and technologies (artificial glaciers, agroforestry, etc.). It also supports the development of local strategies for the territories concerned (i.e., vulnerability analysis, energy assessment and geomatic analysis).		Energy, Environment, Infrastructure, Adaptation Finance, Poverty reduction	Implementation/Project Impact Assessment, Awareness Raising, Impact and Vulnerability Assessment
HELVETAS Swiss Intercooperation: an NGO covering Africa, Latin America, the	Helvetas is an independent organization for development based in Switzerland with affiliated organizations in Germany and the United States. It supports poor and disadvantaged women, men and communities in about thirty developing and transition	Developing and emerging economies	Agriculture and food security, Disaster risk reduction, Ecosystems, Water resources	Adaptation planning and practices, Capacity-building, Communication and

Caribbean, Asia, the Pacific and Eastern Europe	countries.[291] It has projects on the ground, expert advice and advocates for conducive framework conditions benefiting the poor. It follows a multi-stakeholder approach by linking civil society actors, governments and private sector. Helvetas is active in five working areas: (i) water, (ii) food and climate, (iii) education, jobs and private sector development, (iv) governance, (v) gender and social equity. It engages in emergency relief, reconstruction and rehabilitation. In addition to rural areas, it is increasingly involved in urban development and is focusing its work on young women and men.			outreach/awareness, financial support, Institutional arrangements, Observation and scenarios, Science and research, Vulnerability assessment
ICLEI – Local Governments and Sustainability: an NGO covering Africa, Asia, Caribbean and Central America, Europe, North America, Pacific/Oceania, South America	ICLEI, formerly known as the International Council for Local Environmental Initiatives, is a nonprofit organization that helps local governments meet their self-defined sustainability, climate, and energy goals. To help local governments to meet their self-defined goals, ICLEI provides software tools, trainings, technical assistance, guidebooks, as well as vibrant peer networks where local government staff can share challenges and best practices. ICLEI offices around the world are operated through legally independent entities: Africa; North America; Mexico, Central America, and the Caribbean; South America; East Asia; South Asia; Southeast Asia; Europe; & Oceania.	ICLEI members are cities, towns, metropolitan governments, and counties that are committed to sustainable development and join ICLEI in a formal process, normally decided by the local councils.	Energy, Water Resources, Infrastructure, Adaptation Finance, Biodiversity, Disaster-Risk Reduction, Climate Justice	Access to Financial Resources, UNFCCC Negotiations, International Cooperation/Coordination, Greenhouse gas inventories
IGAD Climate Prediction and Application Centre (ICPAC): a regional center/network/initiative covering Eastern, Southern	ICPAC is a Climate Center accredited by the World Meteorological Organization that provides Climate Services to 11 East African Countries. Its services aim at creating resilience in a region deeply affected by climate change and extreme weather.[292]		Agriculture and food security, Disaster risk reduction	Adaptation planning and practices, Capacity-building, Communication and outreach/awareness, Education and training, Monitoring and evaluation, Science and research
International Centre for Climate Change and Development (ICCCAD): a research	ICCCAD aims to be a global Centre of Excellence on Climate Change and Development and is one of the leading research and capacity building organizations working on climate change in Bangladesh. Its mission is to gain and distribute knowledge on climate change and, specifically, adaptation and thereby helping	National government, Local-level government in developing countries and LDCs;	Adaptation Finance, Community-Based Adaptation, Disaster-Risk Reduction, Ecosystem-Based	Impact and Vulnerability Assessment, Climate Data, Information and Observations,

organization covering Asia	people to adapt to climate change with a focus on the global south.[293] ICCCAD's goal is to conduct research to generate peer reviewed publications on climate change, development and adaptation, train leaders and educate international participants on the issue of adaptation. It also aims to build capacity for LDCs and thereby help them to adapt, and to build and lead a network of Southern based institutes.	Communities; NGOs; Academia	Adaptation, Nature-Based-Solutions, Food Security, Freshwater Fisheries, Urban Resilience, Gender, Water Resources, Human Settlements/Migration /Displaced people, Loss and Damage, Knowledge Management	Socio-Economic Data and Information, Research and Science, Planning and Prioritization, Technology Transfer, Monitoring and Evaluation, Training and Education
Inter-American Institute for Global Change Research (IAI): an intergovernmental organization (IGO) covering Caribbean, Central America, South America	IAI is a science and research institute that works to develop the best possible international coordination of scientific and economic research on the extent, causes, and consequences of global change in the Americas, with the objective of significantly expanding the frontiers of knowledge and serving as an effective interface between science and the policy process.[294]			Adaptation policy, Capacity-building, financial support, Science and research
Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES): an IGO/science-policy platform	IPBES was established in 2012 by 94 States to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being, and sustainable development.[295] IPBES Stakeholders are individual scientists and knowledge holders as well as institutions, organizations and groups working in the field of biodiversity and ecosystems services	Science community, institutions, organizations, knowledge holders	Research and education	Knowledge, communication and information sharing, Research and education, Capacity building, Policy support, Cooperation
International Centre for Integrated Mountain Development (ICIMOD): an IGO covering Asia	ICIMOD works through six demand-driven, transdisciplinary Regional Programs to deliver positive impact on the ground:[296] ○ Adaptation to Change ○ Transboundary Landscapes ○ River Basins ○ Cryosphere and Atmosphere	National Government, Local-Level Government, Communities	Urban Resilience, Human Settlements, Water Resources, Food Security Ecosystems, Gender	Awareness Raising, Stakeholder Engagement, Planning and Prioritization, Implementation/Project Impact Assessment, Research and Science

	○ Mountain Environment Regional Information System ○ Himalayan University Consortium (emerging Regional Program). Part of the Adaptation to Change program, the ***'Support to Rural Livelihoods and Climate Change Adaptation in the Himalaya' (Himalica)*** initiative aims to support poor and vulnerable mountain communities in the Hindu Kush Himalaya to mitigate and adapt to climate change. The initiative is supported by the European Union. Himalica has the following components: policy support, knowledge management, action research, pilot projects and capacity building. **Strategic Planning, Monitoring, and Evaluation (SPM&E)** is an institutional-wide advisory unit providing technical support to ensure all ICIMOD programs sustain meaningful impacts across the region.			
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT): a non-governmental organization (NGO) covering Africa, Asia, and the Pacific	ICRISAT undertakes scientific research for development through partnerships to help rural communities develop their own solutions and engage the actors needed to reduce poverty, hunger, malnutrition, and environmental degradation in the dryland tropics.[297]	Governments, local authorities, local communities (farmers), private sector	Agriculture and food security, Socio-economic activities, Water resources, Adaptation finance,	Adaptation planning and practices, Capacity-building, Communication and outreach/awareness, Education and training, Vulnerability assessment
International Climate Initiative (IKI)	IKI is one of the most important instruments of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) for the international financing of climate change mitigation and biodiversity. Through its funding area **Adapting to the impacts of climate change**, IKI is supporting vulnerable countries and regions to strengthen their adaptability to the consequences of climate change. While focusing primarily on ecosystem-based adaptation and national adaptation plans (NAPs), the funding area also encompasses other topics such as instruments for the risk management of extreme climate-related events and	Developing countries in South America, Africa, and Asia.	Rural environment (agriculture, land usage), Built environment (urban development), Water, Research and education, Private sector, Finance,	National adaptation planning, Risk assessments and management, Science, knowledge and information, Access to Finance, Transparency, NDC implementation, Capacity building, Knowledge management,

	community-based adaptation to the impacts of climate change (CBA). Approaches related to this adaptation, for example in the sectors of agriculture and land usage, urban development, sustainable financing, and private enterprise, are also supported by IKI projects.[298] IKI has also established the **NDC Cluster**, a partnership between partner countries and implementing partners involved in climate and development projects. The NDC Cluster supports developing countries with the implementation of their NDCs. The implementing partners cooperate and coordinate their projects in order to allocate resources effectively and efficiently in 27 selected partner countries. The NDC Cluster operates in partnership with the NDC Partnership. The NDC Cluster provides guidance and advisory services on cross-cutting capacity building and knowledge management.[299] Adaptation related projects include ***the Support Project for the Implementation of the Paris Agreement (SPA***), which supports the development, improvement, and implementation of developing countries' NDC adaptation goals.[300] Partners strengthen cooperation through joint international conferences, facilitation of easy access to tools for NDC implementation through a shared Toolbox, a Helpdesk for flexible support, a Good Practice Database for global learning and exchange. Also, the project ***IMPACT*** aims to strengthen the connections between the scientific assessments of climate impacts, vulnerability, and adaptation to help enable access to finance and help implement concrete projects in SIDS and LDCs. The project is implemented in three focus regions –the Pacific, West Africa, and the Caribbean.[301]			Governance, Financing
International Federation of Red Cross and Red Crescent Societies (IFRC): an NGO, National/Public Entity covering	The IFRC aims to consider climate risks in all their work. The IFRC's work includes climate-smart disaster risk reduction with an aim to help vulnerable communities reduce their risk, increase resilience, and prepare for emergencies.[302] IFRC is the secretariat for the **Risk-informed Early Action Partnership (REAP)**, an initiative launched at the UN Climate	National Government, Local-Level Government, Communities, NGOs	Community-Based Adaptation, Ecosystem-Based Adaptation, Disaster-Risk Reduction, Human Settlements, Migration and Displaced people	Stakeholder Engagement, Awareness Raising, Training and Education, Climate Data, Information

Africa, Asia, Caribbean and Central America, South America	Summit in 201, which brings together stakeholders across the climate, humanitarian, and development communities with the aim of making 1 billion people safer from disasters by 2025. It creates a space for knowledge sharing, coherence, alignment and complementarity of existing early warning and early action initiatives/mechanisms.[303] IFRC ***Climate Centre***'s mission is to help the IFRC and its partners reduce the impacts of climate change and extreme-weather events on vulnerable people. The Climate Centre focuses primarily on the provision of guidance and tools to National Societies and their partners, exchange of experience, training and technical back-up for volunteers, delegates and managers specializing in disaster risk management and health. Measures to reduce climate impacts include building riverbank enhancements, storm-proofing shelters and evacuation centers, strengthening bridges, or nature-based solutions such as planting mangroves. **Knowledge, awareness, and education:** IFRC works to implement, promote, and enhance approaches and tools for community-based disaster risk reduction and climate action.[304] Risk assessment tools include the *Enhanced Vulnerability and Capacity Assessment (EVCA*), *Roadmap to Community Resilience (R2R)*, and *Zurich Flood Resilience Measurement in Communities (FRMC*). Planning guidelines include the *National Disaster Preparedness and Response Mechanism Guidelines*. In addition, it introduced ***the Anticipation Hub***, a platform for knowledge exchange, support and policy and advocacy efforts to manage risks to the humanitarian system for practitioners, scientists, and policymakers.[305] **Cooperation**: The IFRC launched the ***Climate and Environment Charter for Humanitarian Organizations*** in May 2021 with a view to foster a strong commitment to climate action across the humanitarian community.[306] The aim is to reduce climate risk by increased focus on climate change adaptation, disaster risk reduction and anticipatory action.[307]		Health, Gender and Equality	and Observations, Research and Science

	Technology/science: IFRC works to leverage new technologies for community-based DRR and climate action. It supports forecast-based action and community early warning systems.[308] **Legislation:** IFRC focuses on legislation for climate-smart reduction of disaster risk and has developed *The Checklist on Law and Disaster Risk Reduction* and its accompanying guide, *The Handbook on Law and Disaster Risk Reduction*, to provide practical guidance on this area of law.			
International Institute for Sustainable Development (IISD): an IGO covering developing countries involved in the NAP process in Africa, Asia, Caribbean and Central America, Pacific/Oceania, South America, Europe	IISD is an independent think tank with a mission to accelerate solutions for a stable climate, sustainable resources, and fair economies. The IISD Resilience program is the secretariat for the **National Adaptation Plan (NAP) Global Network.** NAP Global Network is a group of governments, civil society, communities, businesses, individuals, and institutions working to enhance national adaptation planning and action in developing countries. One of the networks three main activities is supporting national level action on NAP development and implementation. They provide technical support and knowledge sharing to leverage existing resources, minimize overlaps, and identify gaps in supporting the NAP process.[309] The NAP Global Network's activities are demand-driven - through their Country Support Hub, Network participants in developing countries can request free expert advice and/or short-term, targeted in-country technical support on specific issues that will help them to maintain momentum in their NAP process or its implementation.	National Government, Local-Level Government	Adaptation Finance, Gender, Indigenous and Traditional Knowledge, Disaster-Risk Reduction, NAPs, Support in designing domestic fiscal instruments	Planning and Prioritization, Implementation/Project Impact Assessment, Access to Financial Resources, Stakeholder Engagement, Monitoring and Evaluation, Institutional Arrangement, Awareness Raising
International Organization for Migration (IOM): an intergovernmental organization (IGO) covering all regions	IOM is the leading inter-governmental organization in the field of migration and works closely with governmental, intergovernmental, and non-governmental partners. With 174 member states, a further 8 states holding observer status and offices in over 100 countries, IOM is dedicated to promoting humane and orderly migration for the benefit of all.[310] It does so by providing services and advice to governments and migrants.		Displacement, migration, Disaster risk reduction	Adaptation planning and practices, Communication and outreach/awareness, Education and training, Institutional arrangements,

	IOM works in the four broad areas of migration management: (i) Migration and development; (ii) Facilitating migration; (iii) Regulating migration; (iv) Forced migration.			Vulnerability assessment
International Union for Conservation of Nature (IUCN)	IUCN is a membership Union composed of both government and civil society organizations. It harnesses the experience, resources and reach of its more than 1,400 Member organizations and the input of more than 18,000 experts.[311] IUCN works across a wide range of themes related to conservation, environmental and ecological issues. IUCN assesses the impacts of climate change on species and ecosystems. Through its work on ecosystem-based mitigation, adaptation, and disaster risk reduction, it also highlights the important role of nature-based solutions to climate change. It also works to ensure that climate policy and action are gender-responsive, socially inclusive and take into account to the needs of the most vulnerable.[312]		Natural environment, Water, Rural environment, Disaster risk reduction,	Knowledge, information and education, tools and resources, monitoring and evaluation, Gender, Nature-based solutions, Ecosystem-based mitigation,
Lake Chad Basin Commission (LCBC): an intergovernmental organization (IGO) covering countries bordering Lake Chad	LCBC was established in 1964 by the four countries bordering Lake Chad: Cameroon, Niger, Nigeria, and Chad. Since then, the Central African Republic and Libya joined the organization. Egypt, the Republic of Congo, and the Democratic Republic of Congo are observer members. The mandates of the Commission include: the management of the Lake Chad and its shared water resources, preservation of the ecosystems and promotion of regional integration, peace, security, and development in the Lake Chad Region.[313]		Adaptation finance, Agriculture and food security, Natural environment (ecosystem and biodiversity), Water resources, Peace and security	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Monitoring and evaluation, Science and research, Vulnerability assessment
Least Developed Countries Expert Group (LEG): a UNFCCC affiliated body covering least developed countries and developing countries	LEG was established in 2001 and support the least developed countries (LDCs) on adaptation under the Convention, in particular, on the process to formulate and implement national adaptation plans (NAPs), the national adaptation programs of action (NAPAs) and the LDC work program. The LEG undertakes its work through a variety of modalities that include technical guidelines, technical papers, technical guidance, training activities, workshops, expert meetings, case studies, capturing and sharing of experiences, best practices and	Least Developed Countries, Small Island States, and other developing countries.		National Adaptation Planning (NAP) processes, Risk assessment, technical guidance, Training and education, Monitoring and evaluation, Capacity building

	lessons learned, NAP Expo, NAP Central, monitoring of progress, effectiveness and gaps, and promotion of synergy.[314] LEG organizes regional training workshops on NAPs, the ***NAP Expo,*** to promote exchange of experiences and foster partnerships between countries, organizations and relevant actors on how to advance the formulation and implementation of NAPs.[315] Specific objectives include the following: ○ To update stakeholders on the latest guidance on the technical and financial aspects to advance the formulation and implementation of NAPs ○ To discuss country experiences, best practices, lessons learned, gaps and needs and information on support provided and received in relation to the process to formulate and implement NAPs ○ To offer a platform for countries to interact with the GCF and others providing support for NAPs, as a means to improve access to financing for NAPs.			
Least Developed Countries Universities Consortium on Climate Change (LUCCC): a network of universities in the developing world	Least Developed Countries Universities Consortium on Climate Change (LUCCC) aims to foster South-South collaboration for enhancing research capacity and expertise on climate change, with focus on adaptation. LUCCC universities foster learning and capacity for least developed countries and the most vulnerable communities. The objective is 'to enable national agencies to effectively implement community-based adaptation initiatives as they have resource people to train implementers.[316]	Universities in LDCs and national agencies in these countries.	Research and Education	Knowledge and information, Capacity building
Low Emission Development Strategies Global Partnership (LEDS GP): a regional center/network/initiative covering Africa,	LEDS GP is a knowledge and solutions platform that enables collaborative and ambitious climate action, peer learning and innovation. It fosters country leadership and regional communities that enable the transformational changes needed for a low-carbon and climate-resilient development.[317] The LEDS GP operates through country-driven regional platforms that support the implementation and enhancement of Nationally	Energy, transport, agriculture, resource efficiency and finance	Research and education	Capacity building, Knowledge and information sharing, Collaboration and cooperation

Asia, Latin America, and the Caribbean	Determined Contributions (NDCs) and Long-Term Strategies (LTSs) by helping its members define priorities, establish regional communities of practice on sectoral action and resource mobilization.			
Mangroves for the Future (MFF): a regional center/network/initiative covering Eastern Asia, Southern Asia, South-Eastern Asia	MFF is a partner-led initiative to promote investment in coastal ecosystem conservation for sustainable development. Co-chaired by IUCN and UNDP, MFF provides a platform for collaboration among the many different agencies, sectors and countries which are addressing challenges to coastal ecosystem and livelihood issues. The goal is to promote an integrated ocean-wide approach to coastal management and to building the resilience of ecosystem-dependent coastal communities, with particular focus on tsunami-prone countries. The MFF grants facility offers small, medium, and large grants to support initiatives that provide practical, hands-on demonstrations of effective coastal management in action.[318] Mangroves are the flagship of the initiative, but MFF is inclusive of all types of coastal ecosystem, such as coral reefs, estuaries, lagoons, sandy beaches, seagrasses, and wetlands. MFF will increasingly focus on building resilience of ecosystem-dependent coastal communities by promoting nature-based solutions and by showcasing the climate change adaptation and mitigation benefits that can be achieved with healthy mangrove forests and other types of coastal vegetation.	Initially focused on the countries that were worst affected by the tsunami – India, Indonesia, Maldives, Seychelles, Sri Lanka, and Thailand. More recently it has expanded to include Bangladesh, Cambodia, Myanmar, Pakistan, and Vietnam.	Coastal areas/zones, Water resources Disaster risk reduction, Ecosystems, Biodiversity, Finance, Private sector	Adaptation planning and practices, Capacity-building, Monitoring and evaluation, Grants/finance
Marrakech Partnership for Global Climate Action	Under the leadership of the High-Level Climate Champions, the Marrakech Partnership for Global Climate Action supports implementation of the Paris Agreement among Parties and non-party stakeholders by enabling collaboration between governments and the cities, regions, businesses, and investors that must act on climate change. Its mission is to strengthen collaboration between governments and key stakeholders to immediately lower emissions and increase resilience against climate impacts. These actions are guided by the long-term goals of the Paris Agreement and undertaken in the context of the 2030 Agenda for Sustainable Development. The focus is on environmental, economic, and	Governments, initiatives, cities, regions, civil society and private sector	Built environment, Rural environment, Nature	Tracking and reporting, Collaboration, cooperation and coherence, Capacity building, Broadening participation,

	social system transformation, promoting higher ambition of all stakeholders to collectively strive for the 1.5 °C temperature goal and a climate-neutral and resilient world.[319]			
Mekong River Commission for Sustainable Development (MRC): an intergovernmental organization (IGO) covering South-Eastern Asia	The MRC is an intergovernmental organization for regional dialogue and cooperation in the Lower Mekong River Basin, established in 1995 based on the Mekong Agreement between Cambodia, Lao PDR, Thailand and Vietnam. The organization serves as a regional platform for water diplomacy and a knowledge hub of water resources management for the sustainable development of the region.[320]	National governments, local authorities	Agriculture and food security, Coastal areas/zones, Energy, Water resources	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness
Nairobi work program on impacts, vulnerability, and adaptation (NWP) *(within the UNFCCC)*	NWP was established in 2005 and is a knowledge hub for adaptation and resilience.[321] It assists Parties to the UNFCCC, in particular the LDCs and SIDS, in understanding its adaptation and resilience knowledge needs. It facilitates Parties to improve its understanding and assessment of climate change impacts, vulnerability, and adaptation and to make informed decisions on implementing adaptation action. NWP connects constituted bodies and institutional arrangements under the Convention with non-Party stakeholders.[322] NWP also facilitates partnerships for action but is not involved in the implementation of actions. Its work includes: ○ It has established the interactive space **Focal Point Forums** to facilitate exchange of views and collaboration between national governments, partner organizations and thematic experts. ○ NWP is also leading the **Lima Action Knowledge Initiative (LAKI)**, which focuses on bridging adaptation knowledge gaps in countries and sub-regions. ○ NWP facilitates the **Adaptation Knowledge Portal**, with case studies, synthesis reports, action pledges, vulnerability impact assessment tools and program management	Parties to the UNFCCC	Water (ocean, coastal areas, and ecosystems, including mega deltas, coral reefs and mangroves, wetlands, water scarcity), Rural environment (rural communities, agriculture, food security, forests, and grasslands), Natural environment (biodiversity), Built environment (cities and urban systems), Socio-economic (tourism), Extreme weather events and slow onset events, Health, Finance[324]	

	frameworks about adaptation and resilience. Total number of visits to the portal May 2020 to April 2021 are increased compared to 2019 but remain low (46 545).[323] ○ **UN Climate Change and Universities Partnership Program** was launched in 2020 under NWP and provides graduate students the opportunity to work closely with local, national, and regional partners in undertaking research to address knowledge gaps identified through LAKI. ○ NWP also supports the Adaptation Committee and the LEG, and takes part in expert meetings, technical workshops, and events (such as the NAP Expo)			
Nansen Initiative / Platform on Disaster Displacement	The Platform on Disaster Displacement is a state-led initiative working toward better protection for people displaced across borders in the context of disasters and climate change, and a follow-up to the Nansen Initiative, which started as a more informal way to discuss displacement related issues.[325] The Nansen Initiative identified a multitude of effective practices used by several States to admit and protect displaced individuals, including granting a humanitarian visa or temporary protection status. The initiative works to harmonize these practices at regional levels and replicated where needed.	All countries	Disaster displacement	Facilitate regional efforts, Cooperation and coordination, Policy/regulation
Observatory for the Sahara and Sahel (OSS): a regional center/network/initiative covering countries in the Sahara-Sahel region	OSS is a regional entity in Africa that aims to serve as an international framework for partnership and dialogue in the fight against desertification and in the attenuation of the effects of drought, the adaptation to climate change and the protection of biodiversity. OSS supports the efforts of its member countries in the Sahara-Sahel region in the fields of natural resource management and sustainable development, particularly on key themes such as land degradation, desertification, drought, and the adverse impacts of climate change on ecosystems and populations.[326]	Developing countries in the Sahara-Sahel region	Agriculture and food security, Disaster risk reduction, Ecosystems, Water resources	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Institutional arrangements, Monitoring and evaluation, Science and research
OPEC Fund for International Development (OPEC	The OPEC Fund for International Development (the OPEC Fund) is the only globally mandated development institution that		Energy	Adaptation planning and practices, Communication and

Fund): an intergovernmental organization (IGO) covering Africa, Latin America, and the Caribbean, Asia, and the Pacific	provides financing from member countries to non-member countries exclusively. The organization works in cooperation with developing country partners and the international development community to stimulate economic growth and social progress in low- and middle-income countries around the world.[327]			outreach/awareness, financial support
Organization for Economic Co-operation and Development (OECD): an intergovernmental organization (IGO) covering Africa, Latin America, and the Caribbean, Asia, and the Pacific	Together with governments, policy makers and citizens, the OECD works on establishing evidence-based international standards and finding solutions to a range of social, economic, and environmental challenges. From improving economic performance and creating jobs to fostering strong education and fighting international tax evasion, they provide a unique forum and knowledge hub for data and analysis, exchange of experiences, best-practice sharing, and advice on public policies and international standard-setting.[328] The OECD supports countries' efforts to prepare for the effects of a changing climate by providing impartial analysis, policy advice and supporting the sharing of experiences between the public and private sectors. The OECD is helping countries to share their adaptation experiences, identify barriers and inform the development of policy solutions. It also works on integrating adaptation into development cooperation activities and monitoring and evaluation.[329]		Agriculture and food security, Coastal areas/zones, Disaster risk reduction, Ecosystems, Health, Human settlements and infrastructure, Socio-economic activities, Water resources	Adaptation planning and practices, Adaptation policy, Communication and outreach/awareness, Institutional arrangements, Monitoring and evaluation, Science and research, Vulnerability assessment
Pacific Islands Applied GeoScience Commission (SOPAC): an intergovernmental organization (IGO) covering 18 Pacific Island countries as well as Australia and New Zealand	SOPAC's initial focus of its work was on marine mapping and geosciences, but recent years have seen a broadening of this scope to include hazard assessment and risk management, environmental vulnerability, oceanography, energy, water and sanitation and information and communication technologies.[330]		Coastal areas/zones, Disaster risk reduction, Health, Water resources	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Observation and scenarios
Pacific Islands Forum (PIFS): an IGO	PFIS manages several funding assistance schemes which are available to member countries.[331] Its goal is to stimulate economic growth and enhance political governance and security	National member countries,	Adaptation Finance	Access to Financial Resources, Stakeholder

covering the Pacific/Oceania	for the region, through the provision of policy advice and to strengthen regional cooperation and integration through coordinating, monitoring, and evaluating implementation of Leaders' decisions. Its climate change and disaster risk management is specifically related to coordination, high level political advocacy and provision of policy support to its member countries to improve their access to, and management of, climate change and disaster risk finance. ○ The 'Economic Governance' Program provides policy and technical support aimed at improving public and private partnerships through collaboration with private sector organizations, including the Pacific Islands Private Sector Organization (PIPSO), in economic development, trade and investment areas. ○ The 'Political Governance & Security' Program's overriding objective is to give effect to the desire of our Leaders and members for a secure and well-governed region through the provision of high-quality policy advice, coordination, and implementation assistance			Engagement, Planning and Prioritization, Capacity-building, Monitoring and Evaluation
Partnerships in Environmental Management for the Seas of East Asia (PEMSEA): a regional center/network/initiative, UN and affiliated organization covering Eastern Asia, South-Eastern Asia	PEMSEA was created to foster and sustain healthy and resilient coasts and oceans, communities and economies across the Seas of East Asia through integrated management solutions and partnerships. PEMSEA aims to proactively build effective intergovernmental and intersectoral partnerships and expand the capacities of countries and other stakeholders with innovative, cross-cutting policies, tools, and services for integrated coastal and ocean management. PEMSEA applies integrated coastal management for generating and sustaining healthy oceans, people, and economies.[332]	National and local governments, companies, research and science institutions, communities, international agencies, regional programs, investors, donors, learning centers	Agriculture and food security, Coastal areas/zones, Disaster risk reduction, Human settlements and infrastructure, Water resources	Adaptation planning and practices

R20 Regions of Climate Action: an NGO covering North America, South America, Europe, Africa, Asia, Pacific/Oceania, Caribbean, and Central America	R20 supports sub-national governments around the world to develop and communicate low-carbon and climate resilient economic development projects. A key focus is on renewable energy, energy efficiency and waste optimization infrastructure projects, such as retrofitting streetlights with LED, implementing solar projects and supporting low carbon projects for women.[28] The focus is mainly on mitigation related programs, with a mission to strengthen climate resilience: ○ **Cooperation/interconnection:** R20 works - upon demand from the regions - as a "matchmaker" for three actors: sub-national governments, clean technology providers and public-private investors. It also organizes the R20 Austrian World Summit (R20 AWS) which serves as a meeting place for those working on solutions for climate protection, health, and sustainability. ○ **Research/science:** R20 has created a Master's program with one of the leading universities in Oran to help local authorities from different African regions learn how to carry out project feasibility studies.	Local-Level Government, Business, Academia	Energy, Infrastructure, Mitigation, Resilience, Adaptation financing, Gender	Planning and Prioritization, Implementation/Project Impact Assessment, Training and Education, Stakeholder Engagement, Access to Financial Resources, Monitoring and Evaluation
Regional Gateway for Technology Transfer and Climate Change Action (REGATTA): a regional network/UN affiliated initiative covering Latin America	REGATTA´s objective is to strengthen capacity and knowledge sharing of climate change technologies and experiences for adaptation and mitigation in Latin America and the Caribbean. REGATTA is supporting the mainstreaming of adaptation in the National Development Plan (NDP), strengthening the dialogue for the National Adaptation Plan (NAP) process in participating countries. It provides webinars, compiles climate change information, gathers experiences, disseminates cutting-edge knowledge, and builds a stronger connection among relevant individuals from several sectors and sub-regions. The technical information can be used by countries as reference to inform national decision-making processes, support preparation processes for negotiations and promote further research and project development.	National governments, Local governments, Local communities	Science and technology,	National Adaptation Planning, Capacity Building, Information/knowledge, Cooperation, information sharing, awareness raising, technical support, Technology transfer,

	It is also contributing to the implementation of the Climate Technology Centre and Network (CTCN) in the region, through the organization of joint virtual seminars and the provision of technical support to the development of countries proposals.			
Organization of Eastern Caribbean States (OECS): a regional center/network/initiative covering Eastern Caribbean	OECS is dedicated to regional integration in the Eastern Caribbean. Its **Climate Change and Disaster Resilience Work Program** entails programs and projects that promote cooperation and deliver support to Member States at the regional, national and community levels.[333]	Member countries in Eastern Caribbean	Biodiversity, Coastal areas/zones, Disaster risk reduction	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Education and training, Institutional arrangements
Regional Environmental Center for Central and Eastern Europe (REC): an intergovernmental organization (IGO) covering Eastern, Southern Europe	REC assist in addressing environmental issues by promoting cooperation among governments, non-governmental organizations, businesses and other environmental stakeholders, and by supporting the free exchange of information and public participation in environmental decision making.[334] It supports the implementation of the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. It contributes to regional, national, and sub-national efforts to develop and implement low-emission development strategies and to build resilience to climate change. It provides good-quality data for decision makers; promotes dialogue and international cooperation among different stakeholder groups; disseminates low-carbon development knowledge; builds the capacities of national and sub-national stakeholders; and facilitates active public participation in policy making.[335]		Agriculture and food security, Water resources, Disaster risk reduction	Adaptation planning and practices, Vulnerability assessment, Knowledge and information, Capacity building, Cooperation,
Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA): an intergovernmental organization (IGO),	PERSGA is the regional organization for the conservation of the environment in the Red Sea and Gulf of Aden. Its programs include biodiversity, climate change mitigation, monitoring, marine protected areas, information technology, land-based activities, marine pollution.[336]		Biodiversity, Coastal areas/zones, Ecosystems	Adaptation planning and practices, Adaptation policy, Monitoring and evaluation, Observation and scenarios, Vulnerability

regional center/network/initiative				assessment, Capacity building, Education
The Resilient Cities Network (R-Cities): a global initiative/coalition covering all regions	R-Cities consists of member cities and resilience officers from the 100 Resilient Cities program, sharing a common lens for holistic urban resilience and with thousands of projects in implementation. It aims to support cities and their resilience officers in future-proofing their communities and critical infrastructure.[337]	Member cities	Built environment (cities)	Adaptation planning and practices, Education and training, Network and cooperation
Resilience Frontiers (RF)	RF is an initiative that aims to foster collaboration and thought experiments to enhance climate resilience[338]. It establishes a two-year collective intelligence process (2019-2020) followed by an implementation decade (2021-2030). It has partners from UN agencies, international NGOs, research institutes and youth networks. It has undertaken an action pledge under the NWP.	Research institutions and youth networks	Research and education	Ecosystem/nature-based solutions; technology; retooled financial systems; equitable access to data.
SAARC Disaster Management Centre (SAARC DMC): an intergovernmental organization (IGO) covering South Asia	SAARC DMC is center of regional cooperation for holistic management of disaster risk management in South Asia.[339]	Countries in South Asia	Disaster risk reduction	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Education and training
Southern African Science Service Center for Climate Change and Adaptive Land Management: a regional science service center covering Southern Africa	SASSCAL is a joint initiative of Angola, Botswana, Namibia, South Africa, Zambia, and Germany in response to the challenges of global change, including climate change. In relation to climate change, its mission is to strengthen the regional capacity to generate and use scientific knowledge products and services for decision making on climate change and adaptive land management through research management, human capital development and services brokerage.[340] SASSCAL's **Open Access Data Centre** (OADC) aims to support climate change adaptation by making data, information, and knowledge openly available. Adaptation related projects include:	Countries in the Southern African region	Research, science, and education	Climate change data and information services, Research and education, Risk assessment, Capacity development

	○ SASSCAL implements the **Innovative Technologies to Improve Climate Resilience in the Zambian Agricultural Sector (InTeCRes) project**, to build capacity of emergent farmers in the utilization of novel and innovative technologies to improve crop productivity and farm management in the face of climate change.[341] ○ The Miombo Network, a joint initiative dedicated to providing scientific information and policy guidance for sustainable management of the Miombo woodlands across their range countries, aiming at improving the benefits and human livelihoods from the Miombo forest ecosystems.[342] ○ The WeMAST (Wetlands Monitoring and Assessment) project will design and develop an integrated platform for wetland assessment and monitoring that will support better management of selected transboundary river basins in Southern Africa, with special emphasis on the Cuvelai Basin, Okavango River Basin, the Limpopo River Basin, and the Zambezi River Basin.[343]			
Secretariat of the Pacific Community (SPC): an IGO, regional center/network/initiative/research institution covering the Pacific/Oceania	SPC is a scientific and technical organization in the Pacific region that covers more than 20 sectors. It work include knowledge and innovation in areas such as fisheries science, public health surveillance, geoscience and conservation of plant genetic resources for food security, as well as climate change and disaster risk reduction.[344] SPC's strategy is to assist Pacific Island countries and territories to adopt a sustainable 'whole of country, whole of region' approach to addressing climate change challenges, through identification of risks and provision of relevant climate change knowledge, technical assistance and resources to enable them to make informed policy and operational decisions. SPC leads the **Pacific Data Hub**, a central repository of data about the Pacific.[345] It undertakes the following:	National Government, Local-Level Government, NGOs, Communities in the Pacific region	Water, Rural environment, Science and education Agriculture, Coastal Areas/Zones, Health, Infrastructure, Freshwater Fisheries, Water Resources, Biodiversity, Ecosystems, Gender, Community-Based Adaptation, Urban Resilience, Human Settlements	Adaptation planning and practices, Adaptation policy, Capacity-building, Awareness Raising, Stakeholder Engagement, Climate Data, Information and Observations, Planning and Prioritization

	○ develops systems, data, and scientific research to inform evidence-based decision making ○ offers scientific advice and technical support for development outcomes ○ provides regional governance support and coordination ○ convenes and facilitates multi agency multi country efforts ○ delivers training, mentoring and capacity development to empower PICTS to address their development needs ○ hones internal collaboration and collective action for enhanced results		Forestry; Renewable energy; Energy efficiency	
Secretariat of the South Pacific Environment Program (SPREP): an IGO covering the Pacific/Oceania	SPREP is charged with protecting and managing the environment and natural resources of the Pacific. Its core priorities are in the areas of: (i) climate change resilience; (ii) islands and ocean ecosystems; (iii) effective waste management and pollution control; and (iv) environmental governance. SPREP hosts the **Pacific Climate Change Centre**, which is regional center of excellence for climate change information, research, and innovation.[346] SPREP supports members to maximize access to climate finance through its role as an accredited entity to the Adaptation Fund and the Green Climate Fund and through other sources.	Members of SPREP – National Pacific Island Governments, Governments with Pacific interests, Local-Level Government, Business, NGOs, Communities, Academia	Adaptation Finance, Food Security, Infrastructure, Gender, Biodiversity, Coastal areas/zones, Disaster risk reduction, Ecosystems, Human settlements and infrastructure, Socio-economic activities, Water resources	Access to Financial Resources, Planning and Prioritization, Implementation/Project Impact Assessment, Monitoring and Evaluation Adaptation policy, Capacity-building, Education and training, Institutional arrangements
Southeast Asia Network on Climate Change (SEAN CC): a regional center/network/initiative covering Southeast Asia	SEAN-CC's primary objective is to support Southeast Asian countries meet their commitments under the UN Framework Convention on Climate Change. More specifically, it aims to: (i) strengthen the capacities of National Climate Change offices on areas requested by network members both at the national and regional level, and (ii) provide a platform for members to network and share knowledge, best practices and first-hand experiences in climate policy formulation and implementation in their respective countries. Provides increasingly tailored services	Member countries	Agriculture and food security, Biodiversity, Coastal areas/zones, Ecosystems, Socio-economic activities, Water resources	Adaptation planning, Risk assessment, Knowledge and information sharing, Cooperation, Technical support,

	to support members in developing and implementing their climate policies domestically. It supports the mainstreaming of adaptation in National Development Plans. The hands-on understanding of selected approaches, methods and tools in vulnerability, impact and adaptation assessment methods is part of this program, as well as the identification of specifications to advance the National Adaptation Plan (NAP) process in participating countries.[347]			
Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA): a regional center/network/initiative covering South-Eastern Asia	SEARCA established the **Knowledge Center on Climate Change Adaptation in Agriculture and Natural Resource Management in Southeast Asia (KC3),** in order to organize, package and share information, knowledge solutions on climate change-related disasters. KC3 features SEARCA's **Climate Change Adaptation and Mitigation in Southeast Asia (CChAMSEA) Framework**, an online portal of media materials, dynamic exchange of science-based knowledge solutions and good practices, opportunities for graduate scholarship, research and development, short-term training, and policy advocacy, and a contacts database of climate change community members.		Agriculture and food security, Biodiversity, Coastal areas/zones, Ecosystems, Socio-economic activities, Water resources	Capacity-building, Communication and outreach/awareness, Education and training, Institutional arrangements, Science and research
Southern African Development Community (SADC): a regional center/network/initiative covering southern African member states	SADC is a regional economic community comprising of 16 member states from south Africa. The SADC **Regional Early Warning System** (REWS) was established to strengthen the SADC mechanisms for conflict prevention, management, and resolution.[348] It does so through: • compiling strategic assessment and analysis of data collected at regional level • shareing information on major issues posing threat to the security and stability of the region • proposing ways and means for preventing, combating, and managing such threats.	Southern African member states	Disaster risk reduction	Adaptation planning and practices, Education and training, Science and research, Monitoring and evaluation, Observation and scenarios, Capacity-building, Communication and outreach/awareness
SouthSouthNorth (SSN): an NGO, regional	SSN supports national and regional responses to climate change through three practice areas: climate finance, climate services/information and development implementation. SSN is	National Government, Local-Level Government,	Urban Resilience, Human Settlements, Disaster-Risk Reduction, Agriculture,	Climate Data, Information and Observations, Monitoring and

center/network/initiative covering Africa	global and Africa lead for Climate and Development Knowledge Network (CDKN).[29] It undertakes the following: ○ **Research/information/knowledge:** SNN distils and package useful and applicable knowledge for the implementation of climate compatible development. It funds climate research and promotes the integration of climate information and contexts into project design and implementation. Its project ***Future Climate for Africa (FCFA)*** aims to generate new climate science, improving understanding and modelling climate variability and change across Africa. FCFA works to ensure climate information is incorporated in medium to long-term climate resilient policies, plans and investments. It has developed several tools in this regard.[30] ○ **Connection/collaboration:** SNN connects knowledge with decision makers, bring practitioners together to share experiences and engage in peer-to-peer learning and mentor leaders in climate and development.[31] In addition, SSN's project FCFA has assisted in developing a climate risk screening tool for Rwanda's Environmental Fund (FONERWA). It has also applied research and learning on co-production and use of weather information services for WISER and supplied climate information to inform African infrastructure planning decisions for the World Bank.[32] Furthermore, SNN acts as secretariat for the Africa LEDS Partnership (AfLP)[33] and gives technical support to the African Group of Negotiators (AGN) and the Climate Resilient Infrastructure Development Facility (CRIDF)[34]. ○ **Finance:** SSN supports African decision makers and National Designated Authorities (NDAs) with information related to access to finance from GCF and supports capacity building, institutional strengthening, and stakeholder engagement. Its objective is to establish SNN as a trusted partner for governments and other actors in climate finance matters in Africa. Past adaptation related projects include ***the Small Grands Facility*** and ***the Sustainable Settlement Facility***.	NGOs, Academia, Business	Water Resources, Food Security, Finance off-grid energy supply, green industry, resilient livelihoods, Agriculture, Forestry and Other Land Use (AFOLU), Sustainable Cities, Climate Induced Migration and Resilient Infrastructure.	Evaluation, Planning and Prioritization, Awareness Raising, Research and Science, Climate Scenarios

	Current climate finance projects SNN is involved in include the ***IKI Mobilizing Investment program (IKI MI)*** for NDC Implementation focused on the energy sector in two African countries and five developing countries; ***Private Sector Investment for NDC Implementation in Sub-Saharan Africa (PRINDCISSA)*** assessed how the private sector can be incentivized to finance mitigation and adaptation activities in NDCs;[35] ***the Southern African Renewable Energy Investment and Growth (SOARING),*** and ***DECARBOOST*** which aims to catalyze investment to decarbonize Latin America and the Caribbean. ○ SSN also facilitates the ***Southern Africa Climate Finance Partnership (SACFP)***, which is a multi-country platform seeking to improve access to climate finance. It focuses on applied research and knowledge sharing, capacity enhancement and targeted technical assistance.[36]			
Stockholm Environment Institute (SEI): an IGO/research/policy organization covering all regions	SEI is a research and policy organization that tackles environment and development challenges. SEI's work on adaptation and disaster risk includes the following initiatives and projects: ○ Initiative on Governing bioeconomy pathways (resource efficiency, climate-smart and sustainable production systems for food, feed, fuels, and value-added agro-industrial products) aims to better articulate the alternative pathways available for bioeconomy development, and to identify the policies, institutions and governance mechanisms that can facilitate each of them. ○ Integrated climate and development initiative, which enables low- and middle-income countries to integrate planning to address mitigation and development to achieve their NDCs and SDGs. ○ Water beyond boundaries, which introduces sustainable water planning, equitable water access and ecosystem	Scientific community, National and local governments, local communities	Water, Rural environment, Natural environment, Built environment, Production and services, Research and education, Health, Disaster risk reduction, Societal environment	Adaptation planning, risk assessment, monitoring and evaluation, Capacity building

	approaches to water management – with initial focus on the Magalena rivers in Colombia and the Mekong River system in Asia. ○ SEI is responsible for developing and maintaining **weADAPT,** which is an online platform which allows practitioners, researchers, and policy makers to access and share adaptation-related information, experiences and lessons learned. The platform highlights who is doing what, where and how, and is designed to facilitate learning, exchange, collaboration, and knowledge integration.[349] ○ **REXSAC**, which aims to understand Arctic mining, its impacts on local environments, and opportunities for post-extractive futures, with ambitions to make comparisons and understand resource extraction in a global context.			
Sustainable Ocean Alliance (SOA): a network/initiative covering the world's oceans	SOA is a global community of youth, entrepreneurs, and experts in their field, all collaborating to solve the challenges facing the ocean. It holds virtual events and leadership programs and supports entrepreneurs through its **ocean solutions accelerator**. It works to raise awareness of the importance of ocean and climate action, reef and turtle protection, reducing marine pollution, carbon credit schemes, sustainable seafood and food businesses, and ecosystem protection.	Private sector, entrepreneurs for ocean action	Water (ocean)	Awareness raising, Knowledge and education, Collaboration, and cooperation
UNESCO: a UN affiliated body covering all regions	UNESCO seeks to build peace through international cooperation in Education, the Sciences and Culture.[350] Climate change threatens most of UNESCO's marine World Heritage sites. UNESCO joined the public-private partnership the **Resilient Reefs Initiative**.[351] Launched in 2020, it is a four-year initiative to build climate adaptation strategies to protect 50 marine protected sites included in the UNESCO World Heritage List. These sites comprise at least 21 percent of the global area of blue carbon ecosystems. The initiative is focused on communities and livelihoods, and a key part of the initiative is to recruit local chief resilience officers, who bring together various viewpoints from the community, scientists, and other experts to		Adaptation strategies, Ocean focus,	

	empower local communities to own the future of their coral reef ecosystems.			
United Nations Climate Change Secretariat: a UNFCCC affiliated body	The UN CC Secretariat has set up, in collaboration with Asian Institute of Technology, Korea Environment Institute, IHE Delft, Oregon State University, and Alliance for Global Water Adaptation, the **Adaptation Academy**.[352] The Adaptation Academy falls under the UNFCCC Climate Action and Support Transparency Training (CASTT) program established in 2017. The CASTT Adaptation Academy is geared toward experts in developing countries who are preparing their climate vulnerability and adaptation assessments as part of their reporting for the Enhanced Transparency Framework under the Paris Agreement.	UNFCCC countries, with particular focus on developing countries	Education	Adaptation communication, transparency reporting, Adaptation planning, Capacity building, Education, Cooperation, information sharing, awareness raising
United Nations Development Programme (UNDP): an intergovernmental organization (IGO), UN-affiliated organization covering Africa, Asia, Caribbean and Central America, South America, the Pacific/Oceania	UNDP works in 170 countries and territories with international development, to eradicate poverty and reduce inequality. Its work is concentrated in three focus areas; (i) sustainable development; (ii) democratic governance and peace building; and (iii) climate and disaster resilience.[353] Its adaptation-related work include: ○ **The NAP-Global Support Program (NAP GSP)** for LDCs is a UNDP-UNEP program to support LDCs engaged in national adaptation planning processes (NAPs). It assists with identifying technical, institutional and financial needs to integrate climate change adaptation into ongoing medium and long-term national planning (NAPs).[354] It will provide technical support on NAP processes to non-LDCs in the following areas: (i) Institutional support to develop NAP road-maps; (ii) Training on relevant, tools, methods and guidelines to support effective climate change adaptation planning; and (iii) Knowledge sharing to enhance international and regional cooperation NAP-GSP does not provide grants to requesting countries. Support from the program can however assist countries to leverage finance from a variety of existing sources.	National Government, Local-Level Government, Business, NGOs, Academia, Local communities	Agriculture, Disaster-Risk Reduction, Water Resources, Coastal Areas/Zones, Adaptation Finance, Urban Resilience, Human Settlements Climate variability, Adaptation Finance, Gender	Access to Financial Resources, Planning and Prioritization, Stakeholder Engagement, Knowledge sharing, institutional support, regional training, tools, methods and guidelines, UNFCCC Negotiations Awareness Raising, Climate Data, Information and Observations

	○ **The Pacific Solution Exchange (PSE)** is an UNDP facilitated knowledge-sharing forum that supports an email-group of over 1500 members across the Pacific for adaptation-related queries. Members ask each other queries and share answers, insights, experiences, and lessons learned to help with their adaptation work in the Pacific. There are four core services provided (question, discussion, consultation, and collaboration), and currently one PSE community (Climate Change and Development (CCD)). ○ **CIRDA Program** provides support to 11 vulnerable African countries in their efforts to enhance their capacity to collect, analyze and disseminate climate information as a tool in adaptation planning. It does so by providing expert technical advice, promoting regional cooperation efforts, and capacity building. The support provided by the CIRDA Program is in addition to each countries efforts to implement individual national climate information/early warning projects. ○ **The ECCA Program** was first launched in October 2012 by the United Nations Development Program (UNDP) in partnership with USAID, Yale University, the Asian Development Bank and Global Water Partnership. The three-year capacity-building program was conceived with the aim of enhancing the technical know-how of governments to formulate economically efficient development plans, inform climate smart policies and build strong National Adaptation Plans (NAPs). It will continue the work it concluded in 2016 by working directly with government partners and UNDP to grow the region's knowledgebase regarding the costs, benefits, risk management tools, agricultural inputs, and economic indicators for climate change adaptation in the region			

UN Economic Commission for Africa (ECA): a regional center/network/initiative covering Africa	UN ECA is of the UN's five regional commissions. Its mandate is to promote the economic and social development of its member States, foster intra-regional integration, and promote international cooperation for Africa's development.[355] ECA's Technology Climate Change, and Natural Resource Management Division is divided into three main sections: (i) Climate Change; (ii) Green Economy Innovations and Technology; and (iii) Natural Resource Management. It undertakes the following functions:[356] ○ Promote and undertake research to improve capacities of policymakers in analyzing and managing policies to address issues of climate change, environment and natural resource management, science, technology and innovation and transitioning to low-carbon, inclusive green and blue economy ○ Support the formulation and implementation of gender sensitive policies in the areas of climate change, green and blue economy, natural resources management, science, technology, and innovation in support of the key drivers of Africa's sustainable structural transformation ○ Promoting the development of mineral resources in the context of the Africa Mining Vision ○ Advocating policy-relevant research and analysis to inform the formulation and implementation of policies to foster a blue and green economy ○ Supporting member States in addressing challenges of climate change in key sectors and putting in place appropriate plans and mechanisms to reflect national development priorities, policies, strategies and programs ○ Promoting policy dialogues and the exchange of experiences and best practices among stakeholders at the regional, national, and local levels through conferences, meetings, seminars, and electronic forums.	Member states	Agriculture and food security, Disaster risk reduction, Socio-economic activities	Adaptation planning and practices, Capacity-building, Communication and outreach/awareness, Institutional arrangements

UN Economic Commission for Europe, Environmental Division (UNECE): a UN-affiliated organization covering Europe, North America, and Asia	UNECE is of the UN's five regional commissions. Its major aim is to promote pan-European economic integration. One of its thematic areas is 'environment policy' in which the work areas include:[357] ○ clean air ○ shared and safe water ○ safe industry ○ public participation ○ green economy ○ environmental monitoring and assessment ○ The Transport, Health and Environment Pan-European Program (PEP) ○ education for sustainable development ○ environmental performance reviews	Member states	Agriculture and food security, Energy, Human settlements and infrastructure, Water resources	Capacity-building, Communication and outreach/awareness, Institutional arrangements
UN Economic and Social Commission for Asia and the Pacific (ESCAP): a UN-affiliated organization covering Asia and the Pacific	ESCAP is one of the UN's five regional commissions. It operates as a regional hub, promoting cooperation among countries to achieve inclusive and sustainable development. Its Environment and Development Division is mapping paths to a green, resilient, and more equal Asia and the Pacific. It applies 'transformative futures' methods to develop scenarios for a greener, resilient and more equal Asia-Pacific and to identify the actions needed to realize this vision. Its cross-cutting issues focus on green growth and strengthening environmental governance, whereas its thematic areas include:[358] ○ Raising Climate Ambition ○ Safeguarding Ecosystems' Health ○ Protecting the Ocean ○ Climate Change and Air Pollution	Member states	Human settlements and infrastructure, Water resources	Capacity-building, Communication and outreach/awareness, Institutional arrangements

	○ Cities for a Sustainable Future **The Asia-Pacific ICT & DRR Gateway** is an initiative of the ESCAP and is an online portal providing policymakers and relevant stakeholders with news, tools, and resources with regard to information and communications technology and disaster risk reduction from a wide spectrum of international organizations, regional agencies and national ministries in Asia and the Pacific.[359] One of the tools it offers is **hazard alert maps** with overview of latest disaster alerts. It also offers space technology for disaster monitoring, early warning, and emergency response, such as **ESCAP's Regional Cooperative Mechanism for Drought Monitoring and Early Warning**, which uses space data for effective drought monitoring.[360]			
UN Economic Commission for Latin America and the Caribbean (ECLAC): a UN-affiliated organization covering Latin America	ECLAC is one of the UN's five regional commissions. It was founded with the purpose of contributing to the economic development of Latin America, coordinating actions directed toward this end, and reinforcing economic ties among countries and with other nations of the world. The promotion of the region's social development was later included among its primary objectives.[361]	Member states		Capacity-building, Communication and outreach/awareness, Institutional arrangements
UN Economic and Social Commission for Western Asia (ESCWA): a UN-affiliated organization covering Western Asia/Arab region	ESCWA is one of UN's five regional commissions. It supports its 20 member States in their efforts to ensure prosperity, equality, and peace. By analyzing regional and national economic, social, and environmental trends in the light of global United Nations agendas, ESCWA provides Arab countries with policy recommendations that build on a thorough analysis of facts and commonalities.[362] One of its main focus areas is climate change. ESCWA supports member States better predict and adapt to the impact of climate change while sustainably managing their natural resources.[363] he ESCWA Arab Centre for Climate Change Policies addresses the implications of climate change on sustainable development in the region. Drawing upon strategic partnerships, the Centre	Member states	Water resources, Socio-economic activities	Capacity-building, Institutional arrangements, Vulnerability assessment, Adaptation planning, policy

	works on strengthening member States' capacity in climate change assessment, adaptation, mitigation, and negotiations, and in implementing the Paris Agreement. It provides technical assistance to facilitate building climate resilience by mainstreaming climate considerations in development planning and financing, and by designing a science-policy interface to support informed policymaking. ESCWA also manages the **Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region** (RICCAR), which presents a comprehensive scientific assessment of the impact of climate change on the region, and how it affects the vulnerability of key issues such as water, agriculture, natural ecosystems, human settlements, and people in long-term future projections. RICCAR aims at assessing the impact of climate change on freshwater resources in the Arab Region through a consultative and integrated assessment that seeks to identify the socio-economic and environmental vulnerability caused by climate change impacts on water resources in the Arab region. The assessment aims to provide a common platform for addressing and responding to climate change impacts on freshwater resources in the Arab region by serving as the basis for dialogue, priority setting and policy formulation on climate change adaptation at the regional level.[364]			
United Nations Environment Programme (UNEP): a UN-affiliated organization covering all regions	UNEP sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the UN system. Its work includes assessing global, regional, and national environmental conditions and trends; developing international and national environmental instruments; and strengthening institutions for the wise management of the environment. Its work is centered around seven broad thematic areas: (i) climate change, (ii) disasters and conflicts, (iii) ecosystem management, (iv) environmental governance, (v) chemicals and waste, (vi) resource efficiency, and (vii) environment under review.	National Government, Local-Level Government, Academia, NGOs, Business	Rural environment (agriculture, forestry) Water (Water resources, coastal areas/zones, freshwater fisheries), Built environment (infrastructure, urban resilience), Production and services (heavy industry), Natural environment (ecosystems,	Stakeholder Engagement, Knowledge and education, Communication and awareness, Access to Financial Resources, Planning and Prioritization, Impact and Vulnerability Assessment, Stakeholder

	UNEP has assisted over 70 projects on climate change adaptation in over 50 countries for the following themes:[365] (i) **Ecosystem-based Adaptation** - implementing projects that utilize biodiversity and ecosystem services as part of a holistic adaptation strategy. (ii) Knowledge, analysis, and networking - spreading vital adaptation knowledge through well-connected global networks, such as the **Global Adaptation Network** (GAN), see below. (iii) **World Adaptation Science Program** - providing an interface between the adaptation research community and decision-makers. (iv) **National Adaptation Plans** - supporting countries to advance their National Adaptation Plan process. (v) **Access to adaptation finance** - helping governments and partners all over the world to obtain funding for climate resilience (vi) Climate adaptation project list - **supporting projects** on Ecosystem-based Adaptation, National Adaptation Plans, Early Warning Climate Systems, and more. (vii) Climate adaptation resources & multimedia - producing a wide range of **communication and knowledge products** to improve understanding and accelerate action. Its most prominent projects include: o Formed by UNEP in 2010, the purpose of the **Global Adaptation Network (GAN)** is to help the world build resilience toward climate change by spreading adaptation knowledge. GAN acts as an umbrella system across the world, linking networks, organizations and research institutes on local, national, and regional levels, many of		biodiversity, ecosystem-based adaptation), Disaster-Risk Reduction, Health, Energy, Adaptation Finance, Renewable energy, Gender	Engagement, Awareness Raising Community-Based Adaptation, Ecosystem-Based Adaptation, Implementation/Project Impact Assessment, Policy Support, Technology Needs Assessments (TNAs), Technology Transfer, Networking events, Training, Loss and damage

	which bear a focus toward the most vulnerable to the impacts of global warming. GAN's regional networks are: (i) The Asia Pacific Adaptation Network (APAN); (ii) Regional Gateway for Technology Transfer & Climate Action in Latin America and the Caribbean (REGATTA); (iii) Ecosystem-based Adaptation for Food Security in Africa Assembly (EBAFOSA); (iv) EcoAdapt; (v) The West-Asia Regional Network on Climate Change (WARN-CC). GAN has a unique relationship with the UNFCCC through a variety of linkages, including the Adaptation Committee, the Lima Adaptation Knowledge Initiative and the Talanoa Dialogue. By utilizing these relationships, GAN has a proven record of supporting and advancing innovation across the world through wide-ranging activities, all primarily centered around the exchange of knowledge.[366] ○ **The Technology Needs Assessment (TNA) project** is a partnership project between UNEP and UNEP DTU Partnership. Through in-depth research, policy analysis, and capacity building activities, the project assists developing country Parties to the UNFCCC determine their technology priorities for mitigation and adaptation.[367] ○ **The Adaptation Fund Climate Innovation Accelerator (AFCIA),** in which UNEP and UNDP are the implementing entities.[368] Its primary objective is to support developing countries to test, evaluate, roll out and scale up innovative adaptation practices, products and technologies. Based on technical assistance services, 25 micro-grants projects will be implemented for 5 years to enhance climate resilience and adapt to climate change in the countries. Moreover, the AFCIA will facilitate knowledge sharing and the exchange of best practices, strengthening opportunities of South-South and triangular cooperation on innovation in adaptation among the countries.			

United Nations Population Fund (UNFPA): a UN-affiliated organization covering all regions	UNFPA is the UNs sexual and reproductive health agency. Their mission is to deliver a world where every pregnancy is wanted, every childbirth is safe and every young person's potential is fulfilled. UNFPA is working with governments and other partners to better understand population dynamics, how they affect the changing climate and how people can become resilience in the face of these changes.[369]		Disaster risk reduction, Gender, Human settlements, and infrastructure	Adaptation planning and practices, Capacity-building, Communication and outreach/awareness, Institutional arrangements, Monitoring and evaluation, Vulnerability assessment
UN Human Settlements Program (UN-Habitat: an intergovernmental organization (IGO), and UN-affiliated organization covering Asia, Pacific/Oceania, Africa, South America	UN-Habitat works for a better quality of life for all in a n urbanizing world. works with partners to build inclusive, safe, resilient, and sustainable cities and communities.[370] UN-Habitat's **Cities and Climate Change Initiative** (CCCI) seeks to enhance the preparedness and mitigation activities of cities in developing countries. It emphasizes good governance, responsibility, leadership, and practical initiatives for local governments, communities, and citizens. CCCI is globally active in 40 cities. UN-Habitat provides support in the development of climate change vulnerability assessments and climate change action plans. In some countries CCCI supports policy processes: urban and local government concerns are integrated in climate change policies and urban policies need to recognize climate change. A number of tools in support of local action have been developed. Capacity development programs in partnership with local government training institutes and universities are underway.	Local-Level Government	Ecosystem-Based Adaptation, Urban Resilience, Human Settlements	Impact and Vulnerability Assessment, Planning and Prioritization, Stakeholder Engagement, Awareness Raising
United Nations Institute for Training and Research (UNITAR): a UN-affiliated organization covering all regions	(UNITAR) provides innovative learning solutions to individuals, organizations, and institutions to enhance global decision-making and support country-level action for shaping a better future.[371]		Energy, Gender	Adaptation planning and practices, Adaptation policy, Communication and outreach/awareness, Education, and training, Monitoring and evaluation

UN Office for Disaster Risk Reduction (UNDRR): a UN organization covering all regions	UNDRR convenes partners and coordinates activities to create safer, more resilient communities by supporting member states in implementing the Sendai Framework on Disaster Risk Reduction. It builds risk knowledge and hosts **PreventionWeb** as well as **the International Prevention Platform** and regional prevention platforms.	Member States	Disaster risk reduction and prevention	Risk analysis, Knowledge and information, Cooperation and coordination, risk proofing development
United Nations University (UNU): a UN-affiliated organization covering all regions	UNU is a global think tank and postgraduate teaching organization headquartered in Japan. The mission of the UN University is to contribute, through collaborative research and education, to efforts to resolve the pressing global problems of human survival, development and welfare that are the concern of the United Nations, its Peoples and Member States. In carrying out this mission, the UN University works with leading universities and research institutes in UN Member States, functioning as a bridge between the international academic community and the United Nations system.[372]		Disaster risk reduction, Ecosystems, Gender, Human settlements, and infrastructure	Communication and outreach/awareness, Science and research, Vulnerability assessment
West African Science Service Center on Climate Change and Adapted Land Use (WASCAL): a regional center/network/initiative covering Western Africa	WASCAL is a large-scale research-focused Climate Service Centre designed to help tackle this challenge and thereby enhance the resilience of human and environmental systems to climate change and increased variability. It does so by strengthening the research infrastructure and capacity in West Africa related to climate change and by pooling the expertise of ten West African countries and Germany		Agriculture and food security, Disaster risk reduction, Ecosystems	Adaptation planning and practices, Adaptation policy, Capacity-building, Communication and outreach/awareness, Education and training, Science and research
World Agroforestry Centre (ICRAF): a research institution covering Africa, Latin America, and the Caribbean, Asia, and the Pacific	ICRAF is a center of science and development excellence that harnesses the benefits of trees for people and the environment. Leveraging the world's largest repository of agroforestry science and information, it develops knowledge practices, from farmers' fields to the global sphere, to ensure food security and environmental sustainability.[373]		Agriculture and food security, Ecosystems, Socio-economic activities, Water resources	Adaptation planning and practices, Capacity-building, Communication and outreach/awareness, Education and training, Science and research, Vulnerability assessment

World Bank: an intergovernmental organization (IGO) covering all regions	The World Bank Group is the biggest multilateral funder of climate investments in developing countries.[374]		Agriculture and food security, Biodiversity, Coastal areas/zones, Disaster risk reduction, Ecosystems, Gender, Socio-economic activities, Water resources	Adaptation planning and practices, Communication, and outreach/awareness, financial support, Monitoring and evaluation, Science and research, Vulnerability assessment
World Food Program (WFP): a UN-affiliated organization covering all regions	WFP works in over 80 countries to bring life-saving food to people displaced by conflict and made destitute by disasters, and help individuals and communities find life-changing solutions to the multiple challenges they face in building better futures. WFP work to enhance nutrition in women and children, support smallholder farmers in improving productivity and reducing losses, help countries and communities prepare for and cope with climate-related shocks, and boost human capital through school feeding programs. WFP has climate change and disaster risk reduction as focus areas.[375]		Agriculture and food security, Disaster risk reduction, Ecosystems, Gender, Human settlements and infrastructure, Socio-economic activities, Water resources	Adaptation planning and practices, Communication and outreach/awareness, Institutional arrangements, Monitoring and evaluation, Vulnerability assessment
World Health Organization (WHO): a UN-affiliated organization covering all regions	WHO leads global efforts to expand universal health coverage. WHO supports countries in assessing the health gains that would result from the implementation of the existing Nationally Determined Contributions to the Paris Agreement, and the potential for larger gains from more ambitious climate action.[376]		Agriculture and food security, Energy, Gender, Health, Human settlements and infrastructure, Water resources	Adaptation planning and practices, Communication and outreach/awareness, Institutional arrangements, Monitoring and evaluation, Observation and scenarios, Vulnerability assessment
World Meteorological	WMO is dedicated to international cooperation and coordination on the state and behavior of the Earth's		Agriculture and food security, Energy,	**Adaptation Science,** Adaptation planning

Organization (WMO): a UN-affiliated organization covering all regions	atmosphere, its interaction with the land and oceans, the weather and climate it produces, and the resulting distribution of water resources. WMO helps its members to monitor the Earth's climate on a global scale so that reliable information is available to support evidence-based decision-making on how to best adapt to a changing climate and manage risks associated with climate variability and extremes. Climate information is essential for monitoring the success of efforts to reduce greenhouse gas emissions that contribute to climate change, as well as for promoting efforts to increase energy efficiency and to transition to a carbon-neutral economy.[377] ○ ***Adaptation Futures*** is the flagship event of the World Adaptation Science Program (WASP), one of the four components of the World Climate Program based on the WMO Congress XVI Resolution 18.[378] Adaptation Futures is a **science-focused** platform to facilitate dialogue toward action-oriented solutions from stakeholders including academics, practitioners, scientists, and policy makers across the world. The first conference took place in 2010. The next conference will look at how to accelerate adaptation action and knowledge to support action, with particular focus on the Asian region. One of the aims of the conference is to facilitate knowledge sharing, evaluation and learning of actionable solutions across the global north and south. It also aims to connect practitioners, academicians, policymakers and communities in their work toward scaling adaptive capacities across vulnerable landscapes and people.		Gender, Health, Human settlements and infrastructure, Water resources	and practices, Capacity-building, Communication and outreach/awareness, Education and training, Institutional arrangements, Monitoring and evaluation, Observation and scenarios, Science and research, Vulnerability assessment
World Resources Institute (WRI): an NGO, research institution covering Africa, Asia, Caribbean and Central America,	WRI's Climate Resilience Practice helps governments, civil society, and the private sector to develop adaptation solutions in line with the scale and scope of climate change. They work at multiple scales to develop adaptation strategies that both serve and engage vulnerable people, with a particular focus on the poor.	National Government, Local-Level Government, NGOs, Business	Adaptation Finance, Urban Resilience, Human Settlements, Energy, Water Resources, Forestry	Planning and Prioritization, Monitoring and Evaluation, Implementation/Project Impact Assessment, Access

Europe, North America, Pacific/Oceania, South America	Some of the work includes helping city leaders and community members take action to make their cities more resilient; improving the quantity and quality of adaptation finance by empowering civil society to track financial flows and by building capacity among the developing country institutions; identifying successful adaptation measures and how they can spread across multiple scales; advising countries on how to effectively include adaptation in their global climate pledges.			to Financial Resources, Research and Science
World Tourism Organization (UNWTO): a UN-affiliated organization covering all regions	UNWTO's leadership vision acknowledges the most pressing challenges facing tourism and identifies the sector's ability to overcome them and to drive wider positive change, including the opportunities responsible tourism offers for the advancement of the 17 Sustainable Development Goals (SDGs).[379] Its climate focus is mainly on disclosure of CO_2 emissions in tourism, decarbonization of tourism operations and engagement of tourists in carbon removal.[380]	Member States	Energy, Gender, Human settlements, and infrastructure	Adaptation planning and practices, Capacity-building, Vulnerability assessment
World Trade Organization (WTO): an intergovernmental organization (IGO) covering all regions	The overall objective of the WTO is to help its members use trade as a means to raise living standards, create jobs and improve people's lives. The WTO operates the global system of trade rules and helps developing countries build their trade capacity. It also provides a forum for its members to negotiate trade agreements and to resolve the trade problems they face with each other.[381] In the Marrakesh Agreement establishing the WTO, members established a clear link between sustainable development and disciplined trade liberalization in order to ensure that market opening goes hand in hand with environmental and social objectives. In the Doha Round, commencing in 2001, members went further in their pledge to pursue a sustainable development path by launching multilateral trade and environment negotiations.[382] At Doha, members agreed to negotiate on greater market opening in environmental goods and services; on the relationship between WTO rules and trade obligations set out in multilateral environmental agreements (MEAs) and on the exchange of information between those institutions.[383] Due to breakdown of negotiations in 2008,[384] the	Member States	Adaptation finance, Trade	Transfer of climate technology and services, Trade and Climate nexus, Cooperation, Policy/regulatory/legal

	Doha negotiations have not yet come into fruition, and its future is uncertain.			
World Wildlife Fund (WWF): an NGO and research institution covering Africa, Asia, Caribbean and Central America, Europe, North America, Pacific/Oceania, South America	WWF is a conservation organization that works in nearly 100 countries to develop and deliver innovative solutions that protect communities, wildlife, and the ecosystems. WWF works with local communities, governments, and others around the world to help people and nature prepare for the many impacts of a changing climate. Its adaptation related work includes:[385] ○ Work with communities and governments to understand and prepare for climate change ○ Integrate environmental considerations into disaster recovery, reconstruction, and risk reduction ○ Study how people's responses to climate change affect ecosystems and wildlife ○ Assess species to determine traits that make them resilient or vulnerable to changes in climate ○ Ensuring that ecosystem-based approaches to adaptation are incorporated into national development plans ○ Helping countries and regions assess the benefits nature provides under different development and climate change scenarios **Adaptation for Development and Conservation (ADVANCE)** facilitates adaptation by providing new ways of generating and integrating climate risk information into conservation and development planning, policies, and practice. ADVANCE tailers products to address specific needs and capacities of each country, sector, and audience. Climate information meets local decision-making needs, risks are communicated in ways that are easy to understand, and support is provided to integrate climate risk information at the project level.	National and local governments, local communities, NGOs, private sector, scientific community	Ecosystem-Based Adaptation, Disaster-Risk Reduction, Biodiversity, Freshwater Fisheries, Water Resources, Infrastructure; Forestry; Renewable energy; Protected area management	Impact and Vulnerability Assessment, Climate Data, Information and Observations, Climate Scenarios, Stakeholder Engagement, Planning and Prioritization

[1] IPCC 6th Assessment Report, 'Summary for Policymakers', pages 9-10. Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf
[2] Ibid
[3] UNFCCC LDC Expert Group, 'National Adaptation Plans 2020 – progress in the formulation and implementation of NAPs' (2021). Available at: https://unfccc.int/sites/default/files/resource/NAP-progress-publication-2020.pdf
[4] For an in-depth analysis of article 7 of the Paris Agreement, please see Cathrine R. Wenger, 'Article 7 Adaptation' in Geert Van Calster and Leonie Reins *The Paris Agreement on Climate Change – a commentary* (2021), Elgar Commentaries, pages 172-199.
[5] Paris Agreement, article 7.1
[6] United Nations Environment Programme (UNEP) 'Adaptation Gap Report 2020', (2021), page XIV. Available at: https://www.unep.org/resources/adaptation-gap-report-2020
[7] Ibid, IPCC's 6th AR, page 17
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[30] For a full list of possible adaptation related freshwater measures, please see IPCCs list, op cit n. 35, page 255.
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[42] Op cit n. 44, Siri Eriksen et al, pages 9 and 11
[43] Op cit n. 44, Siri Eriksen et al, page 10
[44] Op cit. n.19, GCA page 49.
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[47] Op cit n. 1, UNEP, page 47
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[59] Ibid
[60] Op cit n. 55, LSE, page 14
[61] Op cit. n. 1, UNEP, pages XVII and 47
[62] The UN Convention on Biodiversity (CBD) has released a first draft of a new global framework for managing nature through 2030 in which one of the key targets (target 8) is to use ecosystem-based approaches to contribute to mitigation and adaptation to climate change and to ensure that the efforts avoid negative impacts on biodiversity. The draft CBD framework is available at: https://www.cbd.int/doc/c/914a/eca3/24ad42235033f031badf61b1/wg2020-03-03-en.pdf
[63] SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
[64] Op cit n. 1, UNEP, page 73
[65] Ibid, page 74
[66] Global Mangrove Alliance, available at: https://www.mangrovealliance.org/mangrove-communities-in-rufiji-delta-trained-on-an-alternative-approach-to-mangrove-restoration/

[67] Global Mangrove Alliance, available at: https://www.mangrovealliance.org/gma/#:~:text=The%20Global%20Mangrove%20Alliance%20is,funders%20towards%20a%20common%20goal.
[68] Although increasing, only 10% of the total disaster-related global aid to SIDS went toward prevention and preparedness between 1999 to 2010.
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[71] Maximillien Pardo, 'Disasters after disasters – short recovery intervals and large financial gaps in small island developing states' (July 2021). Available at: https://sdgs.un.org/news/disasters-after-disasters-short-recovery-intervals-and-large-financial-gaps-small-islands#_ftn1
[72] IPCC (2019), 'Summary for Policymakers'. In: *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*, page 9. Available at: https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
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[75] Ibid, IPCC, page 14
[76] FAO (2020), 'Global Forest Resources Assessment 2020: main report', page XI. Available at: http://www.fao.org/3/ca9825en/ca9825en.pdf
[77] Ibid, FAO, page XII
[78] WRI 'State of Climate Action: Assessing Progress toward 2030 and 2050', page 85. Available at: https://publications.wri.org/state_of_climate_action
[79] Op cit n. 82, IPCC, page 10
[80] FAO, IFAD, UNICEF, WFP and WHO (2021), 'The State of Food Security and Nutrition in the World – transforming food systems for food security, improved nutrition and affordable healthy diets for all'. Available at: http://www.fao.org/state-of-food-security-nutrition/en/ and http://www.fao.org/3/cb4474en/cb4474en.pdf
[81] Ibid
[82] Ibid
[83] Op cit n. 82, IPCC, page 26
[84] ie reduction of more than 3 Gt CO2-eq yr. However, please note that carbon sequestration from agro-forestry will eventually reach saturation and is at risk from loss triggered by natural disasters such as flood, drought, fire, pest outbreak or poor management.
[85] ie positive for more than 3 million km2
[86] ie positive for more than 3 million km2
[87] ie positive for more than 100 million people
[88] Op cit n. 82, IPCC, page 26
[89] Op cit. n 82, IPCC, page 26
[90] Definition found in Britannica, available at: https://www.britannica.com/science/agroforestry
[91] Op cit n. 1, UNEP, page XVII and Sinclair, page 22
[92] Sinclair et al (2019), 'The Contribution of Agroecological Approaches to Realizing Climate-Resilient Agriculture', GCA, page 20. Available at: https://www.researchgate.net/publication/341406604_The_Contribution_of_Agroecological_Approaches_to_Realizing_Climate-Resilient_Agriculture

[93] Ibid, Sinclair et al, page 22
[94] Ibid, Sinclair et al, page 20
[95] Op cit n. 86, FAO (2020), page 21.
[96] Ibid, page 22. For a regional and subregional overview of agroforestry coverage, please see page 23.
[97] Lalisa Duguma et al, 'From Tree Planting to Tree Growing: Rethinking Ecosystem Restoration Through Trees' (2020), ICRAD Working Paper no 304. World Agroforestry, page 9. Available at: http://apps.worldagroforestry.org/downloads/Publications/PDFS/WP20001.pdf
[98] Op cit n. 88, WRI, page 85.
[99] See for example, Carolyn Gramling, 'Why planting tons of trees isn't enough to solve climate change' (July 2021) Available here: https://www.sciencenews.org/article/planting-trees-climate-change-carbon-capture-deforestation
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[102] Gibbs, H.K and Salmon, J.M, 'Mapping of the world's degraded lands' *Applied Geography*, Volume 57, (February 2015), page 14. Available here: https://www.sciencedirect.com/science/article/pii/S0143622814002793
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[104] For example, the establishment of concessions/licenses for time limited rights to land, subject to forest management, implementation of restorative practices or implementation of soil and water measures.
[105] Op cit n. 107, Lalisa et al, pages 23-24.
[106] Op cit. n. 107, Lalisa et al, page 12
[107] Ibid, Lalisa et al, page 13
[108] Ibid, Lalisa et al
[109] Op cit n 102, Sinclair et al, page 34
[110] Op cit n. 102, Sinclair et al, page 31
[111] Ibid, page 18
[112] Op cit n. 110, FAO Guidelines (2020), page 72
[113] CRED, 'The Human Cost of Natural Disasters: A Global Perspective' (2015). Available at: https://www.preventionweb.net/publication/human-cost-natural-disasters-global-perspective
[114] Ibid
[115] Ibid
[116] Ibid
[117] ibid
[118] UN, 'The World's Cities in 2018'. Available at: https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf
[119] Ibid, page 9

[120] CRED and UNISDR, 'Economic Losses, Poverty & Disasters 1998-2017', page 7. Available at: https://www.preventionweb.net/files/61119_credeconomiclosses.pdf
[121] Ibid, page 10
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[124] World Health Organization, Heatwaves. Available at: https://www.who.int/health-topics/heatwaves#tab=tab_1
[125] IPCC AR6 WGI 'Summary for Policymakers', page 34 (and underlying report, page TS-48). Available here: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf
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[128] Op cit n. 136, Camilo Mora et al, page 1
[129] UCL, 'Rise in heat-related deaths linked to climate change' (December 2020). Available at: https://www.ucl.ac.uk/news/2020/dec/rise-heat-related-deaths-linked-climate-change
[130] C40 Cities 'For cities, the heat is on'. Available at: https://www.c40.org/other/the-future-we-don-t-want-for-cities-the-heat-is-on
[131] Op cit n. 139, UCL
[132] GCCA and R20, 'A Practical Guide to Cool Roofs and Cool Pavements' (January 2012), page 9. Available at: https://coolrooftoolkit.org/wp-content/pdfs/CoolRoofToolkit_Full.pdf
[133] Eun-Soon Im et al 'Deadly heat waves projected in the densely populated agricultural regions of South Asia' Science Advances, August 2017 Vol 3, no 8. Available at: https://advances.sciencemag.org/content/3/8/e1603322
[134] Ibid. These regions are southwest Asia around the Persian/Arabin Gulf and Red Sea, South Asia in the Indus and Ganges river valleys and eastern China.
[135] Ibid
[136] Hiteshri Shastri et al, 'Flip flop of Day-night and Summer-Winter Surface Urban Heat Island Intensify in India', Scientific Reports 7 40178 (2017). Available at: https://www.nature.com/articles/srep40178
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[141] Op cit n. 140. C40 Cities
[142] USAID, 'Technical Report – Heat Waves and Human Health – Emerging evidence and experience to inform risk management in a warming world', page 3. Available at: https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID-ATLAS_Heat-Waves-and-Human-Health.pdf
[143] Op cit. n. 130, CRED and UNISDR, page 16
[144] For the updated Ahmedabad Heat Action Plan 2019, please see: https://www.nrdc.org/sites/default/files/ahmedabad-heat-action-plan-2019-update.pdf
[145] https://www.nrdc.org/sites/default/files/india-heat-resilient-cities-ib.pdf
[146] Op cit. n. 1, UNEP, page XVII
[147] Ichiro Sato et al, 'Enhancing NDCs: Opportunities in the Forest and Land-use Sector' World Resources Institute (November 2019) page 12
[148] Please note that there are few studies relevant, and the below data is from the study by Qi Zhao et al.
[149] Op cit. n. 148, Qi Zhao
[150] When death ratio was assessed (ie number of deaths per 100 000 residents)
[151] Ibid
[152] Ibid
[153] Op cit. n. 148, Qi Zhao et al
[154] Please see the NAP technical guidelines, but also 'City Resilience Toolkit – response to deadly heat waves and preparing for raising temperatures' available at: https://www.nrdc.org/sites/default/files/ahmedabad-resilience-toolkit.pdf and the USAID technical report at Op cit n. 152.
[155] U.S. Environmental Protection Agency (2012), 'Trees and Vegetation' in: *Reducing Urban Heat Islands: Compendium of Strategies*, page 4. Available at: https://www.epa.gov/sites/default/files/2017-05/documents/reducing_urban_heat_islands_ch_2.pdf
[156] GCCA and R20, 'A Practical Guide to Cool Roofs and Cool Pavements' (January 2012), page 9. Available at: https://coolrooftoolkit.org/wp-content/pdfs/CoolRoofToolkit_Full.pdf
[157] Ibid
[158] Tatsuo Akashi, 'Creating the Wind Paths in the City to Mitigate Urban Heat Island Effects – a Case Study in Central District of Tokyo', page 9 and 10. Available at: https://www.kenken.go.jp/japanese/contents/cib/w101/pdf/mtg/0809dublin/session01.pdf
[159] Uk-Je Sung et al, 'Planning Strategies of Wind Corridor Forest Utilizing the Properties of Cold Air' (March 2021), pages 1-2. Available at: https://www.mdpi.com/2073-445X/10/6/607/htm
[160] Ilham Elsayed, 'Mitigation of the Urban Heat Island of the City of Kuala Lumpur, Malaysia', (January 2012) page 1605. Available at: https://www.researchgate.net/publication/258446479_Mitigation_of_the_Urban_Heat_Island_of_the_City_of_Kuala_Lumpur_Malaysia
[161] Ibid, page 1611

[162] For example, France has implemented traffic-free and traffic-restrictive city zones in Paris by issuing air quality certificates, issuing fines if not kept. From 2030 and onward will all cars need a green license (issued as a sticker on the car) in which only green and hydrogen fuel cell vehicles are allowed to circulate. More information available here: https://urbanaccessregulations.eu/countries-mainmenu-147/france/paris
[163] For example, data for Africa and other regions of the world are limited or considered 'dubious', op cit n. 152 (USAID).
[164] Op cit. n. 137, Camilo et Mora, page 1
[165] Ibid
[166] World Economic Forum 'The Global Risk Report 2021 – 16th edition'. Available at: http://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2021.pdf
[167] Patric Bolton et al, 'The green swan – central banking and financial stability in the age of climate change' (January 2020)
[168] TCFD 'Final Report – Recommendations of the Task Force on Climate-related Financial Disclosures (June 2017). Available at: https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf
[169] For a comprehensive assessment of current climate reporting frameworks, please see Cathrine R. Wenger 'Klimarisiko: begrepet, og systemer for rapportering' in Hans Chr. Bugge (ed) *Klimarett – Internasjonal, europeisk og norsk klimarett mot 2030* (2021) Universitetsforlaget [in Norwegian]
[170] Jenna C. Dodson et al, 'Population growth and climate change: Addressing the overlooked threat multiplier' Science of the Total Environment 748 (2020) 141346, page 1.
[171] UN, Department of Economic and Social Affairs, Population Division (2019), 'World Population Prospects 2019: Highlights', pages 1-2. Available at: https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf
[172] IEA (2021) 'Global carbon dioxide emissions are set for their second-biggest increase in history'. Available at: https://www.iea.org/news/global-carbon-dioxide-emissions-are-set-for-their-second-biggest-increase-in-history
[173] For an interesting insight into gender equality and reproductive health and the current push back on these rights, please listen to the postcast by Mark Leon Goldberg 'How the Fight for Women's Rights Became so Polarized at the United Nations' (August 2021). Available here: https://www.undispatch.com/how-the-fight-for-womens-rights-became-so-polarized-at-the-united-nations/
[174] Op. cit n 185
[175] United Nations Population Fund (December 2011) 'Population and Climate Change Adaptation'. Available at: https://www.uncclearn.org/wp-content/uploads/library/unfpa31.pdf.
[176] Ibid, page 6
[177] Jenna Dodson et al (December 2020), 'Population Growth and Family Planning in the Nationally Determined Contributions (NDCs) made under the Paris Agreement – working paper', page 2. Available at: https://overpopulation-project.com/wp-content/uploads/2020/12/TOP-Population-family-planning-in-the-NDCs-working-paper-December-2020.pdf
[178] Ibid, page 2
[179] Ibid
[180] Op cit. n 185, page 1
[181] WRI, 'How to Sustainably Feed 10 billion People by 2050, in 21 Charts' (December 2018). Available at: https://www.wri.org/insights/how-sustainably-feed-10-billion-people-2050-21-charts

[182] Lucia Tamburino and Giangiacomo Bravo, 'Reconciling a positive ecological balance with human development: A quantitative assessment' Ecological Indicators 129 (2021) 107973. Available here: https://www.sciencedirect.com/science/article/pii/S1470160X21006385
[183] Please see Appendix I for the specific details on how GCA, IPCC, DEval, IISD and the EU structure its adaptation discussion in its reports.
[184] For example, IPCC's 6th assessment report structure its adaptation discussion based on different environments (terrestrial ecosystems, ocean and coastal ecosystems, water-basin/watershed, and cities, settlements and key infrastructure), but also highlights thematic areas ('health', 'poverty, livelihoods and sustainable development' and 'food, fibre and ecosystem products').
[185] For example, the category 'water' is commonly used, but the division between freshwater and ocean/coastal ecosystem is less common. The category 'rural environment' is sometimes mentioned together with food security. In addition, the 'agriculture' sector is also regularly classed together with 'fisheries' and 'forestry' and related products. Cities and urban development are sometimes classed together with key infrastructure.
[186] States adaptation planning processes are reported through the NDCs and NAPs, and are increasingly focusing on sectors reflecting underlying divisions into government ministries and agencies (ie agriculture, fisheries, health, transportation etc).
[187] Haykey Price-Kelly and Anne Hammill, 'sNAPshot: Initiating sector integration of adaptation considerations' (NAP Global Network, November 2015). Available at: https://napglobalnetwork.org/wp-content/uploads/2015/11/napgn-en-2015-snapshot-initiating-sector-integration-of-adaptation-considerations.pdf
[188] The Sendai Framework for Disaster Risk Reduction 2015-2030, available here: https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf
[189] The Sendai Framework, para 13
[190] The Sendai Framework, para 47 (d).
[191] The Sendai Framework, para 13, footnote 8
[192] For example, see the Paris Agreement, articles 7.1, 7.9, 8.1 and 8.4
[193] UNFCCC Secretariat, 'Opportunities and options for integrating climate change adaptation with the Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction 2015-2030' (2017), page 11. Available at: https://unfccc.int/sites/default/files/resource/techpaper_adaptation.pdf
[194] The Paris Agreement, article 8.1 and 8.2
[195] The risk parameters are compiled ascertaining current literature on the impact from climate change referenced in this analysis but includes equitable elements to ensure a more comprehensive assessments of climate change impacts. Please note it is meant to be a starting point for further discussion on the indicators possible for adaptation vulnerability and resilience and is not a comprehensive list.
[196] For a more comprehensive list, please see FCCC/CP/2001/13/Add.1, Decision 2/CP.7, Annex C para 15. Available at: https://unfccc.int/sites/default/files/resource/docs/cop7/13a01.pdf Also, emerging areas for capacity-building has been ascertained in FCCC/SBI/2021/3, part IV para 31. Available at: https://unfccc.int/sites/default/files/resource/sbi2021_03E.pdf
[197] IISD 'NDC Synthesis Report Shows Increased Focus on Adaptation, SDG Linkeages' (10 March 2021). Available here: https://sdg.iisd.org/news/ndc-synthesis-report-shows-increased-focus-on-adaptation-sdg-linkages/
[198] GCA 'Adapt Now: a Global Call for Leadership on Climate Resilience' (13 September 2019). Available here: https://gca.org/wp-content/uploads/2019/09/GlobalCommission_Report_FINAL.pdf
[199] Doswald et al, 'DEval Discussion Paper - Evidence Gap and Intervention Heat Maps of Climate Change Adaptation in Low-and Middle-income Countries' (February 2020). Available here: https://www.deval.org/fileadmin/Redaktion/PDF/05-Publikationen/Discussion_Paper/2020_02_EGM_IHM_LowandMIddle/DEval-Discussion_Paper_2_2020_EGM_and_IHM_of_climate_change_adaptation.pdf

[200] IPCC, 'Decision – Chapter outline of the Working Group II contribution to the Sixth Assessment Report (AR6) as adopted by the Panel at the 46th Session of the IPCC' (6-10 September 2017). Available here: https://www.ipcc.ch/site/assets/uploads/2018/11/AR6_WGII_outlines_P46.pdf
[201] European Commission, 'Forging a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change' (24 February 2021), COM(2021) 82 final. Available here: https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/eu_strategy_2021.pdf
[202] European Commission, 'Proposed Mission: A Climate Resilient Europe: Prepare Europe for climate disruptions and accelerate the transformation to a climate resilient and just Europe by 2030'. Available here: https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/2bac8dae-fc85-11ea-b44f-01aa75ed71a1
[203] The Adaptation Committees overview can be found here: https://unfccc.int/documents/63702. The list of regional centres and networks on adaptation can be found here: https://unfccc.int/process-and-meetings/bodies/constituted-bodies/adaptation-committee-ac/areas-of-work/regional-centres-and-networks
[204] Please note that when information is from the relevant organization's webpage, descriptions and information has been kept as close to the original language as possible in order to ensure accuracy. For reasons of simplicity and reader-friendliness, however, reference to the relevant webpage for each organization is introduced once in the early part of the description.
[205] Type of organization: NGO, Intergovernmental Organization (IGO), UN affiliated, International Finance Institutions, Bilateral organizations, National/public entity
[206] Existing frameworks and initiatives, and details on type of adaptation interventions, including, but not limited to the following types of support provided: (i) scientific/research/education, (ii) national adaptation planning process (NAP), (iii) risk assessments/information/knowledge, (iv) means of implementation (technological, capacity building and finance), (v) financial/market mechanism, (vi) institutional arrangements, (vii) policy/regulatory/legal, (viii) cooperation/information sharing/communication/outreach/awareness raising, (ix) technical support, (x) implementation action, (xii) MRV, (xiii) nature-based/biodiversity/ecological, (xiv) social/behavioural, (xv) disaster risk reduction, (xvi) gender.
[207] Including to whom is the support focused: national or subnational/local governments, local communities, NGOs, private sector, scientific community
[208] *Sectors could include*: Water (freshwater & ocean/coastal areas), Rural environment /primary sector, Built environment (cities, settlements and infrastructure), Production and services. *Thematic areas could include*: Health, Natural Environment, Research and Education, Disaster Risk Reduction (DRR), Adaptation Planning, Social and Behavioural, Technology, and Financial.
[209] For more information on the Adaptation Action Coalition, please see here: https://www.gov.uk/government/publications/adaptation-action-coalition-an-overview/adaptation-action-coalition-an-overview
[210] Please see here for a full list of the Adaptation Committees activities: https://unfccc.int/process-and-meetings/bodies/constituted-bodies/adaptation-committee-ac/areas-of-work-adaptation-committee#eq-4
[211] For information related to the NAP Taskforce, please see: https://unfccc.int/process-and-meetings/bodies/constituted-bodies/adaptation-committee-ac/areas-of-work/AC-NAPTF
[212] https://africaadaptationinitiative.org/
[213] For more information related to projects (i)-(iv), please see: https://africaadaptationinitiative.org/
[214] For more information related to these projects, please see: https://africaadaptationinitiative.org/assets/AAI%20Flagships%205%20and%206.pdf
[215] http://www.uneca.org/acpc
[216] For more information on WISER, please see: https://www.uneca.org/WISER
[217] For more information on ARC, please see: http://www.africanriskcapacity.org/

[218] Please note that the AUC has an array of different development-related areas and is not communicating its adaptation related focus on its web page (in time of writing): http://www.au.int/
[219] http://www.agrhymet.ne/eng/index.html
[220] https://www.alliance4water.org/
[221] To access the BUA Knowledge Platform, please see: https://agwaguide.org/
[222] https://www.alliance4water.org/technical-work
[223] http://otca.org/en/about-us/
[224] http://otca.org/en/ongoing-projects/
[225] http://www.comunidadandina.org/ (website in Spanish)
[226] http://teebweb.org/
[227] The TEEBAgriFood Evaluation Framework can be found here: http://teebweb.org/our-work/agrifood/understanding-teebagrifood/evaluation-framework/
[228] http://www.asiapacificadapt.net/akp-apan-merge/
[229] For more information related to APAN's thematic resources, please see here: http://www.asiapacificadapt.net/explore-resources-by-themes/
[230] For more information about APN, please see: https://www.apn-gcr.org/about/
[231] For more information on ARPNAP, please see: http://www.ukm.my/apn/index.html
[232] https://www.asareca.org/content/about-us
[233] https://asean.org/
[234] https://environment.asean.org/
[235] http://www.acccrn.org/
[236] http://www.acccrn.net/about-acccrn
[237] http://www.acccrn.net/wg/urban-peri-urban-and-ecosystems-working-group
[238] https://www.adpc.net/igo/
[239] For more information on RCC, please see: https://rccdm.net/
[240] http://www.adrc.asia/
[241] https://www.adrc.asia/project/
[242] http://www.apec.org/
[243] See for example C40 City's toolkit for integrating climate adaptation into urban planning: https://www.c40knowledgehub.org/s/article/Integrating-Climate-Adaptation-A-toolkit-for-urban-planners-and-adaptation-practitioners?language=en_US
[244] For C40 City's good practice guide on climate change adaptation in delta cities, see here: https://c40-production-images.s3.amazonaws.com/good_practice_briefings/images/5_C40_GPG_CDC.original.pdf?1456788885
[245] For C40 Cities good practice guide for cool cities, please see: https://c40-production-images.s3.amazonaws.com/good_practice_briefings/images/4_C40_GPG_CCN.original.pdf?1456788797
[246] https://www.c40.org/programmes/c40-cities-finance-facility and https://www.c40cff.org/apply
[247] https://www.c40cff.org/projects/dar-es-salaam-community-support-for-flood-prevention
[248] https://www.c40cff.org/projects/dakar-improving-resilience-to-climate-induced-flooding

[249] https://www.c40cff.org/projects/ethekwini-municipality-durban-transformative-riverine-management-programme
[250] The toolkit can be found here: https://cff-prod.s3.amazonaws.com/storage/files/ZuhZ6NLqbmb7PPiR8872Aod04b1flhkyFVrl3PV4.pdf
[251] https://www.cabi.org/about-cabi/
[252] For more information on CARE's resilience strategy, please see here: https://careclimatechange.org/wp-content/uploads/2020/03/Capacity-statement-CARE-and-reslience-v4.pdf For more information on CARE's adaptation strategies, please see here: https://careclimatechange.org/wp-content/uploads/2019/06/Adaptation-Strategies-Compendium.pdf
[253] https://www.caribbeanclimate.bz/
[254] https://www.cdema.org/about-us/what-is-cdema
[255] http://www.carecprogram.org/
[256] https://www.carecprogram.org/?page_id=31
[257] https://cansouthasia.net/about-cansa/
[258] http://cdkn.org/about/?loclang=en_gb
[259] https://www.cfas.info/en
[260] http://cridf.net/types-of-projects-cridf-works-with/#
[261] http://cridf.net/project-pipeline/
[262] https://www.ctc-n.org/adaptation-fund-climate-innovation-accelerator-afcia-unep-ctcn
[263] http://www.climdev-africa.org/
[264] http://www.climdev-africa.org/climatescience%20
[265] http://www.climdev-africa.org/ccda
[266] https://resilientinvestment.org.
[267] http://portails.cilss.bf/
[268] https://www.cgiar.org/
[269] https://www.cgiar.org/research/program-platform/climate-change-agriculture-and-food-security/
[270] https://ccafs.cgiar.org/
[271] https://cgspace.cgiar.org/bitstream/handle/10568/89827/CCAFS-Web.pdf?sequence=4&isAllowed=y
[272] https://www.unep.org/cobsea/who-we-are
[273] https://www.coraltriangleinitiative.org/about
[274] https://euroclimaplus.org/en/home-en/about-the-programme
[275] https://europa.eu/capacity4dev/articles/euroclima-combatting-climate-change-latin-america
[276] https://ec.europa.eu/clima/news/eu-and-undp-launch-two-year-project-address-urgent-adaptation-financing-gaps-africa_en
[277] http://www.fao.org/climate-change/en/
[278] http://www.fao.org/resilience/areas-of-work/en/
[279] http://www.fao.org/south-south-gateway/overview/en/
[280] http://www.fao.org/technical-cooperation-programme/en/
[281] https://www.insuresilience.org/

[282] https://gca.org/about-us/
[283] http://www.thegef.org/about-us
[284] http://www.thegef.org/gef/climate_change
[285] http://gggi.org/activities/ggpi/ggp-overview/
[286] https://www.gwp.org/en/About/who/What-is-the-network/
[287] https://www.gwp.org/en/we-act/themesprogrammes/Climate-Resilience/Global-Water-and-Climate-Programme/
[288] http://gms-eoc.org/climate-change
[289] https://www.greenclimate.fund/sites/default/files/document/thematic-brief-adaptation_1.pdf
[290] https://www.greenclimate.fund/themes
[291] https://www.helvetas.org/en/switzerland
[292] http://www.icpac.net/
[293] http://www.icccad.net/about-the-centre/
[294] https://www.iai.int/en/
[295] https://ipbes.net/about
[296] https://www.icimod.org/who-we-are/
[297] https://www.icrisat.org/overview/
[298] https://www.international-climate-initiative.com/en/issues/adaptation
[299] https://www.ndc-cluster.net/about
[300] https://www.ndc-cluster.net/project/support-project-implementation-paris-agreement-spa
[301] https://climateanalytics.org/projects/impact-climate-action/
[302] https://media.ifrc.org/ifrc/drr-climate/
[303] For more information about REAP, please see: https://www.early-action-reap.org/
[304] Please see here for further information about IFRC's tools for community knowledge and awareness raising: https://media.ifrc.org/ifrc/drr-climate/community-knowledge-and-awareness-raising/
[305] https://www.anticipation-hub.org/about/
[306] https://www.icrc.org/en/document/red-cross-red-crescent-humanitarian-sector-joins-forces-tackle-existential-threat-climate
[307] For the full text of the Charter, please see here: https://www.climate-charter.org/
[308] https://media.ifrc.org/ifrc/drr-climate/early-warning-early-action/forecast-based-financing/
[309] https://www.iisd.org/projects/nap-global-network
[310] https://www.iom.int/about-iom
[311] https://www.iucn.org/about
[312] https://www.iucn.org/theme/climate-change
[313] http://www.cblt.org/
[314] https://www4.unfccc.int/sites/NAPC/Support/Pages/LEG.aspx

[315] For more information regarding NAP Expo, please see: https://unfccc.int/topics/adaptation-and-resilience/workstreams/national-adaptation-plans-naps/nap-expo-0
[316] http://www.luccc.org/objective/
[317] https://ledsgp.org/?loclang=en_gb
[318] http://www.mangrovesforthefuture.org/who-we-are/about/who-we-are/
[319] https://unfccc.int/climate-action/marrakech-partnership-for-global-climate-action
[320] http://www.mrcmekong.org/
[321] For further insight on the NWP, please see: https://spark.adobe.com/page/TpuJ4xeNwFEeY/
[322] The NWP network consists of over 425 partner organizations, including public entities, academic and research institutions, private sector, non-governmental and civil society organizations, regional centers and networks, and United Nations and affiliated organizations.
[323] Para 128. https://unfccc.int/sites/default/files/resource/sbsta2021_inf02.pdf
[324] For a full list of NWPs thematic areas, please see: FCCC/SBSTA/2019/2, para 18. Available here: https://unfccc.int/sites/default/files/resource/sbsta2019_02E.pdf
[325] https://disasterdisplacement.org/what-we-do
[326] https://www.greenclimate.fund/ae/oss and http://www.oss-online.org/en
[327] https://opecfund.org/
[328] https://www.oecd.org/about/
[329] http://www.oecd.org/env/cc/adaptation.htm
[330] https://gem.spc.int/
[331] http://www.forumsec.org/
[332] http://www.pemsea.org/
[333] https://www.oecs.org/climate-&-disaster-resilience/
[334] http://www.rec.org/
[335] http://www.rec.org/area_of_expertise.php?id=1
[336] http://persga.org/about-us/
[337] https://resilientcitiesnetwork.org/city-resilience-framework/
[338] For more information, please see: http://www.resiliencefrontiers.org/
[339] https://saarc-sdmc.org
[340] https://www.sasscal.org/mission/
[341] https://www.sasscal.org/intecres/
[342] http://miombonetwork.org/
[343] https://www.sasscal.org/wemast/
[344] http://www.spc.int/
[345] https://pacificdata.org/about-us
[346] https://www.sprep.org/pacific-climate-change-centre

[347] https://www.unep.org/news-and-stories/story/people-network
[348] http://www.sadc.int/sadc-secretariat/services-centres/regional-early-warning-centre/
[349] For more information and to access the weADAPT platform, please see here: https://www.weadapt.org/
[350] https://en.unesco.org/
[351] The Resilient Reefs Initiative is a collaboration between the Great Barrier Reef Foundation, UNESCO World Heritage Marine Programme, The Nature Conservancy's Reef Resilience Network, Columbia University's Center for Resilient Cities and Landscapes, Resilient Cities Catalyst and AECOM. More information can be found at: https://whc.unesco.org/en/reefresilience/
[352] For more information on the Adaptation Academy, please see: https://unfccc.int/news/adaptation-academy-launched-in-support-of-developing-countries-climate-plans-and-reporting
[353] https://www.undp.org/about-us
[354] https://www4.unfccc.int/sites/NAPC/Support/Pages/NAPGSP.aspx
[355] http://www.uneca.org/
[356] https://www.uneca.org/TCND
[357] https://unece.org/environment-policy
[358] http://www.unescap.org/our-work/environment-development
[359] http://www.drrgateway.net/ and https://www.unescap.org/sites/default/files/Asia-Pacific-ICT-DRR-Gateway-Leaflet.pdf
[360] https://www.drrgateway.net/space-applications
[361] https://www.cepal.org/en
[362] https://www.unescwa.org/about/mission
[363] https://www.unescwa.org/focus/climate
[364] https://archive.unescwa.org/climate-change-water-resources-arab-region-riccar
[365] https://www.unep.org/explore-topics/climate-action/what-we-do/climate-adaptation
[366] https://www.unep.org/gan/who-we-are
[367] https://tech-action.unepdtu.org/
[368] https://www.ctc-n.org/adaptation-fund-climate-innovation-accelerator-afcia-unep-ctcn
[369] http://www.unfpa.org/pds/climate/
[370] https://unhabitat.org/about-us
[371] http://www.unitar.org/
[372] https://unu.edu/
[373] http://www.worldagroforestry.org/
[374] http://www.worldbank.org/en/topic/climatechange
[375] http://www.wfp.org/climate-change and http://www.wfp.org/disaster-risk-reduction/leap and http://www.wfp.org/climate-change/r4-rural-resilience-initiative
[376] http://www.who.int/globalchange/en/
[377] https://public.wmo.int/en/our-mandate/climate

[378] For more information about Adaptation Futures, please see here: http://adaptationfutures2020.in/about-us.php
[379] https://www.unwto.org/who-we-are
[380] https://www.unwto.org/sustainable-development/climate-action
[381] https://www.wto.org/english/thewto_e/whatis_e/who_we_are_e.htm
[382] https://www.wto.org/english/tratop_e/envir_e/climate_challenge_e.htm
[383] https://www.wto.org/english/tratop_e/dda_e/status_e/envir_e.htm
[384] http://news.bbc.co.uk/2/hi/business/7531099.stm
[385] https://www.worldwildlife.org/initiatives/climate