Adaptation Committee

AC/2018/3

22 February 2018
Agenda item 6

Thirteenth meeting of the Adaptation Committee
Bonn, Germany, 27 February to 2 March 2018

Concept note on the Technical Examination Process on Adaptation

Recommended action by the Adaptation Committee

The Adaptation Committee (AC), at its 13th meeting, will be invited to consider this concept note and agree on next steps, including agreeing on the approach to the 2018 TEMs, considering ways to upscale and enhance the impact of the TEP and agreeing on the topic for the 2020 TEP.

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1. Introduction

1. As per decision 1/CP.21, paragraph 126, the Adaptation Committee is to conduct the technical examination process on adaptation (TEP-A) from 2016-2020, consisting of technical expert meetings (TEMs), technical papers and summaries for policy-makers (SPMs) with a view to identifying concrete opportunities for strengthening resilience, reducing vulnerabilities and increasing the understanding and implementation of adaptation actions. The TEP-A is complemented by a similar technical examination of opportunities for actions with high mitigation potential (TEP-M). The Marrakech Partnership for Global Climate Action,[1] led by two high-level Climate Champions, brings together Party and non-Party stakeholders to enhance collaboration, catalyze the scaling up of efforts and allow for a political showcasing of adaptation and mitigation successes, including those identified through the TEPs.

2. Having concluded an assessment of the TEPs in November 2017 towards improving its effectiveness, the Conference of the Parties (COP) in decision 13/CP.23:

a) Stressed the urgency of improving the TEPs, as outlined in decision 1/CP.21, including to better integrate them with the Marrakech Partnership for Global Climate Action;

b) Strongly urged the Chairs of the subsidiary bodies, the high-level champions, the AC, the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN) to focus the TEPs on specific policy options and opportunities for enhancing mitigation and adaptation that are actionable in the short term, including those with sustainable development co-benefits;

c) Requested the AC to consider the needs of Parties expressed in their nationally determined contributions (NDCs), national adaptation plans (NAPs) and national communications, to address all four functions of the TEP-A[2], and to include in its annual report to the COP recommendations for respective processes and for constituted bodies under the Convention, Parties and other organizations on ways forward and necessary actions to be taken, based on the outcomes of the TEMs;

d) Invited expert organizations, constituted bodies under the Convention and non-Party stakeholders to enhance their engagement in the TEPs;

e) Invited Parties and non-Party stakeholders to organize regional TEMs, building on existing regional climate action events, as appropriate, with a view to examining specific finance, technology and capacity-building resources necessary to scale up actions in regional contexts, including through regional mitigation and adaptation initiatives, and to provide their reports thereon to the secretariat as input to the TEPs;

f) Strongly urged the Chairs of the subsidiary bodies, the high-level champions, the Adaptation Committee, the TEC and the CTCN to ensure the necessary continuity of and follow-up on the identified policy options and opportunities, including by informing the SPMs, the high-level events and the 2018 Talanoa dialogue.

[1] https://unfccc.int/files/paris_agreement/application/pdf/marrakech_partnership_for_global_climate_action.pdf

[2] The functions are:

a) Facilitating the sharing of good practices, experiences and lessons learned;

b) Identifying actions that could significantly enhance the implementation of adaptation actions, including actions that could enhance economic diversification and have mitigation co-benefits;

c) Promoting cooperative action on adaptation;

d) Identifying opportunities to strengthen enabling environments and enhance the provision of support for adaptation in the context of specific policies, practices and actions.

2. Planning of the 2018 TEMs

3. Following the initial topic of "Reducing vulnerability and mainstreaming climate change adaptation, including through the process to formulate and implement national adaptation plans" in 2016, and 2017's "Integrating climate change adaptation with the Sustainable Development Goals and the Sendai Framework on Disaster Risk Reduction",[3] the agreed topic for 2018 is "Adaptation planning for vulnerable groups, communities and ecosystems".

4. The 2018 TEMs will again take place in the context of the SB sessions, which are scheduled from 30 April to 10 May 2018. The COP gave additional guidance to organizing the TEMs, including:

a) Inviting expert organizations to volunteer, through the secretariat, to lead the organization of relevant TEMs;

b) Making the TEMs more interactive, including by means of round tables, thematic dialogues and virtual participation;

c) Making the agenda and guiding questions for the TEMs available well in advance thereof;

d) Concluding the TEMs with a session on proposing ways forward and necessary actions in relation to the identified policy options and opportunities for inclusion in the technical papers and subsequent SPMs.

2.1. Possible sessions

5. In line with mandates emanating from decisions 1/CP.21 and 13/CP.23, the identification of possible sessions by the lead expert organizations should be guided by, and build on:

a) Relevant work undertaken by adaptation-related work programmes, bodies and institutions under the Convention, including previous TEMs;[4]

b) Relevant activities and engagement by the high-level champions and the Marrakech Partnership; and

c) The identified needs of Parties expressed in their NDCs, NAPs and national communications.

6. As for relevant work under the Convention, adaptation planning for vulnerable groups, communities and ecosystems has been addressed through the Nairobi work programme, including through submissions, synthesis papers and meetings, whose outputs already identified gaps and needs for which the TEMs could identify policy options and opportunities. Relevant outputs include:

a) A 2017 Summary report on initiatives in the area of human settlements and adaptation FCCC/SBSTA/2017/INF.3;

b) A 2017 Synthesis report on adaptation planning, implementation and evaluation addressing ecosystems and areas such as water resources FCCC/SBSTA/2017/3;

c) A 2015 Synthesis report on good practices and lessons learned in adaptation planning processes addressing ecosystems, human settlements, water resources and health, and in processes and structures for linking national and local adaptation planning: a synthesis of case studies FCCC/SBSTA/2015/4.

7. The engagement of the high-level champions in 2018 is guided by SDGs 8, 9 and 12. Possible targets around which specific policy options and opportunities could be addressed in the context of the 2018 TEMs are included in table 1 below:

[3] Outputs from the 2016 and 2017 TEP-As are available at http://tep-a.org.

[4] The technical papers are available at http://tep-a.org.

Table 1. Relevant SDG targets for the 2018 TEM-A meetings

SDG	Title	Targets
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.1 Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries 8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all 9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets
12	Ensure sustainable consumption and production patterns	12.2 By 2030, achieve the sustainable management and efficient use of natural resources 12.A Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production

8. Adaptation needs as expressed by Parties are diverse reflecting different national circumstances and capacities, and the term "needs" is used in various ways by Parties.[5] To reflect the different understandings of this term, three categories of needs are considered:

a) Adaptation needs, which refer to the domestic efforts that a country needs to implement to adapt adequately to the impacts of climate change. Adaptation needs are generally defined on the basis of an assessment of vulnerabilities and risks;

b) Implementation needs, which refer to the arrangements and enabling environments that a country needs to have in place domestically to implement their domestic efforts. These can include, for example, institutions, legal frameworks, plans, policies, knowledge, technology, and investments;

c) Support needs, which refer to the international financial, technology, and capacity-building support that a country needs to implement its domestic efforts.

9. Based on the above categorization, annex I synthesizes information from all NDCs that included adaptation-related information (123 out of the 165 NDCs contained in the interim NDC registry), eight NAPs submitted through NAP Central, and 195 national communications (the most recent communications of each Party). The synthesis includes an overview of information related to impacts, vulnerabilities and risks, which provide the basis for defining adaptation needs as well as information on adaptation needs, implementation needs, and finally support needs.

[5] A comprehensive analysis is provided in APA/2017/INF.7.

2.2. Vounteer expert organizations

10. In line with decision 13/CP.23, a number of expert organizations have approached the secretariat to volunteer to lead a session during the 2018 TEMs, including BSR/We mean business, CTCN, and the International Federation of Red Cross and Red Crescent Societies.

11. Other organizations suggested by members of the TEP-A working group include FAO, IUCN, mayor's organizations, SMEs, technology centres and universities, UNCCD and women organizations, the Global Centre of Excellence on Climate Adaptation, ARC Centre of Excellence for Coral Reef Studies, Oxfam and CARE, the World Bank and migration organizations.

2.3. Proposed agenda

12. Taking into account the volunteer and proposed expert organizations and the time constraints during SB 48, it is proposed to organize the TEMs over two days as presented in table 2.

Table 2. Possible agenda for the 2018 TEMs

Time	Day 1	Time	Day 2
10:00-10:20	**Opening** *Leads*: AC, Champions, SB Chairs	10:00-11:30	**Enabling adaptation planning: finance** *Topic: tbd, (making the link to the 2019 TEP)* *Lead: GCF* *Possible support*: GEF, AF, banks
10:20-11:40	**Adaptation planning for vulnerable communities** *Topic:* Connecting international frameworks to national plans and community-led decision-making processes taking into account SDGs 8, 9 and12 *(making the link to the 2017 TEP)* *Lead*: International Federation of Red Cross and Red Crescent Societies *Possible support*: Care, Oxfam, Women's and Mayor's organizations	11:30-12:45	**Ways forward and necessary actions on adaptation planning** *Lead:* AC and leads of previous sessions
11:40-13:00	**Adaptation planning for vulnerable groups** *Topic:* Resilient supply chains and the role of women taking into account SDG targets 8.1 and 8.3 *Lead*: BSR *Possible support*: women's organizations	12:45-13:00	**Closing and outlook to remaining 2018 TEP** *Lead*: AC, Champions, SB Chairs
Lunch break			
15:00-16:30	**Adaptation planning for vulnerable ecosystems**		

	*Topic: S*hort-term socio-ecological solutions, taking into account SDG targets 12.2 *Lead*: UNEP *Possible support*: IUCN, CBD		
16:30-18:00	**Enabling adaptation planning: technology** *Topic:* Enabling the use of adaptation technologies for sustainable urban development *Lead*: CTCN *Possible support*: technology centres and universities		

2.4. Engagement and outreach

13. In line with the COP request for making the TEMs more interactive and making the agenda and guiding questions for the TEMs available well in advance thereof, it is suggested to start engagement of partners and overall outreach well in advance of the TEMs, in order to secure adequate and diverse participation, including policy makers, researchers, civil society, UN bodies, private sector and country representatives.

14. Targeted engagement of partners, as well as overall outreach, are key components of achieving a successful meeting. Therefore, all efforts are undertaken to reach the audience identified above. This will include outreach via the secretariat's channels, including the website, social media, media contacts and others.

15. Outreach and engagement activities can be divided into three stages:

a) Pre-meeting: Ensure participating by advertising the meeting via the respective channels in a timely manner (six to eight weeks before the meeting), including the distribution of the agenda;

b) During the meeting: Ensure the visibility of the meeting in the context of the May Climate Change Conference by advertising via social media and the in-session channels; maximizing use of the remote participation, as much as possible;

c) Capturing the main outcomes of the session in a newsroom article or blog and related social media activities.

16. In order to make the meeting more interactive, the organizers will provide for:

a) Organizing all sessions with a focus on interaction, i.e. reducing the amount of presentations to a minimum;

b) Continued use of the interactive audience management tool "Sli.do", which was used in the 2016 and 2017 TEMs with positive feedback

17. To increase transparency and diversity of input, the AC may also wish to develop a plan to take virtual participation to a much higher level in 2019.

3. Upscaling and enhancing the impact of the TEP

18. In line with the COP invitation to Parties and non-Party stakeholders to organize regional TEMs and to provide their reports thereon to the secretariat as input to the TEPs, the AC may consider how to follow-up on this invitation and to reach out with a view to securing additional input. A list of potential regional events is included in table 3.

Table 3. Opportunities for regional TEMs in 2018

Event	Date	Region	Organizer	Status
2018 Forum of UNEP's Global Adaptation Network. The forum will focus on four main topics: 1) From the Gulf to the World; 2) Adaptation metrics: assessing risks and progress; 3) Adaptation Learning and 4) Reaching the most vulnerable and one cross-cutting theme: Adaptation and non-state actors.	20-21 March	Abu Dhabi, Gulf region	UNEP	Invitation extended by UNEP to AC for a regional TEM session
Asia Pacific Adaptation Summit	October	Asia-Pacific	Philippines co-hosted by Palau with ADB and UNEP support	Collaboration being explored
Regional capacity building workshops			CTCN	Collaboration offered
Other regional adaptation forums and workshops taking into account regional balance (e.g. 2 meetings annually, covering all regions between 2018 and 2020)				

19. Other proposed activities through which to address all four functions of the TEP and to upscale and enhance the impact of the TEP could include:

a) Seeking overall coherence among the various adaptation outreach and information-sharing processes under the UNFCCC, including the Adaptation Forum, the NAP Expo, the Nairobi Work Programme, the CTCN and other relevant activities organized beyond the UNFCCC;

b) Establishing an online platform/ help desk where practitioners can upload questions to be addressed during the TEMs using experiences from different Parties, non-Party stakeholders and technical bodies of the UNFCCC. The platform/ help desk could also feature some follow-up with agencies and NGOs willing to support the practitioners;

c) Production of leaflets or policy guides;

d) Enhance communication and have resume presentation.

4. TEP Topic for 2020

20. While the AC agreed to focus the 2019 TEP on "Adaptation finance", it deliberately left the topic for 2020 open to remain flexible. As requested by the COP, the champions are considering topics for the

mitigation TEP up until 2020 and they plan to organize their engagement in the Marrakech partnership in 2020 around SDG 1: reducing poverty and leaving no one behind.

21. Based on the initial list of topics[6] and taking into account the topics of the 2016-2019 TEPs, the AC could consider focusing on specific policy options and opportunities for enhancing adaptation that are actionable in the short term in the areas of:

a) The 2°C and 1.5 C° temperature limit and at multiple levels (i.e., local, national and regional);

b) Addressing issues relating to transboundary adaptation;

c) Partnerships for adaptation;

d) Building resilience, reducing risk and avoiding mal-adaptation: examining specific policy options and opportunities offered through systematically building upon SDG interactions and leverage points for adaptation;

e) Gender and adaptation;

f) Promoting endogenous technologies and harnessing technology innovations for adaptation;

g) Education and training, public participation and youth to enhance adaptation action.

22. The AC may also wish to consider new topics that are emerging as new priorities and may not have been considered in previous discussions.

5. Next steps

23. The Adaptation Committee may wish to consider the following next steps:

a) Agree on the approach to the 2018 TEMs and request the lead organizations and the secretariat to organize the 2018 TEMs, in particular considering how sessions would arrive at the identification of "specific policy options that are actionable in the short term";

b) Consider ways to upscale and enhance the impact of the TEP, including ensuring that messages and recommendations are substantive, relevant and actionable and that TEMs offer a higher level of virtual participation;

c) Agree on the 2020 TEP topic.

[6] http://unfccc.int/files/adaptation/groups_committees/adaptation_committee/application/pdf/ac10_8_tepa_.pdf

Annex I: Overview of Parties' needs expressed in NDCs, NAPs and national communications

1. Information on impacts, vulnerabilities and risks

1. The first step towards identifying adaptation needs is an assessment of impacts, vulnerabilities and risks. Such assessments help countries identify the anticipated impacts of climate change and the populations, sectors, areas, and/or ecosystems that require adaptation. Given this fundamental role of vulnerability assessments in the determination of needs, this section provides an overview of how such assessments are presented in the source documents.

2. On vulnerability assessments, Parties described the methodologies applied, factors of vulnerability, observed and projected changes in climate, specific impacts and risks, as well as socioeconomic consequences and costs of projected impacts. Parties described vulnerabilities from different spatial perspectives (e.g. national, local, or regional).

1.1. Methodologies, frameworks and guidelines

3. In terms of methodologies, frameworks, and guidelines used for vulnerability assessments, the source documents include information on:

a) General frameworks, data collection, models, institutions and actors involved. Some employ a multi-stakeholder approach to validate identified vulnerabilities, while others use scaled-down global climate models and simulations.[1]

b) Uncertainties in projections and vulnerability assessments, in particular the coarse resolution of climate models, difficulties with scaling down climate models, and various dynamic factors that must be considered. In the light of this, Parties described the confidence levels of their assessments.

1.2. Factors of vulnerability

4. Regarding factors of vulnerability, Parties highlighted e.g. their status as SIDS or LDCs, geographical isolation, limited land resources, location or concentration of populations or activities in high-risk areas, degradation of land and nature, population growth, poverty, poor infrastructure, dependence on natural resources (e.g. rainfall), economic sectors (e.g. hydrocarbons) or technologies (e.g. desalination), low capacity to respond to risks, food security risks and health challenges.

1.3. Observed and projected changes

5. In terms of observed changes, Parties reported in particular on:

a) Increase in temperature in the past 50–60 years, expressed in absolute numbers, as change per decade or as a qualitative description of general warming trends;

b) Change in precipitation in last 50–60 years, expressed as percentage change, as change in number of rainy days or as a qualitative description of regional or seasonal changes;

c) Rise in sea level in last 50–100 years, in absolute terms or rate of change;

[1] Methodologies mentioned include the IPCC MAGICC/SCENGEN model, the IPCC seven steps of climate impacts assessment, RCP scenarios, general circulation models, relevant UNEP handbooks, the NAPA guidelines, the Pacific-Australia Climate Change Science and Adaptation Planning programme's projections for 2100, as well as various local studies

d) Other indicators such as extreme weather, climate-related disasters, glacier melt, coastal erosion, storm surges, and/or ocean acidification;

e) Seasonal variations, such as duration of wet or dry seasons;

f) Regional variations, for example in relation to coastal zones, urban areas, rural areas, and different ecological zones.

6. In terms of projected changes, Parties provided information on expected changes in:

a) Temperature, for various time frames, in particular for medium (to around 2050) and long term (to 2100). These changes were expressed as an absolute increase or a rate of increase, or as expected maximum temperatures. Regional differences were highlighted;

b) Rainfall, expressed as quantified estimates (e.g. a reduction of 20–70 per cent by 2100) or as general descriptions of changes and/or regional variations;

c) Sea level, mainly for the long term (up to 2100), expressed as absolute rise (e.g. 78–100 cm by 2100) or as a rate of change (e.g. 1.5–3.0 mm per year);

d) Various other indicators (see paragraph 5 (d-f) above.

7. Parties also included information on specific extreme events, in particular storms, floods, heavy rainfall and droughts, as well as the costs, losses and/or damage caused by such events. These were expressed e.g. in absolute sums, as proportion of GDP or national budget, as loss of life or as the number of injured people, as lost crops or farmland or as fluctuations in prices of significant resources such as food.

1.4. Climate risks

8. Information on climate risks included both observed risks and risks that are anticipated to increase in the future. These included, in particular:

a) Higher temperatures, heatwaves and wildfires;

b) Variable rainfall patterns, torrential rain, reduced river flows and floods;

c) Droughts, longer dry seasons, desertification and sand storms;

d) Erosion, soil degradation and landslides;

e) More intense or frequent hurricanes, cyclones and storms;

f) Sea level rise, storm surges, coastal degradation, erosion and saltwater intrusion;

g) Ocean acidification, higher ocean temperatures, coral bleaching and reduced coral photosynthesis, and sargassum seaweed;

h) Changes in ocean circulation and changes in El Niño/Southern Oscillation;

i) Outbreaks of pests and of vector- or waterborne diseases;

j) Changes in species distribution, including invasive species;

k) Permafrost and glacier melt, and glacial lake outburst floods.

1.5. Socio-economic impacts and costs

9. Parties described the possible socioeconomic impacts of climate risks and costs, losses and/or damage. These were expressed as absolute or annual financial losses, lost proportion of GDP, losses in priority development sectors (e.g. agriculture, water, infrastructure, energy), or losses caused by specific impacts. The descriptions of impacts include information on risks related to, inter alia:

a) Loss of life, property, livelihood, culture, tradition and heritage;

b) Increased social inequality, instability and conflict, and risks of migration;

c) Vulnerable economic sectors and resources, including information on sector-specific vulnerabilities, incurred and projected damages, as well as the role/relative importance of such sectors in the economy. The sectors highlighted included in particular:

   i) Food security and associated areas (agriculture, animal husbandry, fisheries) (with impacts such as crop and livestock diseases, soil erosion, loss of production and crop yields, changes in fish populations and their distribution, habitat loss);

   ii) Water, sanitation, and health (with impacts such as changes in distribution of resources, and availability and quality of water);

   iii) Health (with impacts such as hunger and malnutrition, diarrhoeal diseases, vector-borne diseases, injury and loss of life from extreme events);

   iv) Education and training;

   v) Natural resources, ecosystems, biodiversity and wildlife, and forests (with impacts such as timing and duration of growing seasons; forest fires; and distribution, endangerment, and extinction of species);

   vi) Settlements, urban development, infrastructure, and buildings;

   vii) Energy (with impacts such as challenges for thermal generation, shifts in energy consumption, higher demand for cooling, economic losses due to interruptions);

   viii) Coastal zones (with impacts such as flooding and inundation, coastal erosion, changes to coastal ecosystems, alterations in sediment deposition);

   ix) Tourism (with impacts such as reduced winter tourism due to lack of snow, damage to archaeological sites, coastal erosion and sea level rise on key tourist areas);

   x) Trade and economic activities (e.g. mining, industry, insurance and financial services).

d) Vulnerable groups and communities, including children, youth, women, pregnant women, elderly, the poor, farmers and smallholders, people with disabilities and/or health problems, indigenous peoples, minorities, artisanal fishers, informal settlers, and riparian dwellers;

e) Particularly vulnerable areas (e.g. river deltas, low-lying territories, mountain ranges, drought-prone regions, cities or specific municipalities);

f) Systematic variations in vulnerabilities, including descriptions of how some sectors, geographical regions and population groups are more vulnerable than others (e.g. by using a social vulnerability index).

10. In addition to climate risks, Parties identified potential positive impacts and opportunities that may emerge, including longer growing seasons, higher agricultural productivity, and increased opportunities in the tourism sector. However, it was also reported that any expected benefits are likely to be offset by negative impacts.

2. Information on adapation needs

11. The source documents describe proposed or planned adaptation options that are needed to address the identified vulnerabilities and risks. Parties often describe indirect actions, such as legislation or institutional measures, intended to facilitate the implementation of concrete adaptation measures, as well as concrete measures for specific sectors. Often a general strategy forms the basis for specific projects. Parties also discuss cross-cutting adaptation measures planned throughout the country, actions that focus on certain regions, actions that benefit multiple sectors, as well as their engagement in

international cooperation. Some provide information on how certain needs were prioritized and the criteria used. The methodologies and priorities used for identifying actions differ for each country.

12. The source materials also include information on how the outlined adaptation options are expected to address the identified vulnerabilities and risks. Such information is provided both in qualitative terms (describing general benefits expected from specific measures), as well as in quantitative terms (providing quantified numerical estimates of expected changes resulting from the measures).

2.1. General adaptation needs

13. Parties referred to general adaptation approaches they need to implement, including:

a) Creating and reforming relevant legal frameworks and regulations;

b) Establishing new institutions, enhancing existing ones, and improving coordination and collaboration between existing institutions;

c) Strengthening vulnerability analysis, e.g. by conducting spatial analysis of populations at risk, or establishing simulation centres for identifying risks;

d) Formulate and implement NAPs, sector-specific plans, local adaptation plans, national climate change policies, and policies for disaster prevention and preparedness;

e) Community-based adaptation and strengthen role of local governments;

f) Mainstream and/or integrate climate impacts and adaptation into development, planning, laws, strategies, policies, regulations, environmental programmes and projects, reforms, and measures for ensuring political stability and security, i.a. by mandating 'climate proofing' of national and subnational plans;

g) Feasibility studies to demonstrate the efficacy and long-term sustainability of proposed adaptation measures;

h) Actions with mitigation and sustainable development co-benefits, including economic diversification;

i) Regional and international cooperation and partnerships with civil society, including community groups and non-governmental organizations;

j) Identifying sources and modalities for adaptation finance, and strengthening investments through, e.g., national funds and enabling environments for the private sector;

k) Insurance schemes, measures to manage financial risk and social safety nets;

l) Measures for conflict prevention and resolution;

m) Gender mainstreaming;

n) Addressing the needs of most vulnerable communities and groups, and strengthening local ownership and social linkages to advance resilience;

o) Enhancing science, monitoring, data and analysis, including in relation to early warning and climate information systems, meteorological frameworks, climate change indicators, models, RCP scenarios, and traditional knowledge;

p) Building capacity through technical training, research and development, data collection and application;

q) Raise awareness by integrating adaptation into education and strengthening communication and outreach, including through public awareness campaigns or by enhancing university curricula.

2.2. Adaptation needs on specific sector or thematic areas

14. The source documents show how countries frame adaptation within their development context and how adaptation efforts focus on important sectors that drive the national economy. Adaptation actions are identified mainly for the following sectors: agriculture and livestock, rangelands, water resources; biodiversity, ecosystems and wildlife; disaster risk management, health, infrastructure and transportation, forestry, industry, energy, mining, services, telecommunications, coastal zones and marine systems; cities, buildings and settlements; land use, fisheries and aquaculture, and tourism.

15. For each sector, Parties describe the completed, ongoing, planned and proposed adaptation measures, as well as relevant sector-specific policies, frameworks and institutions that guide and facilitate adaptation planning and implementation.

16. The sectors reflected in the source documents include:

a) Agriculture and food security;[2]

b) Water;[3]

c) Biodiversity and ecosystems;[4]

d) Health;[5]

e) Disaster risk management;[6]

f) Infrastructure and transport;[7]

g) Forestry;[8]

[2] With measures such as: enhanced irrigation systems, resilient crops or livestock, climate-smart agriculture, diversification, investments and insurance, early warning systems, adapting agricultural calendars, traditional methods, food storage, integrating climate criteria into agriculture and food security policies, and including agriculture in NAPs.

[3] With measures such as: mainstreaming climate change into water sector; national laws, strategies, institutions, regulations or plans; water sector NAPs, cooperating on transboundary waters; technologies for saving, recycling, storage, treatment and irrigation; integrated water resources management, watershed management, early warning systems and emergency measures; monitoring resources and quality; transferring water to distressed areas; and restoring wetlands. Parties also referred to controlling demand by promoting public awareness; metering and distribution, reducing leakage, pricing water; and improving supply by desalination, rain- or floodwater harvesting, multipurpose dams, artificial lakes, groundwater recharge, pumps and wells, and water imports

[4] With measures such as ecosystems-based adaptation, restoration of biodiversity; national strategies, plans and programmes; monitoring biodiversity, conserving wetlands and marine environments, protected areas, ecotourism and other revenue-generating activities, agroforestry, biological corridors, water points for wildlife, and disease control.

[5] With measures such as integrating climate change into health planning, disease control and prevention; combating vector-borne and other diseases; early warning systems, emergency plans, health surveillance, information systems and databases, research; building hospitals and health centres; capacity-building for medical services, communication, education and awareness, and implementing MDGs.

[6] With measures such as early warning systems, monitoring and forecasting, communication systems, emergency preparedness and response, vulnerability mapping, integration of disaster management into climate change and development strategies, insurance, shelters and protective measures, knowledge and awareness, and regional institutions and policies.

[7] With measures such as risk assessment guidelines, integration of adaptation into physical development plans and into land-use, technical, and building codes; urban and local planning, mass transport, infrastructure relocation, inclusion of infrastructure as a sector in NAPs, water catchment protection, flood barriers at subway stations, and dam security.

[8] With measures such as sustainable management of forests, protection and regeneration (including quantitative targets), halting deforestation, reducing illegal logging (including quantitative targets), drought-resistant forest

h) Energy;[9]

i) Coastal zones;[10]

j) Buildings;[11]

k) Land use;[12]

l) Fisheries;[13]

m) Tourism.[14]

3. Information on implementation needs

17. This section focuses on the implementation needs identified by Parties that need to be met to implement their planned adaptation efforts (see chapter III above). In this overview, these are understood in particular as:

a) Domestic barriers and challenges that need to be overcome;

b) Legal and policy frameworks, institutional arrangements, capacities, and investments required to overcome barriers and challenges and implement adaptation efforts;

c) Capacities, skills, and areas of expertise needed to implement adaptation;

d) Investments required to implement adaptation efforts.

3.1. Barriers and challenges

18. In terms of the barriers and challenging, Parties identified, in particular:

a) Social barriers, including low public awareness about climate change and adaptation, as well as inadequate mechanisms for involving local communities;

b) Economic barriers, including high levels of poverty and economic inequality, and the composition of the national economy (e.g. dependence on fossil fuels);

species, conserving watersheds, agroforestry, tax and economic incentives for forest protection, community forest management and enhancing governance.

[9] With measures such as diversification (renewable energy or fuel substitution), adaptation of hydropower to reduced rainfall, performance standards and awareness campaigns to increase energy efficiency, 'climate proofing', integration of climate change into investments, enhanced access to electricity, and review of codes, regulations and policies.

[10] With measures such as integrated coastal zone management; incorporation of climate change into coastal development policies, guidelines and regulations; dykes, breakwaters and other coastal protection measures; monitoring tools, hazard maps and a coastal vulnerability index; mangroves and coastal forests; relocation of vulnerable populations or economic activities; education and awareness.

[11] With measures such as improving building codes, providing incentives for compliance, making homes 'cyclone proof' (e.g. preparing all buildings for extreme events by 2030), relocating settlements in vulnerable areas, alternative housing, and enhancing urban planning.

[12] With measures such as integrated land management, mainstreaming climate change into land reform policies, fighting erosion, combating soil degradation and rehabilitating land.

[13] With measures such as sustainable fishing management, insurance for fishers, artificial reefs to recover fish stocks, protection of breeding sites, cage-culture farming, multipurpose dams, aquaculture on land farms, non-destructive fishing, technological solutions to fisheries management (e.g. radar reflectors on fishing boats) and capacity-building for fishers and institutions.

[14] With measures such as adaptation norms for coastal tourism facilities, nature-based and sustainable tourism, diversification, and use of artificial snow.

c) Financial barriers, such as inadequate funds to conduct vulnerability assessments or to plan and implement adaptation; inadequate domestic financial systems;

d) Technical and knowledge-related barriers, including information and capacity gaps that hinder formulation and implementation of adaptation measures;

e) Administrative and institutional barriers, such as overlapping or unclear mandates of ministries; poor management of resources and problems; absence of effective coordination mechanisms at national or subnational levels; lack of transparency in decision-making; absence of information and knowledge management systems; and insufficient guidelines for mainstreaming climate change into policies and programmes;

f) Political barriers, such as political instability, conflict, or inconsistent and/or insufficient engagement of political officials;

g) Weakness or lack of monitoring and evaluation systems;

h) Parties also highlighted gaps that have not yet been assessed, including needs for designing and implementing harmonized national monitoring and evaluation systems.

3.2. Legal and policy frameworks and institutional arrangements needed

19. In terms of the legal and policy frameworks and institutional arrangements needed to implement adaptation efforts, Parties highlighted in particular:

a) The importance of adopting robust legal frameworks and to pursue legal harmonization of climate-related issues;

b) The types of policy frameworks that are required, in particular planning, including the formulation of NAPs and of regional, local and spatial plans, the preparation of national regulations and long-term plans, the integration of climate change into development;

c) The importance of developing and implementing instruments and markets for finance, insurance and risk;

d) Importance of ensuring synergies with other international processes and treaties;

e) The need to maintain flexibility in adaptation planning and prioritization, including by regularly updating strategies, programmes, plans and assessments so that they continue to meet the needs of citizens and other stakeholders.

f) The importance of coordinating institutions, laws, regulations and governance; including by strengthening links between government departments;

g) Research and development institutions dedicated to climate change adaptation;

h) Introduction of the requirement that each ministry, department and agency prepare a monitoring and evaluation plan with specific indicators.

3.3. Capacities, skills, and areas of expertise needed

20. Parties also identified various types of capacities, skills, and areas of expertise that would need to be developed to implement the intended adaptation efforts. These relate in particular to:

a) Human resources and training;

b) Adaptation-related research and development, including:

i) Research, climate information (including climate data), scaling down of climate models, research and systematic observation, monitoring and weather stations; and providing up-to-date, high-quality, peer-reviewed data tailored to local conditions;

ii) Vulnerability assessments, risk mapping, and early warning systems;

c) Technological development and access to innovative technologies;

d) Awareness, communication and education, and dissemination of evidence for the benefits of adaptation;

e) Assessing adaptation costs to quantify impacts in economic terms;

f) Including gender and human rights considerations into adaptation efforts;

g) Development and implementation of focused adaptation projects;

h) Monitoring and evaluation (careful monitoring and evaluation of implemented adaptation actions is crucial to analyse what is working, what is not working, and why), in particular the development and implementation of monitoring and evaluation schemes, specific indicators, sector-specific databases, community-based monitoring systems.

3.4. Investment needs

21. Countries provided information on the estimated total finance needed for the implementation of their adaptation efforts. They referred to, inter alia, the estimated costs of implementing their adaptation efforts, including policies, specific projects and programmes in various sectors. The costs were expressed in various ways, including as:

a) Total costs of adaptation efforts during a specific implementation time frame (e.g. for a particular five-year period or up to 2030);

b) Annual costs accrued during implementation of efforts;

c) Costs of implementing specific priority measures;

d) Costs of implementing adaptation efforts on sectors, thematic areas, or regions;

e) Proportion of GDP, government spending, or official development assistance.

22. When providing cost estimates for proposed adaptation measures, Parties also provided information on the processes, models, or formulas used for arriving at their cost estimates. They highlighted assumptions and uncertainties associated with the estimates, including lack of studies, insufficient information and methodological challenges.

23. It was emphasized that strong and early mitigation will reduce the need for adaptation efforts and thus reduce costs. In some cases, adaptation costs were contrasted with costs of inaction. Parties also highlighted that adaptation needs and the scale of necessary action may have to be reconsidered in the light of new science and future levels of mitigation.

24. Parties also communicating information related to national resources that may be available for implementation of adaptation efforts or specific aspects of such efforts (e.g. pilot projects, planning, or capacity-building). This included information on possible sources of finance, including domestic sources, specific sums to be mobilized (expressed e.g. in absolute numbers or as a proportion of the total cost of the adaptation component of the NDC), funds, and investment plans.

4. International support needs

25. The source documents all emphasize the importance of support, means of implementation, international assistance, and regional and international cooperation for meeting national adaptation objectives. Accordingly, developing countries included information on their needs for international finance, technology and capacity-building support, identify possible sources of support, and describe their implementation strategies.

4.1. Financial needs

26. In terms of the needs for international finance for their adaptation efforts, developing countries included information on, for example:

a) Total needs for international support for the implementation of adaptation, expressed as absolute numbers for specific time frames, or as annual needs;

b) Financial needs to support the implementation of the policies, programmes and projects identified in the NAPs;

c) Finance needs to implement specific adaptation projects.

4.2. Technology needs

27. Countries also provided information on technology needs, including:

a) That adaptation requires access to technology, that the formulation of a NAP requires technology, that institutions are needed to introduce adaptation technology and to strengthen legal protection of intellectual property rights and that international support is needed to develop domestic technology and for technology training;

b) Areas where technology is needed, for example:

i) Vulnerability assessments;

ii) Forecasting, climate and weather modelling, early warning systems and Doppler radar networks;

iii) Up-to-date and localized climate information and data;

iv) Coastal infrastructure and coastal protection;

v) Water management, including hydrological monitoring, recycling of water, protection of rivers and construction of canals;

vi) Agriculture and food security, including zero-tillage farming, crop varieties, drip irrigation, precision farming, livestock health, and biotechnology against pests;

vii) Forestry, including aeroplanes to fight wildfires;

viii) Resilient transport systems;

c) Progress, results or constraints of technology needs assessments;

d) Intended technology cooperation, for example with universities, research institutions and the private sector, to meet technology needs.

4.3. Capacity-building needs

28. Capacity-building needs were identified in the following specific areas:

a) Human resources and a roster of national experts;

b) Development of adaptation plans and strategies, and drafting project proposals

c) Community resilience and participation;

d) Vulnerability and risk assessment, monitoring, detection and prediction, as well as interpretation of climate information;

e) Research on the impacts of response measures and on economic diversification;

f) Evaluation of adaptation needs and prioritization of efforts;

g) Monitoring and assessing progress on adaptation;

h) Legal frameworks, institutions, taxation and regulations;

i) Health institutions;

j) Soil protection, water resources management and forest management.

4.4. Sources of support

29. Parties also identified possible sources of support for their adaptation efforts, in particular:

a) International sources of finance, for example, bilateral, multilateral and regional sources, international institutions such as the Adaptation Fund, the Green Climate Fund (GCF) (including support for NAPs as requested by decision 1/CP.21, paragraph 46) and the Global Environment Facility (GEF), foreign direct investments, grants and loans;

b) North–South and South–South cooperation;

c) Private sector investments, including by creating adaptation opportunities that can attract private sector investments;

d) Market and non-market mechanisms;

e) Support by UNFCCC institutions (e.g. technology support by the Climate Technology Centre and Network).

30. A number of Parties also indicated their readiness to support other countries through various channels, including South–South and bilateral cooperation, and for specific areas, including awareness-raising, education, capacity-building, research and development, resilient agriculture, forestry, and protected areas.

4.5. Challenges

31. In addition, Parties identified challenges they are facing in relation to international support. These include challenges related to access to support, in particular ineligibility, difficulties in accessing international climate funds, a low level of commitments for support, and a lower share of adaptation funding compared with similar countries.