

REPORT

Water in the Nationally Determined Contributions: Increasing Ambition for the Future

A review on how the inclusion of water has evolved within NDCs, with key trends, gaps, and recommendations identified.



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Contributors

The report was produced by the UNDP-SIWI Water Governance Facility, by David Hebart-Coleman, SIWI, with contributions from Anna Viktoria Bussmann (GIZ), Anna Berg (GIZ), Stefanie Lehr (GIZ), Senter Braunsdorf (GIZ), Jennifer Jun (SIWI), Jakob Schabus (SIWI), Tove Lexen (SIWI), Maggie White (SIWI) and Malin Ingemarsson (SIWI).

Cover photo

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Editing

Green Ink

Layout

SIWI

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Contact

Stockholm International Water Institute
Kabyssgatan 4D, 120 30, Stockholm, Sweden
Visiting Address: Hammarbybacken 31
Tel. +46 8 121 360 00 • www.sivi.org

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Executive summary

Nationally Determined Contributions (NDCs) are the main vehicle being used to implement the goals of the Paris Agreement. Under the Paris Agreement, countries are expected to achieve increasingly ambitious targets regarding mitigation and building climate resilience and adaptation, and the NDC is a key document for outlining their commitments. Since coming into force in 2015, most countries have completed multiple iterations of an NDC, with each NDC expected to be progressively more ambitious than the last. While many were intended to meet global deadlines, the global pandemic upended processes in many countries and resulted in a lengthy release period. This report is concerned with understanding global and regional trends and gaps in the inclusion of water and water-related activities in available enhanced NDCs, along with charting overall changes between the first and second versions of NDCs for non-Annex 1 countries.¹ Such analysis is useful for policy makers and donors to address areas of concern or gaps within NDCs and support implementation efforts of partner countries.

Water is the thread that connects climate change vulnerabilities and responses when it comes to both climate mitigation and adaptation. This report is intended to evaluate whether this central understanding about water and water-related activities is reflected in the most recent iteration of the NDCs, which were lodged mainly in 2021 and 2022, especially given increased global water challenges. Reaching the goals of the Paris Agreement requires strong and clear NDC commitments. The Glasgow Climate Pact, adopted at the 26th Conference of the Parties (COP 26) to the United Nations Framework Convention on Climate Change (UNFCCC), made it clear that most countries need to revisit and further strengthen their NDCs in 2022.

Learning about the current status of NDCs and their evolution, and identifying possible future enhancements is therefore a timely and essential requirement for reaching climate goals. The report makes comparisons on how the inclusion of water has evolved in the NDCs of non-Annex 1 countries in the last five years, identifies key trends and gaps, and make recommendations on activities that will support the development of future NDCs. Given that the NDCs contain a mix of adaptation and mitigation measures, they represent an opportunity to understand

¹ Under the United Nations Framework Convention on Climate Change (UNFCCC), different countries are classified according to their expected commitments. Non-Annex 1 are mainly developing countries whose commitments should include an emphasis on addressing their particular vulnerabilities.

how water impacts, interactions, or limitations are being mainstreamed across multiple climate change planning processes.

A total of 114 NDCs from non-Annex 1 countries, prepared between 1 January 2019 and 4 January 2022, were assessed as part of this process, including NDCs submitted after COP26 (held in Glasgow in 2021), up to January 2022. Non-Annex 1 countries were chosen and many are low and middle-income countries and many are highly vulnerable to climate change impacts. This means that they were more likely to include extensive adaptation sections. Due to the breadth of potential water and water-related activities across multiple sectors, different keywords were used to identify measures and targets across multiple sections in an NDC. Examples include forestry related terms such as afforestation, ecosystem related terms such as nature-based solutions, as well as keywords relevant to water resource management.

Main insights from the analysis show:

Overall, water remains a priority sector for adaptation in most NDCs, with most noting the general impacts of climate change on water resources and the important role of water across many sectors, including as a foundation of economic development. The assessment reveals that the prominence of water and water-related measures in adaptation has increased in the second iteration of the NDCs. **Approximately 85 per cent of assessed NDCs included more measures and details about potential water-related climate impacts and vulnerabilities**, and included water measures across a wider range of sectors in the adaptation sections. **However, water and water-related activities such as water efficiency and energy efficiency for accessing and distributing water are still not seen as important standalone mitigation priorities**, although most mitigation activities are either reliant on water or will have an impact on local hydrological resources such as forestry related measures.

There was an increased inclusion of measures that support water resource management, such as integrated water resource management (IWRM); basin or catchment planning; water, hygiene and sanitation (WASH) activities; investment in water capacity development; and other integrative approaches compared with earlier NDCs. However, while there was an increase in overall numbers of measures, very few specific water-related targets were included in most NDCs, whether adaptation or mitigation, with the exception of mitigation-based targets, for example within the forestry sector.

Increased investment in NDC processes and contents is reflective of the maturation and acceptance of NDC processes within global policy agendas and the increased use of the NDC as a strategic planning tool, albeit with room for future improvement. As the Paris Agreement becomes more institutionalized as a

‘mature’ feature of international climate change regimes, and with the recognition that the NDC constitutes a crucial adaptation communication strategy, along with its mitigation focus and potential to guide future investment, more countries have become invested in NDC development, and many are presently focused on implementation activities. The expanded role and variety of the different non-governmental, intergovernmental, and regional stakeholders included and involved within enhancement processes is also evidence of such maturation, with several NDCs listing consulted stakeholder groups for their respective NDC development processes.

The quantity and quality of water-related content in the NDCs across most regions collectively improved with respect to both breadth and depth of water-related content, with the Latin American and the Caribbean (LAC) and Sub-Saharan Africa (SSA) regions both standing out in this regard. For example, most NDCs sourced from LAC have considerable text and measures devoted to addressing local water security, increased basin-level planning, the inclusion of blue economy measures, and the inclusion of ecosystem- and nature-based solutions. The LAC emphasis on water resources stands in stark contrast to earlier NDCs from the same region, which paid limited attention to water and water-related activities.

Within the NDCs prepared by SSA countries, IWRM continues to be an important priority across most NDCs, along with increased prominence of WASH-related activities and water governance or institutional strengthening to support climate resilience-building. The inclusion of water in other regions also increased, but not as noticeably. In the Middle East and North Africa (MENA) region, much of the water-related content is focused on technical improvements and infrastructure investment as opposed to the implementation of ‘softer’ approaches such as water governance or institutional strengthening, although there are notable exceptions (e.g. Jordan).

Across the enhanced NDCs, several trends around particular topics regarding water and water-related activities were noted. The first was the recognition of the role of ecosystems in addressing climate change challenges, whether through the recognition of nature-based solutions, ecosystem-based adaptation, ecosystem services, or the role of particular types of ecosystems such as wetlands, peatlands, and mangroves. While much of the focus was on mitigation potential, the role of ecosystems in building climate resilience was also elevated. A further trend was the greater inclusion of water resource management concerns or approaches, such as catchment or basin planning, or IWRM.

However, despite a clear improvement in the inclusion of water in NDCs, particularly in the context of adaptation rather than mitigation, there is significant scope for improvement around these key areas:

- **Accounting for the role of water in mitigation activities and planning.** Mitigation activities are often reliant on access to and reliability of water resources or have the potential to affect water resources, thus water resources can be a limiting factor. More effort is needed to understand the implications of mitigation commitments, especially at a catchment level where multiple different sectoral activities may take place.
- **Accounting for sub-national contributions within national commitments.** National-level commitments often mask substantial sub-national differences in terms of water resource endowments and local pressures as well as proposed locations for activities. In addition, such inclusion is beneficial as many responses to climate change will be addressed most effectively at sub-national levels. Some NDCs have started to specifically include sub-national information (e.g. Argentina, Colombia, and Togo), and further efforts should be encouraged.
- **Providing more detail on baseline conditions and increasing the use of quantitative targets and measures.** This will help build the business case for investing in adaptation activities compared with mitigation activities. While many NDCs include adaptation measures, it is often unclear how much investment is needed to implement the measures or fully understand what is being proposed, whether as a conditional or unconditional commitment. This can put adaptation measures at a disadvantage compared with mitigation measures that are often more focused on meeting specific mitigation targets. The use of a single metric across mitigation already makes it easier to evaluate the effectiveness of mitigation investments compared with adaptation investments, and the lack of available baseline information can further embed this disadvantage in relation to adaptation.
- **Better integrating water commitments within and across sectors nationally and regionally, and integrating with other global processes.** The governance of water and the use of water resources often sit at the centre of multiple environmental and development challenges, whether in terms of responding to climate change impacts, building community resilience, or fostering sustainable development. Despite this, few NDCs strongly connected water needs with other processes in which countries are involved. While many made generic references to the Sustainable Development Goals (SDGS) and other development indices, there were few attempts to identify and build on these interactions. This is important

since many adaptation measures could not be evaluated for their effectiveness.

- **Better detailing of the connections between country impacts and vulnerabilities, and the measures included within an NDC.** While NDCs have done a better job of describing the possible range of impacts and vulnerabilities to climate change, more effort is needed to ensure the included measures respond directly to stated impacts and vulnerabilities.
- **Invest in country-level exchanges within transboundary basin countries.** Without more investment in exchanges between countries, it is likely that the measures found in NDCs will continue to have a national focus and pay little regard to the needs of surrounding countries when outlining their commitments. Barriers to inclusion can often be due to political sensitivities, but can also occur due to insufficient lead time in NDC preparation activities, which do not allow for the sharing of commitments, whether present or future.
- **Further work on understanding and detailing the linkages between water quality, freshwater ecosystems, and climate change, whether in terms of adaptation or mitigation.** While the most recent round of NDCs saw an increased role for ecosystems in responding to climate change in most NDCs, issues such as water quality or environmental degradation of freshwater ecosystems were not strongly addressed.
- **An increased focus on water governance is necessary.** Approximately 12 per cent of NDCs referred to water governance, while approximately one third included reference to institutional strengthening of water-related institutions. While these numbers are promising, they are not reflective of the central role played by water in climate change responses, nor the need to ensure that countries are able to manage the trade-offs between different users reliant on joint water resources that climate change will necessitate.

Introduction

In 2015, the Paris Agreement, a legally binding treaty, was adopted. The goal of the treaty is to limit global warming to below 2 degrees Celsius, with a preference for 1.5 degrees Celsius compared with pre-industrial levels. To meet this goal, signatory countries are expected to communicate their activities designed to limit global warming. Between 2020 and 2021, most parties (primarily countries) to the Paris Agreement have enhanced their first Nationally Determined Contributions (NDCs) or, in some rare cases, submitted their very first NDC.

Under the Paris Agreement, signatory countries are expected to achieve increasingly ambitious targets regarding mitigation and building climate resilience, and the NDC is a key document for outlining their commitments, according to their capacity. Since the Paris Agreement came into force in 2016, most countries have completed multiple iterations of an NDC, with each NDC expected to be progressively more ambitious than the last, although what is included within 'ambition-raising' is defined by the country.

As of 4 January 2022, 157 NDCs had been submitted to the NDC registry in the preceding two years, including 114 from non-Annex 1 countries.² Timetables for NDC enhancement and finalization differed strongly among countries during a very challenging period underpinned by the global Coronavirus disease 2019 pandemic across 2020/21, during a time when hygiene and health requirements for water increased as a result of the pandemic. While these NDCs were initially due to be submitted in 2020, many were not submitted until late 2021 and even into 2022.

International climate change planning processes have become increasingly complex, with an increased suite of requirements, tools, and initiatives being utilized to understand what states believe are necessary for addressing their unique climate change challenges, along with outlining their contributions to addressing national and international challenges within their respective capacities. Such tools and processes include Adaptation Communications, National Adaptation Plans (NAPs), Long-Term Strategies, and NDCs. Some processes are formal requirements, such as Adaptation Communications through international global agreements, whereas others, such as NAPs, may not be required but their preparation is strongly

² Under the United Nations Framework Convention on Climate Change (UNFCCC), different countries are classified according to their expected commitments. Non-Annex 1 are mainly developing countries whose commitments should include an emphasis on addressing their particular vulnerabilities.

encouraged through resources being made available for their preparation by international entities such as the Green Climate Fund (GCF). The GCF is presently supporting the preparation of NAP's for approximately 50 countries.³ In parallel, other international agreements, initiatives, or processes, including activities designed to support the achievement of Agenda 2030 and its Sustainable Development Goals (SDGs), will have an impact on addressing NDC commitments, highlighting the need to better integrate climate change impacts and responses across the international policy arena.

Nevertheless, NDCs are maturing as an important climate change planning instrument as they provide an overview of how different countries are responding to climate change nationally and in respect of global goals. Initially, they were intended to be focused on mitigation commitments, mainly through the inclusion of emissions reduction targets and associated activities to understand progress in limiting global warming to below the aspirational temperature threshold of 1.5 degrees Celsius. Today, most NDCs, especially those from non-Annex 1 countries, have included a much broader agenda and include material on climate impacts, climate vulnerabilities, and adaptation activities. Due to this breadth, NDCs are important, not just for communicating national intentions but also to represent a potential tool for the better integration and coordination of climate change response activities across a range of sectors, including helping to mainstream water concerns across other sectors given the role of water as a cross-sectoral connector.



Mining effluent pollutes a river in Rosia Montana, Romania. Source: Shutterstock.

³ Including Albania, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Bangladesh, Benin, Bhutan, Bosnia, Chad, Chile, Colombia, Costa Rica, Cote D'Ivoire, Democratic Republic of the Congo, Dominica, Dominican Republic, Ecuador, Eswatini, Gabon, Ghana, Guatemala, Guinea, Haiti, Honduras, Iraq, Jamaica, Kazakhstan, Kyrgyzstan, Liberia, Madagascar, Malawi, Mauritania, Malawi, Mongolia, Myanmar, Nepal, Niger, Nigeria, Pakistan, Papua New Guinea, Peru, Rwanda, Serbia, Tajikistan, Uruguay, Uzbekistan, Viet Nam, Zambia, Zimbabwe.

Research on the first round of NDCs noted that water was often listed as a priority sector (Simalabwi et al, 2018), whether because of sectoral vulnerability or its role in responses. Water and water-related policies and measures were regularly included in the first round of NDCs, mainly in terms of adaptation where these activities were a response to anticipated extreme events or long-term hydrological changes. However, many of the policies and measures included were general or open-ended with limited specificity, e.g. 'Develop systems to integrate water resource management across all the sectors of human endeavour, land use, and the environment'. Due to the use of general measures, it was often unclear as to the relative strength of a given measure in the context of building climate resilience or other climate goals. This is due in part because limited baseline information or quantitative targets are made available for evaluation of the strength of a measure or its contribution to meeting climate objectives. On several occasions in the first round of NDCs prior to 2019, the water sector was noted as a priority sector in an NDC but there were no policies or measures to support such prioritization. In addition, water and water-related activities were not prominent in the first iterations of mitigation planning.

The enhanced NDC offers an opportunity for countries to increase their climate action profile and global audience to obtain support and investment for their desired water-related mitigation and adaptation activities, especially compared with domestically focused NAPs or similar. There are notable exceptions to this use of the NDC, such as when a party prefers to use a NAP or similar as the main vehicle for communicating adaptation vulnerabilities, challenges, and commitments, but these are uncommon. For example, countries such as Bhutan, Brazil, and St Lucia are using their respective NAPs to articulate most adaptation commitments, but most other countries included substantive adaptation sections in their enhanced NDCs.

While increased ambition is the main driver of national investment in the process of preparing enhanced NDCs, secondary rationales may also apply to investment in national approaches and help to determine the sectors included within an NDC. Secondary rationales include regional leadership ambitions, recognition of their role in environmental stewardship (such as headwaters in the case of Guinea or peatland protection in the case of the Democratic Republic of the Congo [DRC]), increasing national access to climate finance instruments, and a desire to increase international pressure on other countries that are bigger contributors to climate emissions by committing to ambitious agendas. Of these secondary rationales, improved access to finance is likely to form a large part of calculations in many NDCs given the extent of the inclusion of climate finance sections across them.

Each country makes its own determination on which sectors to include within its NDC. While mitigation reporting requirements led to common topic areas being included across NDCs along with some mitigation targets, this flexibility has allowed some countries to show leadership on issues that are relatively unique to

them. Pertinent examples of these include DRC, which has significant text and measures regarding peatlands, or Albania, which has exhaustive material and measures regarding lagoons.



Karavasta Lagoon, Adriatic coast, Albania. Source: Shutterstock.

While such differentiation should be expected given that NDCs are meant to be based upon a country's own vulnerabilities and responses, such differentiation was less strongly evident in the first round of NDCs. The increased inclusion of more 'unique' material provides some evidence of 'maturation' of the NDC process. It is also clear that the global NDC processes involved a wider set of partners providing support to NDC preparation in many countries and included more in the way of consultation activities. Most NDCs included content on the process of consultation, including a list of both internal and external countries. In general, water-related actors were not especially prominent within listed consultation countries, but ministries of water or equivalents were regularly included. Such findings are not dissimilar to recent work on NDCs such as the report by the World Wide Fund for Nature (WWF) on the inclusion of nature-based solutions (NBS) (WWF, 2021).

This report is based upon four interwoven elements that are used to tell the story of water in the NDC's. The first element is an overall assessment of the presence of water and water related measures across different sectoral components, including mitigation and adaptation (pp 22-39). The second element examine the inclusion of integrative measures such as integrated water resource management or basin planning (pp 40-50). The third element explores the gaps and opportunities for improvement that emerge from this round of NDCs (pp 51-54). Finally, the last element, found as Examples within blue boxes throughout the report as well as Annexes 1-13 are measures or provisions that have been taken directly from the country NDCs. This has been to illustrate the breadth of measures in an easy-to-read manner.

Methodology

An analysis of enhanced NDCs was undertaken to determine whether water and water-related activities have increased in prominence compared with the respective first iterations. Such analysis also helps to identify opportunities for further improvements in future NDCs as well as activities that can be undertaken in support of countries implementing their submitted NDCs. Similar types of analysis have been undertaken by WWF in respect to NBS in the most recent iteration of NDCs (WWF, 2021).

The focus of this report's analysis is on the NDCs from 114 non-Annex 1 countries, most of which are developing countries or middle-income countries. This focus was deliberate as it is predominantly non-Annex 1 countries which include water-related measures or vulnerabilities in their adaptation and mitigation provisions. This stands in contrast to Annex 1 countries, whose NDCs are mainly concerned with outlining their mitigation and emission reduction targets. When water-related activities are included in Annex 1 NDCs, such provisions are generally concerned with the inclusion of mitigation targets for water-related ecosystems such as wetlands, or through wastewater emission reduction targets, as opposed to adaptation or resilience-building measures. In addition, the NDCs of Annex 1 countries rarely include statements on vulnerabilities or impacts from climate change in their NDCs and therefore there is less contextual information for understanding why included measures were deemed necessary or relevant as a contribution or commitment.

As well as the focus on non-Annex 1 countries, the report focused on NDCs that were released in the three years from January 2019 to January 2022 as part of NDC enhancements; therefore, not including earlier NDCs from the first round in 2015-2018 as a placeholder in case no enhanced NDCs were available. This is because results from the most recent iterations of a party's NDC are more strongly indicative of current trends and will capture contemporary perspectives around water. Examples of contemporary perspectives that may have gained currency include the specific use of the term NBS, discussed in the results. In addition, in most cases the enhanced NDC was significantly different from the first NDC, calling into question the value of using earlier NDCs as placeholders, although this issue was less apparent when it came to mitigation targets.

Across the 114 NDCs assessed for this analysis, there is a wide variety of approaches, lengths, frameworks, and structures. This is not surprising as there are

few requirements on what is included within an NDC, except for the inclusion of emissions targets and the underlying restriction that longer-term NDC processes anticipate the evolution of commitments whereby ambition by a party must be progressively increased over successive NDCs as well as some reporting requirements through the Katowice rulebook. Due to this significant range, styles, and contents of available NDCs, the methodological approach was relatively simple, and similar to other such exercises being undertaken by international organizations in respect of key issues. It comprised three parts, listed below.

Step 1. Identify references to water and water-related activities

We reviewed the texts of the updated and new NDC documents, focusing on countries' most recent submissions. In each NDC, we looked for references to water and water-related activities and terms. These included: “water”, “hydro”, “lake”, “river”, “basin”, “catchment”, “watershed”, “nature-based solutions”, “NBS”, “ecosystems”, “forests”, “wetlands”, “mangroves”, “agriculture”, “peatlands”, “oceans”, “deforestation”, “afforestation”, “restoration”, “marine”, “irrigation”, “wastewater”, “sanitation”, “hygiene”, “green infrastructure”, and “ecosystem-based”.

These searches were limited to the published NDC documents and did not include material from background documents, NAPs, and so on, even when referenced in the text. The reason for this was twofold: limitations on research capacity and, more importantly, recognition that the NDC is available publicly and to a wider audience and is, therefore, a more important expression of the commitment that a party is making compared with supporting documents that are less accessible.



Restoration of the Alviso Marsh wetlands, San Francisco Bay, USA. Source: Shutterstock.

Step 2. Assess references to water and water-related activities

Following identification using the reference word list, we then extracted relevant information from each party when references were found (see Step 1). These references were then grouped and structured according to sectoral categories found in *Water Interactions for Consideration in NDC Enhancement and Implementation (2020)* prepared by the United Nations Development Programme (UNDP) and Stockholm International Water Institute (SIWI) *Water Governance Facility (WGF, 2020)*, as well as general categories of *General Water Management and Impacts and Vulnerabilities* to capture overall approaches to water resource management. Within each category, water-related contextual information, policies, measures, and targets were assessed against stated impacts and vulnerabilities, and the broad level of inclusion of water in that sector. In terms of this information, each sector was graded across a very simple system of 0 to 3, with 0 = no consideration, 1 = limited consideration as the topic was raised but without support or detail, 2 = one aspect was covered in some detail or multiple sectoral aspects had light detail, and 3 = one or more topics about the sector were covered in depth and the NDC had multiple water-related policies, measures, and targets in the sector.

Step 3. Assess further NDC aspects

These included whether water and water-related activities were found in both climate change mitigation and adaptation sections; whether there were measurable and time-bound numeric (quantitative) targets; whether there were direct water connections to cross-cutting issues such as gender; whether there were estimated budgets for adaptation and mitigation activities; and the level of integration with other international conventions and relevant national policies. In terms of the last, these were primarily connections to the Sendai Framework for Disaster Risk Reduction or the SDGs, but other international conventions such as Ramsar⁴ were noted as appropriate. As well as categorizing water activities across sectors, specific keyword searches were undertaken for terms and concepts associated with understanding water-related interactions and/or contemporary issues. These included integrated water resource management (IWRM), nature-based solutions (NBS), ecosystem-based adaptation (EBA), basin/watershed/catchment planning, water pollution, water governance, and water security.

Following the initial analysis, nine criteria were then applied to aid understanding of how water and water-related activities had changed across the various iterations of an NDC, whether from a country's initial plan to enhanced, or from the first to the second NDC. The following criteria were applied.

⁴ The Ramsar Convention on Wetlands.

- Criteria 1: Recognizing a wider range of water-related risks and vulnerabilities relative to the first NDC.
- Criteria 2: Increased frequency of water-related references relative to the first NDC.
- Criteria 3: Increased or new recognition of IWRM or similar.
- Criteria 4: Increased or new recognition of water-related interactions with agriculture, energy, urban planning, etc.
- Criteria 5: Increased or new specific recognition of catchment or watershed-based activities.
- Criteria 6: As appropriate, recognition of transboundary interactions.
- Criteria 7: Increased or new recognition of cross-cutting issues with water, e.g. gender or human rights.
- Criteria 8: Increased or new recognition of indicators or targets associated with water-related activities.
- Criteria 9: Specific linkages to the SDGs or Sendai Framework.

A classification of water-related measures was also undertaken, using a similar categorization to that given in WWF (2021) in terms of the types of measures being preferred in the NDCs, including policy, management, investments in technology, and so on. This was done at broad levels to assess the type of support that is preferred at national or regional levels, and potentially to lead support from partnering entities.

Variety among the different NDCs makes full comparisons in terms of the ambition or level of inclusivity between NDCs very challenging. This difficulty is compounded by an ongoing lack of metrics that can be consistently applied when assessing water resource management activities across international water processes. While there may be some metrics that could be applied, such as indicators through better referencing of the SDGs, such metrics are rarely used or noted within enhanced NDCs, except in a generic sense. Several countries included some baseline hydrological information in their NDCs that would help determine the strength of their ambition, but this was very rare. This is not just an issue for the water community but is applicable to adaptation in general in that there are few easily measurable, fungible, comparable, or broadly acceptable metrics in adaptation, especially when compared with mitigation that is focused on reducing emissions.

Finally, it is noted that the methodology used for this assessment meant that it is difficult to assess whether the prominence or prevalence of water-related measures increased relative to the prominence of other sectors such as energy and agriculture, and has instead treated water-related contents on their own merits.

Overall results

Examination of 114 enhanced or new NDCs by developing countries lodged in 2021 and 2022 showed there are clear differences between initial and enhanced NDCs for most countries, including increased references to water-related activities and measures. Differences range from the inclusion of more sectors, increased measures and targets for existing sectors, increased emissions modelling, and content regarding increased consultation and engagement. Specifically in terms of water, approximately 85 per cent of the NDCs included increased references to water and water-related activities, including within mitigation sections, although this trend in mitigation was less pronounced and limited mainly to wastewater, forestry, and ecosystem-based measures as opposed to direct connections to water.

Based on the available NDCs, including analysis of those NDCs lodged prior to 4 January 2022, extensive differences also remain between the NDCs prepared by Annex 1 countries and non-Annex 1 countries. Developed countries continue to have a strong emphasis on mitigation targets and proposed levels of emission reductions, with few adaptation-related targets, whereas developing countries have a stronger mix of adaptation and mitigation activities. Earlier mitigation components have expanded within NDCs compared with earlier NDCs formulated by the same party. This means that several NDCs prepared by Annex 1 countries (e.g. Norway) include specific entries around water or water-related activities, but this remains rare, thereby supporting the methodological approach taken.

General connections between the enhanced NDCs and SDGs were made by most countries. Specific references to SDG 6: Clean Water and Sanitation were found in approximately 35 per cent of enhanced NDCs. References to the Sendai Framework, especially in the context of climate vulnerabilities, were found in approximately 30 per cent of enhanced NDCs. However, despite the increased recognition of such connections with other global processes compared with the first round of NDCs, little effort has been made to specifically align with SDG targets and indicators, whether as an evaluative tool or as a measure of progress. In addition, as noted previously, very few NDCs included baseline information that could be used to clearly connect with the targets and indicators of the SDGs, or between the impacts and vulnerabilities listed in the NDC and the proposed measures as a response to those impacts and vulnerabilities.

The role played by water in national economies was increasingly recognized in most NDCs, manifested mainly through an increased number of measures. Most enhanced NDCs include a wider range of sectors and measures compared with their

first iteration, with investments in different water-based approaches in infrastructure (both grey and green), technology, and water management measures being regularly included. Some countries (i.e. Jordan and Panama), explicitly outlined the central role of water in their respective economies and in their response to climate change.

Examples of Country NDC provisions outlining central importance of water:

Jordan: *Water is the defining sector for adaptation to climate change. Being one of the world's most water-scarce countries, the multiplier impact of climate change will only add to the complexity of the water demand management challenges Jordan has been facing and will continue to face.*

Panama: *By supporting logistics, transportation, and financial services, water management is key to the socio-economic and environmental functioning of the country.*

Most water-related measures or targets remain general or open-ended rather than being measurable or specific. A few enhanced NDCs did attempt to provide more specific measures in terms of activities but still did not provide information on baseline conditions, so it was difficult to ascertain the level of commitment. This was a very strong trend across almost all NDCs, especially in terms of adaptation activities, and continues a trend found in the first NDCs. In contrast, most NDCs included quantifiable mitigation targets around energy; waste; transport; agriculture, forestry, and other land use (AFOLU); and agriculture. Many of these include specific activity targets in the forestry, wastewater, hydropower, and ecosystem sectors.



The water stressed landscape along the Jordan River, Jordan. Source: Shutterstock.

Few states include specific baseline information on water-related elements such as access to improved water or sanitation, percentage of wastewater treatment, or other indicators that can be used to understand the impact of the commitments being made by the respective state. This trend was found in the first round of NDCs and has unfortunately continued in the enhanced NDCs. SDG indicators have been prepared to enable monitoring of progress in development issues but could also be used to assess the strength of the commitments made by countries. While not all such indicators are suitable for inclusion in an NDC, especially given that the achievement of some indicators will be affected by climate change, more inclusion of such targets is important for the continued maturation of the NDC process.

The extent to which water-related adaptation measures reduce vulnerability, increase resilience, or respond to extreme or longer-term hydrological changes can only be evaluated against the existing context, but such baseline information was rarely included in the NDCs. Similarly, while some countries linked activities in their NDCs with SDG goals and ambitions, such connections were generally only stated and not demonstrated by specific quantitative or narrative targets. Ensuring that specific connections are highlighted may be a useful avenue for the future development of NDCs and can make the process of assessing contributions/ commitments more accessible or possible.

One significant exception to this was the NDC submitted by Ethiopia, which chose to include information about baseline conditions as well as targets. This approach was used across all adaptation sections. Important water-related examples include the expansion of watershed management from 2.24 million ha (2018) to 10 million ha (2030), increases in per capita potable water supply from 19.36 to 25 litres per capita per day (rural), and from 50 to 100 litres per capita per day (urban), improvements in service provision, assessments of surface and groundwater, etc. This is useful as it can give more information on the scale of commitments and allows for monitoring of progress. It is important that action is undertaken that addresses these key areas to help countries continue to enhance their NDCs, secure finance, and integrate water more widely in international processes.

Increased ambition – the main driver of national investment in the process of preparing enhanced NDCs – has varied significantly among the differing NDC countries and is left to contributing countries to determine. Increased ambition might be the inclusion of more sectors within the NDC, an increased number of targets, increased intensity of emission targets, the inclusion of numeric targets, increased stakeholder engagement and consultation, and other activities, when compared with earlier NDCs. Many NDCs noted the sectors or approaches in which they showed increased ambition. While not common, a water section was specifically included as part of ambition-raising in several NDCs, including Nigeria. Approximately one third of NDCs included estimated budgets for carrying out sectoral mitigation activities, although only 20 per cent included estimated budgets for carrying out sectoral adaptation activities.

Water and mitigation

In line with the United Nations Framework Convention on Climate Change (UNFCCC) Synthesis report published in September 2021, (UNFCCC, 2021) this report noted that all countries have included mitigation activities and targets. Overall, mitigation measures have seen substantive expansion across most enhanced NDCs, including modelling components, but adaptation measures also increased in frequency and depth of content, and the adaptation components still contain the most content relating to water.

Mitigation sections often include the increased use of modelling, especially regarding mitigation and emissions reduction, but in respect to water there is little in the way of modelling and few targets are being set for water-related commitments. In addition, mitigation sections include no information about potential risks to the completion of other mitigation or adaptation activities. It is recognized that the modelling included in the NDCs will be supported by reports that include more detail about modelling, but the NDC itself has insufficient detail to consider the local impacts of any increases in mitigation activities. For example, if there is a shift in the proportion of forests, what impact will this have on environmental aspects such as hydrological conditions that affect other sectors.

In terms of direct water connections, most mitigation measures do not account sufficiently for water-related aspects, despite having potentially significant impacts on local and regional water resources. Most significant mitigation activities are either reliant on water resources, thereby affecting the implementation of other adaptation or mitigation activities also reliant on the same water resources, or can have a significant impact on hydrological systems, such as forestry activities. Despite such potential for substantial impact on water resources from successful implementation of mitigation and adaptation connections, these connections are often hidden and not explicitly addressed in the examined NDCs.

Most mitigation sections included an increased role in emissions reduction for ecosystems such as wetlands, peatlands, seagrasses, forests, and mangroves in tropical localities. Sixty per cent of enhanced NDCs included such ecosystem-based measures.

Wastewater measures and commitments were found in 32 per cent of NDC mitigation sections, although the number of NDCs including wastewater (whether mitigation or adaptation measures) was much higher at 64 per cent. The emission reduction potential of wastewater was recognized in many of these NDCs but few

included targets since many had not been able to fully outline their present situation around wastewater emissions. On many occasions, while wastewater improvement was considered important for both mitigation and adaptation, most NDCs from non-Annex 1 countries were more concerned with including wastewater within their adaptation activities as a climate response, such as reducing health risks from wastewater leakage or poor-quality sanitation, rather than being included as a significant component of mitigation planning.

Forestry activities were the next most common water-related activity found in mitigation sections, with 63 per cent including forest-based measures and targets, although direct connections to water were not noted. Agricultural measures were found in 51 per cent of assessed mitigation sections, although mitigation activity targets were low.



Coffee agroforestry plantation, Ecuador. Source: Shutterstock.

Solid waste management activities and measures were also very common and found in 57 per cent of assessed NDCs. In terms of energy, the focus in many NDCs was on energy efficiency or changes in the generation mix across the energy sector as opposed to water connections, but hydropower activity measures and targets were found in approximately 22 per cent of NDCs. However, few of these activities noted impacts or reliance on water resources.

Probably the largest shift in terms of water-related mitigation measures has been in the much higher recognition of ecosystems playing a role in overall emissions reduction. Approximately 60 per cent of NDCs contained ecosystem-related measures, mainly around forestry. Forests, the blue economy including coastal ecosystems (especially mangroves and seagrasses), and wetlands were the most

recognized ecosystems, although others included lagoon and soil ecosystems. Very little attention was paid to rivers or lakes, except for major systems such as the Aral Sea or Lake Chad, despite growing awareness of their potential for emissions from polluted waterways.



Abandoned ship on the shore of the drying-up Aral Sea, Kazakhstan. Source: Shutterstock.

Outside of ecosystem-related, wastewater, and hydropower mitigation activities, direct water-based mitigation measures were very few; for example, water efficiency actions that would reduce energy requirements whether in water supply or irrigation. There were very few direct water targets found in mitigation sections, although targets in respect of wastewater, forestry, and changes in energy mixes that included hydropower were found.

Specific mitigation targets or activities for the water sector based on the pumping and distribution of water were very rare. Several states (e.g. Jordan) did note that this source of emissions can be highly significant within various sectors such as agriculture and water supply, but any emissions considerations were generally included within electricity targets. It is recommended that mitigation deliberations should take better account of their impact on water and other important resources.

Of note is the increased recognition of co-benefits emanating from adaptation measures and vice versa being listed in most NDCs, a change also recognized by the UNFCCC within its Synthesis Report (UNFCCC, 2021). This includes water-related activities such as afforestation, reforestation, protection of wetlands, increased roles for mangrove forests as part of blue carbon/blue economy measures, and the use of NBS or EBA were examples of activities that have benefits for both adaptation and mitigation. But while many NDCs noted the co-benefits of mitigation activities for adaptation, no NDC recognized potential risks around ‘mal-mitigation’, where mitigation commitments have potential to negatively affect social vulnerabilities, local ecosystems and biodiversity, or adaptation efforts. Similarly, while co-benefits to adaptation were noted, co-benefits for, or dependencies on, other mitigation actions were rarely noted. While it is anticipated that implementation activities being undertaken in many countries may reveal the potential for mal-mitigation and fill in some of these gaps, it is not always clear that this will be the case. While impacts on water resources are the chief concern of this review, other sectors such as ecosystems, agriculture, and energy may also be affected by similar issues in terms of mal-mitigation.

Examples of mitigation measures included in enhanced NDCs:

Belize: *Protection and restoration of mangrove and seagrass ecosystems not only provides emissions reductions benefits, but will also ensure Belize is better placed to protect vulnerable communities and their livelihoods, safeguard its rich biodiversity, and develop sustainably.*

Cabo Verde: *Improving water security and natural replenishment while reducing water carbon intensity*

Chad: *Mitigation measures will be integrated in terms of wastewater treatment and use of solar energy for extracted water, which can reduce emissions.*



Solar-powered water pump. Source: Shutterstock

Water and adaptation

General water and climate adaptation management goals

Overall, a broad spectrum of measures address water resource management, with common policy responses including an increased role for IWRM activities, increased focus on water efficiency improvements, increasing knowledge regarding water resources, increasing water storage potential, the need to increase water security, and increased attention on basin or watershed planning, among others.

Almost all NDCs evaluated in the study included material such as water resource management measures, water-related impacts and vulnerabilities, and institutional and policy responses to climate change, along with a need to increase capacity to address such challenges. Approximately 57 per cent of the NDCs include a high recognition of water resource management, with only a very small number (approximately 5 per cent) not including references to water resource management. In all, 66 per cent of NDCs from Sub-Saharan Africa (SSA) and 62 per cent from the Middle East and North Africa (MENA) regions contained high recognition, while NDCs from Eastern Europe had a much lower proportion (29 per cent) that recognized water resource management.

Institutional responses were a common feature, with institutional strengthening and changes to the water policy landscape included across many NDCs, although direct references to water governance were rare. Water pollution was raised as a concern in 32 per cent of NDCs, often in concert with wastewater measures, but other sources of water pollution were noted. Groundwater resource measures were included in 42 per cent of NDCs, illustrating a growing awareness of the need to better manage these water resources. Water demand management was specifically referred to in approximately 20 NDCs (18 per cent), mainly in adaptation as a response to climate risks. In addition, alternative water sources such as rainwater harvesting were identified as opportunities for water supply and agricultural management.

Finally, the financing of water resource activities, whether soft or hard measures, continues to be a key issue for the sector, but this was a key issue in NDCs as a whole and not just within the water sector. Many NDCs specifically noted the need for more financing options or the development of new instruments to finance adaptation and mitigation activities.

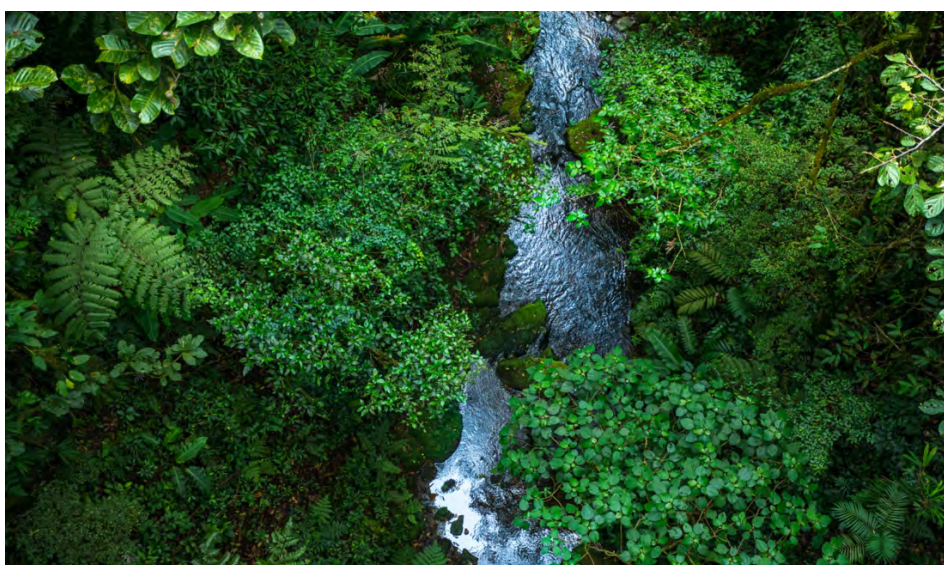
Very few specific targets or measures were included in terms of general water management, with the exception of the NDC from Ethiopia. There were other exceptions where NDCs included a target for the preparation of specific documents, processes, or guidance within the lifetime of the NDC, such as building standards or, in respect of basin planning activities, a target number for the preparation of basin plans during the timeframe of the enhanced NDC. Other targets of this nature included commitments to introduce national guidelines on the use of NBS across different sectors.

Examples of general water management measures included in enhanced NDCs. More examples can be found in Annex 2.

Colombia: *Promote the management of projects that allow advance knowledge of the effects of climate change in water resource availability. It is necessary to improve the estimation of the sector's water demand to improve its information, as well as to promote, design, and apply incentives for its efficient use and reuse that contribute to the management of climate change.*

Costa Rica: *By 2030, water security and sustainability will have been promoted in the face of climate change, as well as the adequate and integrated management of hydrographic basins, through the protection and monitoring of sources, considering both surface and groundwater.*

El Salvador: *Prioritization of hydrographic regions and hydrographic basins susceptible to the effects of climate change and with a higher proportion of protected natural areas; for example, Ramsar sites, biosphere reserves, and landscape-scale conservation areas, with greater importance for the protection of the bodies of surface and groundwater.*



River flowing through the Cloud Forest of Monteverde, Costa Rica. Source: Shutterstock.

Impacts and vulnerabilities

Most enhanced NDCs significantly increased information around their vulnerabilities to the impacts of climate change on key national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. They generally included qualitative information on the likely effects of climate change on key sectors as well as the vulnerabilities to flooding or drought, although this remained limited. Risk assessments, including assessment of cross-sectoral risks, increased in frequency.

While water-related impacts and vulnerabilities within NDCs increased in scope and scale, they remain generic rather than being detailed as specific challenges that a party intends to address. Few countries included quantitative analysis of projected changes in terms of water resources in their vulnerabilities, with most vulnerabilities being expressed in qualitative terms. This could be for a host of reasons including a lack of hydro-meteorological data. A small number of countries did note some anticipated changes around per capita water supply due to climate change impacts, but this type of recognition was rare.

One observation is that few adaptation measures respond directly to the specific water-related impacts and vulnerabilities outlined within an NDC, and **there appears to be no strong connection between the scale of the vulnerability and the strength or scope of the responding commitments**, apart from a general sense of direction towards addressing the risk. This lack of specificity is in keeping with the general approach to adaptation found throughout the NDCs, where the focus is on identifying general measures or approaches as opposed to the inclusion of specific targets. Because of this general approach, there are difficulties in evaluating the strength of the response to the identified vulnerabilities, thus informing climate risk. Further analysis may be required to confirm this observation.

Overall, approximately 43 per cent of the assessed enhanced NDCs contained reasonable detail around impacts and vulnerabilities in terms of water, while in contrast approximately 21 per cent of the assessed enhanced NDCs did not include detail, even if water related activities were later included. Details include information about the sectors that are likely to be most affected, the type of risk, and the extent of the possible change, and connections between measures and the vulnerabilities that they are meant to address. The proportion of NDCs with detail on impacts and vulnerabilities was higher from SSA (57 per cent) and MENA (54 per cent), while it was lower in NDCs from Latin America and the Caribbean (LAC, 28 per cent) or Eastern Europe (29 per cent).

References to and connections with disaster risk reduction (DRR) and the Sendai Framework were contained in 30 per cent of non-Annex 1 country NDCs,

although only a few covered DRR in detail. While 30 per cent was an improvement compared with earlier iterations of the NDCs in terms of starting to recognize DRR within policy approaches, given that almost no parties referred to the Sendai Framework previously given its newness at the time, it appears that there is more work to do around communicating and responding to climate change risks in future NDCs.

Water supply, sanitation, and hygiene

There was much greater consideration of water, sanitation, and hygiene (WASH) activities across the enhanced NDCs, especially compared with the first version of countries' respective NDCs. Risks to water supply were more regularly noted in an enhanced NDC, while the prevalence of sanitation concerns increased markedly to approximately 45 per cent of assessed NDCs. This includes specific reference to WASH or those references to water supply and sanitation that are mainly concerned with expanding coverage and access.

The number of countries that included WASH measures more than tripled to 45 percent compared with the first round of NDCs (15 per cent), **reflecting a greater awareness of the connection between WASH and climate change as well as an emerging consensus that WASH-related infrastructure is under threat from climate change.** Multiple NDCs noted risks to water supply from inadequate wastewater measures, as well as the ongoing risk to WASH service provision from extreme events such as droughts and floods. In terms of targets or indicators, most NDCs did not include specific targets or measures. While water resource management concerns were recognized in the first NDC, there were not similar levels of attention around WASH in these first iterations and this situation continues.



Drinking water manhole cover. Source: Shutterstock.

Overall, approximately 42 per cent of enhanced NDCs contained reasonable detail around WASH in terms of water, while approximately 20 per cent did not include detail. The proportion of NDCs with detail around impacts and vulnerabilities was higher from LAC (56 per cent), MENA (54 per cent), and SSA (51 per cent), while it was lower in NDCs from Southeast Asia (30 per cent) and Eastern Europe (29 per cent).

Increasing access to water resources and water supply networks were the most popular types of measures found in 41 per cent of NDCs, followed by sanitation measures (mainly under the WASH classification) in 34 per cent of measures. General measures to increase climate resilience of water supply and WASH infrastructure were also popular, found in approximately 26 per cent of NDCs. Few NDCs had measures around water utilities, although this was included in Jordan's NDC. The following had the most complete measures regarding WASH: Albania, Benin, Burundi, Cambodia, Congo, DRC, Eswatini, Jordan, Lao People's Democratic Republic (PDR), Malawi, Tanzania, and Togo.

Examples of WASH measures included in enhanced NDCs. More examples can be found in Annex 3.

Angola: *WASH infrastructure, services, and behaviours are sustainable, safe, and resilient to climate-related risks. This goes hand in hand with the sustainable use, protection, and management of surface and groundwater resources, and resilient waste management.*

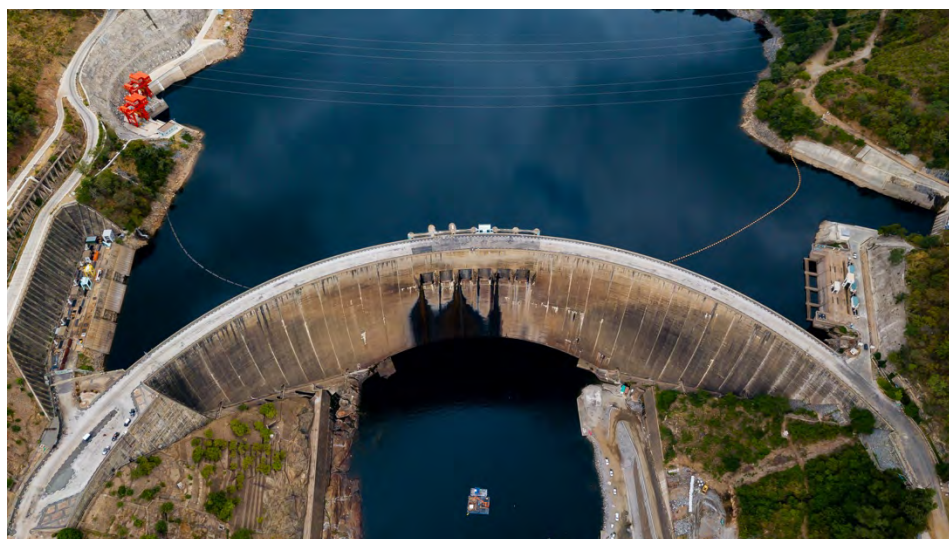
Congo: *Increase the climate resilience of water supply infrastructure by diversifying the sources of water supply for more than 50,000 people (rainwater, surface water, and underground waters).*

Sri Lanka: *Assessment and identification of priority domestic water supply and priority supplementary irrigation schemes to be supported by groundwater resources (by means of tube wells/deep wells) as a climate change resilience-building intervention by 2023.*

Energy and industry

A large proportion of NDCs included expansion of hydropower or hydroelectricity within their future energy profiles. This was most apparent in terms of mitigation because of the potential for emission reduction, but was also noted as a potential vulnerability to the impacts of climate change, such as in Zimbabwe, although very few explicitly considered the risk of hydropower not being feasible over the long term. Multiple NDCs noted the need for rehabilitation and improvement of existing infrastructure to retain or potentially increase generation potential as well as

a need to expand overall hydropower potential. Several states, including Zimbabwe, noted the need for better upstream land and water development to ensure present hydropower opportunities are maintained.



Kariba Dam in the Kariba Gorge between Zambia and Zimbabwe. Source: Shutterstock.

Most energy sections were concerned with multiple activities relating to the reduction of energy use, increased energy efficiency, and climate proofing but connections with water were rarely noted. **While energy targets were a common feature of most NDC mitigation sections, these did not include water-related components beyond hydropower elements.**

Overall, only 16 per cent of enhanced NDCs contained a reasonable level of detail around energy in terms of water interactions, 45 per cent had limited detail, and approximately 39 per cent of the assessed enhanced NDCs did not include material in terms of water-energy interactions. This was despite a higher inclusion of hydropower in many mitigation sections. Measures around hydropower/mini-hydropower were included in 29 per cent of adaptation sections as a climate response, which is slightly higher than the percentage of hydropower measures found in mitigation sections. General water-related renewable energy measures (including efficiency and water pumping options) were found in 22 per cent of NDCs. Specific references to the use of 'nexus' approaches were mentioned in three NDCs, although the nature of nexus was not always detailed.

It is noted that the energy sector analysis was limited to direct connections between water and energy and did not include consideration of biofuels, biomass, and fuel wood, but these components were included more in agriculture and forestry sections. Countries that incorporated more water-related energy measures in

adaptation, especially hydropower, in their NDCs include Cameroon, El Salvador, Eswatini, Jordan, Mozambique, Pakistan, Paraguay, South Sudan, and Tajikistan.

Examples of water and energy measures included in enhanced NDCs. More examples can be found in Annex 4.

Albania: *Transition process towards diversification away from hydropower and promote alternative sources of renewable energy: by 2030, 42 per cent of renewable energy in gross final energy consumption.*

Colombia: *Implementation of a pilot project, with potential for replicability at the national level for the electric power generation sector, in such a way as to reduce the vulnerability of the sector, ensuring the continuity and competitiveness of the generation of electric power with water sources in scenarios of water shortage, progressive increase in temperatures, and/or progressive reduction of rainfall.*

Lao PDR: *Hydropower reservoirs will be effectively managed and shared for multipurpose uses to enhance resilience of the surrounding communities and other sectors through improved flood and drought measures, improved productivity, and water use for recreation and households.*

Urban planning and regional planning

Across the enhanced NDCs there was limited attention on urban planning in terms of the impacts on water resources, although some countries (e.g. Jordan and Panama) mentioned urban planning and addressed its connection with water as an integral part of their response. In addition, some countries noted a desire to improve transport modalities by including river- and lagoon-based transport options. Many countries noted the need to increase solid waste planning options to mitigate emissions and reduce pollution, whether land or water based, but this was mainly in mitigation sections.

Overall, approximately 23 per cent of assessed enhanced NDCs contained reasonable detail around urban planning measures, while approximately 39 per cent did not include detail. The proportion of NDCs with reasonable detail around urban planning was higher in MENA (31 per cent) and SSA (29 per cent), while it was lower in NDCs from Eastern Europe (14 per cent) and small island developing states (SIDS, 11 per cent). Urban planning and development options that connect with water were included in 19 per cent of NDCs. Other measures were related to water transport (5 per cent), climate-proofing of infrastructure and building climate resilience in urban areas (14 per cent), and the use of green infrastructure (11 per cent). Many of these were very broad measures that lacked detail.

NDCs that contained a stronger consideration of water-related transport and urban development/planning components, including the role of green infrastructure, include Benin, Cabo Verde, El Salvador, Eswatini, Jordan, Liberia, Morocco, Myanmar, Nauru, Paraguay, and South Sudan.

Examples of urban planning measures included in enhanced NDCs. More examples can be found in Annex 5.

Antigua: *Climate-proofing identified public buildings to improve resilience to extreme climate events - including tropical storms, hurricanes, droughts and extended dry periods, floods, and rising air temperatures - and improve adaptation interventions during such events.*

Liberia: *Increase urban resilience through use of blue-green infrastructure in the five cities of Buchanan, Gbarnga, Gompa, Monrovia, and Paynesville by increasing the volume of runoff/stormwater captured by at least 10 per cent annually to 2030 and by increasing the number of rain gardens, cisterns, and other rainwater-harvesting installations in urban areas by 15 per cent annually up to 2030.*

Sri Lanka: *Introduce adaptation measures such as urban zoning incorporating disaster risk, forest parks, ground water recharge, air passages/wind corridors, wise use of wetlands, and roadside planting into urban planning to build resilience to climate change.*

Vanuatu: *Institutional and governance-related measures to protect climate-vulnerable urban water sources identified and implemented (e.g. legislating protection of watershed).*



Kalametiya wetlands bird sanctuary, Sri Lanka. Source: Shutterstock.

Agriculture and livestock

Water-related elements were a regular feature in agricultural sections, with multiple measures around irrigation, soil and water conservation, etc., often noted in the text. Most of the measures would be considered as responses to the impacts of climate change and as part of resilience-building as opposed to mitigating emissions. For example, irrigation water efficiency was generally seen as a response to hydrological changes.

Overall, approximately 32 per cent of assessed enhanced NDCs contained reasonable detail around agriculture in terms of water, while approximately 36 per cent did not include detail. The proportion of NDCs with detail around agriculture and water was much higher from SSA (54 per cent) while it was lower in NDCs from SIDS (22 per cent) and LAC (11 per cent). Irrigation efficiency measures were the most common, found in 40 per cent of NDCs, followed by references to climate-smart agriculture (or similar) in 26 per cent of NDCs. Crop shifts (18 per cent), livestock watering concerns (15 per cent), and soil and water conservation (12 per cent) measures were also regularly found. Biomass or biofuel measures (whether mitigation or adaptation) were found in 62 per cent of NDCs and could have significant impacts on agricultural measures.

Countries where NDCs contained stronger and wider-ranging water-related agricultural measures include Benin, Burkina Faso, Cabo Verde, Cambodia, Chad, DRC, El Salvador, Jordan, Malawi, Moldova, Pakistan, Sri Lanka, and Togo.

Examples of agricultural measures included in enhanced NDCs. More examples can be found in Annex 6.

Benin: *Realization of hydro-agricultural developments: development of 1000 ha of low bunds and 300 ha of small, irrigated perimeters, rehabilitation of 200 ha of land degraded by agriculture, construction of four water reservoirs.*

Jordan: *Reduce soil erosion through community management, use of EBA measures, and harvesting of rainwater among small farmers in rural areas.*

Malawi: *Conservation agriculture using crop residue and rotation. Support for and implementation of the planned expansion targets for crop residue and crop rotation to improve soil conservation, resulting in increase of soil carbon stock and improved crop yields.*

Zimbabwe: *Strengthening the resilience of agricultural value chains and resource-use efficiency is expected to reduce the sensitivity of the water, energy, waste, and biodiversity sectors to climate change and variability.*

Forests and other land use

Forests and activities regarding forestry were a common feature across the assessed NDCs, in both mitigation and adaptation sections, with 59 per cent including measures. States included a range of forestry-related measures including avoided deforestation; reforestation and afforestation; forest protection, restoration, and rehabilitation; and sustainable forest management. Measures to prevent forest fires or reduce their impact were found in 24 per cent of NDCs.

Overall, approximately 27 per cent of enhanced NDCs contained reasonable detail around forests and land use in terms of water, while approximately 41 per cent did not include detail. The proportion of NDCs with reasonable detail around forests was higher in LAC (44 per cent) and SSA (37 per cent), while it was lower in NDCs from SIDS (17 per cent), Eastern Europe (14 per cent), and MENA (8 per cent).

NDCs with extensive coverage of forests and land use included Albania, Belize, Benin, Chile, DRC, El Salvador, Moldova, Myanmar, Nigeria, and Pakistan.

Examples of forest measures included in enhanced NDCs. More examples can be found in Annex 7.

Burundi: *Rehabilitate gradient backgrounds in Mimirwa and the Bugesera 9000 ha afforestation created and/or restored and 18,000 ha of watershed protected against erosion.*

Chile: *Under this focus, newly planted forests will both confront climate change and meet numerous complementary objectives through the provision of diverse environmental services including, among others, soil protection, improvement of basins' water regulation, production of timber and non-timber goods, reduction in the severity and extent of forest fires and other natural disasters, biodiversity conservation, provision of sociocultural services, support for the development of associated communities, and reduction of poverty.*

Samoa: *Managing forests responsibly and promoting afforestation is expected to moderate stream flow (reducing the risk of riverine flooding and drought), protect indigenous ecosystems, preserve cultural values, and maintain the supply of non-timber forest products.*

Zimbabwe: *Increased forested land and forest plantations will lead to improvements in soil stability, soil quality, groundwater quality, regulation of surface runoff, etc., thereby decreasing the sensitivity of all sectors that rely on these ecosystems.*

Ecosystems and biodiversity

Across the whole set of NDCs, the inclusion of ecosystems and activities that build on ecosystem services saw the greatest relative increase in policies, measures, and targets between the various iterations of countries' NDCs. This was apparent in both mitigation and adaptation sections. In the case of the former, there was a strong recognition of the role of water-related ecosystems such as wetlands (primarily peatlands and mangrove forests) in the NDCs, especially in terms of being used as NBS for the mitigation of emissions. Of the countries expected to have mangrove-related components, close to 60 per cent of these countries mentioned mangroves within their NDCs. Such measures were often connected to a desire for a better understanding of the role and potential of blue carbon or the blue economy for addressing climate change, whether mitigation or adaptation. Several countries have stood out in this regard, including Costa Rica, Honduras, and others in LAC, as well as increased scrutiny seen in SIDS. Measures recognized both the adaptation and mitigation potential of ecosystems, with many noting the need to restore and rehabilitate ecosystems as a response to the impacts of climate change, better recognizing the suite of services that intact or modified ecosystems provide.

Ecosystems measures were not the primary focus of this report, but a number of themes were identified. Firstly, there was increased recognition of the role played by ecosystems and biodiversity in providing services that will be impacted by climate change, and that there is a need to build ecosystem resilience to climate change. Secondly, there was increased recognition of the role of tools such EBA, biodiversity planning, and landscape approaches in helping to rehabilitate or restore ecosystems as well as a need for greater protection, including the use of protected areas. **However, freshwater-based ecosystems beyond wetlands, lagoons, mangroves, and riparian zones, such as rivers or lakes, were very rarely mentioned, although references to watersheds as units were common. Ten countries specifically mentioned freshwater ecosystems and/or aquatic ecosystems, which would be more inclusive of rivers and lakes and their biological communities.**



Mangrove forest, Belize. Source: Shutterstock.

Overall, approximately 42 per cent of assessed enhanced NDCs contained reasonable detail around ecosystems in terms of water, while approximately 22 per cent did not include detail. The proportion of NDCs with detail around ecosystems was higher in MENA (62 per cent) and LAC (56 per cent), while it was lower in NDCs from SSA (40 per cent) and Eastern Europe (14 per cent).

Measures and detail around wetlands were found in approximately 49 per cent of NDCs. Measures around mangroves were found in approximately 60 per cent of countries hosting mangrove ecosystems. Marine ecosystem references and measures were found in 67 per cent of those countries with coastal areas, while only 35 per cent of NDCs contained material relating to the ocean.

NDCs that contained extensive material around ecosystems, the blue economy, ecosystem-based adaptation, or NBS include Albania, Belize, Cabo Verde, Chile, Costa Rica, El Salvador, Eswatini, Indonesia, Jordan, Mauritius, Morocco, Myanmar, Nauru, Panama, Paraguay, and South Sudan.

Examples of ecosystem measures included in enhanced NDCs. More examples can be found in Annex 8.

Argentina: *The country recognizes the importance of ecosystem-based adaptation and promotes its inclusion as a fundamental support for the conservation, restoration, and sustainable management of ecosystems, especially native forests, wetlands, peatlands, natural grasslands, and other ecosystems with significant carbon content, contributing to the absorption and storage capacity of carbon, reducing vulnerability, and increasing the resilience of ecosystems and the communities that inhabit and depend on them.*

El Salvador: *Conservation, restoration, rehabilitation of one million hectares at the level of ecosystems and landscapes; working on the drivers and causes of deforestation and ecosystem degradation; and promoting the transition towards sustainable agroecosystems.*

Nigeria: *A range of NBS and measures in the water sector have been considered as part of this NDC update. For example, in the water sector, measures such as protecting and restoring degraded watersheds and wetlands to protect water resources and related ecosystem services will help to enhance carbon sinks.*

Panama: *Plans will emphasize the application of NBS, which will result in increased resilience in prioritized watersheds, reduced emissions, and increased carbon storage through reforestation, afforestation, restoration of soils, sustainable management of forests, and the conservation of forest carbon stocks.*

Cross-cutting (gender)

The UNFCCC Synthesis report (UNFCCC 2021) noted increased attention paid to the interactions between gender and climate change in the NDCs. This attention to gender included more detail about specific vulnerabilities and risks as well as different gender-based assessments and activities. Similarly, enhanced NDCs also included more detail and measures about gender and water, including through measures designed to reduce gender-connected water risks, although this was not as frequent as generic gender connections to climate change impacts. **Of note was an increased recognition that gender-based concerns need to be addressed within decision-making and overall governance processes, as well as the need for more emphasis on consultation and engagement, although this was not specific to water.**

Examples of water-related gender measures included in enhanced NDCs. More examples can be found in Annex 9.

Georgia: *Georgia further considers the empowerment of women as agents of change through their participation in decision-making processes related to energy efficiency measures and efficient use of water resources in households.*

Guinea-Bissau: *Incorporating gender facilitates sustainable exploitation and integrated water resource management, as women are at the forefront of distributing this resource for domestic use.*

Suriname: *Awareness-raising programme on the impacts of climate change on water resources and management of these impacts, including from gender perspectives.*

Tajikistan: *Taking into account social and gender issues related to water access and management.*

Zimbabwe: *Zimbabwe will promote the use and roll-out of gender-sensitive climate-smart agriculture technologies and practices such as land and water resources conservation, sustainable mechanization, agroecology, and water-efficient irrigation.*

Cross-cutting (Indigenous Peoples)

Approximately 31 countries included measures and activities relating to the inclusion of Indigenous Peoples, tribal groups, ethnic minorities, and other groups, or the use of indigenous knowledge, most notably in Latin America and Southeast Asia. **Despite increased inclusion, specific measures relating to indigenous peoples and water were few, but some countries (e.g. Belize, Costa Rica, and Venezuela)**

chose to include indicators or measures that helped with understanding the impact of climate change and climate change responses on Indigenous Peoples. However, even where references to Indigenous Peoples were included, these were rarely in specific connection with governance, including water governance or water resource management. Most often, Indigenous Peoples were seen as a stakeholder to engage with, a source of knowledge, or the focus of their inclusion was on their vulnerability to climate change or marginalized status.

Examples of water-related measures that referenced Indigenous Peoples included in enhanced NDCs.

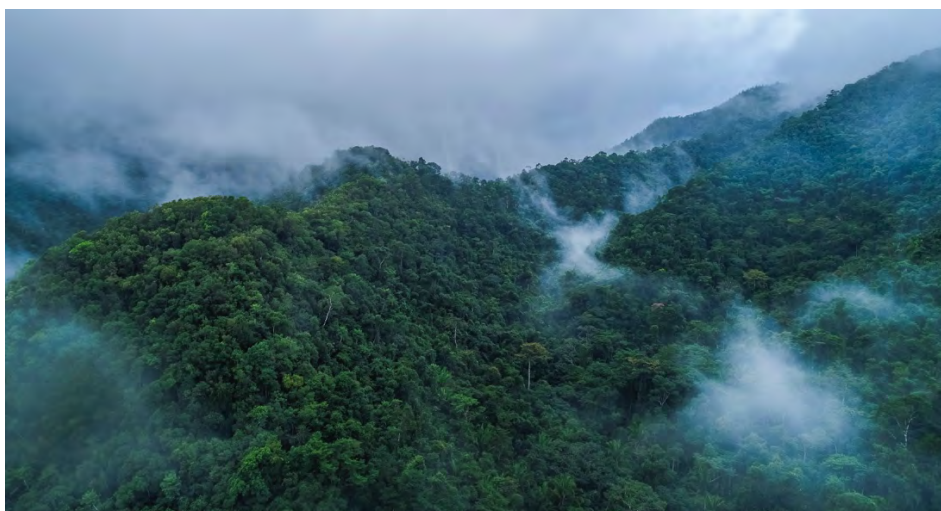
Belize: *Promote and monitor the stewardship of 10,000 ha of local community and Indigenous People's lands as sustainably managed landscape to serve as net carbon sinks.*

Indonesia: *Enhance conservation education, including engaging Adat communities for indigenous knowledge and local wisdom.*

Liberia: *Develop a national plan for ecosystem-based adaption in forests, coastal zones, and urban green corridors, ensuring integration of local and indigenous knowledge, cultural systems, and gender and youth considerations into adaptation plans by 2030.*

Nepal: *Ensure fair and equitable benefits (carbon and non-carbon) from sustainable forest management, watershed management, and biodiversity conservation among local communities, women, and Indigenous Peoples.*

Paraguay: *Promote the exchange of sustainable productive practices carried out in ecosystems, taking into consideration the knowledge and vision of Indigenous Peoples and local communities.*



Rainforests of Belize. Source: Shutterstock.

Cross-cutting (capacity-building and monitoring)

Most of the NDCs included water-related capacity-building. While capacity-building activities were widespread across NDCs, several NDCs also included specific water-related capacity-building activities measures concerning government institutions or community activities.

Institutional strengthening of institutions involved in managing water were common features of approximately 29 per cent of the NDCs. This points to increased recognition of the central role of water.

Examples of capacity-building measures included in enhanced NDCs.

Albania: *Support monitoring agencies in the design and performance of water quality monitoring in each wetland/lagoon to track impacts of climate change on abiotic factors (temperature and dissolved oxygen) to reduce risks through environmental quality monitoring methods and techniques.*

Benin: *Strengthening of the skills of the decentralized services of the Directorate General of Water to predict risks and manage hydro-climatic crises. Capacity-building in terms of taking into account issues relating to climate change in water resources management policies. Training of technical managers in the area of vulnerability of water systems to changes.*

Cambodia: *20+ Provincial Department of Water Resources and Meteorology staff, Farmer Water User Communities, and young-to-middle level Cambodian water professionals receive quarterly training in water resource management. Establishment of 252 knowledge hubs to build local understanding of water resources (water and soil), scheme conditions, and performance changes in agricultural inputs and outputs, etc.*

El Salvador: *Development of a system of training, monitoring, and development of competencies for the integral management of the water resource in its determined variables: basins, micro-basins, water systems, etc.*

Integrative approaches

As well as the increased inclusion of water measures across different sectors, enhanced NDCs also included more measures and activities that support integrated approaches to addressing water challenges both national and at subnational levels such as river basins. These include approaches or a focus on NBS, water governance, water security, and basin planning. Basin planning, or its equivalents, was found in approximately 60 per cent of enhanced NDCs.

Governance

Overall, references to water governance as a specific measure or activity were limited (appearing in approximately 12 per cent of NDCs) and more attention to this as well as adaptation and mitigation governance may be required in future iterations. Some countries made explicit references to water governance, including Cabo Verde, Colombia, and Congo, with others looking at changes within water-related institutions. New forms of water and climate change governance may be required over the long term, whether in the development of new institutions or through the evolution of existing ones (e.g. national or regional river basin organizations), as climatic impacts on water security will be strongly experienced at the local level and many of the requisite changes will be best addressed at this level. This was recognized quite widely in NDCs from LAC. Governance changes may be connected to the role of basin and watershed planning, which will be important in implementing national priorities at the local level. As well as a specific reference to water governance, other elements such as institutional strengthening were found in most NDCs.

The following examples are a small subset of measures that help to illustrate the diversity of approaches included across enhanced NDCs:

Colombia: *Through the implementation of the Water Governance Programme, it will be possible to strengthen the different actors related to IWRM in understanding and making decisions regarding the possible effects of climate change on water resources.*

Eswatini: *Create an enabling environment for the governance of WASH activities to promote resilience against climate change.*

Honduras: *Improvement of governance in adaptation to climate change in water management (micro-basin restoration, preparation and implementation of the National Water Plan and basin water plans; formation and strengthening of water management organizations).*

Vanuatu: *Institutional and governance-related measures to address water -climate vulnerability of rural communities in the six provinces identified and implemented (e.g. community water governance; water efficiency measures; development, implementation and monitoring of community drinking water safety and security planning).*

Nature-based solutions

A good example of shifting international conversations was the inclusion of NBS in NDCs. The concept was not used widely in the first version of most NDCs, although many NDCs included activities that would fall within the NBS concept. These include measures such as undertaking ecosystem management to support the provision of ecosystem services that mitigate carbon emissions, or the increased recognition of the role of ecosystem services in building local climate resilience. In this round, over half of the enhanced NDCs from developing countries used the NBS concept explicitly, whereas many others included activities that were ecosystem-based. Roughly one third were mainly concerned with mitigation, one third with adaptation, and one third with both adaptation and mitigation.

This focus on NBS was complemented by increased inclusion of material around the protection and enhancement of broad water-related ecosystems such as wetlands, peatlands, mangrove forests, seagrass meadows, and marine ecosystems. Measures around mangroves were found in close to 60 per cent of states that host mangrove ecosystems, with some countries seeing an extensive role for mangrove forests in their emission reduction plans. In terms of wetlands, 50 per cent of assessed enhanced NDCs included measures concerning wetlands and peatlands.

Specific references to NBS were found in approximately 45 per cent of NDCs, with particular hotspots in LAC. Ecosystem-based management was also included in approximately 31 per cent of enhanced NDCs. Green infrastructure measures were found in 11 per cent of NDCs, mainly regarding urban planning approaches. References and measures relating to the blue economy/blue carbon were found in 41 per cent of countries that have coastal areas.



Examples of NBS measures included in enhanced NDCs. More examples can be found in Annex 10.

Cabo Verde: *Improve the infiltration and replenishment of water resources through NBS such as soil cover for humidity, altitude moisture, and rain vegetative harvesting, slope stabilization, agroforestry, etc.*

Costa Rica: *During the period of implementation of this contribution, Costa Rica commits to promote NBS as a central pillar of its climate action and to include it in its public policies related to climate change.*

Malawi: *Elaboration of a portfolio of climate change adaptation priority actions for the key sectors aligned with sectoral planning and budgeting, using NBS and EBA.*

Nigeria: *Promote NBS for climate change mitigation and adaptation in the water sector by enhancing integrated approaches to the management of the country's freshwater ecosystems.*

Integrated water resource management

Many enhanced NDCs from developing countries included measures around IWRM, often in tandem with activities such as basin planning, watershed management, water security, and other measures. The number of countries including specific IWRM measures more than doubled compared with the earlier round of NDCs. This was most evident in SSA, where most enhanced NDCs envisaged a strong role for IWRM in addressing water-related challenges. Specific references to IWRM were found in approximately 51 per cent of NDCs, with particular hotspots in SSA. It is noted that IWRM is still used as a general framework as opposed to being applied to specific activities.

Examples of IWRM measures included in enhanced NDCs. More examples can be found in Annex 10.

Belize: *Design and implement an IWRM programme in watersheds to reduce the impacts of climate change, including the establishment of an IWRM agency.*

Rwanda: *The national framework for IWRM will be cascaded down to district and catchment levels. To this end, catchments committees and water-user associations will be established and trained at district level to cover all the 30 districts by 2030.*

Sierra Leone: *Improve institutional and functional capacities for integrated water management.*

Coastal waters

Another topic that has increased in prominence in the last couple of years is that of blue carbon and the blue economy, where the role of oceans, coastal areas, and marine ecosystems is identified increasingly as an opportunity for further action. **The blue economy and blue carbon were referenced in 40 per cent of coastal and island states' NDCs, while marine ecosystems were recognized in close to 70 per cent of NDCs from these same states.**

While the Intergovernmental Panel on Climate Change (IPCC) Synthesis report (UNFCCC, 2021) notes that many countries have outlined adaptation activities with mitigation co-benefits, it is notable that the list in that document includes few water-related activities or infrastructure measures, except for adapting coastal ecosystems.



Blue Bay Marine Park, Mauritius. Source: Shutterstock.

Examples of coastal water measures included in enhanced NDCs.

Belize: *Blue carbon, e.g. basin, fringe, and island mangrove and seagrass ecosystems, plays many important roles as an NBS to climate change with mitigation, adaptation, and resilience co-benefits.*

Costa Rica: *As an overarching ambition of its blue carbon goal, Costa Rica will continue to lead in the conservation, responsible use, and restoration of coastal wetlands by deepening scientific knowledge of the ecosystem services that these habitats provide, and will take steps to better protect and restore these spaces in the future.*

Mauritius: *Marine parks: establish an integrated framework for the management of fisheries founded in the blue economy concept, which includes coastal zone management and marine biodiversity conservation.*

Namibia: *As Namibia works to enhance its climate commitments and revise its NDC, there is an opportunity to explore blue carbon potential. In this update, Namibia seeks to highlight the integration of blue carbon in its future NDC revision process.*

Pakistan: *Prioritize the consideration of 'blue' NBS.*

Togo: *Creation of a ministry in charge of the blue economy.*

Water security

Another concept that has received increased recognition is water security. In the first round of NDCs, approximately 10 NDCs made specific references to water security, although it is recognized that countries included measures that would address water security without using the term specifically. In the most recent round, this number more than tripled to 30 per cent, most notably in LAC. Many of the new water security concerns and measures were closely connected to an increased focus on watershed or catchment management activities, which was once again very prominent in LAC. References to water security were found in 35 per cent of NDCs, most commonly in LAC, and within the NDCs of SIDS.

Examples of water security measures included in enhanced NDCs. More examples can be found in Annex 12.

Chile: *Water security: the instruments and measures arising from the implementation of this NDC shall favour water access in terms of proper quantity and quality, determined according to each basin's characteristics, for its maintenance and timely use for health, subsistence, socioeconomic development, and ecosystem conservation.*

Honduras: *Water security: ensure the availability of water resources and the sustainable and comprehensive management of water to meet the needs of the Honduran population; cover the reliable provision for the production of goods and services contributing to food security, health, and human well-being, the development of our ecosystems as well as the adequate maintenance of livelihoods, counting on the tools that allow the use of monitoring systems, projections, and forecasts for good water planning; financial support necessary for the implementation of policies that incorporate measures and actions for the comprehensive management of water resources in Honduras.*

Nauru: *Water security will be increased by the incorporation of water harvesting into new residential, commercial, and government development, as well as a modern water delivery and sewerage system.*

Sri Lanka: *Government initiatives such as the Mahaweli water security improvement programme, climate resilience improvement project, climate-resilient integrated water management project, strengthening climate-resilience for communities in vulnerable river basins, watershed areas and downstream of the Knuckles mountain range and Surakimu Ganga (protect our rivers) are some of the notable ones addressing water security among many others.*



Rainwater harvesting. Source: Shutterstock.

Basin planning

The NDCs are focused on national commitments and contributions, but it is recognized that many of these will be implemented at a sub-national level and that water impacts and vulnerabilities, as well as local responses, will differ markedly within different geographical regions within a given state. There are no requirements on national entities to provide sub-national details within the process, but an increased number of countries have chosen to do so, including Argentina, Colombia, and South Sudan. Sub-national entities will be affected by the way that national commitments are resourced and distributed to a local level, especially if there are multiple commitments reliant on the same resource. This has led to an increased recognition that activities such as basin or watershed planning will have in addressing commitments and inclusion of such measures.

Among water resource management actions, basin, watershed, or catchment planning were regular measures found in the first round of NDCs. They continue to be popular, with 57 per cent of enhanced NDCs from the recent iteration including such measures. They were often found in concert with other integrative approaches such as IWRM and

water security. It is clear from the descriptions of these measures that they are seen as a significant approach to implementing national commitments at sub-national level and further resources will be required. Several states included targets in terms of the numbers of plans expected to be prepared over the timeframe of the NDC, although these did not stipulate the contents of the plans or the locations of the plans.

Examples of watershed or basin measures and approaches included in enhanced NDCs. More examples can be found in Annex 13.

Colombia: *By 2030, watershed strategic plans for the management of water resources will be established, taking into account climate change adaptation in the country's 101 hydrological basins.*

Congo: *Water catchment improvements: protect water quality and moderate the extremely high and low flows of water resources using an integrated watershed improved management plan in watersheds (informed by monitoring of water resources).*

Morocco: *National watershed development plan: development of watersheds, fixation of ravines, and improvement of benefits to populations by measures against erosion to achieve the objective of 1.5 million ha in 22 priority basins (2015-2030).*

Tunisia: *Rural development integrated with basins and sub-basins that are vulnerable to climate change, depression (sebkhas), and flood regulation.*

Types of measures

As well as the focus on content, an effort was made to group the types of water-related measures included in NDCs. Types of measures include the following.

Policy and law: approximately 43 per cent of NDCs contained water-related measures that anticipate changes to policy frameworks or measures that seek to better implement existing water legislation. Higher proportions of water related measures around policy and law were found in LAC (56 per cent) and MENA (53 per cent).

Examples of policy and law measures included in enhanced NDCs.

Belize: *Undertake water policy reform including pricing and irrigation policies.*

Honduras: *In 2023, the national water policy will have been drawn up and the water authority created, in addition to the strengthening of the national meteorological network among all the institutions that generate hydroclimatic information.*

Management and planning: this was the most common type of measure found throughout the NDCs at 68 per cent. A wide variety of measures are captured within this type. Slightly higher proportions of water-related measures based on management and planning were found in SSA (74 per cent), LAC (72 per cent), and SIDS (72 per cent).

Examples of management planning measures included in enhanced NDCs.

Cabo Verde: *Cabo Verde undertakes to minimize technical and commercial water losses and to mobilize water supply using renewable energy to secure a sustainable and resilient water management system by 2030.*

Costa Rica: *By 2022, 120 associations of administrators of communal aqueduct and sewer systems will incorporate planning processes for comprehensive water management, with a vision of climate resilience.*



Solar powered water pumping station. Source: Shutterstock.

Financing options: financing continues to be a significant issue for the implementation of NDCs, but only 25 per cent of NDCs included measures concerned with improving the resourcing of water-related activities. Higher proportions of water-related measures around financing were found in MENA (38 per cent) and LAC (33 per cent).

Examples of financing measures included in enhanced NDCs.

Colombia: *Identify, promote, and develop mechanisms aimed at increasing investments in structural actions for adaptation to climate change for the water and basic sanitation sector.*

Lebanon: *Develop financing tools for the (water) sector to set-up financial mechanisms allowing the sustainability and the financial balance of the services.*

Capacity-building: most NDCs recognized there was limited local capacity to undertake measures, whether at national or local levels. Specific water-related capacity-building was found in 37 per cent of NDCs. High proportions of water-related capacity-building measures were found in LAC (56 per cent).

Examples of capacity building measures included in enhanced NDCs.

Congo: *The strengthening of the capacities of the administration at the state level in the areas of environmental governance, management of shared natural resources, inter- and intra-state, and how to establish a network of early warning systems will help prevent conflicts and mitigate the effects in targeted areas of the country.*

Information systems: many NDCs noted that their planning and activities suffer from a lack of information, and that there needs to be significant investment in information systems. This includes assessments of the state of water resources and information on floods and droughts, climate systems, and the use of water at local and watershed levels. These types of measures were found in 45 per cent of NDCs. Higher proportions of water-related information systems measures were found in LAC (78 per cent).

Examples of information systems measures included in enhanced NDCs.

Angola: *Increase the number of meteorological and hydrometric stations to improve monitoring of rainfall and increased frequency and intensity of extreme precipitation events.*

Belize: *Establish a national water quality monitoring programme, coordinated by a national water quality task group and including monitoring activities for national coastal and groundwater areas.*

Grey infrastructure improvement: there was increased recognition of the likely impacts of climate change on present and future infrastructure, including infrastructure used for water-related activities. Fifty-three per cent of NDCs included measures that seek to either increase infrastructure provision or climate proof existing water-related infrastructure. Higher proportions of water-related grey infrastructure measures were found in MENA (69 per cent) and SSA (66 per cent).

Examples of grey infrastructure improvement measures included in enhanced NDCs.

Albania: *Climate proofing existing water infrastructure (e.g. pipes).*

Jordan: *Conducting climate-proofing studies for existing water utilities and integration of climate-proofing tools for planned water utilities through developing climate-resilient water safety plans, environmental impact assessment, and other legally binding environmental management tools.*

Green infrastructure improvement: green infrastructure approaches, including the use of NBS, green infrastructure, EBA, and ecosystem functions and services were very common across the NDCs, with 61 per cent of NDCs containing such measures. Higher proportions of water-related green infrastructure and ecological measures were found in Southeast Asia (80 per cent), LAC (78 per cent), and MENA (69 per cent).

Examples of green infrastructure improvement measures included in enhanced NDCs.

Jordan: *Supporting urban green infrastructure interventions for climate resilience. Using green infrastructure interventions in urban areas is a key approach in climate change adaptation and is gaining high momentum around the world.*

Liberia: *Increase urban resilience through use of blue-green infrastructure in the five cities of Buchanan, Gbarnga, Gompa, Monrovia, and Paynesville by increasing the volume of runoff/stormwater captured by at least 10 per cent annually to 2030 and by increasing the number of rain garden, cistern, and other rainwater-harvesting installations in urban areas by 15 per cent annually to 2030.*

Sustainable production: many NDCs (approximately 48 per cent) identified measures that would support improvements to production in agriculture and forestry. Higher proportions of water-related agriculture measures were found in SSA (66 per cent) and Southeast Asia (60 per cent).

Examples of sustainable production measures included in enhanced NDCs.

Belize: *Improve the management of 80,000 ha of the agro-landscape through good agricultural and silvo-pastoral practices, including by bringing 30,500 ha under sustainable agriculture systems with biodiversity benefits and 15,000 ha in production systems under sustainable land management.*

Rwanda: *Increase agricultural production due to improved water management and reduced exposure to extreme climate events.*



Agricultural landscape of Rwanda. Source: Shutterstock.

Technology: many NDCs (approximately 38 per cent) identified measures intended to increase the level of investment or access to technology in multiple water-related sectors, including agriculture, water supply, energy, and urban planning. Improvements to technology were most frequent regarding agriculture and the access to and distribution of water in irrigation. Higher proportions of water-related technology measures were found in MENA (46 per cent) and SSA (46 per cent).

Examples of technology measures included in enhanced NDCs.

Colombia: *Laboratory installed and in operation for geographic analysis at the basin level (processing of satellite images for the analysis of the points where projects with adaptation actions are being implemented). Validated models for the analysis of the effects of climate change on water availability incorporated into IWRM.*

Paraguay: *Access safe water and promote its efficient use through appropriate technologies for collection and storage, considering local vulnerability and climate variability.*

Early warning systems: approximately 35 per cent of NDCs identified a need for improvements to or creation of early warning systems around challenges such as floods and droughts. Higher proportions of water-related grey infrastructure measures were found in LAC (44 per cent).

Examples of early warning system measures included in enhanced NDCs.

Albania: *Establishing the early warning system to prevent floods and fires with impact on sensitive areas/habitats.*

Belize: *Develop and implement an enhanced early warning system for drought and extreme weather events to support farmers in planning for and responding to the impacts of climate change by 2025.*

Gaps and opportunities

Cross-sectoral analysis

Due to increased investment in NDCs, the contents of enhanced NDCs should be given higher regard within international development processes and by global international financial institutions, especially compared with earlier NDC iterations, and should act as a stronger catalyst for finance flows to activities that the party regards as important for its climate ambitions. The contents of enhanced NDCs should be evaluated and included in agreements with financial institutions, such as country strategy papers. While it is noted that the NDCs itself do not always contain sufficient detail for this purpose, such detail should emerge within implementation activities. Various multilateral institutions are already evaluating the NDCs as an input to planning, and future iterations should strengthen their validity accordingly.

While enhanced NDCs have seen much improvement, **there are gaps and challenges that should be addressed as part of the next iteration, and within the long-term strategies that are also in preparation.** While it seems very early to be anticipating the next round of NDCs, more foundational work on some topics will be required. For example, addressing **transboundary concerns** will require more exchange among countries on the activities and commitments of present and future NDCs, as well as engagement on a more regular basis, since it can be difficult to incorporate transboundary matters within limited national preparation timeframes. More effort to build awareness of neighbouring state priorities is also important.

An even broader water perspective is needed. While the prominence of water increased across iterations of the NDCs, most water-related measures were concerned solely with the way water was used within a sector, as opposed to **noting important interactions that could impede the achievement of other sectoral commitments around water.** Many different sectors are reliant on the same resource, but this was rarely examined within NDCs. A few NDCs, such as those from Nigeria, Sierra Leone, and Sri Lanka, included measures that explicitly recognized the benefits for other sectoral uses of water, but these were rare. The most common example of this approach was the need to improve wastewater infrastructure to reduce water pollution in water bodies, noting its importance for downstream water users.

Water quality is a significant gap in terms of preparing measures and responses to climate change impact. While water pollution was raised as a concern in

approximately 32 per cent of the assessed NDCs, often in connection with wastewater problems, very few measures designed to reduce water pollution were included. Research notes that highly polluted water bodies can be significant emitters of greenhouse gases and therefore water pollution should be considered as both a mitigation and an adaptation challenge.



Upgrading the sewer drainage system in Mahasarakham, Thailand. Source: Shutterstock.

Sub-national impact

Most water-related commitments are posted at the national level, as opposed to sub-national considerations, although there was a noticeable rise in the number of states that included sub-national considerations in their NDCs, as well as more recognition of tools that can better integrate national needs and sub-national implementations. It is useful to include IWRM and basin/watershed planning, which can better recognize local interactions that will affect the achievement of commitments. Consideration of sub-national outcomes is important as sub-national entities will be called upon to facilitate implementation, whether adaptation or mitigation, especially where different sectors draw on the same water resources.

The impacts of **climate change will have different effects across states and basins**. Different parts of a state will experience different changes in the hydrological profile, leading to primary, secondary, and tertiary impacts in local economies. Reduced rainfall in a region may lead to an increased dependence on groundwater resources, which in turn may impact existing groundwater resource users who adjust their behaviour accordingly, leading to changes in local activities. Most enhanced NDCs address commitments from a national perspective, although there was increased recognition of sub-national commitments, risks, and responses (e.g. in the NDCs prepared by Argentina, Benin, and Colombia). For countries where adaptation is a priority, more attention to local catchments will be a necessary part of implementation.

The following examples illustrate sub-national measures included across enhanced NDCs:

Armenia: *EBA is expected to become part of the policy mix in each sector, as reflected in sectoral adaptation plans. This ensures that mechanisms and policies supporting improved biodiversity and ecosystem services, income generation, poverty reduction, adaptive development, or resilience of infrastructure and carbon emission mitigation co-benefits, are integrated in sectoral and sub-national activities to reduce the country's overall vulnerability to climate change.*

Cambodia: *Enhance terrestrial and aquatic resources of each ecosystem of the commune and district location to preserve and conserve environmental degradation (35 per cent of total commune land is green spaces) and enhance social stakeholders to participate during road map design and the Commune Land Use Plan /District Land Use Plan study.*

Colombia: *Strengthen resilience and capacity to adaptation to climate-related risks that affect the sector through the implementation of structural and non-structural actions in 30 per cent of the municipalities prioritized by susceptibility to shortages.*

Paraguay: *Promote at sub-national levels the implementation of measures that consider technological innovation and NBS in local development processes, in order to increase their resilience to climate change.*



Drought in Guajira, Colombia. Source: Shutterstock.

Transboundary considerations

Measures relating to transboundary matters remain limited, although it is noted that 12 per cent of countries raised general transboundary matters. While NDCs are necessarily concerned with national commitments, there remains a concern that upstream and downstream ambitions of different countries, whether through adaptation or mitigation measures, may impede the ambitions or commitments of

other countries. These risks are not always made clear, and there is little evidence to suggest that transboundary issues had an impact on national decision-making or that there were any regional exchanges on NDC contents between basin states.

Most consultation processes are national in scope, with predominantly national stakeholders. There may be engagement with such external actors as transboundary river basin authorities, but this is not a given. Much of the target-setting and ambition-raising is undertaken within a relatively short timeframe. Stakeholder and ministerial engagement can be difficult within state institutions, let alone including external countries, which will reduce the opportunities for regional exchanges. In addition, NDC processes often run on different timetables between neighbouring countries, meaning that it is more difficult to engage in a meaningful way. While river basin organizations, when available, can play an important role in such exchanges, more effort to ensure direct ministerial contact may be required. It is recommended that some consideration should be given to supporting inter-state exchanges on the commitments in their enhanced NDCs at the earliest possible stage within the next two years to have more coordinated activities recognized in the next iteration of NDCs.

The following examples are a small subset of measures that help to illustrate transboundary approaches included across enhanced NDCs:

Tanzania: *Promoting and supporting development, management, and equitable utilization of transboundary water resources.*

Guinea: *Preservation and riverine restoration of heads of sources, banks, and beds, , in particular instream and cross-border values, especially through preparation of IWRM action plans.*

Zimbabwe: *All of Zimbabwe's river basins are shared with other countries, both as sources and recipients of headwaters for major rivers. The management of water resources in those countries and heightened competition over shared water resources may impact on water availability and supply, energy availability and supply, transboundary biodiversity conservation, tourism, and green jobs.*



Recommendations

This report is intended to provide an overview and present trends concerning water and water-related measures found in the most recent round of NDCs, prepared between 2019 and 2022. Overall, the report found the inclusion of water had improved in most of the NDCs that were assessed. This information can be used to identify opportunities for supporting countries to implement their NDCs, including identifying suitable avenues for capacity-building, key technological needs, and opportunities for financing activities. The report also identifies several possibilities for improvement in future iterations of NDCs, connected mainly to gaps and trends. While it is anticipated that NDCs are subject to ongoing enhancement every five years, some improvements, such as better coordination around transboundary concerns and exchanges between basin countries on preferred commitments, may require a significant lead time.

The key possibilities for improvement are as follows.

1. Accounting for the role of water in mitigation planning. This includes recognizing the role of water in implementing mitigation activities as well as understanding the impact of mitigation activities on hydrological resources. Mitigation activities are often reliant on access to and reliability of water resources or have the potential to affect water resources, thus water resources can be a limiting factor. More effort is needed to understand the implications of mitigation commitments, especially at a catchment level where multiple sectoral activities may take place. The water and mitigation publication, *The Essential Drop to Reach Net-Zero: Unpacking Freshwater's Role in Climate Change Mitigation* (Ingemarsson et al. 2022), will help countries better understand the linkages, but further investment in the development of tools that can be used at national, sub-national, or basin level by water decision-makers will probably be necessary to ensure that these linkages are accounted for.
2. Accounting for sub-national contributions within future country commitments, whether through basin activities or the contributions of subnational entities. National level commitments often mask substantial sub-national differences in terms of water resource endowments and local pressures as well as proposed locations for activities. Such inclusion is beneficial since many responses to climate change will be addressed most effectively at sub-national levels, whether through local water management, investing in climate resilience, or reducing climate risks. Some NDCs have started to specifically

include sub-national information (e.g. Argentina, Colombia, and Togo) and efforts to encourage other countries should be welcomed. Such bottom-up efforts will also help to better engage sub-national entities and recognize their roles.

3. Providing more detail on baseline conditions and increasing the use of more quantitative targets and measures to better assess the strength of commitments and the overall anticipated costs of implementing measures. While many NDCs include adaptation measures, it is often unclear how much investment is needed to implement the measures or fully understand what is being proposed, whether as a conditional or unconditional commitment. This can put adaptation measures at a disadvantage compared with mitigation measures that are often more focused on meeting specific mitigation targets when it comes to securing investment. The use of a single metric across mitigation already makes it easier to evaluate the effectiveness of mitigation investments compared with adaptation investments, and the lack of available baseline information can further embed this disadvantage in relation to adaptation.
4. Better integrating water commitments within and across sectors and integrating with other global processes, including the risks that mitigation and adaptation activities will impact on the implementation of other activities. The governance of water, and the use of water resources, often sits at the centre of multiple environmental and development challenges, whether in terms of responding to climate change impacts, building community resilience, or fostering sustainable development. Despite this, few NDCs strongly connected water needs to other processes in which countries are involved. While many made generic references to SDGs etc., there were few attempts in the assessed NDCs to identify and build on these interactions. This is also important as many adaptation measures could not be evaluated for their effectiveness and could reduce the business case for investment.
5. Better detailing connections between country impacts and vulnerabilities, and measures included within an NDC. While NDCs have improved when describing the possible range of impacts and vulnerabilities to climate change compared with their earlier iterations, more effort is needed to ensure that the next generation of NDCs include more measures that respond directly to included impacts and vulnerabilities.
6. Invest in country-level exchanges within transboundary basin countries. It is likely that the measures found in NDCs will continue to have a national focus and pay little regard to the needs of surrounding countries when outlining their commitments in NDCs without more investment in exchanges between countries. While it is noted that some transboundary projects exist to help

regions respond to climate change, such as the Programme for integrated development and adaptation to climate change in the Niger basin, transboundary measures are not included in NDCs. Barriers to inclusion can often be due to political sensitivities, but can also occur due to insufficient lead time in NDC preparation activities, which do not allow for the sharing of commitments, whether present or future.

7. Further work on understanding and detailing the linkages between water quality, freshwater ecosystems, and climate change, whether in terms of adaptation or mitigation. While the most recent round of NDCs saw an increased role for ecosystems in responding to climate change in most NDCs, issues such as water quality and environmental degradation of freshwater ecosystems were not strongly addressed.
8. An increased focus on water governance is necessary. Approximately 12 per cent of NDCs referred to water governance, while approximately one third included reference to institutional strengthening of water-related institutions. While these numbers are promising, they are not reflective of the central role played by water in climate change responses and the need to ensure that countries are able to manage the trade-offs between different users reliant on joint water resources that climate change will necessitate.

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Annexes

Annex 1. List of non-Annex 1 countries evaluated for this report

Andorra, Albania, Angola, Antigua and Barbuda, Argentina, Armenia, Bahrain, Bangladesh, Barbados, Belize, Benin, Bhutan, Bosnia-Herzegovina, Brunei, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Cuba, Dominican Republic, Democratic Republic of the Congo (DRC), Democratic Republic of Korea, Ecuador, El Salvador, Eswatini, Ethiopia, Fiji, Gambia, Ghana, Grenada, Georgia, Guinea, Guinea-Bissau, Honduras, Indonesia, Iraq, Jamaica, Jordan, Kenya, Korea, Kuwait, Kyrgyzstan, Lao People's Democratic Republic (Lao PDR), Lebanon, Liberia, Malaysia, Malawi, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Nauru, Namibia, Nepal, Niger, Nigeria, North Macedonia, Nicaragua, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Qatar, Rwanda, Saint Lucia, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Solomon Islands, Somalia, South Africa, South Sudan, Singapore, Sri Lanka, State of Palestine, Saint Kitts and Nevis, Sudan, Suriname, Syrian Arabic Republic, Tajikistan, Tanzania, Thailand, Tonga, Togo, Tunisia, United Arab Emirates, Uzbekistan, Vanuatu, Venezuela, Viet Nam, Zambia, Zimbabwe.

Annex 2. General water and climate adaptation management goals

The following examples illustrate general water management measures included across enhanced NDCs:

Argentina: *Manage water heritage with a comprehensive approach to ensure the availability, sustainable use and quality of the resource for various human and natural uses in the face of the impacts of climate change.*

Benin: *Reduce the vulnerability of natural and human systems to water stress, flooding, and degradation of water quality.*

DRC: *Development of management plans for water resources by hydrological basin.*

Eswatini: *Improve water governance and compliance to help manage water resources more efficiently and effectively to adapt to resultant water shortages from climate change.*

Fiji: *Comprehensive and integrated resource management to conserve and enhance the productivity of freshwater sources.*

Guinea: *Improvement of assessment of climate change and economic activities on surface water (river flow) and promote studies on the economic value of protected areas and ecosystem services.*

Guinea-Bissau: *In the water resources sector, improving the institutional component is the biggest challenge. The creation of alternative funding mechanisms for the water sector, including the private sector, is also worth mentioning as a challenge.*

Jordan: *Integrating climate adaptation and resilience in policy and institutional reforms in the water sector.*

Lao PDR: *Target 2025 Water Resources: mainstream climate change adaptation in sectoral strategy and action plan including through results-based management framework.*

Malaysia: *Malaysia plans to increase diversification and exploration of alternative water sources such as urban-scale rainwater-harvesting system, groundwater, recycled and reclaimed water for conjunctive use.*

Malawi: *Integrated watershed management: a) development and strengthening of water policies, integrated land use management policies, plans and approaches in priority watersheds and reservoirs; b) increase of afforestation and reforestation in catchment areas to cover areas not yet considered, and address deforestation and degradation.*

Mali: *To this end, the Government of Mali has decided to undertake a review of the National Water Policy together with four programmes: a) National Access Programme With Drinking Water; b) National Integrated Water Resources Management Programme; c) National Hydraulic Development Programme; d) National Water Sector Governance Programme.*

Moldova: *Water Resources: assessment of resources evaluation, increasing supply and efficient management of water demand, taking into account social and gender issues; management of extreme events (floods, droughts); effective water treatment and reuse.*

Mozambique: *Promotion of the water security plans and institutional capacity-building of the main actors.*

Niger: *Protection of water resources, water quality, and aquatic ecosystems.*

Nigeria: *Develop and implement a national waste management strategy to reduce pollution of the country's water resources.*

Panama: *Water management in Panama is carried out based on an integrated water and basin management approach. The water-food-energy-climate nexus is widely recognized and has been applied in Panama to advance in a resilient management of water resources through the Programme for Adaptation to Climate Change through Integrated Management of Water Resources.*

Papua New Guinea: *Both planning processes focused on priority watersheds contemplate the development of climate components such as vulnerability index, socioeconomic studies, climate change scenarios, and climate risk assessment.*

Paraguay: *Promote the strengthening of the institutional governance of the resource, based on aspects such as effectiveness (training, coherence between policies, appropriate scales for basin systems, clear roles and responsibilities), efficiency, and participation.*

Rwanda: *A national water security through water conservation practices, wetlands restoration, water storage, and efficient water use.*

Sierra Leone: *The water sector is prioritized for adaptation because future strategies will need to address many emerging trends driven by climate change. These include both demand- and supply-side concerns, including reduced availability, quality, and allocative efficiency.*

South Sudan: *South Sudan will continue to focus on restoring its natural water resources, such as rivers and wetlands, which also provide a source of livelihood to a large number of people.*

Sri Lanka: *The main policy driver in water sector adaptation to climate change is provided by adopting integrated river basin management approach in 15 prioritized river basins in Sri Lanka.*

Suriname: *Protect available water resources against pollution through the establishment, implementation, and enforcement of rules and regulations.*

Tajikistan: *The Programme for Reforming the Water Sector of the Republic of Tajikistan for 2016-2025 envisages the development of a long-term basin plan for the use and protection of water resources in five river basins, the development of seasonal and annual plans for the distribution and management of water resources in river basins, the restoration of irrigation infrastructure and improvement of conditions for its maintenance and operation, the introduction of new water-saving technologies.*

Togo: *Improvement of knowledge of water resources.*

Tonga: *Water security through integrated water management and conservation.*

Uzbekistan: *Adaptation in water management – improve the use of water resources and prevent further salinization and land degradation.*

Vanuatu: *Target Waz: By 2030, six climate-resilient water protection zones declared and sufficiently provide urban water supply needs in normal and (climate, disaster, and environmentally) stressed times.*

Viet Nam: *Developing and implementing the national water resources master plan and river basin integrated master plan, taking into account climate change; developing and implementing measures for ensuring water security in the context of climate change and continuing to enhance the implementation of the above-mentioned ongoing measures.*

Zimbabwe: *Develop and promote resilient water resources management. Zimbabwe will implement actions which: a) support the use of best available hydro-climatic information to improve water resource management (water resource assessment); b) explore options to increase water supply from surface and underground (water demand management and water use), considering gender differences in water supply and access; and c) support the management of extreme events (integrated flood management, drought management).*

Annex 3. Water supply, sanitation, and hygiene

The following examples illustrate measures in the water supply, sanitation, and hygiene (WASH) approaches included across enhanced NDCs:

Albania: *Construction and maintenance of rainwater-harvesting infrastructure, including water reserves.*

Argentina: *Improve existing wastewater collection and treatment systems and build new systems in underserved areas focusing on urban areas with a high concentration of population.*

Benin: *Ensure permanently the water quality of consumption; ensure the supply of drinking water for peri-urban areas.*

Cabo Verde: *Cabo Verde undertakes to minimize technical and commercial water losses and to mobilize water supply using renewable energy to secure a sustainable and resilient water management system by 2030.*

Cabo Verde: *Integrate the climatic, biophysical, and economic limits to increasing water supply into the revisions of National Strategic Plan for Water and Sanitation (PLENAS) and National Plan of Action for Integrated Management of Water Resources (PAGIRE), start by reducing water losses before increasing water supply and ensure a fair share of clean water to all consumers by 2030.*

Cambodia: *Conduct WASH assessments on climate change and develop planning for communities and health facilities.*

Chad: *Integrating adaptation and mitigation into access to WASH improves health and contributes to the economic benefits of communities.*

Chile: *By 2030, all water-related public infrastructure projects will consider in their evaluation, the ability to protect the population and land (through river works) and/or support as a priority the demands of urban and/or rural human water consumption in their areas of influence.*

Colombia: *Identify the impacts and opportunities that the implementation of the reuse of treated wastewater can generate against ensuring the efficient provision of domestic public services of wastewater flow to protect the basins and sources supplying the most polluted aqueducts and strengthen the processes involved in the execution of the programme with criteria for adaptation to climate change.*

Dominican Republic: *Contribute to ensuring the supply and availability of drinking water sources, implementing replenishment projects, and reducing leakage.*

DRC: *Promotion of pro-poor approaches for the establishment of infrastructures and sanitation services.*

El Salvador: *Generation of the regulatory framework for the implementation of sanitary measures in sanitation components (latrines, water systems, gray water management systems and black) with greater resilience and capacity to adapt to climate change and variability.*

Eswatini: *Assess sustainable water supply options beyond 2030 through conducting water assessments/studies to identify potable water supply sources, opportunities, and constraints with a climate lens.*

Jordan: *Improving adaptive capacity of water utilities.*

Kyrgyzstan: *Improving water infrastructure, climatic resilience of drinking water supply, and sanitation infrastructure.*

Lebanon: *Build an operational and sustainable legal and institutional framework to ensure a proper management of the water sector allowing the development of sustainable and efficient services.*

Malawi: *Enhance public awareness about WASH practices; and enhance health surveillance of malaria, diarrhoea, and malnutrition.*

Mauritius: *Strengthening the development of rainwater harvesting with each household having 10 or 15 cubic metre installations.*

Montenegro: *In the domestic wastewater sector, increased connection rates to the sewage system have been considered in line with the planned full implementation of the European Urban Wastewater Treatment Directive.*

Morocco: *Improvement of the efficiency of drinking water distribution networks, and water to industrial and tourist purposes, with an objective of 80 per cent as an average in 2040 and 85 per cent in 2050.*

Mozambique: *Development of more appropriate infrastructure construction technologies for rural sanitation from the point of view of environmental protection and preservation.*

Nepal: *By 2030, the population with access to a basic water supply will increase from 88 per cent to 99 per cent; and population with improved water supply will increase from 20 per cent to 40 per cent.*

Nigeria: *Improve the quality of water-producing ecosystems that serve as sources of supply; including improving the conditions of sanitation services that may negatively impact on these ecosystems.*

Pakistan: *Operationalizing Pakistan WASH Strategic Planning and Coordination Cell established at Ministry of Climate Change to fast-track progress towards climate-resilient WASH.*

Panama: *Panama is committed to achieving equitable access to adequate sanitation and hygiene services for all people, paying special attention to the needs of women and girls and people in vulnerable situations.*

Paraguay: *Promote actions to prevent and deal with water shortages, with the use of rainwater-harvesting and storage systems for consumption, taking into account the hydrological characteristics.*

Sao Tome and Principe: *Implementation of low-cost technologies, adapted and of easy community management, to ensure potable water access for isolated communities.*

Sierra Leone: *Fund research into adopting a water resources and water supply planning method under climate change.*

South Sudan: *To ensure access to safe drinking water and to enhance water resources management practices, South Sudan will invest in establishing efficient water supply infrastructure.*

Suriname: *Including gender-responsive assessment on water management including survey on unpaid time spent by individual household members in supplying water, making it safe for use, and managing it.*

Tajikistan: *Development and implementation of the Drinking Water Supply and Sanitation Programme for the period up to 2030.*

Tanzania: *Promoting climate resilience investment and suitable water supply technologies and infrastructure for sanitation and hygiene services.*

Togo: *Strengthening of sanitation and stormwater drainage in main urban centers.*

Vanuatu: *Indicator Waz.7: Proportion of urban households with access to climate-resilient natural water source in the six provinces.*

Annex 4. Energy and industry

The following examples illustrate water and energy interaction measures included across enhanced NDCs:

Antigua and Barbuda: *100 per cent of the water supply infrastructure powered by their own grid-interactive renewable energy sources.*

Argentina: *Develop measures to ensure energy supply and access through the adoption of resilient and sustainable infrastructure (for example, energy transport and distribution, fuel production, and power generation, with particular emphasis on the assessment of water resources and hydroelectric generation).*

Bhutan: *Future development of hydropower will be as per the revised Sustainable Hydropower Policy 2021 and enhance climate resilience through reservoir/pumped storage schemes to ensure energy and water security.*

Cabo Verde: *The 2030 commitment to use renewable energy for water supply mobilization and to secure a sustainable and resilient water management system.*

Cameroon: *Collection and recovery of biogas in the treatment plants of industrial wastewater.*

Congo: *Development of renewable energy initiatives to fight against water insecurity induced by climate change.*

Dominican Republic: *Energy: promote water-energy-land interaction with renewable energy sources.*

DRC: *Development of water retention basins, construction of dykes to protect production infrastructure for electricity.*

El Salvador: *Conservation of forested areas with a focus on sustainable management and assisted natural regeneration on land owned by Executive Hydroelectric Commission of the Lempa River.*

Eswatini: *Reduce energy consumption in water heating, through replacing conventional geysers with 1,000 solar water heaters by 2030.*

Jordan: *The energy efficiency of all sectors will increase by 9 per cent in 2030 compared to 2018, and that of the water sector by 15 per cent in 2025.*

Mauritius: *Water: increased energy efficiency through the sustainable use of water resources, in particular by improving energy efficiency in the treatment of water resources, and the use of water in energy production.*

Moldova: *Energy: promoting water-energy-land interaction with renewable energy sources; climate protection of the energy system infrastructure; ensure operation of energy infrastructure in any climatic conditions.*

Morocco: *Promote renewable energies (biomass, solar, etc.) in particular in the field of irrigation by promoting the use of pumping solar in water-efficient irrigation projects.*

Nigeria: *Invest in design and management policies and systems for water-intensive energy infrastructure that enables energy system (e.g. solar) resilience.*

Pakistan: *Renewable energy: By 2030, 60 per cent of all energy produced in the country will be generated from renewable energy resources including hydropower.*

Paraguay: *Promote the development of projects for the restoration and reforestation of waterways and priority sub-basins, based on agreements between the National Forest Institute, Ministry of Environment and Sustainable Development (MADES), hydroelectric power plants, and other cooperation.*

Seychelles: *The 2030 commitment to use renewable energy by modernizing the entire electricity sector, increased electricity generation from renewable sources, improved energy efficiency across sectors, and to secure a sustainable and resilient water management system through water supply.*

Tajikistan: *Strengthening hydropower potential and increasing the reliability factor taking into account the effects of climate change (increase in maximum floods or decrease in runoff).*

Zimbabwe: *Improvements in water resources management may have mitigation co-benefits in two ways: a) increased efficiency in water use may increase renewable hydropower supply (displacing thermal power). and (ii) better water management in agriculture may increase crop and pasture productivity, enhancing carbon capture capacity through roots and residues*

Annex 5. Urban planning and regional planning

The following examples illustrate the diversity of urban planning measures included across enhanced NDCs:

Albania: *Water and energy efficiency, and rainwater harvesting are the measures to prioritize in terms of adaptation of the supporting built environment.*

Argentina: *The consolidation of compact and biodiverse cities will be promoted, with the prevalence of use of public transport, which tend to a harmonious coexistence with nature and integrate hydrological systems and natural cycles, maintaining the offer of environmental services.*

Belize: *Implement Land Use Policy and Framework to incorporate responsible and climate-sensitive (and water-sensitive) development and land use.*

Benin: *Municipality of Bonou. Protection and rehabilitation of ecological reserves (biodiversity) bordering on Ouémé river.*

Cabo Verde: *Subordinate the development of tourism zones and infrastructures to more responsible forms of tourism and other land uses such as terrestrial and maritime protected areas, maritime domain, productive soils, water domain, areas of landscape, natural heritage and cultural values, and other environmental constraints.*

Chile: *National Sustainable Construction Strategy, led by the Ministry of Housing and Urban Development, will set forth the guidelines to integrate the concept of sustainable development to the construction sector. This strategy seeks to articulate and link effective energy and environmental plans by establishing goals and objectives in the area of energy, water, waste, and health for the medium and long terms.*

Congo: *Stormwater and drainage systems and the management of waste (sewers, municipal, industrial) require improvements.*

Costa Rica: *By 2030, the continuity of vital public services (health, education, water and sanitation, energy, transportation) has been guaranteed in the face of the adverse effects of climate change, through the application of norms and guidelines with adaptation criteria.*

Gambia: *Developing climate-resilient infrastructure, services, and energy systems. Specific components include developing climate-resilient integrated waste management, addressing the associated need for climate-resilient roads and drainage systems, and actions to climate-proof water supply and sanitation infrastructure, as well as energy infrastructure.*

Jordan: *Supporting urban green infrastructure interventions for climate resilience.*

Kyrgyzstan: *Increased climate resilience of cities through the introduction of ecosystem adaptation methods.*

Malaysia: *Future planning for waste and wastewater infrastructures will take into account their sustainability, efficiency, and effectiveness while avoiding areas that are environmentally sensitive, flood-prone, and categorized as water catchments.*

Morocco: *Ecosystem-based adaptation to mitigate the effects of urban heat islands.*

Mozambique: *Strengthening the resilience of the cities of Quelimane and Nacala in relation to flood and erosion control.*

Myanmar: *Measures to promote and assess the impacts of conservation and expansion of peri-urban and urban green spaces and forests on key climate extreme events: reduction of water runoff, mitigation landslide risks, and reduce urban heat island effects.*

Nigeria: *Increase coverage and quality of treatment of wastewater in municipalities to help protect water basins and sources, and other users dependent on the same source of water.*

Pakistan: *For enhanced urban resilience, urban flooding risks will be reduced by promoting sponge cities, improving urban drainage, undertaking studies to address urban drainage problems in 20 cities of Balochistan, Khyber Pakhtunkhwa, Punjab, and Sindh for enhanced urban resilience, and undertaking non-structural measures, as per National Flood Protection Plan–IV.*

Sierra Leone: *Enhance waste management systems at all levels to reduce pollution and greenhouse gas emissions to improve health of both humans and animals and reduce climate change.*

South Africa: *Ensure the development and deployment of climate-resilient infrastructure that enhances water and energy security.*

Annex 6. Agriculture and livestock

The following examples illustrate the diversity of agricultural measures included across enhanced NDCs.

Albania: *Improve management of water resources through the introduction of simple techniques for localized irrigation (e.g. drip and sprinkler irrigation), accompanied by infrastructure to harvest and store rainwater, such as tanks connected to the roofs of houses and small surface and underground dams.*

Angola: *Implement a water collection and storage system in drought-prone areas to ensure continuity of human supply and watering of livestock despite increased frequency and intensity of periods of drought and water scarcity.*

Antigua and Barbuda: *Strengthening the physical climate resilience of the fisheries and agricultural sectors to slow onset and extreme weather events through the identification and implementation of priority adaptation interventions, with a focus on ecosystem-based adaptation.*

Belize: *Adopt better soil and water management practices, including the use of biochar and improved (solar-powered) irrigation systems.*

Burkina Faso: *Sustainable land management and building resilience of communities in the Toessin dam watershed.*

Burundi: *By 2025, at least 10,000 households use rainwater for agricultural purposes. Collect and use the rainwater for agricultural purposes and other uses.*

Cabo Verde: *Improve agricultural water use through efficient irrigation systems, with an emphasis on micro-irrigation and smart hydroponic systems. Increase the irrigated land based on drip irrigation (17 per cent in 2015) and adopt measures to irrigate from reused treated wastewater as a measure of resilience.*

Chad: *Other priority options in agriculture and animal husbandry include the development of agroforestry and the development of the agro-pastoral value chain approach, improving efficiency of the global livestock sector, investment in improved pasture management, regulation of pastoral mobility, and the diversification of water and soil conservation techniques.*

Colombia: *Improved methods of estimating and measuring the water demand in the agricultural sector.*

Dominican Republic: *Manage the water supply through the improvement and construction of infrastructure and hydraulic equipment (irrigation sector).*

DRC: *Popularize and disseminate resilient agricultural practices and technological packages (use of climate-sensitive seeds, soil management, and water management).*

El Salvador: *Implementation of practices for the transition from traditional agriculture to sustainable agriculture (socially, economically, and environmentally), based on the application of soil, water, and biodiversity conservation technologies in basic grains, vegetables, and fruit crops.*

Eswatini: *Diversifying from heavy water consuming enterprises to drought tolerant commercial crops, trees, and small livestock.*

Mauritania: *Promotion of fish farming to improve food security and reduce poverty in rural areas.*

Mauritius: *Fostering an integrated planning and implementation approach between the water and agricultural sectors.*

Mozambique: *Implementation of the Conservation Agriculture Action Plan and the Rainwater Harvesting and Conservation Action Plan (Technological Adaptation Action Plan for Agriculture).*

Myanmar: *Payments for ecosystem services to provide incentives for upstream watershed actors for watershed afforestation and climate-smart agriculture.*

Sierra Leone: *Enhancing knowledge on surface and groundwater management.*

South Sudan: *South Sudan aims to establish rainwater-harvesting measures for livestock production to reduce vulnerability of cattle keepers and pastoralist communities in water-scarce regions.*

Togo: *Construction and/or rehabilitation of water retention systems for micro-irrigation.*

Tunisia: *Reducing pollution of the agricultural environment (salt and water) due to using practices of biological agriculture and the optimization of the use of chemicals.*

Zambia: *Guaranteed food security through diversification and promotion of climate-smart agricultural practices for crop, livestock, and fisheries production including conservation of germplasm for land races and their wild relatives.*

Annex 7. Forests and land use

The following examples illustrate the diversity of measures across enhanced NDCs around forestry and land use.

Albania: *Adaptation actions targeting the protection of the environment to preserve the water resources, such as the protection of forest in the upper areas of watersheds, are consistent with the implementation of actions to enhance forest management and reduce the fuelwood exploitation increasing the sinks in the forestry and other land use sector.*

Bahrain: *The national project for afforestation, to support increased green areas in the kingdom, to better accommodate rise in temperatures and create green sinks for emission is still at early stages.*

Belize: *Implement reforestation practices for 1,400 ha in forest areas inside protected areas, as well as the restoration of 6,000 ha of degraded and deforested riparian forests by 2030, with 750 ha of this being restored in key watersheds by 2025.*

Benin: *Capacity-building strategy on wildland fire management for a better adaptation to climate change.*

Colombia: *Planting of 8 million trees under the Valle Más Verde programme during the period 2020-2023.*

Costa Rica: *By 2022, the forest cover will increase by 100 ha in protection zones associated with water sources in regions with water risk such as Chorotega and Norte-Norte, based on climate projections.*

Ethiopia: *Afforestation and reforestation of degraded lands through tree planting to restore forest ecosystems for enhancing landscape-based climate resilience.*

Honduras: *The activities of this sector will support the commitment to conservation and functional restoration of 1.3 million ha of functional forest landscapes in 2030, which is included in the section Functional conservation and restoration of rural landscapes.*

Indonesia: *Mainstreaming/integrating climate change adaptation in forest management to support mitigation actions and enhancement of economic resilience of communities living in/surrounding forests.*

Jordan: *Develop a national plan for mitigating forest fires incidents including the identification of hazards, training, resources allocation, awareness and knowledge raising, and engagement of civil society organizations.*

Kyrgyzstan: *Improving climatic resilience of forest ecosystems. Reducing the loss of ecosystem services from forests and biodiversity.*

Liberia: *Revise national policies to address interlinkages between forests and mangroves, coastal ecosystems, water quality, fisheries, mining and energy production, agricultural production, transport infrastructure, and urban green corridors by 2030.*

Malaysia: *Increasing forest catchment capacity and enhancing management are needed to accommodate expected increased runoff volume and peak flood flow due to higher projected rainfall.*

Mali: *The goal is to achieve, by 2030, 340,000 ha (22 per cent of 1,540,000 ha) of reforestation.*

Moldova: *Implement planting of protection forest belts (buffer zones) for agricultural land and water protection, along with those for anti-erosion purposes.*

Myanmar: *Enhancing and expanding forestry areas, communicating their benefits, promoting ecosystem-based adaptations.*

Nauru: *Increased resilience to climate change-induced interruption of affordable food imports through expansion of agroforestry practices to increase local food production.*

Nigeria: *The planned initiatives should ensure that forests are protected and sustainably managed, and forest ecosystem services are properly valued and paid for.*

Pakistan: *Protecting critical mangrove forests in Sindh and Balochistan, and raising new plantations of mangroves over an area of 16,552 ha for climate mitigation, biodiversity conservation, and strengthening local livelihoods of fisheries and eco-tourism.*

Panama: *Plans will emphasize the application of nature-based solutions, the application of which will result in increased resilience in prioritized watersheds, reduced emissions, and increased carbon storage through reforestation, afforestation, restoration of soils, sustainable management of forests, and the conservation of forest carbon stocks.*

Saint Lucia: *Saint Lucia is in the process of exploring a national Reducing emissions from deforestation and forest degradation (REDD+) programme and is implementing efforts to maintain its current forest cover, as well as undertaking efforts to protect watersheds by forest protection measures.*

Sao Tome and Principe: *Development and implementation of a national programme for the sustainable management of forest and managed forest ecosystems by 2025, with an emphasis on drought-resistant managed forest, reduction of illegal logging, and management of protected areas.*

South Sudan: *Utilize indigenous and scientific knowledge to identify combinations of tree species that could provide improved livelihood opportunities to people, while also acting as a carbon sink.*

Annex 8. Ecosystems and biodiversity

The following examples illustrate the diversity of measures across enhanced NDCs around ecosystems and biodiversity:

Albania: *Managing/restoring riverbeds (embankments) and reforesting river sides to increase water retention.*

Antigua and Barbuda: *This project will build resilience of ecosystems and vulnerable communities who depend on them for their livelihoods through innovative financing of EBA measures.*

Barbados: *Implement a new Water Protection and Land Use Policy (2020) designed to help protect groundwater aquifers, coastal coral reefs, mangroves, and seagrass beds, with particular focus on reduction of nutrient loads into coastal waters using nature-based solutions.*

Benin: *Development of the blue economy in forests; action plan for the sustainable management of mangrove ecosystems in Benin.*

Burkina Faso: *Restoration of ecosystems for resilience to climate change of local communities in the area intervention of the Great Green Wall in Burkina Faso.*

Cambodia: *Private sector will be engaged in protection of flooded forests and reforestation activities for example with the incentives for ecosystem services certification scheme or as a part of corporate social responsibility activities.*

Costa Rica: *The country will protect and conserve 100 per cent of the coastal wetlands included and reported in the National Inventory of Wetlands (in the period 2016-2018) by the year 2025 and will increase the area of estuarine wetlands registered by at least 10 per cent for the year 2030, in order to protect and conserve these ecosystems.*

Dominican Republic: *Improve the quality of water-producing ecosystems that serve as sources of supply to systems; including improving the conditions of sanitation services.*

DRC: *Invest in building national capacities and expertise, both on the institutional and technical level, with regard to the sustainable management of peat bogs.*

Eswatini: *Control invasive alien plant species and pollution in catchments to protect water resources (quality and quantity).*

Fiji: *Promote sustainable fishing practices, coastal protection, preservation, and mangroves, and engage coastal communities; address degradation of coral reefs, coasts, and catchments.*

Iraq: *To protect and conserve ecosystems by increasing their resilience to adapt to the effects of climate change and adopting nature-based climate solutions to protect the fragile, rare, and most vulnerable environments.*

Jordan: *Protect wetlands and major watershed areas vulnerable to climate change and enhance law enforcement measures.*

Lao PDR: *Increased climate resilience of cities through the introduction of ecosystem adaptation methods.*

Liberia: *Develop national plan for ecosystem-based adaptation in forests, coastal zones, and urban green corridors, ensuring integration of local and indigenous knowledge, cultural systems, and gender and youth considerations into adaptation plans by 2030.*

Malawi: *Increased ecological resilience to climate change, reduced risk of flooding, linking of aquatic and terrestrial ecosystems, and thermal refugia for aquatic species.*

Mauritius: *Biodiversity: a) assessment and monitoring of blue carbon in coastal and marine ecosystems (mangroves, tidal marshes, and seagrasses); b) comprehensive ecosystem management; c) joint efforts (with local communities, NGOs) to restore ecosystems and, thus, the carbon storage capacity (mangrove, forest, coral reef rehabilitation).*

Moldova: *Wetlands restoration prioritized and implemented. Protect the wetlands areas, allowing restoration of underground water and reducing peak discharges downstream.*

Morocco: *Strengthen the resilience of natural ecosystems in the face of change climate as part of an approach combining the preservation of ecosystem services and sustainable livelihoods.*

Mozambique: *Establishment of cross-border conservation areas to maintain ecosystem functions and allow wildlife migrations.*

Myanmar: *Mainstreaming climate change adaptation into protected areas management and sustainable landscape management including marine ecosystems, marine protected areas, and dryland ecosystems.*

Nauru: *The protection of marine ecosystems as a nature-based solution will augment efforts to reduce coastal erosion.*

Namibia: *Restoration of the savanna through bush thinning for increased land productivity, improved food security, improved groundwater recharge, and increased biodiversity.*

Nepal: *Ensure fair and equitable benefits (carbon and non-carbon) from sustainable forest management, watershed management, and biodiversity conservation among local communities, women, and Indigenous Peoples.*

Paraguay: *Promote the implementation of projects that seek to increase the resilience of ecosystems, based on strategic alliances of key sectors.*

Sierra Leone: *Establish robust and long-term mangrove ecosystem health surveillance, monitoring, and analysis to develop insights into their current state and map future risks and vulnerabilities.*

South Sudan: *Support conservation and management of biodiversity and ecosystems by promoting biodiversity mapping; implementing measures to reduce the deforestation rate by introducing alternate sources of energy and livelihood; and developing policies for effective waste management to prevent discharge of untreated waste into water bodies.*

Sri Lanka: *Increase the production capabilities of fisheries and aquatic resources in 30 lagoons that are highly vulnerable to climate change by 2030.*

Togo: *Assure the restoration and maintenance of riverine catchments and wetland zones.*

Tunisia: *Develop and implement a strategy and action plan for conservation and the management of the biodiversity of terrestrial, marine, and coastal wetlands.*

Viet Nam: *Improving resilience and the restoration of natural and social systems to the negative impact of climate change; monitoring climate change impact on different sectors and regions.*

Annex 9. Gender

The following examples illustrate the diversity of water-related gender measures included across enhanced NDCs:

Cambodia: *Conduct a study on the different impacts of vector-borne and water-borne diseases on women and men, girls and boys.*

Eswatini: *Promote equitable access to knowledge and skills for women on waste management.*

Honduras: *Responsive gender adaptation strategy in the infrastructure sector that encourages the construction of water reservoirs for domestic consumption and family agricultural and livestock production.*

Kyrgyzstan: *Formulation of water sector development policy taking into account adaptation to climate change, gender aspects, and interests of vulnerable groups.*

Myanmar: *Incorporating and enforcing climate change dimensions in environmental and natural resource management policies, rules, and regulations, including gender considerations with mitigation activities planned so they do not harm water and biodiversity systems.*

Pakistan: *Capacity development of women to fully engage in water resource management, maintenance of water infrastructure, low water consuming crop technologies, water efficient technologies.*

Paraguay: *Promote the role of women as agents of change in the access and efficient use of the water resource for consumption and production processes.*

Sierra Leone: *Gender is a cross-cutting concern for adaptation planning because women and girls are subject to a disproportionate amount of risk from climate-related natural disasters.*

Sudan: *Empowerment of women facing increased occurrence of severe droughts and degradation of water resources, scarcity in water, and loss of livelihood sources.*

Annex 10. Nature-based solutions

Further examples of NBS measures:

Colombia: *Exchange of successful experiences for the development of a Portfolio of Climate Solutions based on Nature as an option for adaptation to climate change using marine and coastal biodiversity, with a portfolio that facilitates the formulation and implementation of climate change adaptation initiatives applicable to the marine and coastal areas of the Pacific, Caribbean and Insular regions of Colombia, contributing to the increase of their resilience and decrease in vulnerability to the adverse effects of climate change.*

DRC: *With regard to the forestry and other sector land allocations, taking into account the implementation of nature-based solutions, the DRC will ensure synergies with regional planning and land tenure security.*

Jordan: *Green infrastructure approach is a labour intensive and highly sustainable option that can provide solutions that provide job opportunities while protecting ecosystem services through nature-based solutions.*

Lao PDR: *Increase water resource infrastructure resilience to climate change, including through nature-based solutions. Nature-based solutions shall be prioritized as effective lower cost options to counter climate-induced disasters such as floods, landslides, and droughts.*

Lebanon: *Incorporate Nature-based solutions as a first line of defence from adverse impacts of climate change.*

Paraguay: *Increase the resilience of those ecosystems in which socio-economic and cultural practices are carried out, based on the use of NBS.*

Seychelles: *Prioritize nature-based solutions to protect coastal ecosystems from climate impacts such as storm surges, flooding, and erosion, using the Coastal Management Plan as a guideline for implementation of nature-based solutions.*

Annex 11. Integrated water resource management

Further examples of IWRM measures:

Benin: *Promote the integrated management of water resources at the watersheds and build infrastructure multifunction hydraulics.*

Cameroon: *Integrated management of water resources and development of climate-resilient sanitation systems.*

Colombia: *Through the implementation of the Water Governance programme, it will be possible to strengthen the different actors related to IWRM, in understanding and making decisions regarding the possible effects of climate change on water resources.*

Guinea: *The development of the National Water Policy (2018) aims to develop an integrated approach to water resources throughout the national territory and understand the climatic challenges in a transversal way.*

Maldives: *Implementation of cost-effective IWRM systems to cater for the water needs of the entire population to reduce the risk of water shortages during dry seasons.*

Moldova: *Apply IWRM principles for water quantity and quality based on a water monitoring and maintenance system.*

Nigeria: *Adopt an IWRM approach for the sustainable development of the country's river basins.*

Paraguay: *Promote studies to identify and address the existing capacity gaps for the application of integrated water resources management, particularly in planning, protection, inspection, conflict resolution, and financing related to water resource management needs.*

Suriname: *Explore the development of mechanisms to facilitate IWRM, including appropriate institutional and legislative frameworks at all stages of water planning and management.*

Tajikistan: *Improving water resources management through the full implementation of basin and integrated water resources management.*

Thailand: *Water resource management sectors aims to increase water security, and reduce loss and damage from water-related disasters by developing approaches for integrated water resource management and building adaptive capacity to manage climate risks in water resource management.*

Annex 12. Water security

Further examples of water security measures:

Costa Rica: *By 2030, water security and sustainability will have been promoted in the face of climate change, as well as the adequate and integrated management of hydrographic basins, through the protection and monitoring of sources considering both surface and groundwater.*

Dominican Republic: *In the water security sector (measures one and two), a mobilization of USD \$671 million is projected by 2030, fundamentally directed to investment projects to contribute to the improvement of access to drinking water and sanitation.*

Nigeria: *Furthermore, implementing NBS in Nigeria can bolster water security by increasing the lifespan and efficiency of water supplies and enhancing the storage and recharge of groundwater.*

Panama: *Water security planning will be decentralized to the level of watersheds, particularly with regard to Goal 4 for Healthy Watershed Management.*

Rwanda: *Develop a national water security plan to employ water storage and rainwater harvesting, water conservation practices, efficient irrigation, and other water-efficient technologies.*

Annex 13. Basin planning

Further examples of basin planning measures:

Albania: *Integrated water basin and watershed management (e.g. protection of forest in the upper areas of watersheds).*

Belize: *Enhance the protection of water catchment (including groundwater resources) areas and make improvements to the management and maintenance of existing water supply systems through implementation of the National Water Sector Adaptation Strategy and Action Plan.*

Benin: *Development of small basins slopes for the improvement of food and nutrition security for the benefit of vulnerable populations.*

Cabo Verde: *By 2025, delimitate priority areas, accounting for 6,000 ha, which contribute to the conservation and protection of soils, wetlands, headwaters, ribeiras, and water bodies, and verify compatibility with other land uses.*

Cambodia: *10 river basins have updated river basin management plans.*

Dominican Republic: *Ecosystem-based adaptation through forests and agroforestry systems in prioritized watersheds.*

El Salvador: *Preparation of the Integrated Watershed Management Policy.*

Ethiopia: *Area under integrated watershed development 10 million ha.*

Indonesia: *Implementation of integrated upstream and downstream approach in forest rehabilitation and restoration, watershed management planning, and protection of terrestrial water resources.*

Jordan: *Supporting watershed- and basin-level management of water resources including transboundary water.*

Liberia: *Catalogue 100 per cent of water catchments in forest areas, with 50 per cent of these under sustainable management plans by 2030.*

Nigeria: *Integrate basin-level mechanisms to evaluate the robustness and flexibility of water commitments within and between catchments (possible inter-basin transfers) at national and regional (transboundary) levels.*

Paraguay: *Promote the articulation of governance systems through inter-institutional coordination of water resources by river basin, at an appropriate scale.*

Sierra Leone: *Established watershed and freshwater committees that are gender sensitive for responsible and sustainable water management.*

South Sudan: *To maintain water quality and quantity for the future, the Government of South Sudan is prioritizing an integrated water catchment management approach.*

Sri Lanka: *River basin-wide vulnerability, risks, and capacity assessments carried out in 15 river basins in Sri Lanka by 2025.*

Tajikistan: *Improving water resources management through the full implementation of basin and integrated water resources management.*

Vanuatu: *Natural resource related measures to protect climate-vulnerable urban water sources identified and implemented (e.g. reforestation of watershed).*

Viet Nam: *Developing and implementing the national water resources master plan and river basin integrated master plan, taking into account climate change.*

Zambia: *Protection and conservation of water catchment areas and enhanced investment in water capture, storage, and transfer (linked to agriculture, energy, ecological, industrial, and domestic use purposes) in selected watersheds.*