KINGDOM OF BAHRAIN
Supreme Council
for Environment

The Kingdom of Bahrain's NDC 3.0 to the UNFCCC

2025

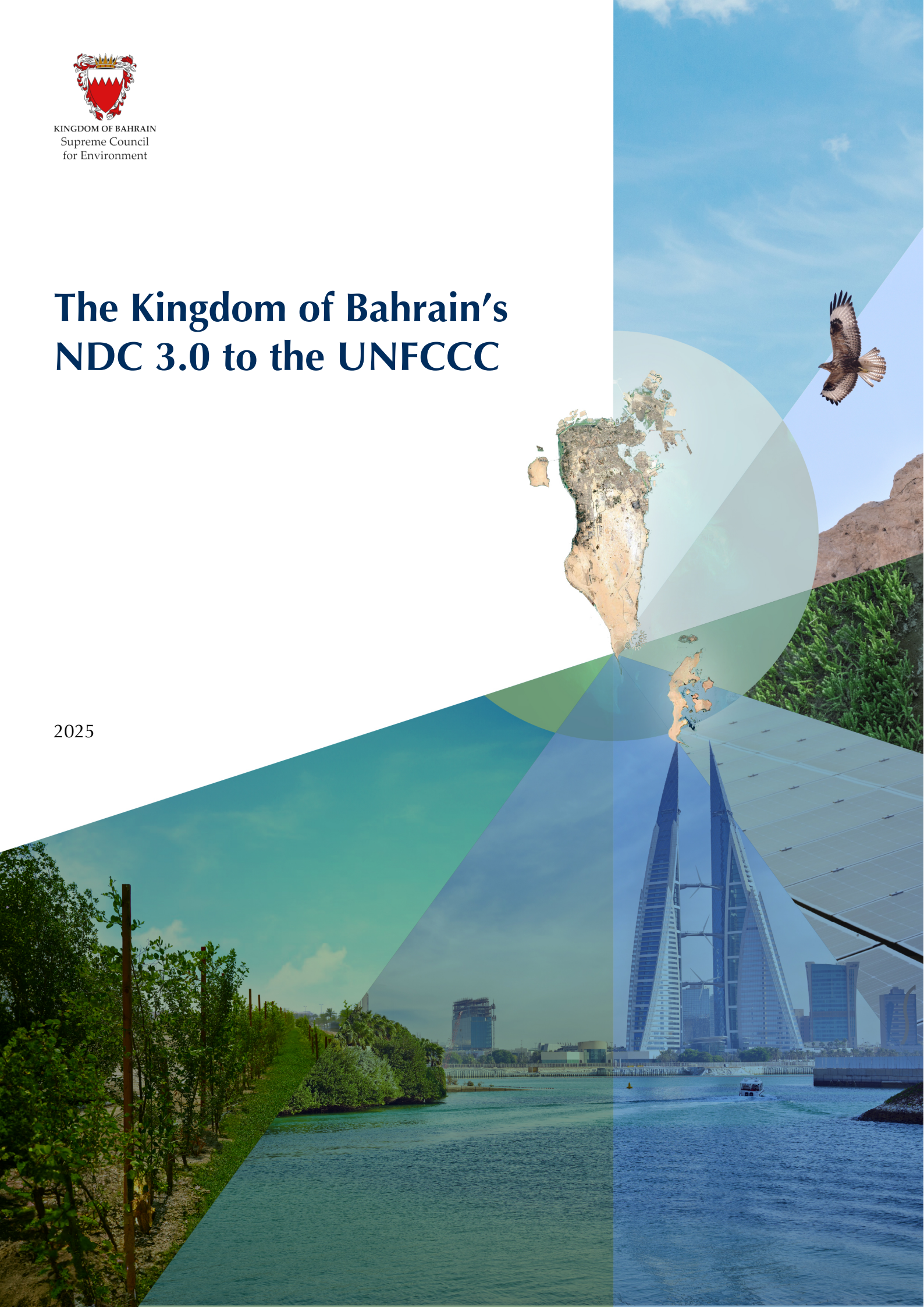


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1. National Circumstances

The Kingdom of Bahrain, located in the Arabian Gulf, is a small island state comprising approximately 33 natural and 51 artificial islands, shoals, and small islets, all of which are predominantly characterized by a desert environment. The Arabian Gulf area is highly vulnerable to climate change. Bahrain is thus susceptible to various climate change impacts, including rising temperatures, water scarcity, and rising sea levels.

Bahrain is an arid country with mild, pleasant winters, and hot, humid summers. Relative humidity is highest during the winter months of December through February. Rainfall in Bahrain is limited, erratic, and occurs in brief concentrated periods, with an average annual total of approximately 64 millimeters over the past decade, distributed across an average of merely ten days per year. Over the period from 1940 to 2021, the mean annual temperature in Bahrain has made a notable increase of around 2◦C.

With a total land area of approximately 780 km2, Bahrain is among the smallest countries in the world and is characterized by one of the highest population densities. Bahrain's coastline and land areas have evolved considerably over the past 30 years due to land reclamation projects that continue to this present day. The majority of the population resides in the capital, Manama, which is situated on Bahrain Island, the Kingdom's largest land mass.

Historically, Bahrain's economy was primarily based on pearl diving up until the discovery of oil in the 1930s. Since then, the oil and gas sector has played a central role in the Kingdom's economy. This dependence on natural resources has made economic diversification a fundamental element to Bahrain's pursuit of sustainable development. Efforts to reduce reliance on the oil and gas sector date as early as the 1970s and in 2008, the Kingdom launched its Economic Vision 2030 which encompasses a comprehensive plan to develop a productive globally competitive economy, shaped by the government and driven by a pioneering private sector. Bahrain has made significant strides in diversifying into sectors such as manufacturing, finance, and hospitality. Nonetheless, public revenue remains highly dependent on the contributions of the oil and gas sector. Accordingly, Bahrain is vulnerable not only to the adverse impacts of climate change but also to the potential impacts of response measures.

Bahrain's national circumstances play a significant role in shaping the trajectory of its greenhouse gas (GHG) emissions and removals. Factors such as the country's climate,

industrial expansion, population growth, and economic development have direct implications on its GHG inventory over time. These factors are further detailed below.

Population Growth and Urbanization

Bahrain's population grew by approximately 26% over the past decade, driving increased demand for energy, transportation, and waste management services. Urbanization and population growth have direct implications on GHG emissions, as does Bahrain's economic growth. Nonetheless, Bahrain's contribution to global GHG emissions remains negligible.

Water Scarcity and High Dependence on Seawater Desalination

Bahrain is a highly water-stressed country from a freshwater resource availability perspective. Water scarcity in Bahrain plays a key role in increasing GHG emissions due to the country's reliance on energy-intensive seawater desalination. With limited freshwater resources, desalination is vital but contributes to higher energy consumption, particularly during peak summer months when water demand surges. As electricity generation in Bahrain is predominantly fossil fuel-based, the growing need for desalination has led to increased emissions from the energy sector. Enhancing the efficiency of desalination processes and incorporating renewable energy sources like solar can help reduce the environmental impact while addressing the country's water security needs.

High Ambient Temperature

One of the key national circumstances influencing GHG emissions in Bahrain is the country's high ambient temperature. Bahrain experiences long, hot summers with temperatures frequently exceeding 40°C, which significantly affects energy consumption, especially in sectors such as electricity generation and air conditioning. The high demand for cooling drives increases in electricity consumption during peak summer months, which, in turn, results in increased GHG emissions. Cooling needs for residential, commercial, and industrial facilities also lead to greater use of energy-intensive technologies as well as high amounts of HFCs refrigerants.

Economic and Industrial Expansion

Bahrain's robust economic growth and industrial expansion are also key drivers of GHG emissions. The country's growing industrial base, especially in hard-to-abate sectors such as aluminum and steel production, has significantly driven emissions in the Industrial Processes and Product Use (IPPU) sector. This growth aligns with

Bahrain's efforts to diversify its economy, increase industrial output, and reduce reliance on the hydrocarbon sector. Furthermore, it also illustrates the challenge of balancing economic growth with efforts to reduce GHG emissions.

Energy Sector Dominance

Bahrain's energy sector remains the predominant source of GHG emissions. The high reliance on hydrocarbons – primarily natural gas – for electricity generation and industrial processes is a central feature of Bahrain's emission profile. While there have been efficiency improvements in electricity production through phasing out old single gas turbine power stations and producing power through combined cycle gas turbines, overall energy consumption continues to rise due to population and economic growth.

Energy Transition Challenges

Parallel to its reliance on fossil fuels, Bahrain also faces challenges in transitioning to alternative forms of energy. Limited land area, high urban density, low wind speeds and an absence of geothermal and hydropower sources pose considerable obstacles to an energy transition. Although solar energy represents Bahrain's most viable domestic renewable energy option, limited land availability and competing land-use demands constrain large-scale deployment. Despite these challenges, Bahrain remains focused on exploring and pursuing viable opportunities for developing alternative energy sources.

Impacts of the Implementation of Response Measures

Article 4(8) and 4(10) of the United Framework Convention on Climate Change recognize the circumstances of developing countries with economies that are vulnerable to the adverse effects of the implementation of response measures, including countries whose economies are dependent on fossil fuels. Under Article 4(15), the Paris Agreement also requires Parties to consider the economies most affected by the impacts of response measures, particularly developing countries.

Bahrain's reliance on oil and gas revenues, along with its limited capacity for alternative energy, are key features of its national circumstances. These factors make the Kingdom particularly vulnerable to the impacts of global climate change response measures. Such measures may lead to economic losses that, in turn, hinder Bahrain's ability to pursue effective climate action and achieve broader sustainable development objectives.

In this context, Bahrain considers economic diversification a critical strategy to limiting the adverse impacts of response measures. Economic diversification not only supports national development and sustainable growth but also enables a gradual shift away from resource dependence.

Limited Agricultural Activity

Agriculture in Bahrain is a minor sector, contributing less than 0.1% to total GHG emissions. The limited agricultural activity in the country, due to its arid climate and lack of arable land, means that the Agriculture, Forestry, and Other Land Use (AFOLU) sector is not a significant source of emissions.

Further details on Bahrain's national circumstances may be found in Bahrain's First Biennial Transparency Report (BTR) to the UNFCCC.

2. Contributions to Mitigation

As a small island state, the Kingdom of Bahrain's contribution to global greenhouse gas is negligible, estimated at below 0.07%. Despite this minimal contribution, Bahrain recognizes the importance of addressing climate change and promoting sustainable development. In its commitment to contribute to the global fight against climate change, it herewith presents ambitious mitigation contributions consisting of adaptation actions and economic diversification measures with mitigation co-benefits.

This NDC is anchored in the principle of equity and common but differentiated responsibilities and respective capabilities (CBDR-RC), in the light of different national circumstances It marks a progression in the Kingdom's mitigation ambitions, as it transitions the Kingdom to quantitative mitigation contributions and, correspondingly, enables quantitative reporting. It also doubles the renewable energy capacity contribution communicated in the previous NDC.

This commitment is conditional on the availability of sufficient means of implementation and continued alignment with the Kingdom's sustainable development priorities.

Moreover, Bahrain commences implementation of these actions with the understanding that they may be financed through sources other than its public budget, for example, through carbon markets.

Economic Diversification with Mitigation Co-benefits

- *Contribution 1: Achieve total installed renewable energy capacity equal to 20% by 2035*

Adaptation with Mitigation Co-benefits

- *Contribution 2: Increase the number of trees from 1.8 million to 3.6 million by 2035*
- *Contribution 3: Plant 1.6 million mangrove seedlings by 2035*

2.1 Information to Facilitate Clarity, Transparency, and Understanding

1. Quantifiable information on the reference point	
a. Reference year(s), base year(s), reference period(s) or other starting point(s)	See 1(b) below.
b. Quantifiable information on the reference indicators, their values in the reference year(s), base year(s), reference period(s) or other starting point(s), and, as applicable, in the target year	**Contribution 1: Renewable Energy** The reference indicator is the total percentage of renewable energy installed capacity. The reference year for this indicator is 2010, whereby the total renewable energy installed capacity was equal to 0 MW. The reference point for this indicator is 0%. **Contribution 2: Afforestation** The reference indicator is the number of trees planted. The reference year for this indicator is 2021 and the reference point for this indicator is zero trees. **Contribution 3: Mangroves** The reference indicator is the number of mangrove seedlings planted. The reference year for this indicator is 2021and the reference point for this indicator is zero mangroves.

1. Quantifiable information on the reference point	
c. For strategies, plans and actions referred to in Article 4, paragraph 6, of the Paris Agreement, or polices and measures as components of nationally determined contributions where paragraph 1(b) above is not applicable, Parties to provide other relevant information	Not applicable.
d. Target relative to the reference indicator	**Contribution 1: Renewable energy** Total installed renewable energy capacity equal to 20% in 2035. **Contribution 2: Afforestation** 1.8 million trees planted. **Contribution 3: Mangroves** 1.6 million mangrove seedlings planted.
e. Sources of data used in quantifying the reference point	The sources of data include the Ministry of Electricity and Water Affairs, the Electricity and Water Authority, the Ministry of Municipalities Affairs and Agriculture, and the Supreme Council for Environment.

1. Quantifiable information on the reference point	
f. Information on the circumstances under which the Party may update the value of the reference indicator	Bahrain may update the value of its reference indicators to reflect changes in economic and policy direction, revisions in technical analysis, or the adoption of new or improved methodologies or data sources by its national data providers.

2. Time frame	
a. Time frame and/or period for implementation, including start and end date, consistent with any further relevant decision adopted by the Conference of the Parties serving as the meeting of the Paris Agreement	This NDC is a continuation and a strengthening of the mitigation contributions in Bahrain's 2021 NDC. **Contribution 1: Renewable energy** Start date: 2017 End date: 2035 **Contribution 2: Afforestation** Start date: 2022 End date: 2035 **Contribution 3: Mangroves** Start date: 2022 End date: 2035

2. Time frame	
b. Whether it is a single-year or multi-year target, as applicable	Single year targets for 2035

3. Scope and coverage	
a. General description of the target	See 1(d) above.
b. Sectors, gases, categories and pools covered by the nationally determined contribution including, as applicable, consistent with Intergovernmental Panel on Climate Change (IPCC) Guidelines	Bahrain's NDC consists of adaptation actions and economic diversification measures with mitigation co-benefits. The sectors covered by this NDC include energy, forestry and cross-cutting sectors. Gases covered include CO_2, CH_4, and N_2O.
c. How paragraphs 31(c) and (d) of decision 1/CP.21 were taken into consideration	In line with paragraphs 31 (c) and (d) of decision 1/CP.21, Bahrain will continue to strive to include all categories of anthropogenic emissions and removals in its NDC, as appropriate. As a small island state vulnerable to climate change impacts and global response measures, Bahrain has focused this NDC on actions that contribute to global mitigation efforts, increase local resilience to climate change impacts, and diversify its economy in a way that gradually reduces the Kingdom's resource dependence.

3. Scope and coverage	
d. Mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans, including description of specific projects, measures and initiatives of Parties' adaptation actions and/or economic diversification plans	Some of the co-benefits expected from the contributions outlined in this NDC include: • Reduced greenhouse gas emissions • Carbon sequestration In addition to the specific adaptation actions and economic diversification actions presented in this NDC, Bahrain has steadily pursued various measures aimed at transforming its economy and enhancing the resilience of key sectors, in alignment with broader sustainable development goals. Some of these efforts are reflected in Bahrain's First Biennial Transparency Report.

4. Planning processes	
a. Information on the planning processes that the Party undertook to prepare its nationally determined contribution and, if available, on the Party's implementation plans, including, as appropriate: i. Domestic institutional arrangements, public participation and engagement with local communities and indigenous	This NDC was prepared by the Supreme Council for Environment (SCE), with regard to the commitments and direction of His Royal Highness Prince Salman bin Hamad Al Khalifa, the Crown Prince and Prime Minister. The SCE serves as the government entity responsible for protecting the environment, maintaining natural resources, and developing strategies related to the environmental and sustainable development. Within the SCE, the Climate Change and Sustainable Development Directorate (CCSD) is the technical body responsible for climate change-related matters. The CCSD works on both climate mitigation and adaptation and is Bahrain's focal point for the UNFCCC.

4. Planning processes	
peoples, in a gender-responsive manner ii. Contextual matters, including, inter alia, as appropriate: a. National circumstances, such as geography, climate, economy, sustainable development and poverty eradication; b. Best practices and experience related to the preparation of the nationally determined contribution; iii. Other contextual aspirations and priorities when joining the Paris agreement	To prepare the NDC, the SCE consulted relevant stakeholders, including line ministries involved in implementing mitigation and adaptation related actions in the Kingdom. Following this consultation, the NDC was presented to the Ministerial Committee for Development and Infrastructure and Projects. The Committee is chaired by HE the Deputy Prime Minister and Minister for Infrastructure and enjoys the high-level participation of their Excellencies, the Minister of Oil and Environment, the Minister of Industry and Commerce, the Minister of Municipalities Affairs and Agriculture, the Minister of Works, the Minister of Electricity and Water Affairs, the Minister of Transportation and Telecommunications, the Minister of Housing and Urban Planning, and the Minister of Cabinet Affairs. Finally, the report was presented to the Cabinet for high-level approval. The Cabinet is the executive authority in Bahrain and comprises His Royal Highness the Crown Prince and Prime Minister, His Excellency the Deputy Prime Minister, and the Kingdom's 23 ministers. In addition to this formulation process which ensures high-level political endorsement, this NDC builds on the Kingdom's existing plans and policies, including the economic diversification measures listed in the previous NDC, and, more significantly, Bahrain's Economic Vision 2030. The 2030 Vision is a strategy document that plans the continued development of Bahrain's economy, including its non-hydrocarbon sectors. Launched in 2008 after four years of extensive discussions with the public sector, the private sector, and international consultancies and bodies, the Economic Vision 2030 aims to

4. Planning processes	
	build a better life for every Bahraini. It also establishes sustainability, fairness, and competitiveness as guiding principles to development. Moreover, this NDC also takes into account various factors, including the Kingdom's technical capabilities and the global urgency to accelerate climate action.
b. Specific information applicable to Parties, including regional economic integration organizations and their member States, that have reached an agreement to act jointly under Article 4, paragraph 2, of the Paris Agreement, including the Parties that agreed to act jointly and the terms of the agreement, in accordance with Article 4, paragraphs 16–18, of the Paris Agreement	Not applicable.
c. How the Party's preparation of its nationally determined contribution has been informed by the outcomes of the global stocktake, in accordance with Article 4, paragraph 9, of the Paris Agreement	The preparation of this NDC was informed by the outcomes of the first global stocktake (GST), which took place in Dubai at COP28 and marks a progression beyond Bahrain's previous NDC. More specifically, this NDC responds to the GST's call to triple renewable energy capacity globally and accelerating zero- and low- emission technologies by striving to double Bahrain's previous renewable energy contribution. It also responds to the encouragement to implement integrated, multi-sectoral solutions, such as nature-based

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	solutions, by committing to quantifiable contributions related to afforestation and mangrove planting.
d. Each Party with a nationally determined contribution under Article 4 of the Paris Agreement that consists of adaptation action and/or economic diversification plans resulting in mitigation co-benefits consistent with Article 4, paragraph 7, of the Paris Agreement to submit information on: i. How the economic and social consequences of response measures have been considered in developing the nationally determined contribution; ii. Specific projects, measures and activities to be implemented to contribute to mitigation co-benefits, including information on adaptation plans that also yield mitigation co-benefits, which may cover, but are not limited to, key sectors, such as energy, resources, water	To ensure a balanced approach to climate action, Bahrain's NDC was formulated with due consideration of its national circumstances, including its vulnerability to both climate change impacts and the implementation of response measures. It has also considered the Kingdom's broader strategic direction, such as that contained in Economic Vision 2030. (See 4(a) above) To this end, Bahrain's NDC consists of actions that not only contribute to reducing global GHG emissions but also enhance economic diversification and increase resilience to climate change. The mangrove and tree planting contributions included as part of this NDC provide the added benefits of increasing coastal resilience from sea level rise, combating desertification and reducing urban heat island effect. The contributions relating to renewable energy contribute to enhancing the Kingdom's energy security by diversifying the energy mix, without compromising the Kingdom's wider economic development. Further details on Bahrain's national circumstances and other adaptation actions may be found in Chapter 1 and 3, respectively.

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resources, coastal resources, human settlements and urban planning, agriculture and forestry; and economic diversification actions, which may cover, but are not limited to, sectors such as manufacturing and industry, energy and mining, transport and communication, construction, tourism, real estate, agriculture and fisheries	

5. Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals	
a. Assumptions and methodological approaches used for accounting for anthropogenic greenhouse gas emissions and removals corresponding to the Party's nationally determined contribution, consistent with decision 1/CP.21,	Not applicable - Bahrain's NDC consists of adaptation actions and economic diversification measures with mitigation co-benefits. While Bahrain intends to track progress, the Kingdom currently lacks the technical capability to account for the anthropogenic GHG emission reductions and removals resulting from the adaptation actions and economic diversification measures outlined within this NDC as well as other policies, actions and policies implemented across the Kingdom.

5. Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals	
paragraph 31, and accounting guidance adopted by the CMA	When preparing its national GHG inventory, Bahrain accounts for anthropogenic GHG emissions and removals according to the 2006 IPCC Guidelines and its 2019 Refinement and uses a mix of Tier 1 and 2 methods, where applicable. Further information on Bahrain's national GHG inventory preparation process may be found in Bahrain's first Biennial Transparency Report (BTR).
b. Assumptions and methodological approaches used for accounting for the implementation of policies and measures or strategies used in the nationally determined contribution	Bahrain does not have the technical capability to account for the anthropogenic GHG emission reductions and removals corresponding to specific policies, measures or strategies. Bahrain's assumptions and methodologies for tracking afforestation, mangroves and renewable energy contributions are detailed under Bahrain's first Biennial Transparency Report and may be updated, as appropriate.
c. Information on how the Party will take into account existing methods and guidance under the Convention to account for anthropogenic emissions and removals, in accordance with Article 4, paragraph 14, of the Paris Agreement	See 5(a) above.

5. Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals	
d. IPCC methodologies and metrics used for estimating anthropogenic greenhouse gas emissions and removals;	See 5(a) above.
iv. Sector-, category- or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, as appropriate, including as applicable: i. Approach to addressing emissions and subsequent removals from natural disturbances on managed lands; ii. Approach used to account for emissions and removals from harvested wood products; iii. Approach used to address the effects of age-class structure in forests;	See 5(a) above.

5. Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals	
v. Other assumptions and methodological approaches used for understanding the nationally determined contribution and, if applicable, estimating corresponding emissions and removals, including: i. How the reference indicators, baseline(s) and/or reference level(s), including, where applicable, sector-, category- or activity-specific reference levels, are constructed, including, for example, key parameters, assumptions, definitions, methodologies, data sources and models used; ii. For Parties with nationally determined contributions that contain non-greenhouse-gas components, information on assumptions and methodological	See 5(a) and 5(b) above.

5. Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals	
approaches used in relation to those components, as applicable; iii. For climate forcers included in nationally determined contributions not covered by IPCC guidelines, information on how the climate forcers are estimated; iv. Further technical information, as necessary;	
vi. The intention to use voluntary cooperation under Article 6 of the Paris Agreement, if applicable	Bahrain is considering the potential role of voluntary cooperation as per Article 6 of the Paris Agreement in meeting national development and climate objectives, and reserves its right to use cooperative approaches under Article 6.

6. How the Party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances	
a. How the party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances	Bahrain considers this NDC as fair and ambitious in light of its national circumstances. As a small island state, Bahrain is disproportionately affected by climate change impacts despite its minimal contribution to global GHG emissions. Nonetheless, Bahrain is strives to take measures to further emission reductions. Moreover, this NDC takes into account Bahrain's current technical capabilities as well as the global urgency to accelerate climate action. This approach is aligned with the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC).
b. Fairness considerations, including reflecting on equity	See 6(a).
c. How the Party has addressed Article 4, paragraph 3, of the Paris Agreement	This NDC is a clear progression in Bahrain's mitigation ambition as it transitions the Kingdom's to quantitative mitigation contributions. It also doubles the renewable energy capacity contribution communicated in the previous NDC. Bahrain has also followed ICTU guidance to enhance the NDC's clarity, transparency and understanding.
d. How the Party has addressed Article 4, paragraph 4, of the Paris Agreement	The ambition of this contribution is informed by Bahrain's national circumstances and capabilities. Bahrain looks to continue to assess transitioning its NDC to an economy-wide emission reduction contribution.
e. How the Party has addressed Article 4, paragraph 6, of the Paris Agreement	Bahrain's NDC consists of adaptation actions and economic diversification measures with mitigation co-benefits.

7. How the nationally determined contribution contributes towards achieving the objective of the Convention as set out in its Article 2	
a. How the nationally determined contribution contributes towards achieving the objective of the Convention as set out in its Article 2	The adaptation actions and economic diversification measures with mitigation co-benefits submitted as part of this NDC contribute to the global response to climate change, including the Convention's objective of: • Holding the increase in global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C; and • The adaptation actions with mitigation co-benefits also contribute to the goal of increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas development, in a manner that does not threaten food production.
b. How the nationally determined contribution contributes towards Article 2, paragraph 1(a), and Article 4, paragraph 1, of the Paris Agreement	See 6(a-e) above.

3. Contributions to Enhance Adaptive Capacity, Strengthen Resilience and Reduce Vulnerability

As a small island state situated in an arid region, Bahrain faces notable multifaceted challenges related to climate change, including rising temperatures, water scarcity, and potential sea level rise. Adaptation thus plays a critical role in enhancing the Kingdom's climate resilience and securing the Kingdom's path to sustainable development.

The Kingdom of Bahrain recognizes that effective climate action requires a comprehensive approach that addresses both mitigation and adaptation. In line with this approach, the Kingdom presents the following adaptation actions as part of its NDC. These actions include both new activities and expansions of existing efforts. Together, these actions strengthen the resilience and adaptive capacity of various sectors.

The implementation and scaling up of adaptation action is not without its challenges. Financing for adaptation represents a meagre fraction of international climate finance. Adaptation actions are currently being taken with limited resources and in the context of other competing priorities. Institutional capacities and technological availability also pose hurdles to implementation.

3.1 National Adaptation Investment Plan

The National Adaptation Investment Plan (NAIP) serves as the Kingdom's guiding document on adaptation action. It identifies sectors most vulnerable to climate change, outlines corresponding climate adaptation actions, and translates those actions into a portfolio of projects. The NAIP also examines the financing options for each of these adaptation actions, thus taking a proactive approach to addressing the global challenge of mobilizing adaptation finance.

As of 2024, the formulation and development of the NAIP as a strategy document has concluded with the approval of the Ministerial Committee for Development and Infrastructure and Projects. The NAIP process, informed by wide stakeholder input, culminated in the development of 14 project concept notes targeting the following

sectors: (a) water resources, (b) agriculture and food production, (c) ecosystem services and biodiversity, and (d) urban development.

While the formulation of the NAIP marks a significant step forward toward enhancing the resilience of key sectors in Bahrain, further work is required to develop these concept

notes into viable project proposals and proceed with implementation. The implementation of these projects requires significant financial resources, as the estimated investment requirement is estimated at approximately USD 1.61 billion.

To further support NAIP implementation, the following actions are proposed to be undertaken:

- Formalize institutional arrangements related to the monitoring and tracking of NAIP projects
- Improve existing project concept notes with key implementing entities
- Strengthen human resource capacity within government to address climate change-related impacts

3.2 Water Resources

As a low-lying arid island country with one of the highest population densities in the world, Bahrain faces acute land and resource constraints. This concentration intensifies pressure on limited natural resources, particularly freshwater. Growing demand from domestic, agricultural, and industrial sectors, coupled with minimal natural replenishment, has made Bahrain increasingly reliant on costly water sources such as energy-intensive seawater desalination, and treated wastewater (i.e., TSE). The clear imbalance between limited natural water supplies and rising demand spotlight's the Kingdom's water vulnerability as a challenge that is further intensified by climate change impacts. Climatic extremes, including long, intensely hot summers, erratic and limited rainfall, and high evapotranspiration rates create a persistent water deficit. As a result, Bahrain ranks among the most water-scarce countries in the world.

To meet its water needs, Bahrain heavily relies on non-conventional water sources. Desalinated seawater constitutes the majority of the total water supply and is supplemented by treated wastewater and groundwater. Groundwater, the only conventional water source, is becoming increasingly constrained due to over-extraction and rising salinity levels from seawater intrusion and reduced recharge rates.

In response to these growing challenges, Bahrain has developed a comprehensive National Water Strategy 2030, which emphasizes demand-side management, improved efficiency, and increased water reuse.

To enhance water security, the following actions are proposed to be taken forward:

- Expand the use of treated wastewater (i.e., TSE Reuse) – including municipal wastewater, greywater, and harvested rainwater – to reduce pressure on desalinated water and groundwater supplies
- Strengthen monitoring and regulation of groundwater with advanced technologies to detect illegal wells, monitor extraction rates, and assess aquifer health in real-time
- Accelerate the integration of digital tools and platforms into water resource management to improve transparency, operational efficiency, and data-driven decision-making
- Modernize water distribution networks by replacing aging pipelines and reducing leakage in both drinking water distribution and treated wastewater distribution systems
- Adopt energy-efficient and climate-smart technologies in desalination and wastewater treatment, including the use of renewable energy, brine management innovations, and waste heat recovery systems
- Incorporate future climate risks into the planning and design of new water infrastructure projects
- Extend water networks to support food production and afforestation projects, ensuring a reliable supply for sustainable agriculture and urban greening efforts
- Invest in developing human capital across government institutions to strengthen the implementation of integrated water resources management (IWRM) and climate adaptation strategies
- Increase outreach and education to promote water-saving behaviors, highlight the value of non-conventional water resources, and encourage community engagement in conservation efforts

3.3 Agriculture and Food Security

The agricultural and food production sector in Bahrain, including the livestock and fisheries subsectors, faces several challenges, many of which are exacerbated by climate change impacts. Adverse climatic conditions, such as high temperatures, soil salinization, irregular and insufficient and rainfall pose increasingly difficult farming conditions. Rapid urbanization, a decline of arable land, limited-size farm holdings, and growing disinterest in joining the agricultural profession also create additional obstacles to domestic food production.

Moreover, there are key interlinkages between agriculture, food security and water scarcity. Despite contributing to less than 1% to Bahrain's GDP, agricultural activities consume a disproportionately high share of water resources. Lack of rainfall and a limited network to transport existing treated wastewater has led to an unsustainable dependence on already limited groundwater supplies. This unsustainable use of water further strains the agricultural sector and undermines long-term food security.

As a result of these circumstances, Bahrain currently imports approximately 90% of its food requirements. In response, several national initiatives have been launched to enhance food security and support domestic food production. Currently, the livestock sector meets around 12% of the country's consumption needs, while local poultry production fulfils approximately 25% of national demand for poultry meat and 20% for eggs. Fish resources supply about 50% of the country's consumption needs, and vegetable production contributes approximately 10%.

To further promote sustainable agricultural development and enhance national food security, the following actions are proposed:

- Introduce nutritionally and economically valuable crops that are resilient to harsh climatic conditions and limited water resources
- Establish a plant genetic resource bank to preserve and document local genetic diversity, including crops tolerant to salinity and heat, to support the sustainability of future agricultural production
- Promote and expand the use of modern technologies in smart agriculture
- Strengthen agricultural data infrastructure to support evidence-based decision-making in support of climate-resilient agricultural policies
- Deliver training programs to enhance awareness and skills in the agricultural field across a range of beneficiary groups, including women and youth
- Develop comprehensive training in modern agriculture to raise awareness and upgrade skills to adapt to climate change impacts and support sustainable production
- Strengthen implementation and enforcement of regulations to protect marine resources and avoid fish stock depletion
- Prohibit discarding and ensure that all fish caught are landed or utilized to reduce waste
- Explore investments along fish value chain to enhance food security and aquaculture development

3.4 Biodiversity and Ecosystem Services

The Kingdom of Bahrain is an archipelago comprising approximately 33 natural and 51 artificial islands, shoals, and small islets. While most of Bahrain is characterized by a desert environment, the Kingdom encompasses a variety of ecosystems. This includes marine and coastal ecosystems (e.g. coral reefs, mangroves, seagrass beds, mudflats) as well as desert and agricultural ecosystems (e.g. palm groves, freshwater springs, local varieties of crops). Together, these ecosystems provide an array of ecosystem services that include provision services (e.g. pearl, fish, molasses), regulating services (e.g. coastal protection), supporting services (e.g. fish nurseries, carbon fixation) and cultural services (e.g. recreation, tourism).

Moreover, Bahrain is home to approximately 1,455 species, ranging from insects to large mammals. This figure is likely an underestimate, as numerous taxa remain unidentified due to a shortage of national field studies and surveys.

There are a total of six marine protected areas and two terrestrial protected areas in Bahrain. Terrestrial and marine areas in Bahrain are exposed to effects of warming oceans, sea level rise, increased evaporation, and potential changes in storm patterns. Marine organisms and associated fisheries are identified as especially sensitive to climate change impacts, mainly due to an increase in average sea temperature rather than ocean acidification. More generally, biodiversity is also affected by anthropogenic pressures, such as land reclamation, urban expansion and groundwater depletion.

Recognizing the importance of preserving biodiversity and ecosystems, Bahrain's National Biodiversity Strategy and Action Plan (NBSAP) sets out a transformative vision of nature conservation that ensures the protection of biodiversity, and its sustainable use and resilience amid climate and development pressures. In support of this vision, an action plan has been developed to enhance biodiversity monitoring systems. This action plan represents a key step toward deepening the understanding of how local biodiversity is affected by climate change impacts.

The Kingdom of Bahrain is also undertaking a pioneering initiative utilizing the Animating the Carbon Cycle (ACC) model, initiated by the Global Rewilding Alliance and Yale University. The ACC model highlights the role of wildlife in delivering critical adaptation and resilience benefits as well as carbon regulation. In Bahrain, this work focuses on Dugongs and their interactions with seagrass ecosystems near the Hawar Islands, aiming to enhance understanding of the interlinkages between ecosystem services and nature conservation. The Hawar Islands host one of the world's largest aggregations of Dugongs.

The proposed actions outlined to enhance protection of biodiversity and ecosystem services include:

- Continue implementation of nature-based solutions that enhance climate resilience and support biodiversity conservation efforts
- Study proposed sites identified as environmentally sensitive areas, with the objective of expanding conservations areas to include these sites, subject to qualifying criteria
- Improve ecosystem and species monitoring systems in a manner that supports ecosystem restoration and rewilding initiatives
- Enhance the capacity of national personnel and institutions to sustain long-term biodiversity management, monitoring, and reporting
- Study the Animated Carbon Cycle (ACC) in local marine ecosystems to enhance understanding of how animal contributions support ecosystem services

3.5 Coastal Resilience

As a low-lying island state, coastal resilience is a pertinent aspect to Bahrain's long-term sustainability. Bahrain's 2021 NDC detailed plans to build on existing coastal resilience measures by developing a coastal resilience plan and strategy to identify potential sea level rise (SLR) risks and mitigate their potential impact.

Following extensive modelling of climate scenarios, and detailed examinations of critical assets exposed to potential future sea conditions and storms, a coastal resilience strategy and action plan was developed. The coastal resilience strategy and action plan proposes more than 200 physical and non-physical interventions to protect proximately 140 km of coastline and assets spanning residential, energy, water, food, tourism, commercial, health, transport, industry, ICT, government, finance and emergency services sectors. A prudent approach was taken whereby the overall recommended interventions focus on mitigating the risk of the most severe sea level scenario, despite its low probability.

An online WebMap tool, featuring a digital terrain model of the Kingdom, georeferenced asset locations, and current and future land use maps, was also created. This WebMap tool allows interactive interrogation with the inundation extents for all examined SLR scenarios and the exposure of individual assets to each scenario, thus allowing relevant public actors to stress test vulnerabilities under different future scenarios and adjust a multitude of assumptions and variables as new data becomes available.

The development of the coastal resilience strategy and action plan officially concluded in 2023 and was presented to the highest levels of government, including His Majesty King Hamad bin Isa Al Khalifa.

The strategy and action plan has now transitioned to an implementation phase, focused on executing the proposed recommendations. Due to the significant investment required (estimated at USD 318 - 424 million) and the geographical scope of the proposed action plan, implementation is expected to extend well into the long-term. Implementing the proposed recommendations will ultimately enhance the Kingdom's coastal resilience to even the least likely sea level scenario.

4. Means of Implementation

Implementing and accelerating climate action in Bahrain requires significant resources. Bahrain's ability to fulfill its NDC, across mitigation and adaptation, is dependent on the availability of means of implementation, including finance, technology and capacity building.

4.1 Finance

Bahrain's NDC is conditional on the availability of sufficient financial resources and continued alignment with the Kingdom's sustainable development priorities and efforts to eradicate poverty. A considerable amount of finance is required to implement Bahrain's NDC. For example, approximately USD 1.61 billion is required to implement the National Adaptation Investment Plan alone, whereas the cost to implement the Kingdom's coastal resilience plan and strategy are estimated at around USD 318 - 424 million.

Notably, a significant portion of Bahrain's public revenue is dependent on revenues from the energy sector. Accordingly, negative impacts on Bahrain's energy sector could constrain the ability to implement climate action. Persistent declines in global oil prices, for example, have led to successive budget deficits, which in turn have driven an increase in public debt.

As mentioned in previous sections, Bahrain views economic diversification as a key means of enabling climate action, mitigating the adverse impacts of response measures, and contributing to the Kingdom's sustainable development. The Kingdom remains focused on the ongoing development of its non-hydrocarbon sectors, in alignment with its long-standing commitment to economic diversification. These non-hydrocarbon sectors include tourism, logistics, financial services, telecommunications, IT and digital economy,

and manufacturing. Moreover, Bahrain continues to implement initiatives to reduce government expenditures; increase revenues; reskill and upskill Bahrainis corresponding labor market needs; bolster private sector growth; attract Foreign Divest Investment; and foster public-private partnerships.

The Kingdom has also explored innovative ways to finance climate action, such as public-private partnerships. Examples of these innovative initiatives, such as Solar Financing Schemes and the BOOM (Build, Own, Operate, Maintain) model, may be found in Bahrain's First Biennial Transparency Report (BTR). Bahrain notes that

financing for its NDC may come from sources beyond the national public budget, such as carbon markets.

4.2 Technology

The development, deployment and diffusion of technology are vital enablers to achieving the Paris Agreement's goals. Bahrain encourages the use of best available technologies that accelerate emission reduction and climate resilience efforts.

Bahrain recognizes Carbon Capture, Utilization and Storage (CCUS) and Carbon Capture and Storage (CCS) as technologies that support economic diversification and enhance energy security. These technologies also have the benefit of preserving existing infrastructure investments and facilitating the decarbonization of hard-to-abate sectors, as well as contributing to environmental efforts. More generally, these carbon management solutions help contribute to global climate goals without affecting developing countries' economic growth.

Moreover, Bahrain is in the process of its first Technology Needs Assessment (TNA) which will identify, evaluate and determine technologies that reduce greenhouse gas emissions and/or increase climate resilience in selected sectors. The TNA will assess barriers and solutions related to technology diffusion and deployment and develop technology action plans to improve the uptake and market penetration of technologies prioritized by stakeholders in Bahrain. Following this activity, one or more concept notes will be developed to support implementation and facilitate submission to a funding agency. The TNA process will involve various stakeholders, and its country-driven and participatory nature provides the opportunity to further national capacity and understanding in both mitigation and adaptation action.

4.3 Capacity Building

Bahrain continues to improve its capacity to address climate change and recognizes the key role of capacity building in enhancing technical capabilities, advancing knowledge and furthering best practices. The Kingdom both implements and benefits from capacity building initiatives and welcomes the establishment of partnerships in this area.

Climate change is perceived as an inherently cross-sectoral issue that spans a multitude of sectors and encompasses a diverse range of stakeholders. While the government organizes a range of activities and actions to enhance environmental awareness, deepen understanding of climate action and transfer green skills, further partnerships are required to enhance the Kingdom's technical capabilities and empower stakeholders as agents of change.

Additional details on the Kingdom's capacity-building efforts are provided in its first Biennial Transparency Report (BTR).



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