

KINGDOM OF SAUDI ARABIA

UPDATED FIRST  
NATIONALLY DETERMINED  
CONTRIBUTION

2021 SUBMISSION TO UNFCCC

The Kingdom of Saudi Arabia is pleased to submit the Updated First Nationally Determined Contributions (NDC) to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC). As an update of the previously submitted INDC, this document is based on the following principles and decisions:

- a. Decisions 1/CP.19, 1/CP.20, 1/CP.21 and 1/CP.24,
- b. Article 3 of UNFCCC,
- c. Economic Diversification Initiative (as per decision 24/CP.18, Doha 2012),
- d. Paris Agreement Articles 4.1, 4.7, and 4.15

To achieve its sustainable development objectives, the Kingdom is engaging in actions and plans in pursuit of economic diversification with the following co-benefits:

- a. Greenhouse gas emission avoidance, reduction and removal
- b. Climate adaptation
- c. Managing the impacts of response measures

The Kingdom actively contributes to the UNFCCC and Paris Agreement goals, while maximizing long-term benefits and minimizing potential negative side effects. This NDC reflects the Kingdom's efforts in the context of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

## EXECUTIVE SUMMARY

The Kingdom of Saudi Arabia reaffirms its commitment to Paris Agreement goals and achieving mitigation co-benefits through economic diversification and adaptation. The Kingdom will implement actions, projects, and plans outlined in this submission that aim at reducing, avoiding, and removing GHG emissions by 278 million tons of CO<sub>2</sub>eq annually by 2030, with the year 2019 designated as the base year for this NDC. This ambition is more than a two-fold increase versus the previous one as outlined in the Kingdom's INDC (130 million tons of CO<sub>2</sub>eq). Thus, this submission represents progression and the highest possible ambition.

The ambitions set in this NDC are contingent on long-term economic growth and diversification with a robust contribution from hydrocarbon export revenues to the national economy. Through its Vision 2030, the Kingdom has already instigated a comprehensive set of unprecedented reforms in the public sector's operating model, the economy, and society as a whole. The new ambition is also premised on the assumption that the economic and social consequences of international climate change policies and measures will not pose a disproportionate or abnormal burden on the Kingdom's economy (Paragraph 2 of Article 3 of the UNFCCC).

The Kingdom has embarked on a comprehensive and highly ambitious set of measures to realize its climate ambitions using the Circular Carbon Economy Framework.

The Kingdom is developing and implementing holistic and harmonized programs, policies, initiatives, and collaboration platforms to address climate change challenges at the national, regional and global scale. Examples include the Saudi Green Initiative, the Middle East Green Initiative, the Circular Carbon Economy National Program, the National Renewable Energy Program, and the Saudi Energy Efficiency Program. The Kingdom is also a member and active participant of major international initiatives such as Global Methane Initiative, Mission Innovation, Clean Energy Ministerial, and Net-Zero Producers Forum.

## 1. NATIONAL CIRCUMSTANCES

Physical, economic and social factors are the main determinants of the vulnerability of a country to climate change. The Kingdom of Saudi Arabia exhibits significant vulnerability in all three aspects. As an arid country with a harsh climate and sensitive ecosystem, Saudi Arabia is particularly vulnerable to climate change. About 76% of its area (including 38% as deserts) is non-arable land. The average annual rainfall in the Kingdom is low. Renewable surface water resources are limited while the Kingdom lacks rivers and lakes. Groundwater from local aquifers (mostly non-renewable) is the major water supply source for domestic, agricultural and industrial purposes. Thus, water scarcity is common and changes in the water balance would have serious implications for the desert ecosystem, agriculture, industry and other sectors.

Oil production, processing and export are the primary economic activities of the Kingdom of Saudi Arabia. The reliance on limited income resources puts at risk its ability to maintain a level of growth in the long run, hence economic diversification is a key factor influencing the stability and sustainability of the Kingdom's economic growth. In 2016, the Kingdom of Saudi Arabia has embarked on Vision 2030 which charts out the path for economic diversification and a prosperous future in all development areas.

Since the inception of the Sustainable Development Goals (SDGs), the Kingdom of Saudi Arabia took an active part in related consultations and has pledged its commitment to meet these goals. Central to all sustainable development plans and programs is an economic diversification designed to diversify the Kingdom's sources of national income and reduce dependence on revenues from limited sources by increasing the share of other sectors in gross domestic product. These sectors include the manufacturing industries, energy, energy-related derivatives, mining, tourism, logistics, and information technology industries.

## 2. NDC Ambition

The Kingdom aims at reducing and avoiding GHG emissions by 278 million tons of CO<sub>2</sub>eq annually by 2030, with the year 2019 designated as the base year for this NDC. This ambition is more than a two-fold increase versus the previous one as outlined in the Kingdom's INDC (130 million tons of CO<sub>2</sub>eq). Thus, this submission represents progression and the highest possible ambition.

This NDC is driven by the aim to implement measures that accelerate the economic diversification process under Section 3 below (Scenario 1). Estimates and ambitions will be adjusted depending on the level of development and progress toward economic diversification as well as feedback from different sectors of the economy.

## 3. DYNAMIC BASELINES

Two scenarios for determining dynamic baselines for the period 2020–2030:

Scenario 1: Economic diversification with a robust contribution from hydrocarbon and its derivatives export revenues. Export revenues channeled into investments in high value-added sectors such as financial services,

medical services, tourism, education, renewable energy and energy efficiency technologies to enhance economic growth. Ambitions outlined in this NDC are set under this scenario.

Scenario 2: Accelerated domestic industrialization based on sustainable utilization of hydrocarbons. A heavy industrial base built to use domestic energy resources as feedstock or energy source abated with best suitable technologies. Increasing contributions of petrochemical, cement, mining and metal production industries to the national economy. In this case, this NDC will be adjusted to account for this scenario.

The main difference between the two baseline scenarios is the allocation of hydrocarbons produced for either domestic consumption or export. While exported hydrocarbons will not contribute to the GHG emissions of Saudi Arabia, the domestic consumption will increase its GHG emissions. For the ex-ante estimations, the baseline is determined based on differently weighted combinations of the two scenarios.

#### 4. CONTRIBUTION TO ECONOMIC DIVERSIFICATION WITH MITIGATION CO-BENEFITS

The Kingdom of Saudi Arabia has embarked on a series of comprehensive economic reforms with sustainability as one of its core pillars. The NDC will be achieved by the deployment of various actions and plans as described below.

##### 4.1 ENERGY EFFICIENCY

The Kingdom's energy efficiency strategy, policies, measures and initiatives actively promote and support mitigation co-benefits across the economy. The Saudi Energy Efficiency Center runs an Energy Efficiency Program targeting three main sectors that account for 90% of the national energy demand: industry, building and land transportation. Its initiatives include progressively stringent efficiency standards in all three sectors.

Numerous initiatives will be implemented to improve and raise the efficiency of energy consumption in the targeted sectors including improving the efficiency of home appliances and air conditioning units, improving the efficiency of feedstock utilization in key strategic sectors such as petrochemicals, improving transportation fleet fuel economy, phasing out inefficient used light-duty vehicles, implementing aerodynamic regulation for heavy-duty vehicles, and improving the thermal efficiency of power generation, transmission, and distribution.

The National Energy Services Company (Tarshid) was established to incentivize energy efficiency in government buildings and private sector investment in energy efficiency services. It plans to retrofit the entire pool of public and governmental assets and facilities which include 2 million street lights, 110,000 government buildings, 35,000 public schools, 100,000 mosques, 2,500 hospitals and clinics.

##### 4.2 RENEWABLE ENERGY

**Power Sector:** Renewable energy projects will contribute to the diversification of the energy mix used in electricity production. Thus, the renewable energy ambition aims to reach around 50% of the energy mix by 2030. Through the National Renewable Energy Program, the Kingdom will implement a set of comprehensive

reforms, regulations and policies to stimulate private sector investment, research and development, employment in renewables. The program sets out a roadmap to diversify local energy sources, stimulate economic development and establish the local renewable energy supply chain and industry. The Kingdom will seek to localize a significant portion of the renewable energy value chain in the Saudi economy, including research & development and manufacturing. Specific technologies for deployment include solar PV, concentrated solar power, wind, geothermal energy, waste to energy and green hydrogen.

**Green Hydrogen:** Using its high-yield solar and wind resources, the Kingdom is uniquely positioned to become a global leader in green hydrogen production. The Kingdom's flagship giga-project, NEOM, will be building one of the world's largest green hydrogen facilities. The plant will be powered by over four gigawatts of renewable energy from solar and wind. Once onstream by 2025, it is expected to produce 650 tons per day of green hydrogen by electrolysis and 1.2 million tons per year of green ammonia.

#### 4.3 CARBON CAPTURE UTILIZATION & STORAGE

Capturing CO<sub>2</sub> emissions at the point source for conversion into value-added products or storage in geological reservoirs is a critical technology for the Paris Agreement goals.

The Kingdom is planning to build upon its experience in the CO<sub>2</sub> Enhanced Oil Recovery (EOR) project and its world's largest carbon capture and utilization plant as part of the National Circular Carbon Economy Program.

**CCUS Hubs:** To advance the uptake of CCUS technologies and scale up its deployment, the Kingdom plans to transform Jubail and Yanbu into global hubs for carbon capture, utilization and storage. The hubs will leverage the concentration of the manufacturing industry, proximity to sinks and transport infrastructures. Jubail and Yanbu are homes to the regional petrochemicals, steel and other heavy industries. Both cities represent the economy of scale opportunity when it comes to reducing, reusing, recycling and removing GHG emissions.

**Blue Hydrogen:** In addition to green hydrogen, due to the abundance of natural resources, underground carbon storage capacity and CCUS technology expertise, the Kingdom has the potential to become a world-leading producer of blue hydrogen. The Kingdom is developing a National Hydrogen Strategy to chart pathways to become a global leader in the hydrogen industry. With associated carbon emission captured, utilized and/or stored in geological formations, blue hydrogen can be utilized domestically in various industrial sectors. Pilots, research and demonstrations will be prioritized to improve technology maturity and lower costs in the aviation, shipping, petrochemicals, and steel industries.

#### 4.4 UTILIZATION OF GAS

As part of reforms of its domestic energy sector, the Kingdom aims to increase the utilization of natural gas in its energy mix. By 2030, the Kingdom aims that up to 50% of its electricity generation is expected to be met by natural gas significantly lowering the carbon intensity of domestic energy generation.

## 4.5 METHANE MANAGEMENT

Considering its global warming potential, methane emission management is central to climate change action. The Kingdom plays a world-leading role in methane management in the energy sector. The methane management measures include zero flaring in the oil and gas industry, recovery and subsequent utilization for power generation and petrochemicals production. The Kingdom as a member of the Global Methane Pledge initiative will collaborate with other members to reduce global methane emissions by 30% by 2030 relative to 2020 levels.

## 5. CONTRIBUTIONS TO ADAPTATION

Taking into account the environmental factors of the region, the Kingdom of Saudi Arabia is continuously investing considerable efforts and resources in activities that help protect and renew its natural environment including biodiversity of land, seas and coastlines. Saudi Arabia differentiates its adaptation measures into those with mitigation co-benefits and those that are entirely aimed at adaptation and raising resilience. Adaptation measures also contribute to economic diversification. The NDC in this area is driven by the aim to implement measures that will enhance resilience and accelerate economic diversification.

### 5.1 ADAPTATION WITH MITIGATION CO-BENEFITS

The following adaptation measures are expected to have significant mitigation co-benefits:

#### 5.1.1 Water and wastewater management

Water scarcity in the region presents various challenges to the economic and social growth of Saudi Arabia. Implementing adaptation actions related to water management presents opportunities to reduce exposure and vulnerability.

Desalination of seawater provides about 70% of potable (domestic) water supply in the Kingdom. The Kingdom is taking a number of steps in deploying desalination technologies to minimize the GHG emissions in the form of co-benefits from this sector leading to saving of energy from this sector. These steps include:

- a. Reverse Osmosis (RO) technology: The Kingdom is gradually replacing the conventional energy-intensive multi-stage flash (MSF) and multiple effect distillation (MED) technologies by lower energy consuming RO technology, reducing the energy consumption in this sector. RO is approximately 30% less energy-intensive than the conventional MSF and MED technologies.
- b. Renewable Energy for Seawater Desalination: NEOM city will be using renewable energy resources such as solar, wind and green hydrogen for the seawater desalination for their potable water needs.
- c. Minimizing Leaks in the Potable Water Distribution System: Old water distribution network will be replaced with a new water distribution network to minimize the leakages in order to save desalinated potable water avoiding increasing the production capacity of the existing plants or avoiding the need for new desalination plants.
- d. Increasing the use of treated wastewater: The Kingdom is working on expanding the wastewater collection, treatment and reuse to augment the need for potable and groundwater in city greening

and in agriculture. This will help reducing the need for potable water (desalinated water) for city greening and groundwater for agriculture.

- e. Rain Water Harvesting: Encouraging rainwater harvesting to augment the need for potable and irrigation water.
- f. Storage of Surface Water Runoff: Increasing the storage of surface water runoff through constructing new dams in the country.
- g. New Irrigation Techniques: Employing new irrigation techniques such as surface irrigation, drip irrigation, sprinkler irrigation, subsurface irrigation, and other techniques will minimize the use of and save a substantial amount of precious groundwater used for agriculture.

### 5.1.2 Marine Protection

The Kingdom will implement coastal management strategies that are designed to reduce coastal erosion, increase the sinks for blue carbon, maintain related ecosystems and address the threats that climate change poses for marine livelihoods. The Kingdom supports the planting of mangrove seedlings along its coasts. In addition, the Kingdom strengthens and enhances the coral reef restoration program throughout the northwestern Arabian Gulf. Saudi Arabia's new generation coral reef restoration technologies accelerator aims to develop innovative technologies that enhance the thermal resilience of coral reefs and provide cost-effective options to scale up reef restoration by bringing together national stakeholders. Several studies were conducted to estimate the outtake of mangroves and other blue carbons for the Red Sea and the Arabian Gulf. These studies will be utilized in estimating a more accurate blue carbon sinks.

### 5.1.3 Reduced desertification / Tree Planting

The region suffers from desertification. Saudi Arabia undertakes measures to enhance desertification management: actions that promote the stabilization of sand movements around cities and roads while increasing sinks capacity through using green belts as barriers; develop and enhance arid and semi-arid rural areas through various natural resource conservation activities, biodiversity and ecosystem-based adaptation efforts. The objective is to improve soil quality, water, pasture and wildlife resources through a system of protected areas and reserves. Adaptation with mitigation co-benefits may include measures of planting trees to combat desertification, reducing and improving land management practices, especially for agriculture and forestry.

Tree planting and rehabilitating hectares of land over this decade as part of the Saudi Green Initiative. Recycled water from an irrigation network will be used for this purpose. The greening initiative will lead to mitigation co-benefits that can be estimated through approved methodologies.

### 5.1.4 Urban Planning

The Kingdom is taking actions to develop mass transport systems in urban areas such as the development of the metro and bus network in Riyadh, Jeddah and Dammam, which will provide significant sustainability, environmental and public health benefits. The Kingdom already started construction of metro in Riyadh and in the process of making it operational. The newly built Riyadh metro and bus network will save thousands of car journeys and liters of fuel daily. In addition, Saudi Railway network will be expanded to connect major cities and



ports which will result in reductions in traffic and GHG emissions. Approved methodologies will be used to estimate avoided GHG emissions.

As part of Vision 2030, the Kingdom has launched a series of mega-projects aimed at reimagining all aspects of urban development. As an example, NEOM introduces a new model for urban sustainability powered by 100% renewable energy. Development that spans 26,500 km<sup>2</sup> adopts environmental responsibility principles and promotes sustainable and regenerative development practices. It acts as a world-scale laboratory of future-proof urbanization. The project will develop the LINE, a city of a million residents with a length of 170 km that aims to preserve 95% of nature within NEOM, with zero cars, zero streets, zero carbon emissions and to be powered by 100% renewable energy and green hydrogen.

## 5.2 ADAPTATION UNDERTAKINGS

The following adaptation contributions are expected to support Saudi Arabia's efforts to address climate change and raise resilience to its impacts:

**Integrated Coastal Zone Management Planning (ICZM):** Take the necessary action to develop and implement ICZM plans that would take into account the protection of coastal infrastructures such as roads, residential areas, industrial complexes, desalination plants, seaports, etc.;

**Early Warning Systems (EWS):** Develop and operationalize EWS that would reduce vulnerability due to extreme weather events such as rainstorms, floods and dust storms by increasing resilience of infrastructure;

**Integrated Water Management Planning:** The kingdom has limited reserves of exploitable non-renewable groundwater and low recharge rates (2.8 bcm in Arabian Shield) due to arid conditions. The Saudi National Water Strategy 2030 aims to work towards addressing all the key challenges, leveraging previous and on-going studies, and reform the water and wastewater sector to ensure sustainable development of water resources while providing affordable high-quality services. Strategic programs and initiatives include laws and regulations, management, innovation and capacity building, and service quality.

**Infrastructure and Cities Designs:** Put in place the necessary policies to make cities and infrastructure more sustainable. Improving the cities design by increasing the efficiency of buildings by making them more resilient to heatwaves.

## 6. RESPONSE MEASURES

The social and economic welfare losses arising from climate change response measures will increase the vulnerability of economic diversification and adaptation initiatives of the Kingdom. Additionally, the opportunities for addressing key requirements for achieving sustainable development.

As a developing country with limited sources economy, the Kingdom considers the management of response measures as one of the building blocks of its NDC implementation. The Kingdom recognizes that international

cooperation in addressing response measures is critical in achieving Paris Agreement goals. The Kingdom is actively engaged in the following:

- i. Socio-economic research studies to assess the impacts of mitigation policy measures implemented outside Saudi Arabia on the Saudi economy, including data and modelling tools.
- ii. Research and development of technologies that enhance economic competitiveness.
- iii. Technology cooperation based on the approaches outlined in paragraphs 24-29 in decision 5/CP.7 will allow for the identification of appropriate technological options, which are consistent with national priorities, and domestic human and financial resources to promote enabling environment for economic diversification and technological development (e.g., carbon capture utilization and storage).
- iv. Research into understanding the long-term impacts of response measures on energy market stability and to develop measures that can sustain a stable energy market in the long run.

## 7. NDC TIMEFRAME

The ambitions outlined in this NDC applies to the period from 2020 to 2030.

## 8. MEANS OF IMPLEMENTATION

To deliver the ambitions set out in this NDC, the Kingdom will use the following key means of implementation: initiatives and national programs; finance; technology; voluntary cooperation, approaches and mechanism under Article 6 of the Paris Agreement; and capacity building.

### 8.1 INITIATIVES AND PROGRAMS

#### 8.1.1 Saudi Green Initiative

Launched in 2021, the Saudi Green Initiative contributes towards achieving the climate ambitions of the Kingdom of Saudi Arabia. As a national initiative, it aims at improving the quality of life and protecting future generations. With its ambitious plans and goals, the Saudi Green Initiative is a leap forward within the Kingdom's ambition to become a global leader in forging a greener future. To support its ambitions, the initiative will draw on the expertise and resources of multiple Saudi government entities and private sector partners.

#### 8.1.2 Circular Carbon Economy Approach

The Circular Carbon Economy (CCE) approach consist of the "4Rs" model of reduce, reuse, recycle, and remove to manage GHG emissions:

- Reduce: reduce emissions through sustainable consumption, enhanced efficiencies, including fuel efficiencies, cleaner energy systems, electrification and renewables, and improving energy and process efficiencies
- Reuse: reusing emissions without changing its chemistry
- Recycle: recycling emissions or products containing GHGs into similar or different products with different chemical characteristics

- Remove: removing emissions from the system, partially (if it will be reused or recycled) or fully (storage)

A combination of the four levers outlined above provides optimum solutions fit for the different contexts in different countries and sectors capitalizing on their strengths and minimizing costs. CCE can play an analytical, voluntary, and complementary role in achieving international and domestic climate and development goals, such as those articulated in nationally determined contributions.

The Kingdom's CCE approach has its genesis in strategic decision to build a petrochemical industry making use of waste gases that were being flared as a by-product of oil production in the 1970s. The strategy drastically reduced GHG emissions, created employment opportunities and helped to diversify the economy. It exemplifies the Kingdom's drive to turn "Emissions to Value" (E2V) by using the nation's vast hydrocarbon resources to develop a circular carbon economy.

## 8.2 FINANCE

The implementation of this NDC is not contingent on receiving international financial support.

## 8.3 TECHNOLOGY

It is the Kingdom's position that technological innovation and deployment at scale is the key to the Paris Agreement goals. Furthermore, all technologies must be considered for ambitious global climate change targets to be achieved in the most sustainable manner. Given their abatement potential, deployment of and collaboration on the following technologies is crucial: carbon capture, utilization and storage (CCUS), direct-air capture (DAC), clean hydrogen. In climate adaptation, the following technologies are prioritized: (a) water saving, recycling, capture, irrigation and sustainable management for agriculture purposes and (b) early warning system against meteorological extreme events (such as floods, sandstorms and droughts).

The Kingdom has prioritized international technology cooperation and technology transfer at both public and private sector levels. It plays a leading role at various platforms such as Mission Innovation, Clean Energy Ministerial, and Global Methane Initiative.

## 8.4 ARTICLE 6 VOLUNTARY COOPERATION, APPROACHES AND MECHANISM

The Kingdom of Saudi Arabia considers voluntary cooperation and approaches referred to in Article 6.2 as well as the mechanism referred to in Article 6.4 of the Paris Agreement as essential for international climate goals. Once operationalized, such cooperation, approaches and mechanisms including internationally transferred mitigation outcomes, will play a role in achieving the Kingdom's climate change ambitions. They will enhance private sector engagement, advance innovation in business models, unlock investment flows and support cleaner energy technology development. Therefore, the Kingdom reaffirms its support for the completion of rules required for Article 6 operationalization.

## 8.5 CAPACITY BUILDING

The human capability ecosystem in Saudi Arabia has undergone many successful transformational changes to support the Vision 2030 ambitions. The Human Capability Development Program officially launched in 2021 was created to develop citizens' capabilities to participate effectively in the ongoing local economic, social, and cultural developments. As the country still investing in enhancing the basic skills, more highly specialized capabilities are required to navigate through climate change challenges. The ambitions set out in this NDC require sustained capacity-building efforts and upgrading of skills at the individual and systemic levels to support their implementation.

## 9. MONITORING AND REPORTING ON NDC IMPLEMENTATION

A national monitoring, reporting and verification (MRV) system is a key success factor for contribution to economic diversification and adaptation measures with mitigation co-benefits. Established and managed by the Kingdom of Saudi Arabia Designated National Authority, the national MRV system is an integral part of the existing and future monitoring and reporting structures. It provided input into the NDC development and ambition. The MRV system tracks the progress towards achieving NDC projects and plans and any modifications thereof.

## 10. AMBITION AND FAIRNESS

As a developing country with limited sources economy and historically low GHG emission contribution, the Kingdom considers its 2030 ambition as fair, given that the sum of the contributions leads to a significant deviation from a business-as-usual scenario emission.

The Kingdom aims at reducing, avoiding, and removing GHG emissions by 278 million tons of CO<sub>2</sub>eq annually by 2030 - a more than two-fold increase versus the previous ambition as outlined in the Kingdom's INDC (130 million tons of CO<sub>2</sub>eq). Thus, ambition represents progression and the highest possible ambition. Furthermore, by supporting mitigation efforts in other countries (e.g., Middle East Green Initiative), Saudi Arabia's efforts extend beyond its borders.