



CLIMATE CHANGE STRATEGY

IN THE EMIRATE OF ABU DHABI
2023 - 2027

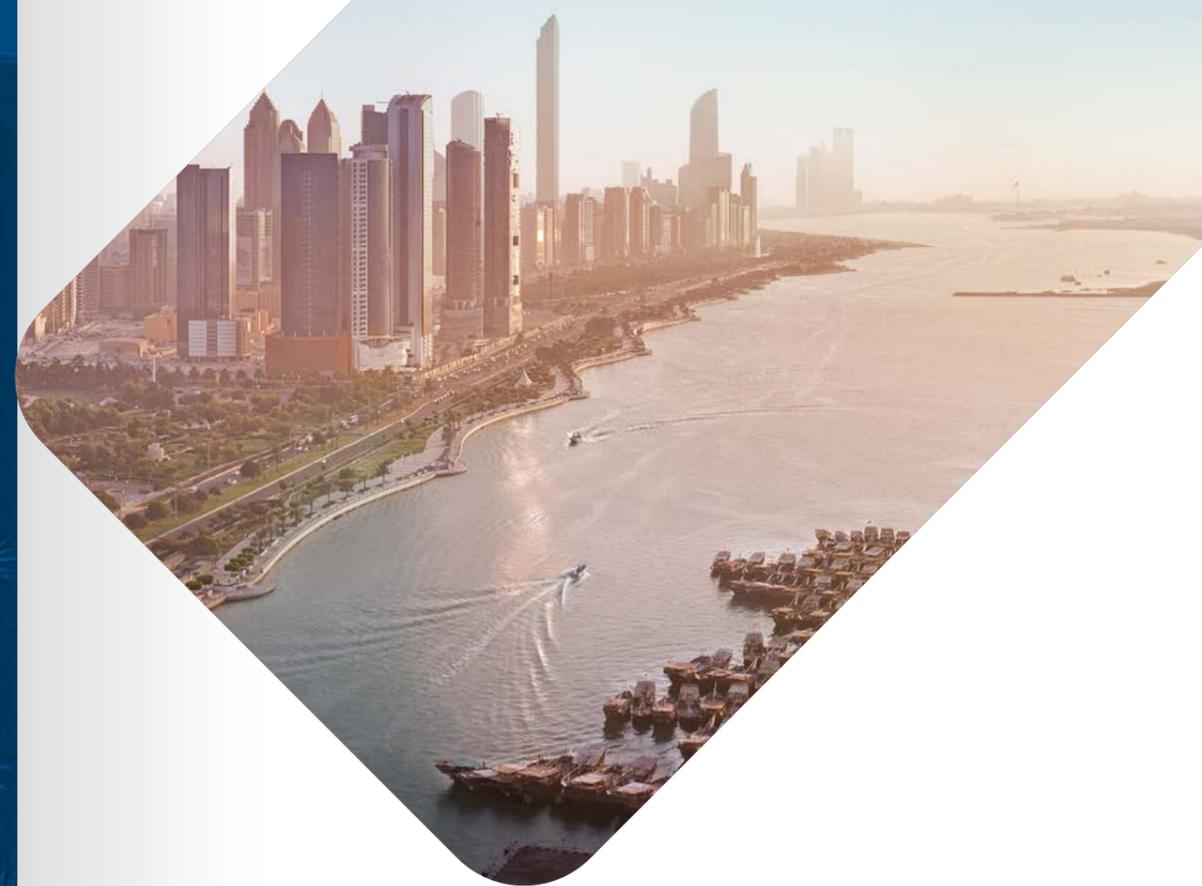


هيئة البيئة - أبوظبي
Environment Agency - ABU DHABI

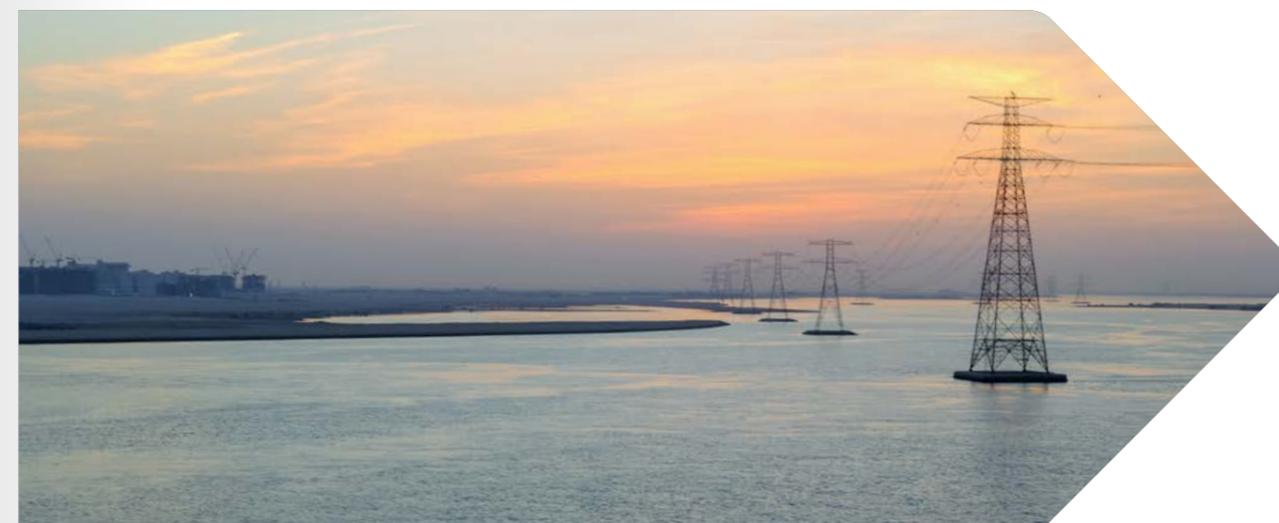


SECTION 1

INTRODUCTION



The Climate Change Strategy in the Emirate of Abu Dhabi 2023-2027 reflects the emirate's ambition for effective climate action at various levels. The strategy promotes greater resilience in key sectors and makes adaptation to climate change integral to government entities' plans. Additionally, it outlines Abu Dhabi's plan to reduce greenhouse gases (GHGs) significantly in line with the country's announcement of achieving climate neutrality by 2050. Likewise, the strategy drives innovation in carbon capture and storage, and identifies actions aimed at economic diversification towards low-carbon sectors.



The strategy focuses on reducing GHG emissions and adapting to the impacts of climate change in the Emirate of Abu Dhabi. On behalf of the Abu Dhabi government, the Environment Agency – Abu Dhabi (EAD) supervises the development of the strategy by consulting, coordinating, and cooperating with government entities, the private sector, and scientific research centres. The scope of the strategy includes three main themes:



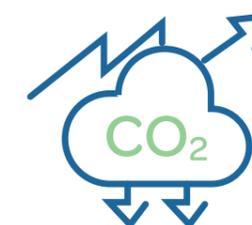
MITIGATION OF CLIMATE CHANGE

Reducing emissions in key sectors.
Resort to carbon sequestration and storage.



ADAPTATION TO CLIMATE CHANGE

Enhancing the resilience of the four key sectors (energy, health, infrastructure, and environment) in adapting to the expected risks of climate change.



ECONOMIC DIVERSIFICATION THROUGH INNOVATIVE, LOW-CARBON SOLUTIONS

Stimulating various sectors towards economic diversification by innovating low-carbon solutions and identifying related opportunities.

SECTION 2

SCOPE



SECTION 3

STRATEGY DEVELOPMENT



EAD has developed this strategy by forming a supervisory committee comprising the following entities:

1. Abu Dhabi Executive Office (ADEO)
2. Environment Agency – Abu Dhabi (EAD)
3. Department of Energy - Abu Dhabi (DOE)
4. Department of Municipalities and Transport (DMT)
5. Department of Economic Development (DED)
6. Abu Dhabi Waste Management Company (Tadweer)
7. Abu Dhabi Agriculture and Food Safety Authority (ADAFSA)
8. Abu Dhabi Public Health Centre (ADPHC)

The committee members prepared the strategy, which included defining objectives, targets, and a detailed action plan. The Abu Dhabi Climate Change Taskforce, comprising 26 key entities in the emirate and formed pursuant to the decision of the Chairman of the EAD No. 3 of 2020 (dated 22/12/2020), were consulted during the process. EAD has prioritised climate change in its 2021-2025 strategy. Consequently, and based on the Foundational Strategy for Natural Resources, Environment, and Energy, the agency has reviewed existing local and federal plans, as well as those still under development, to ensure they align with the strategy. The agency has also collaborated with the Ministry of Climate



THE ABU DHABI CLIMATE
CHANGE TASKFORCE
COMPRISES
26 KEY ENTITIES

Change and Environment (MOCCAE), particularly within the context of national pathways and the required studies developed by the ministry to achieve climate neutrality by 2050. In addition, EAD has conducted reference benchmarking on climate change mitigation and adaptation with a number of countries in the region and from around the world to provide a clear understanding of what can realistically be achieved within the next five years. Additionally, ADEO's Resilience Study on how Abu Dhabi could become the most resilient globally in adapting to climate change (2022) was another helpful source.



4.1 A GLOBAL PERSPECTIVE ON CLIMATE CHANGE IN THE UAE

There are several indicators that measure the status of countries in climate change. The most important indicators were addressed in this strategy despite the many challenges in using them, such as the use of outdated data or differences in data calculation methods used by various international entities. The following main KPIs were reviewed in this strategy:

1. The Environmental Performance Index (EPI), which includes the climate change issue category.
2. Emissions per capita.
3. Emissions per unit of GDP.
4. UAE's share of global emissions.
5. Emissions per kWh.



INCREASE IN GREEN HOUSE GAS EMISSIONS



POPULATION GROWTH



ECONOMIC GROWTH



DESALINATION REQUIREMENTS

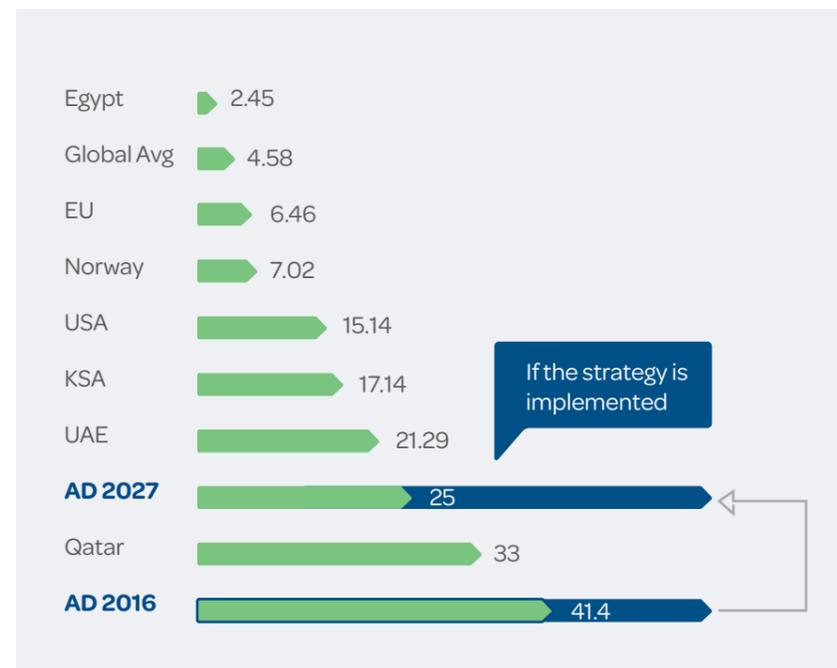
The **2022 Environmental Performance Index (EPI)** ranked the UAE **117th out of 180 countries** for climate change with a score of 34 (where 100 represents the best and 0 the worst)¹. According to the Climate Change Tracker that assesses whether countries are on track to meeting climate mitigation commitments, the UAE's efforts were rated as "highly insufficient" in the update dated November 2021.

SECTION 4

CLIMATE CHANGE CHALLENGE

Furthermore, the **emissions per capita** indicator shows that the Emirate of Abu Dhabi has the highest emissions *per capita* globally. Meanwhile, the UAE ranked third worldwide in relation to *per capita* emissions for the base year of 2016. Additionally, national greenhouse gas inventory reports indicate an increase in emissions over the past two decades due to economic and population growth, among other factors such as desalination requirements.

GHG/CAPITA IN TONS OF CO₂ EQ. - 2016



As for the **carbon emissions per each dollar of GDP indicator**, the country's position is very close to the global average, as each dollar causes 290 grams of emissions compared to the global average of 280 grams, while this value rises up to 320 grams in the Emirate of Abu Dhabi according to the base year 2016. It is worth mentioning that the combined share of EU countries in emissions per each dollar of GDP is about 160 g². **The UAE ranked 22nd, and Abu Dhabi 27th** for the same base year (the 1st rank represents the highest level of emissions per each dollar of GDP)³.

GHG/ PER UNIT OF GDP IN ABU DHABI - 2016 KG/INTERNATIONAL US



As for the **share of the country and of Abu Dhabi of total global emissions**, the country's share of global emissions was 0.55% whereas **Abu Dhabi's contribution was 0.29 %** in 2016⁴.

% OF ABU DHABI CONTRIBUTION TO GLOBAL EMISSIONS - 2016



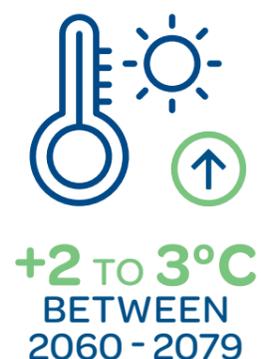
The **emissions per kilowatt hour indicator** is an important indicator for understanding the status of countries in terms of emissions. The UAE ranked 38th, and Abu Dhabi 71st in 2016 (the 1st rank represents the highest emission level per kilowatt hour globally)⁵.

GHG EMISSIONS/KWHR IN GRAMS - 2016



4.2 CLIMATE CHANGE - STATE

The state of climate change in the Emirate of Abu Dhabi is characterised by an increase in air and marine water temperatures, as well as higher salinity levels in the latter. Additionally, sea levels are rising, heavy rainfall is becoming more frequent, and there are notable changes in weather patterns such as increased humidity, shifts in the season of migration and reproduction, and altered periods of north winds.



4.2.1 Increase in Temperature

According to Abu Dhabi State of Environment Report 2017, **temperature in the UAE is expected to increase** by 2-3 °C between 2060 and 2079. The increase in the temperature of the Arabian Gulf waters is also mainly related to climate change, as temperature there has risen on average by 0.2 °C per decade over the past 50 years⁶. Consequently, further increase in temperatures is expected in the coming decades.

4.2.2 Sea Level Rise

The sea level of the Arabian Gulf is expected to rise by 0.5–0.65 metre by 2100⁷. Globally, sea level is expected to rise by 0.52–0.98 m by 2100. The anticipated rise in sea levels will have a detrimental impact on the inhabitants of Abu Dhabi. This is due to the fact that around 85 % of the population and 90 % of the emirate’s infrastructure is located on the coastal areas. As such, sea level rise might necessitate relocation of residents and residential areas⁸. The rise in sea levels will also result in significant damage to roads and pavements, which will disrupt public transportation and have a negative impact on economic activities. This will result in increased maintenance costs as well⁹.



**+0.5 TO 0.65M
BY 2100
IN THE REGION**

4.2.3 Intensifying Marine Water Acidity

Climate change is significantly impacting marine water quality in the Arabian Gulf. The water in this region is becoming increasingly acidic at a faster rate than in most other ocean waters worldwide. The effects of climate change in the Arabian Gulf can already be observed through damage to marine habitats and species.



4.2.4 High Impact on Public Health

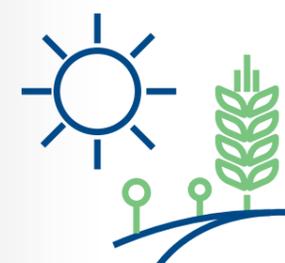
High temperatures have a detrimental impact on public health, especially for outdoor workers. This is evidenced by the hundreds of cases of physical exhaustion reported in Abu Dhabi each month. In fact, outdoor workers account for 80 % of heat-related health conditions¹⁰.



80% OF HEAT-RELATED HEALTH CONDITIONS

4.2.5 Affected Food Security in the Supply Chain

Climate change is negatively impacting food security in the UAE and the Emirate of Abu Dhabi, primarily due to the country’s dependence on food imports and limited availability of fertile land and freshwater. While the UAE has a very good score in food availability, quality, and safety, ranking 23rd out of 113 countries in the 2022 Global Food Security Index, its scores in sustainability and adaptation are low. This is largely due to extreme weather conditions, dependence on non-renewable groundwater resources, and insufficient commitments in the area of adaptation, particularly in agriculture¹¹.



LIMITED FERTILE LAND AND FRESHWATER

4.2.6 The Effect on Biodiversity

Climate change is profoundly affecting the biodiversity of the Emirate of Abu Dhabi. For instance, in 2017, global coral bleaching resulted in the loss of nearly 75 % of the Gulf’s offshore coral reefs. Marine species were further affected by flooding due to a storm on the low island of Bu Tinah, which is one of the main nesting shores for turtle in the emirate. This led to the loss of all eight incubators for the endangered hawksbill sea turtles on the island in 2019 and 2021¹². Coastal and land wetlands, including mangrove forests, are also expected to diminish, coupled with a decline in fisheries due to exceeding the thermal limits of reproduction^{13,14}. Moreover, water demand in Abu Dhabi is projected to increase by 30 % between 2017 and 2030¹⁵. This might lead to greater reliance on energy-intensive desalinated water, causing a surge in marine salinity and changes to local temperatures that threaten marine biodiversity due to discharge of additional brine water.



**-75%
GULF’S OFFSHORE
CORAL REEFS.**



**-80 MM BETWEEN
1982 - 2013**

4.2.7 Shifts in Precipitation

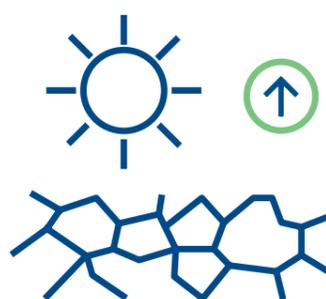
Climate change is causing lower precipitation levels in Abu Dhabi, with a decreasing average annual rainfall observed between 2015 and 2018. Analysis by EAD indicates an 80 mm decrease in rainfall levels in Abu Dhabi between 1982 and 2013, despite the increase in heavy rainfall in the last few years.

4.2.8 Increasing Humidity

Climate change exacerbates the already high humidity levels in the Emirate of Abu Dhabi, with readings occasionally reaching as much as 90 % during extremely hot days¹⁶. By 2100, humidity levels are expected to rise by an estimated 10 %¹⁷.



+10% BY 2100



**EXPERIENCE 90
CONTINUOUS
DAYS OF SEVERE
DROUGHT BY 2050**

4.2.9 Rising Incidence of Storms and Extreme Weather Conditions

Climate change leads to more frequent and severe occurrence of storms, enhancing wind speeds, particularly the northern winds, beyond its typical levels in the Arabian Gulf region. This amplifies the impact of sea-level rise through storm surges. Drought levels have increased over the past two decades, and groundwater levels continue to decline. As a result, Abu Dhabi is projected to experience about 90 continuous days of severe drought by 2050¹⁸. In 2021, Abu Dhabi experienced its highest recorded temperature of 50.7 °C¹⁹. Floods and soil erosion have also become more frequent and intense over the past few decades.

In 2017, Abu Dhabi witnessed over 500 incidents leading to more than 12 000 emergency calls²⁰. A notable case of heavy rainfall occurred on July 27th and 28th, 2022, which was considered the most intense in decades. Although its impact on Abu Dhabi was limited to causing some difficulties, it resulted in a semi-disaster in other areas of the UAE, posing a threat to people's lives²¹.



**+5.6% ANNUAL
GROWTH, 2010-2016**



**\$ GDP
+1.2% ANNUAL
GROWTH, 2015-2018**

4.3 CLIMATE CHANGE – DRIVERS

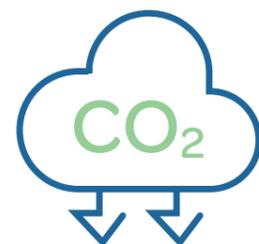
Human activities that burn fossil fuels and emit greenhouse gases are altering the global climate. Additionally, global population and economic growth largely intensify this phenomenon, and thus the negative effects of fossil fuel dependence are forming an international tendency to unite to face the global challenge of climate change. All countries, regardless of their level of development or population, have an obligation to address this global issue and adapt to the new reality.

Locally, the increase in greenhouse gas emissions is attributed to human factors, such as population and economic growth, which contribute to the expansion of sectors associated with greenhouse gas production. Abu Dhabi's population, which was nearly 3 million in 2016, is growing rapidly due to improvements in health services and an influx of expats, with an annual growth rate of about 5.6 % between 2010 and 2016. Additionally, the Emirate's GDP grew by nearly 1.2 % annually between 2015 and 2018²².

4.4 CLIMATE CHANGE - PRESSURES

Greenhouse gas emissions in Abu Dhabi continue to rise, driven by increased CO₂ emissions. Between 2010 and 2018, these emissions increased by an annual rate of 2.8 %, reaching approximately 120 405 million tonnes of carbon dioxide equivalent in 2018²³. This rise is mainly due to growth in the energy, desalination, and transport sectors.

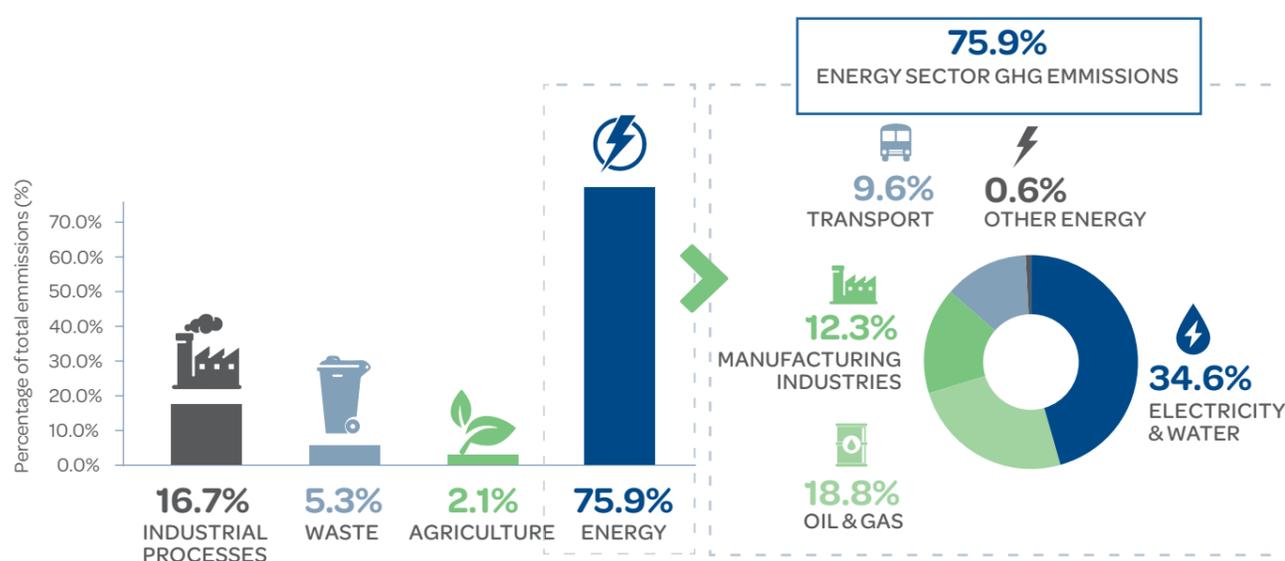
Four sectors contributed to 92 % of emirate’s emissions: the electricity and water (34 %), followed by the industry and manufacturing sector (29 %), the oil and gas sector (19 %), and the transport sector (10 %). It is worth noting



+2.8%
ANNUAL INCREASE
BETWEEN 2010-2018

that between 2010 and 2018, emissions from the sectors of electricity, water, oil, and gas grew by 4 % and 6 % per annum²⁴. Additionally, industry and manufacturing are expanding, with a growing number of facilities and licenses leading to higher greenhouse gas emissions. Meanwhile, road transport is rapidly increasing, with a marked annual increase of 5 % in registered vehicles resulting in higher emissions.

KEY EMITTING SECTORS - 2018 (EAD)



4.5 CLIMATE CHANGE - IMPACT

Overall, Abu Dhabi and the UAE at large are vulnerable to the impacts of climate change, particularly in terms of water scarcity, agriculture, biodiversity, and fisheries. The Emirate of Abu Dhabi is particularly vulnerable to water scarcity due to limited groundwater reserves and their depletion, as well as reliance on desalination to produce potable water. The agricultural sector is also vulnerable to climate change impacts, as it heavily relies on scarce rainfall and depleted groundwater reserves.

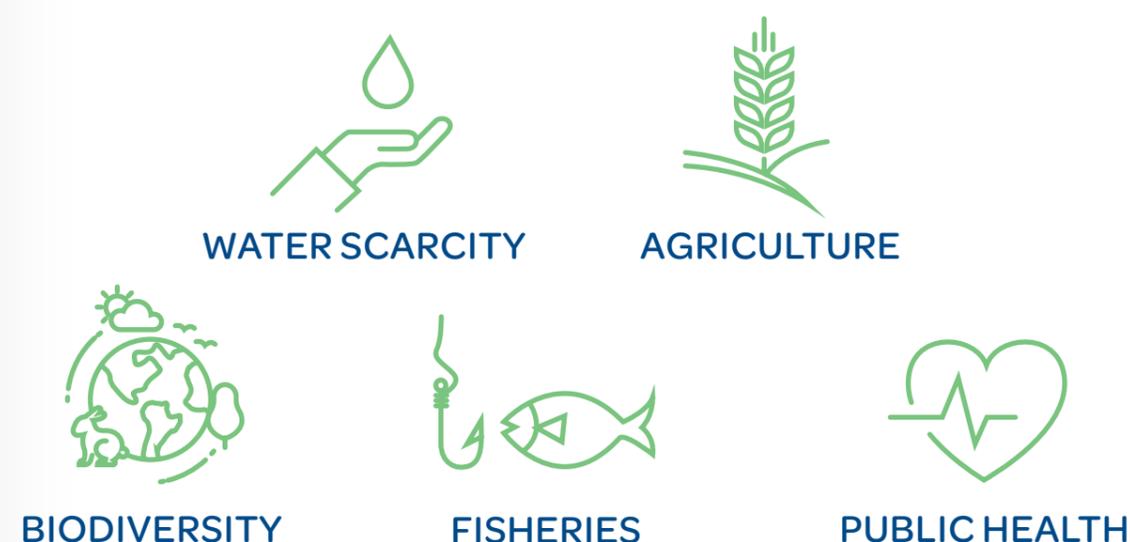
Biodiversity, particularly within the marine ecosystems of the Arabian Gulf - known as the “world’s warmest sea” - is critically sensitive to climate change. These changes are evident, with the phenomena like coral bleaching and intensified storms events impacting turtle nesting on low-lying islands. Based on future modelling by the Abu Dhabi Global Environmental

Data Initiative (AGEDI), commercial fish stocks in the Gulf are expected to continue declining, with the local extinction rate in the Arabian Gulf expected to increase by 2090 compared to 2010, according to the worst-case scenario of temperature increase.

The “National Climate Change Adaptation Programme” of 2019, which offers a comprehensive risk assessment and adaptation analysis in health, energy, infrastructure, and environment sectors, climate change variably impacts public health both directly and indirectly.

The programme emphasises that climate change impacts will significantly affect the country’s growth potential, including the health sector²⁵. Available scientific literature indicates a strong link between climate change and health-related issues. Health conditions, fatal and non-fatal, such as heatstroke, cardiovascular diseases, and respiratory diseases are associated with climate change-related variables and may increase as temperatures rise.

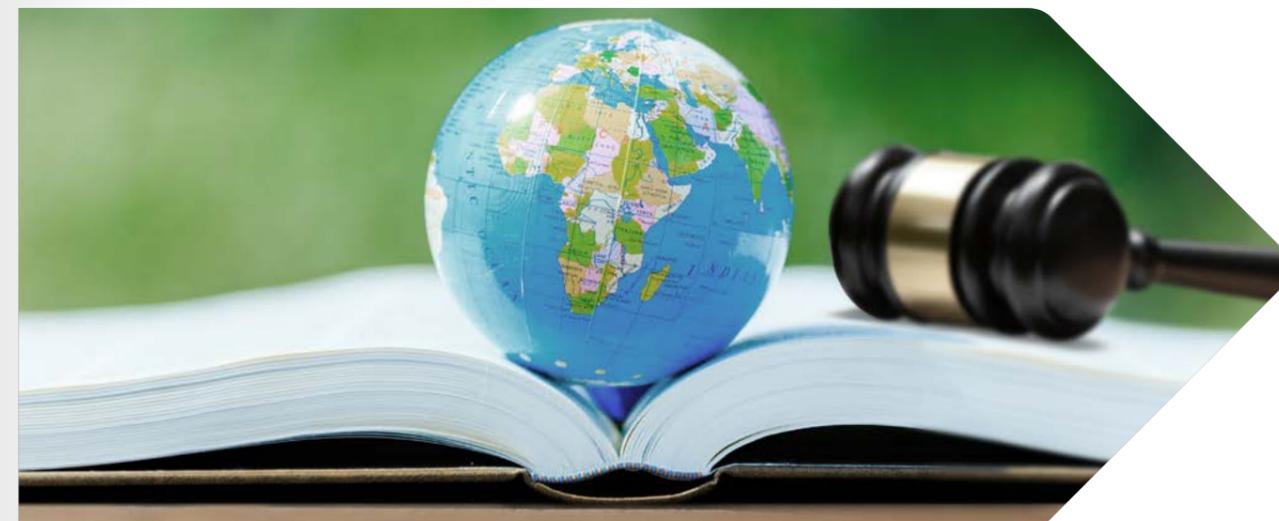
VULNERABLE TO IMPACTS ON





SECTION 5

LEGAL FRAMEWORK



Government intervention to manage GHGs and improving natural and built environment resilience is justified by Law (16) of 2005 Pertaining to the Reorganisation of EAD. In addition, it is derived from a number of applicable international conventions and federal regulations.



5.1 RELATED INTERNATIONAL AGREEMENTS

Federal Decree No. (61) of 1995 concerning the Ratification of the United Nations Framework Convention on Climate Change: The UAE ratified the decision concerning the United Nations Framework Convention on Climate Change on 20 December 1995, that was established to reach the stabilisation of greenhouse gas concentrations in the atmosphere at a level that prevent dangerous anthropogenic interference with the climate system.

Federal Decree No. (75) of 2004, by which the UAE ratified the Kyoto Protocol immediately upon its entry into force in 2004. The Protocol is the first legally binding treaty to reduce greenhouse gasses, and it has enabled cooperation between developed and developing countries in this regard.

Federal Decree No. (238) of 2016 concerning the Ratification of the Paris Agreement on Climate Change: The UAE ratified the Paris Agreement on 12 December 2016. The agreement aims to confirm the global response to the threat posed by climate change through: (a) maintaining a global average temperature rise of well below 2 °C above pre-industrial levels; (b) enhance capacity to adapt to the adverse effects of climate change; (c) make financial flows consistent with a path leading to low-carbon development to cope with climate change.



5.2 OTHER FEDERAL REGULATIONS

Article 9 of **Federal Law No. (24) of 1999 concerning the Protection and Development of the Environment** states the following:

“All pertinent bodies, especially the bodies entrusted with the planning and the economic and constructional development, shall take into account the aspects of protection of the environment, control of pollution, and rational use of natural resources upon setting the plans of economic and social development and upon executing the projects.”

Moreover, **Article 4 of Cabinet Resolution No. 98 of 2019 on the Use of Alternative Fuel Resulting from Waste Treatment Processes in Cement Factories** states the following:

“All cement factories that use coal in their energy production operations must commit to using a minimum of 10 % (if available in the country) of their total energy needs from alternative fuel emerging from municipal solid waste treatment plants in the country starting in 2020, and to monitoring air quality around them.”



5.3 LOCAL REGULATIONS

Broadly, climate change is not explicitly addressed directly in any local regulation. However, **Law No. (16) of 2005 pertaining to the Reorganisation of the Abu Dhabi Environment Agency** states in section 12 of article 3 (EAD mandate) the following:

“Prepare the plans required for formulating and developing a balanced environment policy and applying it to the industrial and economic and agricultural projects carried out in the Emirate of Abu Dhabi for protecting environment and wildlife.”

Section 25 of the same article also states the following:

“Combat pollution, protect safety and quality of air, water, soil, natural resources, biological diversification, and ensure the optimal utilisation of environment and its resources for the purpose of protecting man and the environment, formulate a constant control system and propose suitable solutions for the various environment problems.”



SECTION 6

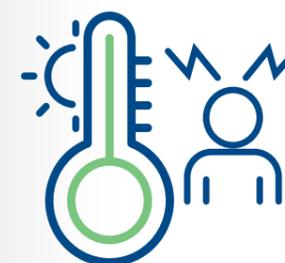
ECONOMIC RATIONALE FOR CLIMATE ACTION

Climate change is expected to negatively impact the global economy by reducing growth, as countries' economies may struggle to produce goods and services in the face of expected climate impacts if the earth's temperature levels exceed 2 °C or more²⁶. This impact will be more severe for warmer countries, such as those in the Arabian Gulf, although they possess sufficient resources to promote resilience and reduce the repercussions of climate change²⁷. According to an IMF report in 2019, under the best-case scenario (assuming temperature rise is reduced under the Paris Agreement), the UAE's GDP *per capita* is projected to shrink by 0.08 %, 0.22 %, and 0.65 % in 2030, 2050, and 2100, respectively. In the worst-case scenario, these figures are expected to decrease by 0.93 %, 3.10 %, and 9.31 %, respectively²⁸.



IMF PROJECTIONS FOR UAE GDP PER CAPITA SCENARIOS

	BEST-CASE	WORST-CASE
2030	- 0.08 %	-0.93 %
2050	- 0.22 %	-3.10 %
2100	- 0.65 %	-9.31 %



2.6%
CONTRACTION IN THE UAE'S TOTAL GDP BY 2030 DUE TO HEAT STRESS

Furthermore, the imperative to mitigate climate change by reducing GHG and improving the resilience of the built and natural environment is supported by economic justification to address market failures. These failures, manifest when the production or consumption of goods and services results in GHG emissions and associated climate impacts not internalised. These impacts include loss of work capacity due to heat, public health risks, sea level rise effects, and deteriorating agricultural productivity.

According to a 2019 report by the World Bank, heat stress is expected to result in a 2.6 % contraction in the UAE's total GDP by 2030. This impact is anticipated to be especially profound in sectors like construction, industry, and agriculture sectors²⁹. However, the UAE is one of the first countries to support clean energy transformation, aiming to produce 50 % of its energy from clean sources by 2030, making it a pioneering country in addressing climate challenges and reducing negative impacts on the local economy, developing green sectors, and creating job opportunities.

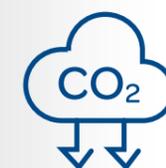


SECTION 7

FEATURES OF BEST STRATEGIES TO ADDRESS CLIMATE CHANGE



According to the 2022 Climate Change Performance Index, Denmark achieved the highest ranking, followed by Sweden, for their efforts in addressing climate change and its impacts³⁰. A review of Denmark's strategy revealed that it is based on the following key features:



It sets ambitious targets to reduce GHG emissions.



It includes a green finance component.



It includes goals for adaptation and sustainable development.



It clearly addresses pathways for private sector involvement and innovation.



It has an outward focus with global goals, recognising that climate change is not just a domestic issue.

The Climate Change Strategy in the Emirate of Abu Dhabi covers all of the above features. It is worth noting that it also includes a global objective that is linked to the emirate's investments.



SECTION 8

THE STRATEGY VISION



Climate stewardship by reducing emissions in key sectors, improving resilience to expected impacts while promoting investment attractiveness, fostering innovation, and driving towards a low-carbon economy.



SECTION 9

STRATEGY OBJECTIVES, INDICATORS AND TARGETS 2023-2027

ENHANCE RESILIENCE OF VULNERABLE SECTORS TO ADAPT TO CLIMATE CHANGE IMPACTS

- Percentage of adaptation plans developed for the **four key sectors (health, energy, infrastructure, and environment)** with sub-indicators to be identified to ensure that plans are implemented in coordination with concerned entities
- 100%

INCREASE REMOVAL OF GREENHOUSE GAS (GHG) EMISSIONS THROUGH CARBON SINKS

- Percentage of emissions removed from total emissions through **carbon sinks**
- 3% by 2027

DRIVE A LOW-CARBON INNOVATION AND ECONOMIC DIVERSIFICATION AGENDA

- Percentage of Abu Dhabi's investments in **ESG compliant companies** committed to climate action
- 10% by 2050

REDUCE GHG EMISSIONS IN KEY SECTORS

- Percentage of **total GHG emissions** reduced from 2016 levels
 - Percentage of GHG emissions reduced in the **electricity and water sector** from 2016 levels
 - Percentage of GHG emissions reduced in the **transport sector** from 2016 levels
 - Percentage of GHG emissions reduced in the **agricultural sector** from 2016 levels
 - Percentage of GHG emissions reduced in the **industrial sector** from 2016 levels
 - Percentage of GHG emissions reduced in the **waste sector** from 2016 levels
 - Percentage of GHG emissions reduced in the **oil and gas sector** from 2016 levels
- 22% by 2027
- 41% by 2027
- 10% by 2027
- 20% by 2027
- Target Unavailable
- 41% by 2027
- To be determined

Indicator Target



10.1 LOCAL AND FEDERAL EXISTING PLANS (MITIGATION AND ADAPTATION)

There are many existing and planned initiatives related to mitigation and adaptation to climate change, or to increase transparency on this subject in the UAE and Abu Dhabi.

At the federal level, several policy instruments have been developed to mitigate climate change, including:

- The **UAE Environment Policy**, adopted by the Cabinet in 2020 and announced by the Ministry of Climate Change and Environment, includes climate change as one of its key pillars. This national policy defines a set of targets and indicators as stipulated in other national sectoral strategies and plans.
- The **UAE Net Zero by 2050 strategic initiative**, which was announced by the UAE leadership on 7 October 2021 with the aim of achieving climate neutrality by 2050. The UAE has also committed to investing more than AED 600 billion in clean and renewable energy until 2050 and playing a global role in combating climate change.
- The **UAE Green Agenda 2015–2030**, which sponsors research and development related to clean technologies.
- **The National Climate Change Plan of the UAE 2017–2050**, which is a comprehensive framework to address the causes and impacts of climate change, plan the transition into a climate resilient green economy and achieve a better quality of life.
- **UAE Energy Strategy 2050**, which was launched in 2017 and aims at introducing renewables to the energy mix.
- **UAE’s new fuel pricing policy**, launched in 2017, which aims to lower fuel consumption.
- The **UAE has set a clean energy target of 50%** by 2050.
- **Nationally Determined Contributions (NDC)s**, which was submitted by the United Arab Emirates to the United Nations Framework Convention on Climate Change in 2015. The second edition of the NDCs Report, submitted in 2020, sets a target of reducing GHG emissions by 23.5 % by 2030 compared to the expected Business-As-Usual (BAU) scenario. The second edition of the NDCs Report was updated in 2022 to reflect a higher level of ambition of achieving a 31 % reduction by 2030 compared to the expected BAU scenario.
- The **National Net Zero by 2050 Pathway**, which was announced during the country’s participation in the COP 27 event held in Sharm el-Sheikh on 12 November 2022. The Pathway aims to achieve an 18 % reduction in GHG emissions compared to the target reduction rates in the updated NDC Report 2 under the Paris Agreement by 2030, then reach a 60 % reduction by 2040, and reach neutrality by 2050.



MORE THAN
600 BILLION AED
INVESTMENTS IN
CLEAN ENERGY
BY 2050

SECTION 10

STRATEGY AND OPTIONS ANALYSIS

On adaptation, the UAE developed the **Green Building and Sustainable Building Standards in 2010 and the National Climate Change Adaptation Programme in 2017**. The UAE government has also launched the UAE National Framework for Action on Climate Change and Health 2019, in partnership with the World Health Organization (WHO). The Framework sets out the UAE’s strategic response to public health challenges posed by climate change. In addition, the Ministry of Climate Change and Environment launched the UAE Climate Risk Assessment & Adaptation Measures in 2019, which were integrated with the **UAE’s disaster risk reduction strategy** and its early warning system, which focuses on the current and long-term safety and well-being of the country’s society³¹.

The UAE Water Security Strategy 2036 is another important adaptation initiative. This strategy aims to ensure continuous and sustainable access to water and increase the use of treated water to 95 % by 2036, with a major

focus on desalination, as well as reducing water use and losses across the country^{32,33}.

+95% USE OF TREATED WATER BY 2036

Additionally, the **UAE’s National Biodiversity Strategy (2014–2021)** has played a significant role in guiding the country’s efforts towards environmental conservation and nature-based climate solutions.

To address the impact of high temperatures on public health, the UAE has implemented mid-day breaks for all outdoor workers during the hottest summer months.

At the local level, Abu Dhabi has announced several sector-specific initiatives, including the DOE’s **Clean Energy Target for 2035 and 2050**. The Foundational Strategy for Natural Resources, Environment, and Energy has set a goal of reducing GHG emissions by 2041.

10.2 ANALYSIS OF CLIMATE CHANGE ADAPTATION AREAS

In 2019, the National Climate Change Adaptation Programme identified the four sectors that are most vulnerable to climate change impacts:



INFRASTRUCTURE **ENVIRONMENT** **ENERGY** **HEALTH**

While there are many local plans, adapting these sectors to the consequences of climate change needs to be tailored to put them on track. In the ADEO’s Resilience Study on how Abu Dhabi could become the most resilient globally in adapting to climate change (2022), four scenarios were identified, and their results analysed as follows:

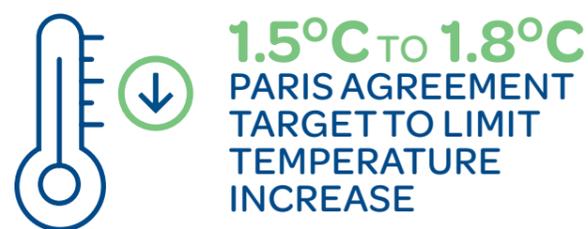
Scenario:	Environmentally	Economically	Socially
Scenario 1 Abu Dhabi progresses with the <i>status quo</i> with various policies and plans. Abu Dhabi is also continuously seeking new innovations to integrate Work in the emirate continues as usual with various policies and plans, even if the emirate integrates its efforts systematically	<ul style="list-style-type: none"> • High climate risk • High levels of air pollutants • Irreversible degradation in biodiversity, particularly in marine biodiversity, due to high salinity driven by desalination 	<ul style="list-style-type: none"> • Productivity levels can decrease • Increase in energy bills that are difficult for consumers to pay • High cost of living • High cost of infrastructure maintenance 	<ul style="list-style-type: none"> • Deterioration in the quality of life • Low levels of activity due to pollutants and their health effects • High cost of living • Increase in food costs
Scenario 2 Abu Dhabi defines a higher commitment to climate action and standards to be observed by the public and private sectors	<ul style="list-style-type: none"> • Improved climate control technologies, such as cloud seeding • Net-zero production requirements are approved. • Certification in climate resilience is implemented 	<ul style="list-style-type: none"> • Investment is shifted towards energy, food security, water supply, and modern agriculture to improve the availability of basic needs • Achieving economic benefits through a flexible system • High costs associated with climate-related losses. • Higher and faster inflation • Pressure on public funding due to the high cost of infrastructure 	<ul style="list-style-type: none"> • Best-in-class research on climate-related diseases is leveraged. • Medical tourism is promoted. • Inequality in social and health care may arise. • Low wages due to inflation • High cost of living
Scenario 3 Abu Dhabi leads the charge in technological innovation, driving significant climate action and integrating technology across production systems	<ul style="list-style-type: none"> • Widespread climate readiness 	<ul style="list-style-type: none"> • High prices • Significant technology investments • Public debt due to investment • Attraction of capital • High production flexibility • Prosperity for SMEs 	<ul style="list-style-type: none"> • Significant improvements in food security and technology-related healthcare • Multigenerational workforce • Better-designed jobs

Scenario:	Environmentally	Economically	Socially
Scenario 4 Abu Dhabi invests considerable resources in critical technologies, such as quantum computing, to enhance climate resilience and propose strategic actions	<ul style="list-style-type: none"> Radical shift toward green chemistry and away from pollutants Full resilience to climate change 	<ul style="list-style-type: none"> Investment in quantum computing technology Abu Dhabi as a beacon for investment opportunities Trading in green materials Advanced carbon credit exchange 	<ul style="list-style-type: none"> Significant prevention and treatment of climate-induced diseases Accelerated production of treatments and vaccines that maintain public health Broad improvement in quality of life

Through this strategy, ambitious adaptation plans will be developed to ensure that Abu Dhabi falls under scenario 3 or 4 for each of the target sectors. These plans will chart a clear adaptation pathway for the emirate, ensuring that the four main sectors most vulnerable to climate change impacts are fully shielded from these impacts by 2050.

10.3 ANALYSIS OF CLIMATE CHANGE MITIGATION OPTIONS

The Paris Agreement, adopted by 197 countries in 2015, aims to significantly reduce global GHG emissions and limit global warming in this century to 2 °C compared to pre-industrial levels, while seeking to reduce the increase to 1.5 °C. The agreement marked the beginning of a shift towards a low-carbon world, and its implementation is essential to achieving the Sustainable Development Goals (SDGs).



The strategy was developed based on reduction scenarios required to achieve the Paris Agreement targets, aligning with the

1.5 °C to 1.8 °C temperature increase. The strategy is a crucial step for the Emirate of Abu Dhabi towards achieving the country's climate neutrality by 2050, as declared by the UAE leadership in October 2021. It is also in line with the efforts of many countries, regions, and cities to reduce GHG emissions and achieve net zero emissions by 2050. The strategy sets goals and targets that are aligned with the best global climate change strategies, builds on the emirate's achievements in climate action, and seeks to achieve great positive changes in carbon impact on GDP, in line with the best countries in the world.

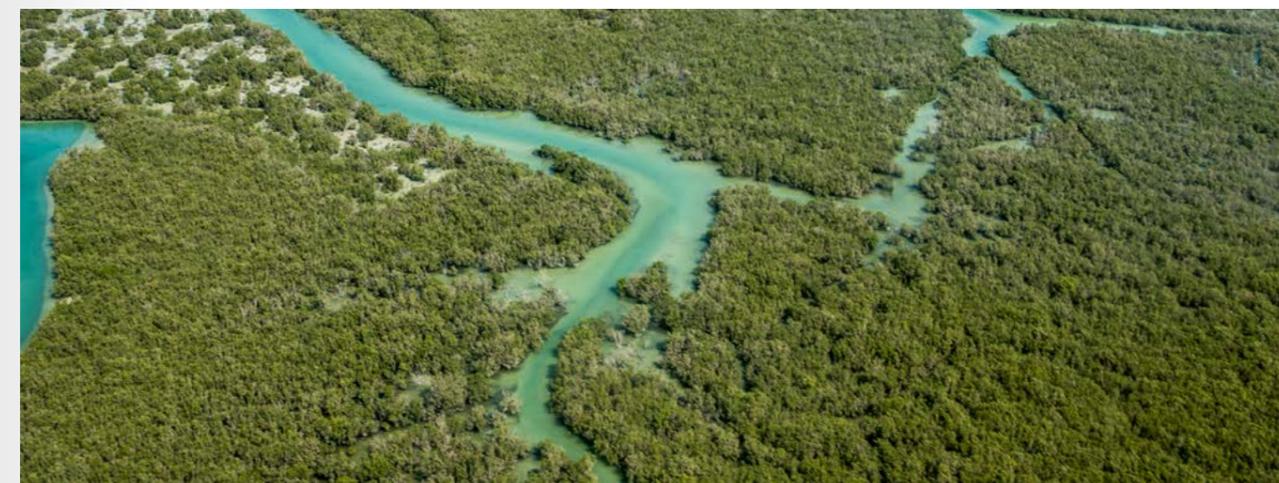
After studying the potential for reducing emissions in key sectors in the emirate from 2023 to 2027, it was found that the medium-term target of a 22 % reduction in emissions over the five years, from the total emissions in 2016 as a base year, was the best option in the climate neutrality journey (contributing to achieving a 35 % reduction by 2030) to limit the temperature rise to no more than 1.8 °C under the Paris Agreement. Other options considered were a very tight 1.5 °C temperature rise option compared to heat rise options exceeding 1.8 or 2 °C.



MEDIUM-TERM TARGET OF 22% REDUCTION IN EMIRATE EMISSIONS 2023-2027 BEST OPTION TO LIMIT TEMPERATURE RISE TO <1.8°C

This option raises the emirate's rank in the emission level index for every US dollar of GDP from a parallel value to the 27th (calculated for countries and not regions) to a value equal to the 43rd ranked countries, making the emirate better than countries such as Japan and Germany (at their 2016 levels).

The MOCCA's Net Zero Pathways Study in 2022 identified three different pathways based on the amount of temperature rise under the Paris Agreement. The "Least-cost" pathway relies on delaying the most expensive measures to reduce the financial impact as much as possible, but it was deemed unsuitable for limiting the temperature increase to 2 °C. The "Diversify" pathway involves making the most of cost reduction in the near future while investing in economic diversification opportunities, making it suitable for achieving the target of a temperature increase of less than two degrees. The "Climate Champion" pathway includes accelerating climate action to stay within the 1.5 °C temperature rise rate as a major target. All these pathways lead to net zero in 2050, but commitment to one of them in the short term, such as this strategy, determines the extent to which the country is committed to reducing the consequences of climate change in terms of increasing the Earth's temperature. Therefore, demonstrating Abu Dhabi's stewardship, the strategy has set a target to reduce emissions in line with the Climate champion pathway, which could also be considered as part of the Diversify pathway³⁴.



10.4 ECONOMIC ANALYSIS

The Net Zero Pathways Study, conducted by MOCCA in 2022, includes an analysis of the economic benefits and costs associated with each pathway. Despite the high costs, the emission reduction targets outlined in this strategy have the potential to deliver significant economic returns. For example, the selected Diversify pathway (*i.e.*, staying within the target of less than 2 °C) is expected to generate economic returns of over AED 975 billion on the country's GDP, with a cost of approximately AED 160 billion until 2050 at current prices. The Climate champion option, while having the highest cost of AED 190 billion until 2050 at current prices, is projected to result in an additional AED 1 000 billion on the country's GDP³⁵.

BENEFITS AND COSTS OF CLIMATE ACTION TO UAE GDP UNTIL 2050

DIVERSIFY PATHWAY:



RETURN
AED **975**
BILLION

COST
AED **160**
BILLION

CLIMATE CHAMPION PATHWAY:



RETURN
AED **1 000**
BILLION

COST
AED **190**
BILLION

Achieving net zero emissions in the four main sectors of Abu Dhabi (water and electricity, oil and gas, transport, and industry) will require significant investments in the medium and long term. According to an initial study by the DOE, the environmental sustainability scenario, which sets a net zero emission target for the energy sector by 2050, will require an additional investment of over USD 7 billion at present value when compared to the benchmark situation without the net zero emission target. To date, the additional costs have not been adjusted downwards to account for the expected significant benefits from carbon absorption and use. In addition, as network emissions approach zero by 2050, the remaining emissions in other energy-intensive sectors continue. Although part of these costs may be passed on to consumers, achieving climate neutrality in these sectors will require increased investment in emission reduction strategies or the purchase of carbon credits to offset emissions. Furthermore, a socio-economic study conducted by the DOE suggests a positive impact resulting from additional investment and lower emissions under the environmental sustainability and entrepreneurship scenario.

ECONOMIC IMPACT TO UAE GDP PER CAPITA BY 2100

BAU SCENARIO: **-8 TO 10%**

PARIS AGREEMENT SCENARIO: **-0 TO 1%**

In contrast, the economic impact of taking no action, or insufficient action, will be significant. Under the BAU scenario, there will be a severe impact on countries' average incomes. The UAE's losses are estimated to be 8–10 % of GDP *per capita* by 2100. However, under the Paris Agreement scenario, which is accompanied by clear emission mitigation policies by 2030, the country's losses are estimated to be between 0–1 % of GDP *per capita* in 2100³⁶.

Nevertheless, the UAE and Abu Dhabi are well-positioned to promote the adoption of clean technologies that are expected to provide more opportunities to rationalise expenditures and create more jobs.

The fourth GHG emission inventory of the EAD shows that the avoidable cost of environmental damage by reducing emissions in 2030 was estimated at USD 12.5–15.8 billion³⁷. This cost was calculated based on reducing emissions by only 8 % from the 2016 baseline according to plans set before 2018.

According to the International Renewable Energy Agency (IRENA), 11 million renewable energy jobs were created globally in 2019, driven by solar PV technologies with around 3.8 million jobs³⁸. Besides employment figures, the sector is expected to enhance workforce upskilling and training. Locally, the ambitious national clean energy target of 50 % by 2030 is in line with the country's objective of encouraging investments, attracting foreign investments, expanding supply to meet domestic energy demand, and diversifying its energy portfolio.

ADOPTING DIVERSIFY OR CLIMATE CHAMPION PATHWAYS WILL:

CREATE **280 000 +** NEW JOBS

DEVELOP AROUND **40 000** EXISTING JOBS

MOCCA's Net Zero Pathways Study in 2022 showed that adopting one of the two pathways, Diversify, or Climate champion, would create over 280 000 new jobs and develop around 40 000 existing jobs³⁹.

10.5 ENVIRONMENTAL ANALYSIS

The option of reducing emissions by 22 % by 2027 (aligned with a 35 % target reduction by 2030) will reduce emissions across the four main sectors: electricity and water, transport, industry, and oil and gas (reducing emissions intensity). In addition, emissions from other sectors, such as agriculture and waste, will also be reduced.

Concerned parties in these sectors have identified the reduction rate in their sectors. Accordingly, more than 25 million tonnes of emissions will be reduced from the total recorded emissions in 2016, without considering all private sector initiatives, as follows:



A 41 % reduction in the electricity or water sector, equivalent to about 16.6 million tonnes of emissions per year.



A 10 % reduction in the transport sector, equivalent to about 2 million tonnes of emissions per year.



A 41 % reduction in the waste sector, equivalent to about 2 million tonnes of emissions per year.



A 20 % reduction in the agriculture sector, equivalent to about 519 000 tonnes of emissions per year.



The percentage of reduction in the industry sector has not been determined yet.



REDUCING OPERATIONAL EMISSIONS INTENSITY -25% BY 2030

In the oil and gas sector, ADNOC is targeting to reduce its operational emissions intensity by 25% by 2030. Work will continue with the company to set interim targets for the percentage change in total sector emissions. It should be noted that the company has identified initiatives that reduce

emissions by around 13 million tonnes. However, there is a need to calculate their impact for 2016 levels, as the emissions associated with this sector can rise as a result of sectoral expansion plans.

Several important private sector initiatives aimed at reducing emissions in the emirate are worth mentioning. For example, the Abu Dhabi Sustainability Group, established by the EAD in 2008, includes more than 50 government entities and major companies operating in the emirate. The Group's key member companies report on their ESG practices⁴⁰, including data on emissions, their timeline, and future commitments, with many setting targets for reducing emissions. Here are some examples:



REDUCING EMISSIONS -421 000 TONNES PER YEAR

EGA aims to reduce emissions by 421 000 tonnes per year.



COMMITMENT TO TRANSITION TO A NET ZERO BY 2050

Etihad Airways aims to reduce its emissions by 50 % by 2035 to reach net zero by 2050.



COMMITMENT TO TRANSITION TO A NET ZERO BY 2050

First Abu Dhabi Bank announced its net zero commitment by 2050, which requires reducing its emissions from ~61 000 tonnes in 2017 to 32 500 tonnes by 2020⁴¹.



REDUCING EMISSIONS NET ZERO IN OPERATIONS BY 2030 NET ZERO IN FUNDING BY 2050

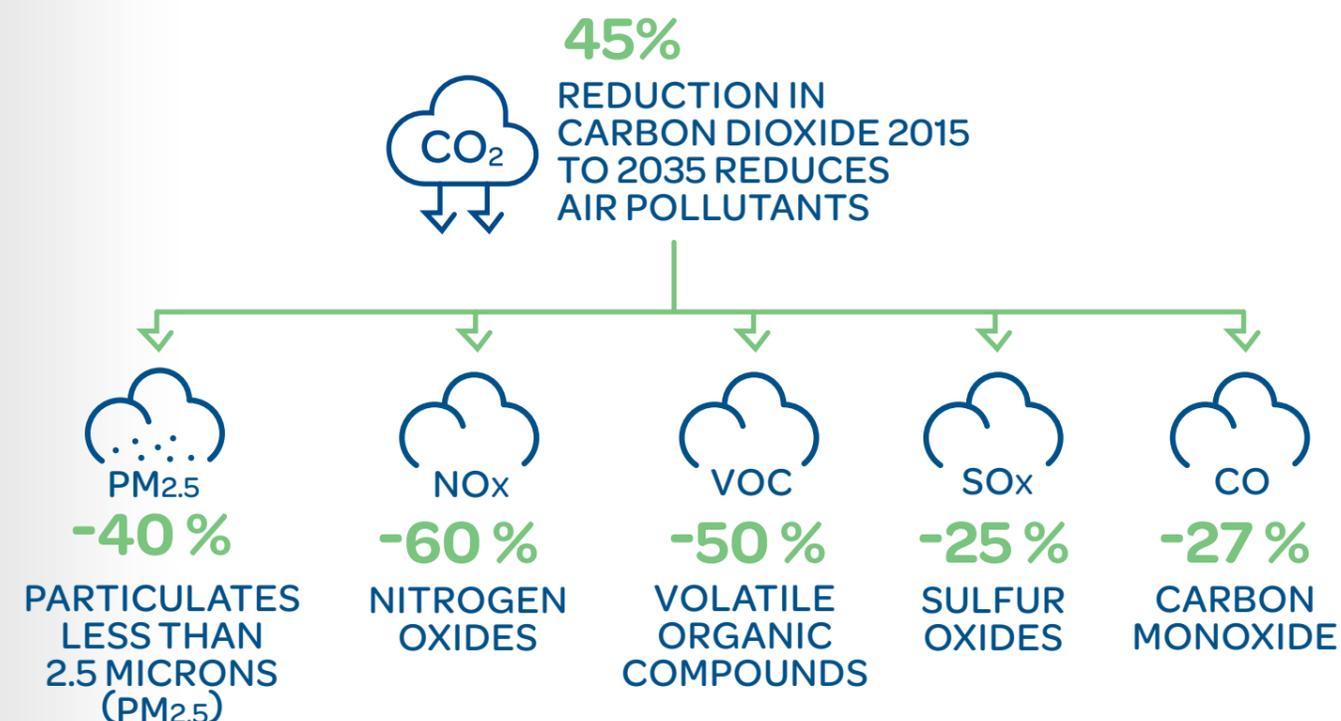
HSBC aims to achieve net zero in its operations by 2030 and in its funding by 2050.

In addition to reducing emissions from key sectors, the strategy's objective is to eliminate GHG emissions by balancing the remaining emissions through natural and artificial carbon sinks of 3 %, equivalent to about 4 million tonnes of CO₂ emissions per year. ADNOC's goal of reducing emissions intensity by 25 % by 2030 will be achieved through the company's 5 million tonnes carbon sinks.

In addition, reducing GHG has significant benefits for air quality. According to the Intergovernmental Panel on Climate Change (IPCC) report, with strict climate policies, the decline in black carbon is expected to slightly exceed 50 % and sulfur dioxide is expected to decline by about 75 %, which would have far-reaching benefits on the ecosystem, resource sufficiency, and energy system flexibility⁴².

In Abu Dhabi, the Abu Dhabi Global Environmental Data Initiative conducted an assessment in 2015 to show the combined benefits of GHG mitigation. The reduction of

emissions associated with the implementation of all policies in the areas of energy, water, transport, and industry would result in a sharp decline in the average annual growth rate of emissions. An assessment of implemented policies revealed that the estimated reduction of carbon dioxide by 45 % in 2035 compared to the base year 2015 would also lead to reduced air pollutants, including a 40 % reduction for particulates less than 2.5 microns (PM2.5), 60 % for nitrogen oxides, 50 % for volatile organic compounds, 25 % for sulfur oxides, and 27 % for carbon monoxide compared to the base year 2015⁴³.



10.6 SOCIAL-HEALTH ANALYSIS

In addition to the job creation described in the economic analysis section above, significant emission reductions are expected to have health benefits, including lower rates of disease and mortality associated with exposure to pollutants and heat waves.

MOCCAЕ conducted an assessment of the impact of climate change on health and identified high and medium risks associated with strokes and stress resulting from heat waves. Vulnerable groups such as outdoor workers, the elderly, children, and individuals with special conditions like diabetes, high blood pressure, and

social isolation will be most affected. According to a 2019 report issued by the Ministry of Health and Prevention, if high emissions scenario continues, the number of deaths due to heat is expected to increase by up to 15 persons per 100 000 for those aged 65 and above by 2080, compared to almost zero deaths per 100 000 people per year between 1961 and 1990. The report concluded that rapid emission reductions could contribute to an 80 % reduction in heat-related deaths⁴⁴.

MOCCAЕ’s Net Zero Pathways Study in 2022 found that focusing on improving air quality through emissions reduction will lead to significant public health improvements, starting as early as 2025. (Currently being identified)

According to a 2015 report by the Abu Dhabi Global Environmental Data Initiative, reducing GHG emissions is closely linked to improving air quality and is expected to have common health benefits in the emirate.

EAD’s fourth GHG emission inventory indicates that mitigation strategies will improve air quality by reducing short-lived gases and particulates arising from human activities, resulting in around 839 fewer early deaths and 11 700 fewer health facility visits in 2030 compared to the “business as usual” scenario in 2016⁴⁵.

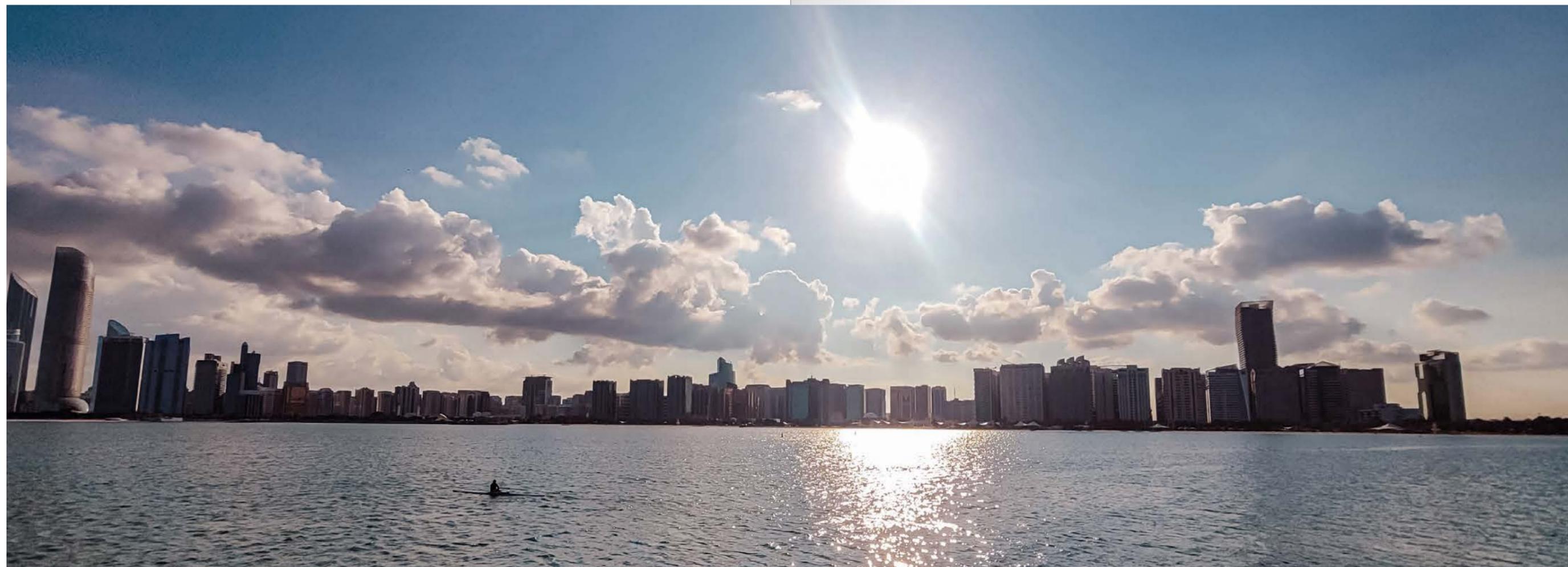
By implementing climate mitigation policies that also improve air quality, it is possible to further reduce disease and mortality rates associated

with air pollution and GHG emissions from the land transport sector.

IMPROVED AIR QUALITY COMPARED TO BAU BY 2030

-839
EARLY DEATHS

-11 700
HEALTH FACILITY VISITS





SECTION 11

DETAILED ACTION PLAN 2023-2027

The strategy has identified various existing, approved, and new initiatives and projects required to achieve its objectives for each of the set targets. Although measuring the contribution of each initiative to the set targets is challenging, the key initiatives associated with emission mitigation have clearly stated their contribution to the reduction targets. In terms of achieving the targets, the strategy aims to accomplish the following:

Strategy Objective	Strategic Target	What the Strategy Initiatives will Achieve	Remarks
Enhance resilience of vulnerable sectors to adapt to climate change impacts	100 % of the 4 key sectors have adaptation plans in place	<ul style="list-style-type: none"> The entities responsible for the four key sectors (infrastructure, energy, environment, and health) have identified new initiatives for each of these sectors to have ambitious adaptation plans by 2024. 	The plans will define adaptational targets to be achieved for each of the key sectors. All four sectors will be protected from the impacts of climate change by 2050.
Reduce GHG emissions in key sectors	Reduce GHG emissions by 22 % by 2027 compared to the base year 2016	<ul style="list-style-type: none"> A 41 % reduction in the electricity and water sector, equivalent to about 16.6 million tonnes of emissions per year compared to 2016 levels. A 10 % reduction in the transport sector, equivalent to about 2 million tonnes of emissions per year compared to 2016 levels. A 41 % reduction in the waste sector, equivalent to about 2 million tonnes of emissions per year compared to 2016 levels. A 20 % reduction in the agriculture sector, equivalent to about 519 000 tonnes of emissions per year from 2016 levels. The percentage of reduction in the industry sector has not been determined. In the oil and gas sector, ADNOC is targeting to reduce its operational emissions intensity by 25 % by 2030. 	Aligned with the 30 % target by 2030, which also aligns with the 1.5-1.8 °C temperature rise trajectory (closest to the Climate champion trajectory).

Strategy Objective	Strategic Target	What the Strategy Initiatives will Achieve	Remarks
Increase removal of greenhouse gas (GHG) emissions through carbon sinks	3% of emissions removed from the total emission	Percentage of CO ₂ emissions removed from total emissions through natural sinks, equivalent to about 4 million tonnes of emissions per year.	ADNOC is working on removing 5 million tonnes through artificial sinks by 2030.
Drive a low-carbon innovation and economic diversification agenda	10% of Abu Dhabi investments in ESG-compliant companies committed to climate action by 2050	The Department of Economic Development, Abu Dhabi Global Market, and the emirate's investment funds will work together to develop the target for the next five years, along with its desired outcomes.	This indicator can be measured through ESG reports issued by major companies.

A detailed list of initiatives and projects is developed separately from the strategy document.





SECTION 12

STRATEGY IMPLEMENTATION REQUIREMENTS



Multiple factors need to be in place to execute the strategy. The main factors are as follows:



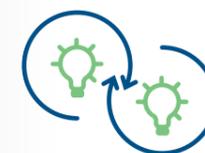
Entities' commitment to implement their initiatives and projects and follow up on implementation within a clear governance framework from the ADEO.



Provide the necessary financial and technical support to implement these initiatives and projects.



Engage and encourage the private sector to adopt policies and implement programmes that support climate action.



The need to adopt a platform for the transfer of expertise and knowledge exchange, especially with regard to technical and technological requirements.



SECTION 13

LIST OF TERMS

Term	Definition
Climate change	Climate change is the result of human activity that directly or indirectly changes the composition of the atmosphere, in addition to natural climate variations over a given period of time.
Adaptation to climate change	This refers to various measures taken to reduce the exposure of both natural and human systems to present or future impacts of climate change. Different types of adaptation can be identified, such as proactive and reactive adaptation, private and public adaptation, and automatic and planned adaptation. Examples of such measures include the construction of dams on rivers or seawalls on coasts, replacing sensitive facilities with new ones that are more heat- and shock-resistant, among others.
Mitigation or reduction of climate change	This refers to the use of technological advancements and replacement of existing resources in order to reduce emissions for each unit of input. While there are many social, economic, and technological policies that can reduce emissions related to climate change, mitigation involves applying policies to lessen GHG emissions and improve their sinks.
Carbon capture and storage	This process involves the separation of CO ₂ from industrial and energy sources and transporting it to storage sites to isolate it from the atmosphere on a long-term basis.
United Nations Framework Convention on Climate Change	The Convention was adopted in New York on May 9, 1992, and was signed by more than 150 countries, along with the European Union, at the Earth Summit in Rio de Janeiro in 1992. The main objective of this agreement is "to stabilize greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interventions in the climate system". Moreover, the Convention entails the commitment of all parties. Under the Convention, Parties listed in Annex I to the Convention aim to control GHG emissions not regulated by the Montreal Protocol at 1990 levels by the year 2000. The Convention entered into force in March 1994.
Emissions trading	A market-based approach to achieving environmental objectives that allows those who reduce GHG emissions below the maximum emission level to use or trade in excess reductions to compensate for emissions from another source within or outside the country. Trading can occur between companies or at the local and international levels. The principle of using "licenses" for domestic trade regimes or "quotas" for international trade regimes was adopted in the second assessment report prepared by the Intergovernmental Panel on Climate Change (IPCC). Emissions trading under Article 17 of the Kyoto Protocol is a negotiable quota system based on assigned amounts calculated on the basis of commitments listed in Annex B to the Protocol for reducing and minimizing emissions.

Term	Definition
Equivalent CO₂ Emission	The amount of CO ₂ emission that produces the same radiation effect as a given greenhouse gas, or a mixture of well-blended greenhouse gases, all multiplied by their global warming potential. The calculation takes into account the different times at which they remain in the atmosphere.
Clean technologies	Production engineering and processes that reduce pollutants and environmental impacts inherent in industrial production.
Equivalent CO₂ concentration	The concentration of carbon dioxide that produces the same amount of radiation effect as any combination of carbon dioxide and other GHGs.
Biodiversity	Biodiversity refers to the diversity of organisms derived from all sources, including terrestrial and marine ecosystems, aquatic organisms, and ecological compounds of which they are part, including diversity within species and between species and ecosystems.
Carbon dioxide (CO₂)	A natural gas and a byproduct of burning fossil fuels and biomass, and of changes in land use and industrial processes. It is the main anthropogenic greenhouse gas that affects the earth's radiative balance. It is also the reference gas by which all greenhouse gases are measured, and therefore it has the potential to cause a global warming rise of 1 degree Celsius.
Carbon market	A trading system through which countries may purchase or sell units of GHG emissions in an attempt to apply their national emissions restrictions, either under the Kyoto Protocol or under other agreements.
Carbon tax	Tax levied by governments on the use of carbon fuel.

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